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THE IMPACT OF FAMA-FRENCH FACTORS AND COSKEWNESS IN ISE

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DECLARATION

I hereby declare that this master’s thesis titled as “The Impact of Fama-French Factors and Coskewness in ISE” has been written by myself without applying the help that can be contrary to academic rules and ethical conduct. I also declare that all materials benefited in this thesis consist of the mentioned resourses in the reference list. I verify all these with my honour.

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ÖZET

Yüksek Lisans Tezi

Fama French Faktörlerinin ve Piyasa Faktörünün İmkb'deki Etkisi

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Varlık fiyatlandırma yatırımcılar ve finans bilim adamları için her zaman ilgi çekici bir konu olmuştur. Varlık fiyatlandırma kavramında, Sermaye Varlıklarını Fiyatlandırma Modeli (SVFM) önemli bir yere sahiptir. SVFM, geliştirildiği günden itibaren finans dünyasında büyük ilgi görmüştür. Model hala portföy yönetimi ve sermaye maliyetinin tahminlemesi vb. akademik çalışma ve uygulamalarda yaygın olarak kullanılmaktadır. SVFM, gerçekçi olmayan varsayımlarından dolayı çok sayıda eleştiri almıştır. Modelin geliştirilmesinden günümüze kadar, modelin çeşitli türevleri ortaya çıkmıştır.

Bu tez çalışmasında, Sermaye Varlıklarını Fiyatlandırma Modeli, Fama French Üç Faktör Modeli ve Fama French Üç Faktör Modeli' ne piyasaya göre çarpıklık faktörünün eklenmesiyle oluşan Dört Faktör Modeli uygulanmıştır. Temmuz 2002- Haziran 2010 döneminde, piyasaya göre çarpıklık faktörünün endüstri, büyüklük, defter değeri/piyasa değeri ve piyasa değeri ve momentuma göre İMKB' de yer alan hisselerden oluşturulmuş olan portföylerin değişkenliğindeki etkisi, Harvey ve Siddique (2000)' nun metodolojisine benzer bir yöntem kullanılarak incelenmiştir. Daha sonra, piyasaya göre çarpıklık faktörü ve Fama French faktörlerinin piyasa faktörünün portföylerin artık getirilerinin değişkenliğini açıklama gücünü arttırıcı bir etkisinin olup olmadığı Gibbons–Ross–Shanken (1989)' in çok değişkenli testi ile test edilmiştir. Son

olarak, incelenen varlık fiyatlandırma modellerinde yer alan faktörlerin açıklama gücü Fama- MacBeth ve Full Information Maximum Likelihood (FIML) metotları ile test edilmiştir.

Anahtar Kelimeler: Varlık Fiyatlandırma, Piyasaya Göre Çarpıklık, Fama French Faktörleri, İMKB.

ABSTRACT

Master's Thesis

The Impact of Fama French Factors and Coskewness in ISE

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Asset pricing is always an attractive topic for investors and finance scholars. The Capital Asset Pricing Model (CAPM) has an important place in the concept of asset pricing and it has attracted a great deal of attention by the finance world since it was developed. It is still widely used in academic research and applications, such as portfolio management and estimation of the cost of capital. The CAPM has taken a large number of criticism because of its unrealistic assumptions and from the time of the creation of the model to the present, different versions of the model have emerged

In this dissertation, the CAPM, the Fama French Three Factor model and the Four Factor Model which incorporates co-skewness – third order co-moment- into the Fama French Three Factor model are implemented. The impact of coskewness on the variation of portfolios that are formed according to industry, size, book to market ratio and momentum for ISE over the period July 2002 to June 2010 are investigated by using a similar methodology to Harvey and Siddique (2000). Then by performing multivariate testing procedure of Gibbons–Ross–Shanken (1989), these models are tested to reveal whether there is an incremetal effect of coskewness and Fama French factors to the market factor in explaining the variations of excess returns. Lastly, the explanatory power of factors in the analysed asset pricing models are tested by means of the Fama- MacBeth and Full Information Maximum Likelihood (FIML) methods.

Key Words: Asset pricing, Co-skewness, Fama French Factors, ISE.

THE IMPACT OF FAMA-FRENCH FACTORS AND COSKEWNESS IN ISE

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CHAPTER TWO
EMPIRICAL ANALYSIS

ABBREVIATIONS

AMEX American Stock Exchange

APT Arbitrage Pricing Theory

BH Portfolio contains the stocks in the big size group that are also in the high book to market- value- group

BL Portfolio contains the stocks in the big size group that are also in the low book to market- value- group

BM Portfolio contains the stocks in the big size group that are also in the medium book to market- value- group

BE/ME Book to Market Ratio

BLEV Book Leverage

CAPM Capital Asset Pricing Model

CRSP Center for Research in Security Prices

D/(D + BE) Debt to Book Value of Total Assets

D/(D + ME) Debt to Total Assets

E/P Earning to Price Ratio

EAFE Europe, Australia, and the Far East

EI/BE Earnings on Book Equity

FF Fama French Factors

FIML Full Information Maximum Likelihood

FTSE Financial Times Stock Exchange

GIL Turkish Government Internal Loan Index

GRS Gibbons, Ross and Shanken

HML High Minus Low

HMLEP High Minus Low E/P Ratio Stocks

IFC International Finance Corporation

ISE Istanbul Stock Exchange

LS Least Squares

LSE London Stock Exchange

LTS Least Trimmed Squares

ME Market Equity

MLEV Market Leverage

NASDAQ National Association of Securities Dealers Automated Quotations

NYSE New York Stock Exchange

OLS Ordinary Least Squares

P/E Price to Earning Ratio

REIT Real Estate Investment Trust

RMSE Root Mean Squared in-Sample Pricing Error

S^- Portfolio of stocks with the most negative coskewness

SH Portfolio contains the stocks in the small size group that are also in the high book to market- value- group

SL Portfolio contains the stocks in the small size group that are also in the low book to market- value- group

SM Portfolio contains the stocks in the small size group that are also in the medium book to market- value- group

SKS Coskewness mimicking portfolio

SMB Small Minus Big

SUE Standardized Unexpected Earnings

SUR Seemingly Unrelated Regression

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INTRODUCTION

Asset pricing that has more than three hundred years old history (Cheng and Tong, 2008:1) is always an attractive topic for investors and finance scholars. The Capital Asset Pricing Model (CAPM) of William Sharpe (1964) and John Lintner (1965) marks the birth of asset pricing theory (Fama and French, 2004:25). The CAPM has attracted a great deal of attention by the finance world since it was developed. It is still widely used in academic research and applications, such as portfolio management and estimating the cost of capital.

The CAPM's main implication is that the variation of excess stock returns can be explained by the market factor –systematic risk- alone. During the last half-century, the validity of the model has been investigated. Even though early studies about the CAPM have found some supporting evidence (Black, Jensen and Scholes (1972), Fama and MacBeth (1973)), a large body of literature has documented the invalidity of the model

The CAPM has taken a large number of criticism because of its unrealistic assumptions. From the time of the creation of the model to the present, some versions of the model have emerged. In recent years, the discussion is focused on the two assumptions of classical CAPM: asset returns have normal distribution and market excess return is the unique factor in explaining the variation of excess returns. In the literature, there have been studies providing supporting evidence against both of these assumptions. Some studies have concluded that asset returns are characterized by skewness and significant leptokurtosis[1]; providing evidence against the normality assumption. Again, some other studies have found ignored firm specific factors such as size and value as significant factors[2]. Up to the study of

[1] Examples of evidence on the nonnormality of returns include Chunhachinda et al. (1997) that represent the returns of the world's 14 major stock markets are not normally distributed. For ISE, Harris and Kucukozmen (2001) reject the normality of daily equity returns.

[2] On the second criticism area, there have been a large number of studies identifying a number of variables that have explanatory power on the cross sectional variation in stock returns in addition to

Harvey and Siddique (2000), these assumptions were analysed seperately. Harvey and Siddique (2000) take into consideration the two criticized points together and develop "Four Factor Model" by adding coskewness factor to the Three Factor Model that includes size and value premium in addition to market beta. The study is taken as a basis for most subsequent studies considering skewness in the asset pricing models.

Lin and Wang (2003) adopt the methodology of Harvey and Siddique (2000) for Taiwan stock market during the period January 1986 to December 2000. For Istanbul Stock Exchange (ISE), the study of Mısırlı and Alper (2008) is the first and only study investigating the relative importance of coskewness in explaining the variation of excess returns in ISE. They investigate the impact of coskewness on the variation of portfolio excess returns in ISE over the period July 1999 to December 2005 by adopting similar methodology with Harvey and Siddique (2000).

In this dissertation, the CAPM, the Fama French Three Factor model and the Four Factor Model are implemented. The purpose of this dissertation is to investigate the impact of coskewness on the variation of portfolios that are formed according to industry, size, book to market ratio and momentum for ISE over the period July 2002 to June 2010 by using the similar methodology to Harvey and Siddique (2000).

This dissertation adds to the existing literature on ISE and emerging markets in two dimensions. There is no previous dissertation trying to reveal the possible incremental effect of coskewness factors over market factor and size and value factors in explaining the variations of excess returns in ISE. The other intended contribution of this dissertation is to use an extended dataset compared to previous

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the market beta. Firm size (Banz (1981), Keim (1983)) and book-to-market equity (BE/ME) (Rosenberg et al., 1985; Chan, Hamao and Lakonishok (1991) are two of the most significant factors in explaining the cross-section of average returns. Aydogan and Gursoy (2000), Gonenc and Karan (2003), Bildik and Gulay (2002), Aksu and Onder (2003), Gokgoz (2007) are some of the important researches investigating the effects of firm specific factors on the stock returns of ISE firms.

studies on ISE. The dataset includes all stocks that are listed in ISE during 1998-2010.

The remainder of this dissertation is organized as follows. In chapter one, a brief history of the CAPM, multifactor models and asset pricing models with higher order co-moments and examination of the previous studies that fall in to their categories will be given. In the first section of chapter two, the data and their sources will be presented. Then, data sampling criteria and portfolio formation process will be explained and preliminary statistics will be given. In the next section, the effectiveness of the CAPM, the Three Factor Model and the Four Factor Model will be tested and compared through time series analysis. In this section, the multivariate test of Gibbons, Ross and Shanken (GRS) (1989) will be applied to ISE. In the last section of this chapter, cross sectional regressions will be run following Fama–MacBeth (1973) as well as full information maximum likelihood (FIML) to investigate the incremental power of coskewness over CAPM and Fama–French factors. In the last section, conclusion part will be introduced.

CHAPTER ONE
ASSET PRICING MODELS

1.1 THE CAPITAL ASSET PRICING MODEL

The CAPM developed by Sharpe (1964) and Lintner (1965) relates the expected rate of return of an individual security to its systematic risk. The foundations for the development of asset pricing models were laid by Markowitz (1952) and Tobin (1958) (Galagedera, 2007:821). Markowitz (1952) argues for the explicit recognition of risk and its quantification in terms of variance. He also introduces the notion of a mean-variance efficient portfolio as one that (1) provides minimum variance for a given expected return and (2) provides maximum expectereturn for a given variance (Markowitz, Todd and Sharpe, 1987:x). His model represents the efficient frontier of portfolios and the investors are expected to select a portfolio in accordance with their risk preferences from the efficient portfolio set.

According to the model of Markowitz, investors only care about the mean and variance of portfolio alternatives during one-period investment horizon. Sharpe (1964) and Lintner (1965) add two key assumptions to the Markowitz model to identify a portfolio that must be mean-variance-efficient. The first assumption is complete agreement, and second is that there is borrowing and lending at a risk-free rate, which is the same for all investors and does not depend on the amount borrowed or lent. (Fama and French, 2004:26).

Tobin (1958) shows that under certain conditions Markowitz's model implies that the process of investment choice can be broken down into two phases: first, the choice of a unique optimum combination of risky assets; and second, a seperate choice concerning the allocation of funds between such a combination and a single riskless asset (Sharpe, 1964:426).

These theories were later expanded by Treynor (1961), Sharpe (1964), Lintner (1965) and Mossin (1966) (Rejepova, 2005:3). They develop a computationally efficient method, the single index model, the CAPM, where return on an individual security is related to the return on a common index (Jones, 1991). The notation that the CAPM bases on is that intelligent, risk –averse shareholders will seek to diversify their risks, and, as a consequence, the only risk that will be rewarded with a risk premium will be a systematic risk (Shapiro and Sarin, 2009:415).

The CAPM is developed under these assumptions (Focardi and Fabozzi, 2004:512):

- Investors make investment decisions based on the expected return and variance of the return.
- Investors are rational and risk averse.
- Investors subscribe to the Markowitz method of portfolio diversification.
- Investors all invest for the same period of time.

- Investors have the same expectations about the expected return and variance of all assets.
- There is a risk-free asset and investors can borrow and lend any amount at the risk-free rate.
- Capital markets are completely competitive and frictionless.

The assumptions of the CAPM imply that the market portfolio M must be on the minimum variance frontier if the asset market is to clear. This means that the algebraic relation that holds for any minimum variance portfolio must hold for the market portfolio. Specifically, if there are N risky assets (Fama and French, 2004:28);

(Minimum Variance Condition for M) $E(R_i) = E(R_{ZM}) + [E(R_M) - E(R_{ZM})]\beta_{iM}$, $i = 1, .. , N$.

where E(Ri) is the expected return on asset i, and β_{iM}, the market beta of asset i, Cov (R_i, R_M) is the covariance of its return with the market return divided by the variance of the market return,

$$\beta_{iM} = \frac{Cov(R_i, R_M)}{\sigma^2(R_M)}$$

Another implication of the CAPM is that all investors hold the market portfolio and non-systematic risk is diversified away. So, the only systematic risk is taken into account.

The CAPM predicts that the expected return on an asset above the risk-free rate is linearly related to the systematic risk, which is measured by the asset's beta. This model assumes that, investors only care about expected return and variance of the return in their investment decision making process and are exposed to only systematic risk that is represented by "beta" in this model equation. An asset can have positive, negative or zero beta. If an asset has positive beta, it moves in the same direction as the market portfolio. For the assets having a negative correlation to the market portfolio, the beta will be negative and they will move in the opposite direction to the market portfolio. On the other hand, beta of the assets having zero correlation between their returns and market's return such as risk free assets are zero.

During the last half century, there have been numerous studies investigating the validity of the CAPM for developed and emerging markets. In early studies about the CAPM, some supporting evidence about the model have been found (Black, Jensen and Scholes (1972), Fama and MacBeth (1973)). But by the early 1970s, several studies suggest that there are deviations from the linear CAPM risk return trade-off due to other variables that affect this tradeoff. The purpose of these studies are to find the components that CAPM is missing in explaining the risk-return trade-off and to identify the variables that create those deviations (Michailidis et al., 2006:80). As a result of these studies, modifications to the model have been made and versions of the model have emerged (Lintner (1971), Sharpe and Cooper (1972), Mayers (1976), Merton (1973), Rubinstein (1976), Elton and Gruber (1978), Breeden, Gibbons and Litzenberger (1989), Fama and French (1995), Kraus and Litzenberger (1976), Harvey and Siddique (2000)). Zero Beta CAPM, Consumption Based CAPM, Multifactor Models, CAPM with Higher Order Co-moments, Multi-Period CAPM and Multi-Beta CAPM are the most widely used versions of the CAPM. There are numerous studies conducted about the traditional CAPM and its versions. In Appendix-A, some of the important empirical studies about the CAPM and its versions are given.

1.2 MULTI-FACTOR MODELS

The majority of the asset pricing literature provide evidence that the variation in the excess stock returns cannot be explained by the market beta alone and show that macroeconomic factors and some firm specific factors such as size and book to market ratio (BE/ME) can explain a sizeable portion of these variations.

Multi factor asset pricing models are constructed by adding these significant factors and various macro economic factors to the market factor in the CAPM. In this section, the Arbitrage Pricing Theory (APT) that considers macro economic factors and the studies investigating firm specific factors in the asset pricing concept will be addressed. The Fama French Three Factor Model, regarded as the most important of the studies that investigate firm specific factors, will be described in detail.

1.2.1 The Arbitrage Pricing Theory

The Arbitrage Pricing Theory is a multi-factor model developed by Ross (1976). The APT assumes that stock returns are generated according to factor models. According to the APT, there are n systematic factors that cause asset returns to systematically deviate from their expected values. The theory does not specify how large the number n is, nor does it identify the factors. It simply assumes that these n factors cause returns to vary together. There may be other, firm-specific reasons for returns to differ from their expected values, but these firm-specific deviations are not related across stocks. Since the firm-specific deviations are not related to one another, all return variation not related to the n common factors can be diversified away (Davis, 2001:3).

The equation of the APT is given below:

$$E(r_j) = r_f + b_{j1}RP_1 + b_{j2}RP_2 + \ldots + b_{jn}RP_n \qquad i=1, \ldots, N$$

E_i= ith asset's expected return

r_f = risk free rate

b_{i1}= sensitivity of the ith asset to factor n also called factor loading,

RP_k= risk premium of the factor

The equation states that the security's expected return is related to the security's factor betas. Each factor represents risk that cannot be diversified away. The higher a security's beta with regard to a particular factor is, the higher is the risk that the security bears. In a rational world, the expected return on the security should compensate for this risk. The above equation states that the expected return is a summation of the risk-free rate plus the compensation for each type of risk that the security bears (Ross, Westerfield and Jaffe, 2002:299).

1.2.2 Studies Investigating Firm Specific Factors in Asset Pricing

The APT studied the effects of a few pervasive factors that are dominant source of co-variation among asset returns. While the studies continue to be made to enhance the CAPM, towards the 1980s, firm specific factors are started to evaluate in asset pricing concept. There have been lots of empirical studies investigating those factors in this concept. Among the studies, the one that had created a tremendous impression and widely used in the finance world is the Fama French Three Factor Model.

This sub-section is divided into two parts. In the first part, the previous important studies that only considers one firm specific factor -size, book to market, price to earnings (P/E) ratio and debt to equity -in addition to the market factor will be addressed. In the second part, the previous important studies analyzing the effects of two or more firm specific factors jointly on the stock returns, again in addition to the market factor will be addressed.

1.2.2.1 Studies Investigating the Effects of One Firm Specific Factor on Stock Returns

1.2.2.1.1 Price to Earnings Ratio

One important factor that is used to explain the variation of the excess stock returns is price to earning ratio. Price to earnings ratio displays the relative stock returns when other factors are kept constant. It is widely argued that the P/E ratio implicitly incorporates the perceived riskiness of a given company's future earnings and it reflects the structure of the balance sheet of the company (Setiawan,2010:24).

Basu (1977) empirically tests whether the investment performance of common stocks is related to their P/E ratios by using the database that represents over 1400 industrial firms, which actually traded on the New York Stock Exchange (NYSE) between September 1956-August 1971. He computes the P/E ratio of every sample security and rank them in an ascending order. Then he divides the securities into five portfolios in accordance with this ranking. He implements the CAPM to the excess returns of these portfolios. According to the result of this study, the low P/E portfolio groups have earned higher absolute and risk-adjusted rates of return than the high P/E securities. This result asserts that P/E ratio is related to average stock returns in the U.S.

P/E ratio is used in later studies with other firm specific factors, such as size, book to market ratio etc. [3]These studies will be addressed under the heading of Studies Investigating The Effects of Two or More Firm Specific Factors On Stock Returns.

1.2.2.1.2 Size Effect

As mentioned before, firm specific factors' explanatory effects on the variation of the stock returns are studied starting from the years of 1980s. While in the earlier studies, the additional explanatory power of size factor over the CAPM is investigated, subsequent studies use this factor with other firm specific factors, especially with book to market ratio.

Banz (1981) investigates whether the size effect exists as a relevant factor for asset pricing. He examines the relationship empirically between the return and the total market value of NYSE common stocks during the period 1936-1975. He uses the following asset pricing model in this study:

[3] e.g. Reinganum (1981), Basu (1983) and Jaffe, Keim and Westerfield (1989) examine the size and earnings- price factors' effects jointly on the variation of stock returns. Chan, Hamao and Lakonishok (1991) uses earnings yield, size, book to market ratio, and cash flow yield for Japanese stocks.

$$E(R_i) = \gamma_0 + \gamma_1\beta_1 + \gamma_2\,[(\varphi_i - \varphi_m)/\,\varphi_m]$$

where

E(Ri): Expected return on security i,

γ_0: Expected return on a zero beta portfolio

γ_1: Expected market risk premium

γ_2: Constant measuring the contribution of ϕ_i to the expected return of a security

φ_i:Market value of security i and

φ_m: Average market value

He finds that on average, small NYSE firms have significantly larger risk over the whole analysis period. Investors can earn from holding very small firms long and very large firms short, on average, 1,52 percent per month or 19,8 percent on an annualized basis. The size effect is not linear in the market proportion but it is most pronounced for the smallest firms in the sample.

Keim (1983) examines the empirical relation between abnormal returns and market value of NYSE and American Stock Exchange (AMEX) common stocks month by month over the period 1963-1979. His findings show that daily abnormal return distributions in January have large means relative to the remaining eleven months, and that the relation between abnormal returns and size is always negative and more pronounced in January than in any other month.

Chan and Chen (1991) examine the differences in structural characteristics that lead firms of different sizes to react differently to the same economic news. They find that a small firm portfolio has low production efficiency and high financial leverage. In their analysis they construct two size-matched return indices designed to mimic the return behavior of marginal firms and find that these return indices are important in explaining the time-series return difference between small and large firms. They conclude that the size effect is mainly driven by marginal firms in distress.

1.2.2.1.3 Book to Market Ratio

Another important and one of the most used firm specific factors in asset pricing is book to market ratio. According to the studies investigating developed markets, small capitalization, high BE/ME “value” stocks earn higher returns than high priced “growth” stocks.

Rosenberg, Reid and Lanstein (1985) examine the relationship between stock returns and book-to-market ratio for the common stocks of NYSE firms during the period January 1973- September 1984. They find that firms with high BE/ME have higher returns than firms with low BE/ME (Drew and Veeraraghavan, 2002:337-338).

Lakonishok, Schleifer and Vishny (1994) try to make potential statements for why portfolios with high BE/ME (value strategies) outperform the market, using the stocks in the NYSE and AMEX during the period April 1963- April 1990. They bring an explanation about why value strategies have produced superior returns by using the overreaction hypothesis, like the studies of DeBondt and Thaler (1987) and Haugen (1995).

Their results establish three propositions. First, a variety of investment strategies that involve buying out of favor stocks have outperformed glamour strategies over the analysis period. Second, the market participants appear to have consistently overestimated future growth rates of glamour stocks relative to value stocks. Third, using conventional approaches to fundamental risk, value strategies appear to be no riskier than glamour strategies.

1.2.2.1.4 Debt to Equity

Researchers found that leverage is another factor affecting the stock returns. Bhandari (1988) investigates the effect of debt to equity ratio on the expected common stocks returns during the period 1948- 1981. He divides the difference between the book value of total assets and common equity to the market value of common equity and uses as debt to equity ratio. According to his result, expected common stock returns are positively related to the ratio of debt (non-common equity liabilities) to equity, controlling for the beta and firm size and including as well as excluding January, though the relation is much larger in January.

1.2.2.2 Studies Investigating the Effects of Two or More Firm Specific Factors on Stock Returns

The mentioned previous studies above that examine the effects of only one firm specific factor as an additional factor to the market factor in explaining the variation of excess stock returns, present evidence against the CAPM. Those additional factors such as size, book to market ratio etc. have been shown to be significant determinants of variation of excess returns. From this point forth, studies that incoporate two or more firm specific factors into the CAPM have been made. In this part, those studies for developed and emerging markets will be addressed under the two headings.

1.2.2.2.1 Studies for Developed Markets

Reinganum (1981), Basu (1983) and Jaffe, Keim and Westerfield (1989) examine the size and earnings- price factors' effects jointly on the variation of stock returns. Reinganum (1981) tests the validity of the CAPM and efficient market hypothesis. He uses the model of Latane, Jones and Rieke (1974) and Latane and Jones (1977) about standardized unexpected earnings (SUE) to test whether abnormal returns can be earned during the period from 4th quarter of 1975 to 3rd quarter of 1977. He constructs low and high SUE portfolios and test whether the difference in the expected returns between these portfolios is zero. The mean difference between these portfolios is not found statistically significant. The result supports the assumption of market efficiency and the CAPM. Then he constructs ten earnings to price ratio (E/P) and intersection of size and E/P portfolios by using the ranked E/P and market value of analysed firms by using the annual data from 1963 to 1977. He implements the CAPM for these constructed portfolios and compares mean excess return, beta and average median of them. His findings suggest that the simple one-period capital asset pricing model is misspecified. The set of factors omitted from the equilibrium pricing mechanism seems to be more closely related to firm size than E/P ratios.

Basu (1983) examines the empirical relationship between earnings' yield, firm size and returns on the common stock of NYSE firms during the period 1963-1979. He shows that E/P is a significant factor in explaining the cross-section of average returns on U.S. stocks and there is a positive relationship between average return and E/P during the analysis period. Also he claims that E/P effect subsumes the size effect due to the disappearance of size effect when both variables are jointly considered (Jaffe, Keim and Westerfield 1989:135).

Jaffe, Keim and Westerfield (1989) reexamine the relation between stock returns and the effects of size and earnings to price ratio for the period 1951- 1986 – longer sample period than the studies previously made for the two factor- by considering the difference between January and other months. Different findings and opinions about the relationship and interaction between size and E/P factors motivate them to make this research.

They use two ranking procedures in the portfolio formation. In the first one, initially they rank the analysed firms on the ratio of year-end earnings to share price at the end of March in each year and placed into one of six groups. Then, they rank the stocks in each E/P group on the March 31 market value of their common stock outstanding. The procedure in the second one is identical to the first one except that firms are ranked on market value first and then ranked on E/P.

They use the following Seemingly Unrelated Regression (SUR) model to test for significance of the size and E/P effects by considering the differences in the effects in January versus the other months:

R_{pt}- R_{Ft}= α_{0j} D_{jt} + $\alpha_{0r}(1- D_{jt})$ + $\beta_{pj}(R_{mt}-R_{Ft})D_{jt}$ + $\beta_{pr}(Rmt-R_{Ft})$ (1- D_{jt}) + α_{1j} $[(E/P_{pt})D_{jt}]$ + α_{1r} $[(E/P_{pt})D_{jt}]$ + α_{2j} $(LMVE_{pt}D_{jt})$ + α_{2r} $[(LMVE_{pt}$ $(1-D_{jt})]$ + ept

p=1,…,25 and t=1,…,T

where D_{jt} is a dummy variable that takes the value of one if month t is January and zero otherwise, R_{mt} is the monthly return for the market index, R_F is the monthly return on a risk free asset, E/P_{pt} is the average earnings to price ratio of the securities in portfolio p for time t, and $LMVE_{pt}$ is the natural logarithm of the average market value of outstanding common stock in the portfolio for time t.

According to their findings, E/P and size effects are significant for the whole sample period. The result is inconsistent with Basu (1983) and Reinganum (1981). When they consider the January effect, they find a difference between January and the rest of the year; the coefficients on both E/P and size are significant in January, but only the E/P coefficient is significant outside of January and their portfolio formation procedures do not affect the results on E/P. They also find evidence of consistently high returns for firms of all sizes with negative earnings.

Chan, Hamao and Lakonishok (1991) examine the cross-sectional differences in returns on Japanese stocks to the underlying behavior of four fundamental variables: earnings yield, size, book to market ratio, and cash flow yield. They find that there is a significant relationship between these fundamental variables and expected returns in the Japanese market. The book to market ratio and cash flow yield have the most significant positive impact on expected returns among the four fundamental variables.

Fama and French (1992) investigate the roles of market beta, size, leverage, book to market equity and earnings-price ratios on the cross sectional variation in average stock returns. They find that beta does not seem to help explain the cross-section of average stock returns and the combination of size and book to market equity seems to absorb the roles of leverage and E/P in average stock returns during their 1963-1990 sample period.

Coming to the year 1993, Fama and French (1993) extend the study of Fama and French (1992) and the worldwide known Fama French Three Factor Model is constructed. This model has made tremendous impact on the financial world. In this study they consider bond returns in addition to common stock returns during the period 1963- 1990 as a distinction from their study at 1992. They expand the set of variables used to explain returns of bond returns to examine whether variables that are important in bond returns help to explain stock returns and vice versa. Also they change their approach in testing asset pricing models. They use time series regression approach of Black, Jensen, and Scholes (1972) instead of cross sectional analysis.

In time series analysis, the explanatory variables used fall into two sets, those are for explaining the variation of bond returns and those are for stocks. The unexpected changes in interest rates and default risk factor are used as explanatory variables for bond returns. As for stock returns, they use the variables that mimic the risk factors in returns related to size and value of the firms.

Fama and French (1992) use six portfolios formed from sorts of stocks on market capitalization and book to market equity. They use the same six portfolios in this study to form the intersections of size and book to market equity portfolios. In June of each year during the whole analysis period, they simple sort of all NYSE stocks on Center for Research in Security Prices (CRSP) into two groups on market capitalization. They use the median NYSE size to split NYSE, AMEX and National Association of Securities Dealers Automated Quotations (NASDAQ) stocks. These groups are called by small and big (S and B).

They also break these stocks into three book to market equity groups based on the ranking of them on their book to market values for each year. They call the top of 30% of the ranked values of BE/ME is High (H), middle 40% is Medium (M) and bottom 30% Low (L). They compute book to market equity of each stock by dividing the book common equity for the fiscal year ending in calendar year t-1 to market equity at the end of December of t-1. Then, they construct size portfolios of SL, SM, SH, BL, BM and BH from the intersections of two size portfolios and the three BE/ME groups. For example SH portfolio contains the stocks in the small size group that are also in the high book to market- value- group.

They choose stocks to be in a portfolio group by considering some criteria.

- They do not use negative BE/ME firms.
- They use only firms with ordinary common equity as classified by CRSP.
- Portfolios are formed for the period from July of year t to June of t+1 and reformed in June of t+1.
- A firm must have CRSP stock prices for December of year t - 1 and June of t and COMPUSTAT book common equity for year t – 1 to be included in the tests.
- They do not include firms until they have appeared on COMPUSTAT for two years to avoid the survival bias inherent in the way COMPUSTAT adds firms to its tapes

They calculate monthly value- weighted returns on the six portfolios by considering these criteria.

As for size factor they construct a portfolio SMB –small minus big- that mimics the risk factor in returns related to size. They compute the monthly return of this portfolio by using this equation:

$$SMB = 1/3(SL + SM + SH) - 1/3(BL + BM + BH)$$

As for value factor they construct a portfolio HML –high minus low- that mimics the risk factor in returns related to value. They compute the monthly return of this portfolio by using this equation:

$$HML = ½ (SH + BH) – ½ (SL + BL)$$

They construct twenty five intersection portfolios by using the same portfolio formation procedure in the six intersection portfolios and examine the relationship of their excess returns and explanatory variables. They first examine the explanatory power of bond and stock market factors separately to test whether bond- market factors that are important in bond returns capture common variation in stock returns and vice versa. Then, they examine the joint explanatory power of the bond and stock-market factors, to develop an overall story for the common variation in returns. Because of my dissertation is focused on stock market, the sections of this study about stock market factors is reviewed.

In stock-market factors analysis, they examine three regressions. In the first one, they use only market excess return as an explanatory variable. SMB and HML are used jointly in the second regression. In the third regression all variables - market excess return, SMB and HML- are used as explanatory variables. This regression model is called as the Three Factor Model that considers market, size and value factors in explaining the variations of stocks and bonds returns.

$$R_i – R_f = \alpha_i + \beta_i (R_m – R_f) + s_i (SMB) + h_i (HML)$$

where R_i-R_f is the excess return of each intersection portfolio, R_m is the value-weighted percent monthly return on all the stocks in the analysis. R_f is the one-month Treasury bill rate, observed at the beginning of the month. SMB (small minus big) is the return on the mimicking portfolio for the size factor in stock returns. HML (high minus low) is the return on the mimicking portfolio for the book-to-market factor.

Their findings are consistent with the study of Fama and French (1992). They suggest that there are common return factors related to size and book-to-market equity that help capture the cross-section of average stock returns in a way that is consistent with multifactor asset-pricing models.

Claessens, Dasgupta and Glen (1995) examine the cross-sectional pattern of returns in 19 developing countries empirically. They use data compiled by the International Finance Corporation (IFC) for analyzed countries during the period of 1986-1993, which provides 96 monthly observations for each country. They use size, trading volume, dividend yield, earnings/ price and cross exchange rates in addition to beta as explanatory variables in their cross sectional model. According to their results, in addition to beta, two factors, size and trading volume have significant explanatory power in a number of these markets; dividend yield and earnings/price ratios are also important, but in slightly fewer markets. For Turkey, size, E/P, dividend yield and turnover that express the value traded measured in dollars relative to the number of shares outstanding are found as significant factors.

Fama and French (1995) study whether the behavior of stock prices, in relation to size and book-to market-equity, is consistent with the behavior of earnings to provide an economic foundation.

They form six size- book to market intersection portfolios by using the same procedure and databases of Fama French (1993) for each year during the period from 1963 to 1992. As a measure of profitability, they use earnings on book equity that is the ratio of common equity income for the fiscal year ending in calendar year t to the book value of common equity for year t - 1.

They draw a plot representing average profitability as a function of size and BE/ME for a long period around the portfolio formation. Their aim is to reveal how earnings behave before firms are classified as small or big on ME and low or high on BE/ME, and how profitability evolves in the years after portfolio formation.

Their other research questions are, whether there are market, size and BE/ME factors in earnings shocks like those in stock returns, and whether variation in stock returns traces to common factors in stock returns. Firstly they adopt Fama French Three Factor Model to examine the relationship between market, size and BE/ME factors in stock returns. Then they investigate the relationship between the change in fundamental variables (EI/BE, ln EBI, and lnS)[4] and market, size and BE/ME proxies for the analysis period. They express this relationship as follows:

$$\Delta Y(t+1) = a + b\Delta Mkt(t+1) + s\Delta SMB(t+1) + h\Delta HML(t+1) + e(t+1)$$

where $\Delta Y(t+1)$ is the change in a fundamental variable (EI/BE, ln EBI, or ln S) from year t to t + 1 for all firms in each six intersection portfolio. ΔMkt, ΔSMB and ΔHML are the market, size and BE/ME factors in ΔY.

Their results indicate that, as they expected, firms with high BE/ME have low ratios of earnings to book equity and vice versa. Small stocks within book-to-market groups tend to be less profitable than big stocks. According to the results of Fama French Three factor model for market, size and book to market factors in stock returns and in earnings and sales, there are market, size and book to market factors in fundamentals that are similar to those in stock returns. The market and size factors in earnings help explain the market and size factors in returns, but it is not valid for book to market factor.

Barber and Lyon (1997) adopt the methodology of Fama French (1992) for both financial and nonfinancial firms. Fama and French (1992) exclude financial firms from their analysis, because of their different leverage characteristics. Barber and Lyon (1997) want to investigate whether the relationship between firm size, book-to-market ratios, and security returns for financial and nonfinancial firms is similar or not during the period July 1973-December 1994. They use the firms with available returns data on the CRSP NYSE/AMEX/NASDAQ monthly returns files

[4] EI/BE: Equity income/book equity, EBI: Equity income plus interest expense and preferred dividends summed over all stocks in a portfolio, S is the sum of sales for the stocks in a portfolio.

from July 1973 through December 1994 in their analysis. As a result, they find a similar relation between firm size, book-to-market ratios, and security returns for financial and nonfinancial firms. In addition, they present evidence that survivorship bias does not significantly affect the estimated size or book-to-market premiums in returns.

After the studies of Fama and French (1992 and 1993), there have been large number of studies to investigate their findings robustness. Knez and Ready (1997) investigate the robustness of the estimated risk premia for size and book-to-market factors by using a new regression technique, called least trimmed squares (LTS). This technique obtained by incorporating a robust regression technique into the Fama MacBeth procedure, is not sensitive to outliers or leverage points. This robust technique allows them to isolate influential observations if the estimates are driven by a small subset of firms or months. Also, they use the least squares (LS) technique and compare the results to those obtained using LTS. Their aim is to reveal whether the size and value effect are driven by extreme observations. They use the same data as in Fama and French (1992). According to their results, the negative relation between firm size and average returns is driven by a few extreme positive returns in each month. In fact, when only 1 percent of each month's observations are trimmed, there is a significant positive relation between firm size and average returns.

Fama and French (1998) examines whether there is a value premium in markets outside the United States and whether a risk model that describes the U.S. returns can describe an other market returns. They study returns on market, value, and growth portfolios for the U.S. and twelve major EAFE (Europe, Australia, and the Far East) countries.

They construct value and growth portfolios for analyzed markets during the period of 1975 to 1995. Then they implement the CAPM and two factor CAPM that includes the difference between the global high and low book to market returns in addition to global market excess return for these portfolios. Their results indicate that value stocks tend to have higher returns than growth stocks in twelve of thirteen major markets during the analysis period. An international CAPM cannot explain the value premium in international returns. But a two factor CAPM that explains returns with the global market return and a risk factor for relative distress captures the value premium in country and global returns.

Clare, Priestley and Thomas (1998) explore the relationship between beta and expected returns by using a one-step estimator to McElroy, Burmeister and Wall (1985) in addition to two step estimator due to Fama and MacBeth (1973) algorithm. They test for a linear and positive relationship between beta and expected returns for a sample of UK stock returns over the period 1980-1993. Until this study, all studies of the relationship between beta and expected stock returns have been used US stock return data.

They integrate the Fama French explanatory variables by estimating a series of cross-sectional regressions using the CAPM errors as dependent variables and the accounting variables (appropriately lagged) as independent regressors. When they estimate the CAPM by using one step approach, they find that beta has a significant and powerful role and Fama and French variables do not have any significant role for in explaining expected returns in contrast to US findings. When they consider Fama MacBeth t statistics, price effect is found as a significant factor in the UK stock market.

Chen and Zhang (1998) compare the return experience of value stocks across the six countries. The countries are the well-established market of the United States; is less persistent for the growth markets of Japan, Hong Kong, and Malaysia; and is almost nonexistent for the high growth markets of Taiwan and Thailand. Their findings reveal that strong value stock effects persist in the United States, are less persistent in Japan, Hong Kong, and Malaysia; and are undetectable in Taiwan and Thailand.

Trecartin (2000) examines whether the book equity-to-market equity ratio and other value/ growth variables predict returns consistently from 1963 to 1997 using monthly intervals. He examines the reliability of the book to market ratio by comparing its relation with the return in ten year periods and five year sub-periods. He uses all firms on NYSE, AMEX, and NASDAQ if they meet the used criteria. He uses the criteria mentioned in the study of Fama and French (1993) and additional two criteria: A firm must have sales in at least two adjacent years during the five years preceding year t in order to calculate sales growth rates, and the firm must also record earning. Stock return is used as the dependent variable in monthly regressions as in Fama and French (1992). As variables, he uses book to market ratio, cash flow, weighted growth in sales and June ending market value of firms studied.

He finds that the book-to-market effect is statistically related to return as predicted in less than 50% of the monthly time periods examined. Also, the variable is not always significant in five-year sub-periods. However in ten-year periods BE/ME is significantly related to return. Thus the data supports the view that the BE/ME variable is not a reliable predictor of return over short time horizons.

Dimson, Nagel and Quigley (2003) investigate the UK stock market by using a new dataset of accounting information that covers virtually all UK firms ever listed on the London Stock Exchange (LSE) during the period of 1995- 2001. They evaluate the size and value effects on the analyzed firms' stock returns. Even though their focus is on book-to-market as a measure of value, they also provide some information on the role of dividend yields. They form portfolios like the mechanism of Fama and French (1993) but a few adjustments done where necessary to account for characteristics of the UK data.

They find that there is a strong value premium in the UK for the period 1955-2001. The value premium exists within the small-cap as well as the large-cap universe. They also find that dividend yield as a measure of value produces strikingly similar results.

Dunis and Reilly (2004) analyze the investment returns of best decile growth stocks and value stocks portfolios by using daily data over the period 31st December

2000 to 31st December 2002. They use 5 variables to categorize a panel of 689 stocks from the FTSE All-Share index. These variables are price/book value ratio, price/earnings ratio, cash flow/price ratio, dividend yield and value of firms. As firms' value, they assume that investors have priced in their opinions of future prospects of firms and give them a value.

Their results suggest that a "value-growth" factor is significant in the UK stock market no matter which of the five relative valuation techniques are used. Value stocks outperform growth stocks, on average, for all five relative valuation techniques used during the period studied, both absolutely and after adjustment for risk. Value stocks also outperform the market, on average, for all five relative valuation techniques, both absolutely and after adjustment for risk. The lowest market capitalization decile portfolio is the best performing relative valuation technique, in terms of its risk-adjusted return, and the level of returns for all the value deciles are significant no matter which of the five methods of selecting the value decile portfolio are used.

Charitou and Constantinidis (2004) examine empirically the Fama and French three factor model of stock returns using Japanese data over the period 1991- 2001. Their main aim is to provide evidence that would contribute to the effort of explaining the Fama and French three factor model in a country that differs substantially from the US not only with regards to its financial reporting system but also as it relates to its economic characteristics. They use all industrial firms with ordinary common equity included in the Global Vantage database over the analysis period. They construct six intersection portfolios like in the study of Fama French (1993) and examine whether market equity (size, ME) and book-to-market equity (BE/ME) are related to profitability of firms when profitability is measured by earnings on book equity (EI/BE).

They find that the size and BE/ME effect are not very clear in Japan. When the testing portfolios consist of small stocks, the explanatory power of the size factor (SMB) dominates the explanatory power of the BE/ME factor (HML). The opposite occurs when the testing portfolios consist of big stocks. In US the explanatory power of the HML factor always dominates the explanatory power of the SMB factor. They explain that the difference may be due to the economic crisis in Japan during the period examined, and specifically to the low profits of small low-BE/ME stocks.

Peterkort and Nielsen (2005) investigate whether the book to market ratio acts as a proxy for risk by developing a leverage-based alternative to traditional asset pricing models.

They use only ordinary common shares and firms traded on the NYSE, the AMEX, or the NASDAQ over the period 1978- 1995. They measure market leverage (MLEV) as debt to total assets D/(D + ME), and book leverage (BLEV) as debt to book value of total assets D/(D + BE). They use share price and firm size to control for sample bias problems. Transaction and liquidity costs, bias in measured returns, and sample-selection bias are all expected to be most severe in small, low-price stocks. They define size and price control variables as ln(ME) and 1/(price per share).

They demonstrate the relations among MLEV, BLEV, BE/ME, and average return by constructing portfolios. Each year they sort the base sample into 10 MLEV decile portfolios. They then sort each MLEV decile portfolio into 10 BE/ME subdecile portfolios, resulting in 100 portfolios each year. They calculate the average value for BE/ME, BLEV, and average monthly returns for each portfolio each year. They find no relation between average stock returns and the book-to-market ratio in all-equity firms after controlling for firm size, and an inverse relation between average stock returns and the book-to-market ratio in firms with a negative book value of equity.

Bornholt (2007) introduces an approach that is called as reward beta approach to estimate expected returns and compares its performance with the CAPM and the three factor model by using the same data of Fama French (1992)’s study. The reward beta approach introduced in this paper uses forward-looking portfolio reward beta estimates in the following equation to estimate expected returns.

$$E[R_i] = r_f + \beta_{ri}[E(R_m) - r_f], \quad \text{for all } i \leq N$$

Then a version of the market model that is compatible with the reward beta approach is constructed. The version of market model is:

$$R_j - r_f = \beta_{rj}[E(R_m) - r_f] + \beta_j[R_m - E(R_m)] + \varepsilon_j,$$

In this model, portfolio j' s expected return is determined by its reward beta, β_{rj}, the risk-free rate and the market risk premium. The model's error specification implies that β_j in the equation above equals the portfolio's CAPM beta.

This study compares the CAPM, the Fama–French three-factor model and the reward beta approach by using the same data and portfolio formation procedures with the study of Fama French (1992). Bornholt (2007) evaluates the three competing approaches by splitting the overall sample into two parts: within-sample period in which each model's parameters' time-series estimates are calculated and out-of-sample in which time series estimates are used in cross-section regressions to test the competing models' explanations of portfolio out-of-sample average excess returns.

The empirical evidence in this paper does not support the CAPM and the three factor models. On the other hand, the reward beta approach is strongly supported by the empirical evidence reported in this paper.

Ho and Hung (2009) investigate whether incorporating investor sentiment as conditioning information in asset-pricing models helps capture the impacts of the size, value, liquidity and momentum effects on risk-adjusted returns of individual stocks.

Their findings indicate that investor sentiment plays an important role in conditional asset-pricing models for capturing the anomalies.

In Appendix-B the above- mentioned studies about multifactor models for the developed markets are given.

1.2.2.2.2 Studies for Emerging Markets

The effects of ignored firm specific factors by the CAPM on the variation of stock returns for the emerging markets have also been examined. In this part, the studies for the Istanbul Stock Exchange, the only securities exchanges in Turkey, will be addressed under the heading of Studies for Turkey.

Rouwenhorst (1999) examines the sources of return variation in emerging stock markets. They try to answer two sets of questions. The first set of three questions concerns the existence of return premiums: (1) Do the factors that explain expected return differences in developed equity markets also describe the cross section of expected returns of emerging market firms? (2) Are the return factors in emerging markets primarily local or do they have global components as well? (3) How does the emerging market evidence contribute to the international evidence from developed markets that similar return factors are present in markets around the world?

The second set of questions relates to the interpretation of the return factors. (4) Is there a cross-sectional relationship between liquidity and average returns in emerging markets? (5) Are the return factors in emerging markets cross-sectionally correlated with liquidity?

In this study, 20 emerging markets with 1750 individual stocks are analyzed during the period 1982 to 1997. As a result, it is found that the return factors in emerging markets are qualitatively similar to those in developed markets. Small stocks outperform large stocks, value stocks outperform growth stocks and emerging markets stocks exhibit momentum. He reaches to the same results for Turkish market. Portfolios with small stocks have more return than portfolios with large stocks (0.72 % monthly), and portfolios of value stocks have more return than portfolios of growth stocks (2.86 % monthly) in Turkish market. There is no evidence that local market betas are associated with average returns. The low correlation between the country return factors suggests that the premiums have a strong local character. A Bayesian analysis of the return premiums in developed and emerging markets shows that, unless one has strong prior beliefs to the contrary, the empirical evidence favors the hypothesis that size, momentum, and value strategies are compensated for in expected returns around the world.

Ho, Strange and Piesse (2000) test the independent and joint roles of market, size, book to market, market leverage, book leverage, dividend yield and earnings to price factors on the variations of stock returns for Hong Kong stock market during the period of January 1980 to December 1994. They use an extended version of Fama and French's (1992) cross-sectional estimation model:

$$Rit = \gamma_0 + \gamma_1\beta_p + \gamma_2 \ln(ME)_{i,t-1} + \gamma_3 \ln(BE/ME)_{i,t-1} + \gamma_4 \ln(A/ME)_{i,t-1} +$$
$$\gamma_5 \ln(A/BE)_{i,t-1} + \gamma_6 \ln(E/P)_{i,t-1} + \gamma_7 \ln(DY)_{i,t-1} + \gamma_8 \ln(P)_{i,t-1} + u_i$$

where R_{it}: excess return on stock i, β_p: post-ranking beta for portfolio p, ME: market equity, BE: book equity, BE/ME: book to market equity, A: total asset, A/ME: market leverage, A/BE: book leverage, E: earnings pers hare, E/P: earnings – price ratio, DY: dividend yield, P: price pers hare of the stock, ln: natural logarithm.

They follow four steps to testing the model. In the first step, they form portfolios based on firm size and then beta for the first two years of the analysis period. In the next step, they estimate post ranking beta for these constructed portfolios for the remaining part of the analysis period. Then they adopt the Fama MacBeth (1993) algorithm and hypotheses testing.

Their results indicate that beta, book leverage, earnings-price ratio and dividend yield are not priced, whereas relatively strong book-to-market equity and market leverage effects and marginally significant size and share price effects are observed.

Drew and Veeraraghaven (2002) examine whether there is a size and value premium in markets outside the USA and the multifactor model of Fama-French (1996) can capture the cross-section of average stock returns for the Malaysian setting. In this study, the firms with available returns data during the period December 1992 to December 1999 are used. They construct six portfolios as the intersection of the two size portfolios and three book to market portfolios and analyze the relationship between the excess returns of these portfolios' excess returns with market, size and value risk premium by using Fama French Three Factor model. They find that size and value premium exist in markets outside the USA and small and high book-to-market equity stocks generate higher returns than big and low book-to-market equity stocks in the Malaysian setting.

Empirical researches investigating the effects of firm specific factors on the stock returns of ISE firms have conflicting results. Most of the important studies that use directly ISE database are given below.

Aydogan and Gursoy (2000) investigate the ability of average P/E and book-to-market ratios to predict future stock market returns in emerging equity markets during the period of 1986-1999. They use a group of countries widely known as "emerging equity markets" defined and monitored by IFC arm of the World Bank. They compute the market averages of E/P and BE/ME for all analyzed emerging markets and pool them to see whether they are related with 3, 6 and 12-month future returns. They make groups based on ranking pooled observations with respect to E/P and BE/ME and evaluate their relations between various future returns. They find that returns are higher after observing a high E/P (low BE/ME) in a market. They test statistical relationship between E/P, BE/ME and future returns by using two sets of econometric tests. They initially group observed average E/P and BE/ME into quintiles in 19 emerging equity markets and associate them with 3-month, 6-month and 12-month ahead future returns. They estimate the following regression models via ordinary least squares (OLS).

$$R_i = \lambda_0 + \lambda_1 EP_i + \lambda_2 \beta_i + \varepsilon_i$$

$$R_i = \lambda_0 + \lambda_3 BEME_i + \lambda_2 \beta_i + \varepsilon_i$$

$$R_i = \lambda_0 + \lambda_1 EP_i + \lambda_2 \beta_i + \lambda_3 BEME_i + \varepsilon_i$$

where R_i = 3, 6 or 12 month ahead returns in national market i, EP_i is the average earnings to price ratio in market i, $BEME_i$ is the book-to-market ratio in market i, λs are regression coefficients, and ε' s are error terms. Then they carry out a time series – cross sectional estimation of international CAPM models by using the following regression models.

$$R_{it} = \lambda_0 + \lambda_1 EP_{it} + \lambda_2 \beta_{it} + \varepsilon_{it}$$

$$R_{it} = \lambda_0 + \lambda_1 BEME_{it} + \lambda_2 \beta_{it} + \varepsilon_{it}$$

$$R_{it} = \lambda_0 + \lambda_1 EP_{it} + \lambda_2 \beta_{it} + \lambda_3 BEME_{it} + \varepsilon_{it}$$

They estimate the coefficients with SUR method because of the cross sectional components of the error terms could be correlated.

According to their findings, Fama MacBeth method does not provide significant coefficients, but, E/P and BE/ME appear to predict future returns in pooled estimation. However, explanatory powers are very low in shorter return horizons.

1.2.2.2.2.1 Studies for Turkey

Gonenc and Karan (2003) study the comparison of returns between value and growth, and between small and big portfolios for ISE. Their sample covers more than 80 percent of the capitalization of the ISE for the sample period from 1993 to 1998.

They use adjusted monthly returns of stocks in this sample. They rank stocks according to their BE/ME ratios at the end of the each calendar year from 1992 to 1996 and then group the stocks based on the breakpoints for the bottom 30%, middle 40%, and top 30% of the ranked values. Thus they obtain three BE/ME portfolios. They also create two size portfolios by using market value of each stock in June of each year in the analysis period.

They find that growth portfolios have superior performance over value portfolios and big stocks have more both monthly and annually return than small stocks in the ISE. Their results do not confirm the evidence from most developed and emerging markets. Size and BE/ME risk factors along with market risk premium produce better descriptions of the returns on value and growth portfolios.

Bildik and Gulay (2002) examine the momentum and contrarian effects on stock returns in ISE between years 1991 and 2000 by using the same empirical methodology in Jegadeesh and Titman (1993).

They use all stocks traded in National Market of the ISE by extracting shares of investment trusts, real estate investment trust (REITs), other stocks delisted or halted by the Exchange by the time and also the stocks which has less than 12 month-data for the period from January 1991 to December 2000. All prices are adjusted for dividends, rights issues and stock splits. They analyze both whole sample period and two equal sub-periods to reveal time variation.

They implement total 16 strategies of selecting stocks based on their returns over the past 1, 3, 6 and 12 months and hold the selected stocks from 1 month to 12 months. They use one-month period both for prior and holding periods different from previous studies, from the points of the myopic investment characteristics of investors in Turkish stock market as a result of inflation. They also examine the returns of the winner and loser stocks in the 24 and 36 months following the formation period.

They construct five momentum portfolios that range from the top winners (P1) to top losers (P5). The empirical findings reveal that prior loser-stocks are found to outperform prior winner-stocks. The average difference between the P1 and P5 portfolio returns during the 10-year period is 1.14 % per month in favor of losers hypothesis. Also, they find that as the holding period extends average abnormal returns and the average abnormal return difference per month between losers and winners increase.

Then, they form size, price, BE/ME, E/P sorted portfolios by using the constructed momentum portfolios. They analyze the formed portfolios' average monthly return difference between P1 to P5. According to the average monthly return difference of five factor based portfolios, price based portfolios' return difference is found as the highest one and E/P is the smallest one. They find significant evidence regarding the existence of size, price, E/P and BE/ME effects on stock returns in ISE.

In the last section of their study, they test the sensitivities of the winners-losers portfolios for the strategies on selecting stocks due to their past 12 month performance and holding them 6 month by running the Three Factor Fama French Model, the CAPM and various multi-factor time series regressions. In addition to the factors; market, SMB and HML, they also use HMLEP (High minus Low E/P ratio stocks) as an additional factor to the three-factor Fama French model.

Their findings show that there is significant price, size, BE/ME and E/P effects in stock returns in ISE, consistent with the previous empirical work. According to the analyzed strategies based on five different factors such as past return, size, price, BE/ME and E/P, in various length of formation and holding periods, it is found that stocks which have lower price, smaller size, lower past-return, higher-BE/ME and E/P are significantly provide higher returns than others. On the other hand, findings show that losers are riskier than the winners because they are more sensitive to all three Fama-French factors.

Aksu and Onder (2003) examine the size and book-to-market effects on stock returns and their rational risk explanation in the ISE. They use the same stock selection and portfolio formation methodology of Fama and French (1993). Their sample includes only non-financial firms that traded in the ISE during the 1993-1997 period. They adopt the CAPM and three-factor Fama and French (1993) model to individual stock returns and to constructed portfolios. Their results show that, on average, high book-to-market and small capitalization stocks provide significant excess returns and this predictability is largely related to firm specific and macro-economic distress. They find that only the market and the size factors are significant when the CAPM and three-factor Fama and French (1993) to individual stock returns. They also investigate whether the observed size and book-to-market effects are related to firm specific or macroeconomic distress risk. They find that size and BE/ME are related to profitability.

Gokgoz (2007) investigates the viability of the CAPM and the Three-Factor Model on basic indices on ISE (Real Estate, Securities, Industrials, Services and Technology) within 2001-2006. He applies time series and cross sectional regressions to test the viability of the models on the basis of empirical data.

In the time series regression analyses, the daily returns of the 30 days based Turkish Government Internal Loan Index (GIL) return is used as risk free rate. He uses the same portfolio forming approach with the Fama and French (1993, 1996). According to the time series regression analyses the CAPM and the Three Factor Model are viable for the selected ISE indices during 2001-2006 period. In the cross sectional regression analyses, he estimates the cross section regression coefficient of market, size and value factors' beta by using 72 monthly data of the time series estimated beta coefficients data. He uses Fama MacBeth procedure in cross sectional analysis and applies GRS test to investigate the statistical inference of time series regressions of the analyzed models. His results reveal that all the ISE indices indicated similar results in the time series regression tests and in the cross sectional regression analyses for the CAPM and the Three Factor Model. Regarding the results of the time series and cross sectional regression tests, both the CAPM and the Three

Factor Model is found applicable and viable on the ISE indices. In Appendix- C, the above- mentioned studies about multifactor models for the emerging markets and Turkey are given.

1.3 CAPITAL ASSET PRICING MODEL WITH HIGHER ORDER CO-MOMENTS

Previous empirical researches on financial markets find evidence against the CAPM's assumption of normality. Asset return distribution is not normal and the mean and variance of returns alone are insufficient to characterize the return distribution completely. This has led researchers to pay attention to the third moment – skewness – and the fourth moment – kurtosis (Galagedera, 2007:825). This attention has more focused on skewness and its impact on the variation of excess stock and portfolio returns.

The skewness characterizes the degree of asymmetry of the asset and portfolio returns among the mean. Positive (negative) skewness indicates a distribution with asymmetric tail extending towards more positive (negative) values. It has been ignored by most portfolio analysis including traditional CAPM, following Markowitz (1952).

This literature implies that an efficient frontier of portfolios that includes the best mean and variance composition can be prepared by using the mean and variance of the portfolios. In evaluating investment alternatives, an investment with a given mean and variance is preferred to an investment with the same variance and smaller mean and also, the investment is preferred to an investment with the same mean and larger variance. Hence an investment alternative on the efficient frontier is presumably preferred to any alternative that is not on it.

In the literature, ignoring the third and higher degree moments in asset pricing is based on some reasons. Some of them are about the form of the utility function, form of distribution of cash flows and adequacy of estimation provided by considering only the first three terms in the expansion (Jean,1971:506). Even though these reasons make analyses easier, the assumption of normality of asset and portfolio returns that lead to ignore third and higher degree of moments in asset pricing concept is not realistic as for large number of researchers. There is considerable evidence in the literature that the unconditional returns distributions can not be characterized adequately by only the first two moments.[5] The importance of higher moments in asset prices is supported by significant empirical evidence (Appendix-D). In this part of my literature review, I will try to address the most significant of the studies addressing the skewness factor in asset pricing.

Beginning from Arditti (1967) skewness factor is considered in a market context. Arditti considers a model which identifies several risk variables and their relationship to the required rate of return. He examines the risk variables by dividing into two groups: variables that are directly related with the probability distribution of returns of a firm's stock and variables that are intertwined with the firm's financial policies. While the first group includes the second and third moments of distribution – variance and skewness- and the coefficient of correlation between the returns from a single stock and all other available stocks, dividend earnings and the debt- equity ratios are placed in the second group. But he does not distinguish between systematic and unsystematic skewness, considers total skewness. According to the findings of this study, the second and third moments of the probability distribution are reasonable risk measures while the market correlation coefficient of returns is not. Thus he has shown the empirical importance of skewness in explaining ex-post returns.

Jean (1971) makes a general extension of the two parameter analysis to three or more parameters. He tries to find an equilibrium relation between the expected return and the third moment of the investment's returns based on the equilibrium relation of Sharpe (1964) Lintner (1965).

[5] Merton (1982) shows that if instantaneous returns are normal, then the price process is lognormal and, unless the measurement interval is very small, the simple returns are not normal.

According to the mean variance model, the expected return on security i, $E(R_i)$, is expressed as follows:

$$E(R_i) = R_f + \frac{[E(R_m) - R_f]}{\sigma^2(R_m)} Cov(R_i, R_m),$$

where, risk free rate, R_f, expected market rate of return, $E(R_m)$, variance of market portfolio, $\sigma^2(R_m)$ and covariance between the market portfolio and security i, $Cov(R_i, R_m)$.

Jean (1971) tries to find an equilibrium relation between the expected return and the third moment of the investment's returns based on Sharpe's approach. He expresses the expected return, E, standard deviation, σ, and the cube root of skewness as follows:

$$E = aE(R_m) + (1-a)R_f$$
$$\sigma = a\sigma(R_m)$$
$$m_3 = am_3(R_m)$$

a: proportion of wealth invested in the market portfolio

$1-a$: proportion of wealth invested in the risk free asset

Jean obtains the risk premium expressed in terms of the third moment is:

$$\frac{E(R_m) - R_f}{M_3(R_m)} E(vivm^2)$$

where

v_i=R_i- $E(R_i)$,

v_m=R_m-$E(R_m)$,

$M_3(R_m)$: third moment of the market portfolio,

$E(vivm^2)$: a measure of third moment interaction between the ith security and the market portfolio.

Jean (1971) neglects the interrelationship between different moments in deriving equilibrium tradeoffs as it is pointed out by Arditti and Levy (1972). Then Simonson (1971) tries to quantify the speculative risk incurred by managers of mutual funds by incorporating the third moment of the distribution of returns from a portfolio to extend of portfolio theory using the same methodology with Jean.

Arditti and Levy (1972) claim that the mean- skewness model used by Jean (1971) relies on economically unacceptable assumptions. They claim that even though Jean (1971)'s analysis is technically correct and all his mathematical results are straightforward, his results are economically invalid because his mean-skewness model relies on economically unacceptable assumptions. Jean finds a positive premium for skewness that means if the skewness is getting higher, the required expected return will be getting higher. But Arditti (1967) mentions that investors like positive skewness, then a negative premium should arise. According to Arditti and Levy (1972) these contradictory results stems from derivation an equation relationship between expected return and skewness while completely ignoring the other distribution moments particularly the variance. They state that it must be found an equilibrium relation that takes the first three moments into account simultaneously to deal with skewness in a correct way.

Francis (1975) addresses the question whether investors prefer investments that are positively skewed or not. He uses quarterly rates of return from 113 large mutual funds over the period January 1960 to December 1968.

Firstly he regresses these mutual funds' geometric mean rates of return against the standard deviation. The regression result supports the well accepted model. Then, he regresses these returns against the skewness. This regression result indicates that skewness is statistically significant but it alone has little explanatory power on the mutual funds' geometric mean rates of return and its sign is positive.

Lastly a multiple regression with both the standard deviation and skewness as independent variables is estimated. This regression result has similar findings. Again skewness is statistically significant and its sign is the opposite of Arditti' s results. Consequently, Francis (1975) concludes that investors do not consider the skewness of a mutual fund's shares when investing and that empirical evidence on the subject tends to be sample dependent and therefore inconclusive.

Rubinstein (1973) also considers skewness factor in a market context. He tries to extend the mean-variance security valuation model to a general parameter preference model and considers quadratic and separable cubic utility as special cases.

Rubinstein (1973) derives the following equation for expected return on security j ($E(R_j)$) for the arbitrary number of co-moments by assuming perfect markets, a risk free asset, and homogeneous expectations:

$$E(R_j) = R_f + \sum_{n=2}^{\infty} \vartheta_{in} . \sigma_{in} (R_j . \tilde{W}_i)$$

where σ_{in} is the nth co moment, $\tilde{W}_i$ is individual i' s future wealth. For the case of separable cubic utility he derives the market relation

$$E(R_j) = R_f + \lambda_2 Cov(Rj, R_m) + \lambda_3 Cos(R_j, R_m, R_m)$$

where m denotes the market portfolio, Cos is coskewness, and λ_2 and λ_3 are the appropriate market measures of risk aversion.

Kraus and Litzenberger (1976) provide a three moment variation of the single period asset pricing model by adding “systematic skewness” on asset pricing in the US market. They argue that all investors having utility functions displaying the desirable behavioristic attributes determined by Arrow (1971) –decreasing marginal utility of wealth, non-increasing absolute risk aversion– denote a dislike of standard deviation and a preference for positive skewness. They do not consider general investor attitudes toward the fourth and higher moments. They construct a model by focusing on the relationships between the three moment capital asset pricing model and the traditional form of capital asset pricing model by specifying the form of characteristic lines for securities. According to them while linear characteristic lines are consistent with the traditional form of the CAPM, quadratic characteristic lines for securities are consistent with the three moment CAPM. These are expressed by them as follows:

$$\tilde{R}_i - R_F = c_{0i} + c_{1i}(\tilde{R}_M - R_F) + c_{2i}\left(\tilde{R}_M - \overline{R_M}\right)^2 + \tilde{e}_i$$

In this equation the error term e_i is assumed to be homoscedastic, independent of the excess rate of return on the market portfolio, $R_M - R_F$, independent of the squared deviation of the excess rate of return on the market portfolio from its expected value, $\left(R_M - \overline{R_M}\right)^2$, and to have an expected value of zero. Their empirical results support their expectations about investors' preferences for variance and skewness and confirm that the prediction of a significant price and sign of systematic skewness.

Friend and Westerfield (1980) test the three parameter CAPM represented by Kraus and Litzenberger (1976). They adopt the model in a more comprehensive way by incorporating bonds and stocks rather than only stocks into the analysis. They use the Standard & Poor's 500 Composite Index for all common stocks from 1947 to 1964 and NYSE Composite Index from 1964 to 1976; the Salomon Brother's Total Performance Index for all corporate bonds from 1969 to 1976, and Moody's Composite Bond Index from 1947 to 1968 and U.S. Government bond index developed by Bildersee (1975) for all long-term marketable government issues from 1947 to 1973, and Salamon Brother's government bond yields from 1974 to 1976. Also they carry out test for individual and groups of assets, construct market portfolio of stocks by a value weighted and equally weighted index, use predictive and contemporaneous risk measures for different periods. For the all alternatives mentioned above, they investigate whether the two conclusions of Krauz and

Litzenberger (1976) that (1) incorporating coskewness to covariance is required to explain the returns on individual risky assets and (2) the implied riskless market rate of return and the actual risk-free rate of return are not significantly different from each other are supported or not. They find some supportive evidence for their first conclusion but on the other hand provide no support for the second conclusion. So they come to the solution that Kraus and Litzenberger (1976) modified form of the classical CAPM is not successful.

Simkowitz and Beadles (1978) investigate the necessity of diversification for investors making decisions considering only on the first three moments of return distributions. They use monthly returns of 549 common stocks that were continuously listed on the NYSE during the period January 1945-December 1965. Fisher's Aritmetic Index and the yield on 30- day Treasury Bills are used as a market proxy and risk free rate of return. They perform regression equation of the CAPM model and save error terms for all securities over the 252 months. They divide these error terms into mutually exclusive classes and find the number of occurrences in each class. The frequency distribution of the previously stated error terms reveal that they are markedly right skewed around the mean of zero. Then they find the number of errors falling within ten standard deviation classes that start with 0-1 standard deviation and finish with 9-10 standard deviations. According to the dispersion of the number of errors within the standard deviation boundaries, they conclude that positively skewed errors imply decreasing portfolio skew with diversification.

Scott and Horvath (1980) consider investor preferences for higher moments and show theoretically that investors should display an aversion to even moments and a positive preference for odd moments.

Barone- Adesi (1985) investigates the model of Kraus and Litzenberger (1976) and arbitrage pricing theory by using the empirical tests of Black-Jensen-Scholes and Gibbons. They choose the NYSE equally weighted index as the proxy of market portfolio and Treasury bill monthly rates of return as the riskless rate during the period January 1926- December 1970. Their results provide some support to the

Kraus and Litzenberger hypothesis on skewness preference. On the other hand there is some evidence that tested arbitrage equilibrium is not a complete description of security pricing.

Singleton and Wingender (1986) investigate the persistency of skewness of individual stocks and portfolio returns among the chosen five and ten year sub periods in the whole analysis period 1961-1980. They use monthly return data from the CRSP file. They compute the skewness of the returns of individual stocks and portfolios for each sub period to evaluate the skewness persistency among different time intervals. Also they compare the skewness persistency of individual stocks and portfolios to evaluate the conclusion of Simkowitz and Beedles (1978) that skewness is rapidly diversified away when securities are combined into portfolios. Similar to Simkowitz and Beedles (1978), their results reveal that skewness is less persistent and frequent for stock portfolios than individual stocks.

Harvey and Siddique (2000) make a study considering systematic coskewness in the asset pricing framework. They use monthly U.S. equity returns from CRSP NYSE/AMEX and NASDAQ files during the period July 1963 to December 1993. They examine individual equity returns and portfolios of equities that are formed with respect to industry, size, book to market ratios, coskewness with the market portfolio and several momentum strategies. They consider that the marginal rate of substitution between periods is a nonlinear function of market, size (SMB) and value (HML) factor, as assumed by Bansal and Viswanathan (1993), and assume the stochastic discount factor is quadratic in the market return rather than linear in the market return as distinct from the CAPM. They also assume the existence of a conditionally risk free asset and construct a formulation accommodating nonincreasing absolute risk aversion that can be explicitly modeled as skewness in a two-period model. As a result they obtain following the conditional version of three moment Capital Asset Pricing Model first proposed by Kraus and Litzenberger (1976).

$$E_t[r_{i,t+1}] = \lambda_{1,t} Cov_t[r_{i,t+1}, r_{M,t+1}] + \lambda_{2,t} Cov_t[r_{i,t+1}, r^2_{M,t+1}]$$

where

$$\lambda_{1,t} = \frac{V_t[r^2_{M,t+1}]E_t[r_{M,t+1}] - S_t[r_{M,t+1}]E_t[r^2_{M,t+1}]}{V_t[r_{M,t+1}]V_t[r^2_{M,t+1}] - (S_t[r_{M,t+1}])^2};$$

$$\lambda_{2,t} = \frac{V_t[r_{M,t+1}]E_t[r^2_{M,t+1}] - S_t[r_{M,t+1}]E_t[r_{M,t+1}]}{V_t[r_{M,t+1}]V_t[r^2_{M,t+1}] - (S_t[r_{M,t+1}])^2};$$

$E_t[r_{M,t+1}]$: The expected value of market risk premium at time t+1 ($r_{M,t+1}$) based on the information at time t;

$V_t[r_{M,t+1}]$: The variance of market risk premium at time t+1 ($r_{M,t+1}$) based on the information at time t;

$S_t[r_{M,t+1}]$: The skewness of market risk premium at time t+1 ($r_{M,t+1}$) based on the information at time t.

Rewriting the equation [2]*, the following model can be obtained.

$E_t[\, r_{i,\,t+1}\,] = A_t E_t[\, r_{M,\,t+1}\,] + B_t E_t[\, r_M^2{}_{,\,t+1}]$ [3]

where A_t and B_t are functions of the market variance, skewness, covariance and coskewness.

They compute coskewness in four ways. The first two are “direct” and the remaining ones are based on sensitivities to coskewness hedge portfolios that capture the effect of market-wide systematic skewness. The first measure is a direct measure of coskewness $\beta_{SKDi,}$ which is defined as

$$\hat{\beta}_{SKD,i} = \frac{E[\varepsilon_{i,t+1}\varepsilon^2_{M,t+1}]}{[\sqrt{E[\varepsilon^2_{i,t+1}]}E[\varepsilon^2_{M,t+1}]]}$$

where $\varepsilon_{i,t+1} = r_{i,t+1} - \alpha_i - \beta_i(r_{M,t+1})$, the residual from the regression of the excess return on the contemporaneous market excess return. ε_{Mt} shows the difference of market excess return from its mean value. $\hat{\beta}_{SKD,i}$ indicates the contribution of the ith asset to the skewness of the market portfolio. Negative coskewness means that it has decreasing effect on the skewness of the market portfolio and it should have a higher expected return for risk averse investors.

The second measure is obtained by regressing excess return of the i'th asset on a constant, excess market return and its square. The third measure of coskewness, which is a conditional measure, is about value weighted coskewness hedge portfolio. While the portfolio is constructed, they use the first 60 months of returns in the analysis period and compute the standardized direct coskewness ($\hat{\beta}_{SKD,i}$) for each of the stocks in the NYSE/AMEX and NASDAQ universe. Then they rank the stocks based on their past coskewness and form three value-weighted portfolios: 30 percent with the most negative coskewness (S^-), the middle 40 percent (S^0) and 30 per-cent with the most positive coskewness (S^+). For the estimation period, which covers the period July 1968 to December 1993, they compute the coskewness for a risky asset from its beta with the spread between the returns on the S^- and S^+ portfolios and call this measure $\beta_{SKS.}$ Their another measure of coskewness for an asset is from its beta with the excess return on the S- portfolio that is denoted by β_S^-. They also investigate the unconditional skewness, the CAPM beta, a test representing whether coskewness is time varying, the average return and the standard deviation. They perform the test of whether coskewness is time varying by estimating the first two autocorrelations for ($\varepsilon_{i,t}\varepsilon^2_{M,t}$).

They also examine whether skewness can explain what other factors – market excess return, SMB and HML – do not. They perform F test of Gibbons Ross and Shanken (1989) where F (N,T-N-1) to test jointly whether the intercepts are different from zero for the Fama French Three Factor model and the four factor model including coskewness factor.

They lastly perform two different cross sectional test to the CAPM and different combinations of multifactor models to investigate the incremental power of coskewness. The first test is Fama- MacBeth (1973) algorithm involving a two stage estimation carried out period by period with betas estimated in the time series and the risk premia estimated in the cross section. In this test they first estimate betas for 60 monthly observations and then the excess returns of the 61 month are regressed on these betas. The second test is a full information maximum likelihood (FIML) method that does not allow time series variation in the betas.

In the last part of their study, they analyze the individual securities in the FIML framework, economic significance of coskewness and momentum strategies and skewness relationship. In the analysis of individual stock returns, they estimate risk premia for the full sample; stocks with return history is less than 24 months, between 24 and 60 months and 60 and 90 months, and greater than 90 months for the Fama French Three Factor Model, Fama French Model with directly computed coskewness $\hat{\beta}_{SKD}$ and Fama French Model with the spread between S^- and S^+ portfolio $\hat{\beta}_{SKS}$. According to their findings the size effect is related how long a stock is listed and size and value factors appear to be more important for firms where the number of returns available to estimate the market beta is small. To test economic significance of skewness, they consider root mean squared in-sample pricing error (RMSE) for both portfolios' and individual stock returns. They compare each model's RMSE relative to CAPM's RMSE. They find RMSE of the CAPM, Three Factor Model, Three Factor Model with skewness and CAPM with only skewness factor. Their findings suggest that when skewness factor is added to the asset pricing models considerable reduction of RMSE exists but the reduction in RMSE for portfolios is greater than individual stocks. To understand how the abnormal returns from momentum strategies relate to skewness, they examine the momentum strategies with six different holding periods: one month, three months, 6 months, 12 months, 24 months, and 36 months. They find that the skewness of loser portfolios is higher than that of the winner portfolio for every momentum definition.

Their findings show that coskewness is important and an asset pricing model incorporating coskewness is helpful in explaining the cross-sectional variation of equity returns.

The study of Harvey and Siddique (2000) is one of the most important studies incorporating coskewness into the asset pricing concepts and taken as a basis for most subsequent studies considering skewness in the asset pricing models.

Lin and Wang (2003) make a study of asset pricing with the systematic skewness in the pricing model by adopting the Fama French three factor model and four factor model that contains skewness factor used by Harvey and Siddique (2000) for Taiwan stock market during the period January 1986 to December 2000. They adopt the similar portfolio construction phases and momentum strategies with Harvey and Siddique (2000). Their findings show that skewness is significant for all constructed portfolios and has a marginal contribution for explaining portfolio excess returns. The results of momentum strategies indicate that loser holding periods have higher skewness compared to winner portfolios.

Chung, Johnson and Schill (2006) test the hypothesis whether Fama French factors proxy for the pricing of higher order co-moments. They use the first tenth moments in their analysis, as distinct from the previous studies in which at most the first fourth moments have been used. They extend the market relation derived from Rubinstein (1973) for the case of separable cubic utility to the case of n co-moments:

$$E(R_j) = R_F + \sum_{i=2}^{N} \lambda_i b_{ij}$$

where b_{ij} is the i^{th} order systematic co-moment between R_j and R_m, and λ_i is the market measure of risk aversion for the i^{th} co-moment.

They construct size based and book to market based portfolios over the 1930 to 1998 sample period. They estimate the following regression:

$$r(j,t) = a_1 + a_{SMB}s(j,t) + a_{HML}h(j,t) + \sum_{i=2}^{n} a_i b(i,j,t) + e(j,t)$$

where $s(j,t)$ and $h(j,t)$ are the factor loadings for SMB and HML, respectively, and b(i, j,t) is the i^{th} systematic co-moment.

Their results suggest that when higher order systematic co-moments are included in cross-sectional regressions for portfolio returns, Fama French factors proxy for higher order co-moments generally become insignificant.

Smith (2007) explores the empirical usefulness of conditional coskewness to explain the cross-section of portfolio returns by comparing the conditional CAPM, conditional two and three moment CAPM. He uses 17 value-weighted industry portfolios whose returns were obtained from Ken French's Website. He does not reject the conditional three moment CAPM and find strong evidence that both coskewness and the price of coskewness risk are both time-varying. He also adds conditional coskewness to the Fama- French factors and compare the performance of this model with three factor and three moment model. His results reveal that adding conditional coskewness to the Fama–French factors does better than either the three-factor or three-moment model alone.

In Turkey for ISE, the study of Mısırlı and Alper (2008) is the unique study considering coskewness in asset pricing concept. They investigate the impact of coskewness on the variation of portfolio excess returns in the ISE over the period July 1999 to December 2005. Their study is similar with Harvey and Siddique (2000) and Lin and Wang (2003). Initially they want to reveal whether coskewness is significant and important factor for the stocks traded in ISE.

They use 194 stocks after excluding shares of investment trusts, real estate investment trusts, illiquid stocks, stocks with negative book value and other stocks having less than 36 observations. They form various portfolio groups with respect to industry, size, book to market ratios, coskewness with the market portfolio and several momentum strategies. They construct value weighted industry portfolios by excluding industry categories which include less than 10 stocks and they obtain 10 industry portfolios. As the second portfolio group, they construct 10 size portfolios with respect to the market capitalization of stocks. The first size portfolio contains the stocks with the lowest and the tenth the highest market value. Also they construct 16 Fama French portfolios that are sorted firstly on size and then book to market value. At the end of each month they sort stocks in ascending order according to market capitalization and classified into four size groups. Then in each size group, stocks are sorted again with respect to their book-to-market ratios and divided into four further subgroups. In descriptive statistics, they only use these portfolio groups. They use the unconditional and conditional coskewness measures in the study of Harvey and Siddique (2000) and unconditional coskewness measure of Kraus and Litzenberger (1976). The descriptive statistics in this study show that coskewness plays an important role in explaining cross section of asset returns in ISE.

Then they estimate a traditional CAPM, Fama French three factor model and four factor model that contains the coskewness factor to examine the incremental effect of Fama French factors and coskewness on the variation of portfolio excess returns. In time series and cross sectional analysis they follow the methodology of Harvey and Siddique (2000). As distinct from the previous studies on ISE, they perform the multivariate test of Gibbons et al. (1989) to investigate whether adding the size (SMB), value (HML) factors and/or coskewness factor to the traditional CAPM would remove any pricing bias captured by the intercept term.

In time series analysis, they use three different momentum strategies and two value weighted coskewness portfolios. They construct 10 equally weighted momentum portfolios formed with respect to their past j month performance (from t-j to t-2) and held for k months. The used pairs of j and k values in their momentum strategies are (12,1), (12,6) and (6,6). They form two different coskewness portfolios that are held for 1 and 6 months. GRS test results regarding Fama French three factor model for each momentum strategies show that size and value factors lead to pricing bias. In sum according to GRS test results, they conclude that the CAPM model outperforms the three factor model for ISE and for almost all portfolio strategies; coskewness factor has some incremental power in explaining excess returns of portfolios in ISE and reduces the pricing bias. But the contribution of coskewness over the CAPM and three factor model is not significant.

In the last section of their study, they conduct cross-sectional analysis to evaluate the relative contribution of the coskewness factor in explaining excess returns in ISE. Similar to Harvey and Siddique (2000) and Lin and Wang (2003), they perform Fama Mac Beth (1973) algorithm and FIML method to CAPM and different combinations of multifactor models (the three factor model, four factor model with SKS and S^- , CAPM +SKS and CAPM + S^-). According to the cross sectional analysis results, coskewness has a significant contribution to the CAPM, especially for size portfolios but does not have a significant incremental explanatory power over Fama French factors.

In this dissertation, the impact of coskewness on the variation of portfolios that are formed according to industry, size and book to market ratio and momentum will be investigated for ISE over the period July 2002 to June 2010 by using the similar methodology to Harvey and Siddique (2000). Then by performing multivariate testing procedure of Gibbons–Ross–Shanken (1989), traditional CAPM, three and four factor model will be tested to reveal whether there will be an incremental effect of these factors to market factor in explaining the variations of excess returns.

CHAPTER TWO
EMPIRICAL ANALYSIS

2.1 DATA AND THEIR SOURCES

The purpose of this dissertation is to investigate the impact of coskewness on the variation of portfolio returns and reveal whether coskewness has an incremental effect on explaining these returns over the period July 2002 to June 2010. By adopting a similar methodology to Harvey and Siddique (2000), industry, size, size and book to market ratio and momentum portfolios will be formed. Then by performing multivariate testing procedure of Gibbons–Ross–Shanken (1989), the CAPM, the Fama French Three Factor model and the Four Factor Model will be tested to reveal whether there is an incremental effect of coskewness to market, size and value factor in explaining the variations of those portfolios' excess returns. Also, cross sectional regressions will be run following Fama–MacBeth (1973) as well as full information maximum likelihood (FIML) to investigate the incremental power of coskewness over CAPM and Fama–French factors.[6] In this part of this dissertation, the data to be used both in portfolio formation and empirical analysis and their sampling criteria will be described.

Firstly data sampling criteria will be addressed briefly. Then, sources of sample data in portfolio formation and their preparation steps will be explained.

2.1.1 Data Sampling Criteria

The data base in this dissertation includes monthly returns of all stocks traded in ISE from July 1998 to June 2010. Financial firms are excluded from the sample because the high leverage that is normal for these firms probably does not have the same meaning as for nonfinancial firms, where high leverage more likely indicates distress (Fama and French, 1992: 429). In addition to that, companies that have more

[6] These tests are conducted by some researchers, e.g. Harvey and Siddique (2000), Lin and Wang (2003) and Mısırlı and Alper (2008).

than one group stocks[7], stocks with negative book value, stocks having less than 48 observations are excluded from the sample. These criteria used in portfolio formation change the sample size for each year in the analysis period. In the table below sample sizes for each year are represented.

Table 1: Number of Stocks Included in the Analysis for Each Year

2001	2002	2003	2004	2005	2006	2007	2008	2009
177	166	169	175	188	191	198	196	187

2.1.2 Monthly Price and Return Data of Stocks Traded in the ISE

Monthly price data used in this dissertation include the closing price on the last trading day of each month of stocks that are traded in the ISE during the period July 1998 – June 2010. The monthly return of a stock is calculated according to the following formula:

$$G_i = \frac{F_i * (BDL + BDZ + 1) - R * BDL + T - F_{i-1}}{F_{i-1}}$$

where

G_i : Return for the month "i"

F_i : The closing price the stock on the last trading day of the month "i"

BDL : The number of rights issues received during the month

BDZ : The number of bonus issues received during the month

R : The price for exercising rights (i.e. subscription price)

T : The amount of net dividends received during the month for a stock with a nominal value of TL 1,000/TRY 1

F_{i-1} : The closing price of a stock on the last trading day of the month "i-1"

[7] Similar to the study of Strong and Xu (1997) companies having more than one group stocks are excluded from the sample because the identification of their financial statements and market value data can cause some difficulties

2.1.3 The Market Portfolio and Risk Free Rate

The ISE 100 index is used as the proxy of market portfolio. In Appendix-E over the analysis period, the ISE 100 index monthly return is given. While calculating the risk free rate, annual compound interest rate of the discounted treasury auctions obtained from under secretariat of treasury are used[8]. Firstly, for each month in the analysis period, annual compound interest rate of treasury auctions taken in the month is weighted by total net bid amount in this month. Then calculated annual interest rate for each month is transformed to monthly interest rate by using this formula:

$$R_M = (R_A + 1)^{1/12} - 1$$

R_A: Weighted annually compound interest rate of discounted treasury auctions

R_M: Monthly interest rate of treasury bill (monthly risk free rate)

Calculated monthly interest rate, R_M is used as the monthly risk free rate. If there is no treasury auction in a month in the analysis period, the average of the calculated risk free rate for the next and previous month is used as the risk free rate of this month. In Appendix-F calculated risk free rate is given.

2.1.4 Portfolio Formation

In this dissertation, individual stock returns mentioned above are used and three portfolio types are formed according to different strategies. As Mısırlı and Alper (2008) mentioned, applied research analyzing the effect of coskewness on excess returns in emerging markets can be divided into two groups. The studies in the first group use various emergent markets' excess returns as dependent variable. On the other hand the second group use excess returns of portfolios' including grouped individual stocks in accordance with different criteria. Harvey (2000) falls into the first group, while Harvey and Siddique (2000), Lin and Wang (2003), Hung

[8] http://www.treasury.gov.tr

(2004), Mısırlı and Alper (2008) are in the second group. This dissertation is similar to Lin and Wang (2003) and Mısırlı and Alper (2008).

In this dissertation, portfolios are constructed according to size, industry, size and book-to-market ratio, momentum and coskewness. All portfolio groups except for the industry group use the data that are selected according to the data sampling criteria. In the process of constructing industry portfolios, all the industry categories[9] containing 10 or more than 10 stocks are included[10]. All portfolios are formed value weighted. Each year's portfolio period consists of the period from July of the year to June of the next year.

In the following parts, size, industry and Fama and French portfolios (intersection of market and book to market ratio) construction steps will be addressed.

2.1.4.1 Size Portfolios

The first portfolio group is size portfolio. In the formation of each year's size portfolio, each year's selected stocks according to the sampling criteria are used. At the mid of each year, these stocks are sorted in ascending order with respect to their midyear market capitalization and classified into ten size portfolios. Monthly value-weighted stock returns for ten size portfolios are calculated from July of year t to June of year t + 1, and the portfolios are reformed in June of year t + 1.

2.1.4.2 Industry Portfolios

The second portfolio group is industry portfolio. For each year in the analysis period, all industry categories containing 10 or more stocks are considered in construction of industry portfolios. As a result 10 industry portfolios are obtained.

[9] The industry categories that are presented in annual"ISE Stock Market Basic Ratios" are used in industy portfolio formation.

[10] Each industry portfolio includes equal or more than 10 stocks like in the study of Mısırlı and Alper (2008)

1. Manufacture of food, beverage and tobacco
2. Textile, wearing apparel and leather industries
3. Manufacture of paper and paper products, printing and publishing
4. Manufacture of chemicals and of chemical petroleum, rubber and plastic products
5. Manufacture of non-metallic mineral products
6. Basic metal industries
7. Manufacture of fabricated metal products, machinery and equipment
8. Banks and participation banks
9. Holding and investment companies
10. Investment trusts

Monthly value-weighted industry portfolios' stock returns are calculated from July of year t to June of year t + 1, and the portfolios are reformed in June of year t + 1.

2.1.4.3 Fama French Portfolios

The third portfolio group is Fama French portfolios formed yearly from a simple sort of firms into two groups on market capitalization and another simple sort into three groups on BE/ME, as in Fama and French (1995).

In June of each year t from 2002 to 2010, the selected stocks are ranked on size. Then the medians are used to allocate those stocks to two groups, small or big (S or B). The stocks are then broken into three book to market groups based on the breakpoints for the bottom 30 percent (Low), middle 40 percent (Medium), and top 30 percent (High) of the ranked values of book to market ratio for those stocks.

Book to market ratio of each stock is calculated by dividing the book value of the stock for the fiscal year ending in calendar year t – 1 to the market equity at the end of December of year t – 1.

The final portfolios are the six intersections of the two ME and the three BE/ME groups (SL, SM, SH, BL, BM, and BH). For example, SM represents the stocks in the small size group that are also in the medium BE/ME group, while BM represents the stocks in the big size group that are also in the medium BE/ME group. Monthly value-weighted stock returns for the six portfolios are calculated from July of year t to June of year t + 1, and the portfolios are reformed in June of year t + 1. I calculate returns beginning in July of year t to be sure that book equity for year t - 1 is known as in Fama and French (1995). All portfolio groups' excess returns are given in Appendix-G.

2.2 PRELIMINARY ANALYSIS

The purpose of this dissertation is to investigate whether coskewness has a significant role in explaining excess returns of portfolios formed according to size, industry and size and book-to-market ratio in ISE. To investigate the impact of coskewness on the variation of portfolio returns, some descriptive statistics of these portfolio groups must be computed as a preliminary analysis.

These descriptive statistics will provide some information about the sign, magnitude and significance level of different skewness and coskewness measures and also the CAPM beta of portfolio excess returns. Following Harvey and Siddique (2000) and Lin and Wang (2003) one measure of skewness and four measures of coskewness are calculated.

For the skewness measure, standardized unconditional skewness is used. Standardized unconditional skewness is the third central moment about the mean.

The first coskewness measure, the standardized unconditional coskewness or direct measure, as Harvey and Siddique (2000), is defined as

$$\hat{\beta}_{SKD,i} = \frac{E\left[\varepsilon_{Mt}^2 \varepsilon_{it}\right]}{E\left[\varepsilon_{Mt}^2 \sqrt{E\left[\varepsilon_{it}^2\right]}\right]}$$

In the equation, ε_{it} is the residual from regressing the excess return of the ith asset on a constant and market excess return. ε_{Mt} shows the difference of market excess return from its mean value. $\hat{\beta}_{SKD,i}$ indicates the contribution of the ith asset to the skewness of the market portfolio. A negative measure means that the security is adding negative skewness. According to our utility assumptions, a stock with negative coskewness should have a higher expected return-that is, the premium should be negative (Harvey and Siddique, 2000:1276). According to Harvey and Siddique (2000), examining $\hat{\beta}_{SKD,i}$ provides some advantages because $\hat{\beta}_{SKD,i}$ is constructed from residuals that are independent of the market return by construction.

The second measure of coskewness, unconditional measure, η_i is in the following equation. It shows the coefficient of squared term obtained by regressing the excess return of the ith portfolio against a constant, excess market return and its square.

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_m - R_t) + \eta_i (R_m - R_t)^2 + \varepsilon_i$$

η_i is equal to $E\left(\varepsilon_{i,t+1}\varepsilon_{M,t+1}^2\right) / V\left(\varepsilon_{M,t+1}^2\right)$, where $\varepsilon_{i,t+1}$ represents the residuals from the regression of the excess return on the contemporaneous market excess return and $\varepsilon_{M,t+1}$ represents the residuals of the excess market return over its mean.

Following Harvey and Siddique (2000), for the third measure of coskewness, a conditional measure, two value weighted hedge portfolios are formed. The period from July, 1998 to June, 2002 is used as the pre-estimation period. The length of the pre-estimation period is determined in accordance with previous studies in this area.[11] Using the 48 months of returns in the pre-estimation period, standardized coskewness for each analyzed stock is computed. Then, the stocks are ranked based on their past coskewness and two value weighted portfolios are formed.

These are S^-, that consists of 30% of the stocks with the lowest coskewness and S^+ that includes 30% of the stocks with the highest coskewness. The spread for the 49th- month returns on S^- and S^+ is the coskewness hedge portfolio that mimics ex ante conditional coskewness. The 49th month excess returns on S^- and S+ are then used to proxy for systematic skewness. The coskewness for a portfolio from its beta with the spread between the returns on the S^- and S^+ portfolios is computed and called β_{SKS}. The fourth measure of coskewness for a portfolio from its beta with the excess return on the S^- portfolio. This measure is called β_{S^-}. This methodology is much in the same way Fama and French (1993, 1996) form SMB and HML to investigate size and book-to-market effects.

In addition to these measures, the CAPM beta, average excess return and standard deviation of each portfolio are computed. Also cross-sectional correlations between all measures and average excess return of each portfolio are presented in the tables below.

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[11] Harvey and Siddique use 60 months as pre-estimation period while the length of their estimation period is 25 years. Lin and Wang (2003)' s pre- estimation period is from January 1986 to December 1990, while their empirical testing period is from January 1991 to December 2000. Mısırlı and Alper (2008) use data from July 1996 to June 1999 as pre- estimation period. Their empirical testing period is from July 1999 to December 2005.

Table 2: Descriptive Statistics of Industry Portfolios

Panel A: Industry portfolios	Unconditional skewness	Standardized unconditional coskewness	Average excess returns	β to (Rm - Rf)	β to $(Rm - Rf)^2$	β to SKS	β to (S^- -Rf)	Standard deviation
Manufacture of Food, Beverage and Tobacco	-0,144947	-0,451251**	0,695524	0,565102**	-0,011437**	-0,166951	0,365956**	8,33134
Textile, Wearing, Apparel and Leather Industries	-0,477854**	-0,516063**	-0,382261	0,772434**	-0,012944**	-0,17003	0,563661**	9,935714
Manufacture of Paper and Paper Products, Printing and Publishing	0,262373	-0,139663	-0,06113	0,980349**	-0,004410	-0,06007	0,646826**	12,57459
Manufacture of Chemicals and of Chemical Petrolueum, Rubber and Plastic Products	0,439703*	0,008145	0,72788	0,811967**	0,000183	-0,02128	0,693407**	9,940196
Manufacture of Non-Metallic Mineral Products	-0,241067	-0,215076	0,947288	0,760148**	-0,004369	0,091045	0,654309**	9,216382
Basic Metal Industries	-0,043093	-0,073519992	1,461155	0,923983**	-0,002542	-0,055401	0,623883**	12,54027
Manufacture of Fabricated Metal Products, Machinery and Equipment	-0,117043	0,050037	0,55755	1,025391**	0,001051	0,05518	0,802898**	11,73813
Banks and Participation Banks	0,357211	0,37045**	1,545527	1,143748**	0,006550**	0,278375	0,748052**	12,5932
Holding and Investment Companies	0,053313	0,072316	0,429703	1,116201**	0,001108	0,148897	0,828888**	12,14971
Investment Trusts	0,746402**	0,262425*	1,063812	0,879067**	0,007941*	0,163043	0,747083**	11,54668
correlation with average excess returns	0,40706	0,608289	1	0,186498	0,600381	0,567776	0,173996	0,209594

Table 3: Descriptive Statistics of Size Portfolios

Panel B: Size portfolios	Unconditional skewness	Standardized unconditional coskewness	Average excess returns	β to (Rm - Rf)	β to $(Rm - Rf)^2$	β to SKS	β to $(S^- - Rf)$	Standard deviation
s1	0,696384**	-0,054316	1,736968	0,705747**	-0,001911	0,02968	0,500202**	11,00238
s2	-0,318716	-0,491634**	1,284162	0,808839**	-0,013324**	-0,090489	0,578617**	10,51975
s3	-0,060088	-0,288000*	0,986098	0,82037**	-0,007341*	-0,091903	0,558523**	10,39744
s4	0,018176	-0,209113	1,084287	0,784825**	-0,005439	-0,086122	0,542973**	10,16782
s5	1,528729**	-0,173207	2,156437	0,795939**	-0,00693	-0,0417	0,653652**	12,46601
s6	0,011309	-0,194554	1,250623	0,803414**	-0,004842	0,016338	0,613168**	10,17219
s7	-0,342484	-0,327779**	0,95008	0,854458**	-0,006858**	-0,05538	0,650541**	10,13846
s8	-0,398666*	-0,4170173**	0,524091	0,767472**	-0,009203**	-0,093674	0,568351**	9,496608
s9	-0,318305	-0,261990854	0,149365	0,820618**	-0,004357*	-0,013996	0,620034**	9,37616
s10	-0,089877	-0,154864	0,652919	0,815463**	-0,002314	0,045419	0,646834**	9,171082
correlation with average excess returns	0,840561	0,365896426	1	-0,387293	-0,039948	0,067398	-0,125658	0,93092

Table 4: Descriptive Statistics of Fama French Portfolios

Panel C: Fama French portfolios	Unconditional skewness	Standardized unconditional coskewness	Average excess returns	β to (Rm - Rf)	β to $(Rm - Rf)^2$	β to SKS	β to $(S^- - Rf)$	Standard deviation
SL	0,286608	-0,283970103*	1,153785	0,777781**	-0,010266*	-0,169527	0,49692**	11,67789
SM	0,379672	-0,309186379**	1,279533	0,793017**	-0,009083**	-0,06803	0,601415**	10,7189
SH	0,19517	-0,136950157	1,797751	0,777496**	-0,003563	0,027329	0,617393**	10,10777
BL	-0,152537	-0,202019301	0,657464	0,777836**	-0,003194	0,043365	0,595901**	8,891809
BM	-0,108966	-0,156327869	0,000805	0,890744**	-0,002725	-0,011888	0,715631**	10,11844
BH	-0,235848	-0,30454723**	1,459755	0,789836**	-0.007173**	-0,107712	0,576199**	9,880939
correlation with average excess returns	0,408847	-0,296474	-0,356377	-0,784553	-0,31054	-0,223988	-0,562388	0,226683

Notes: 1. According to Pearson and Hartley (1975), when the number of observations, n=100, the critical value at the significance level 5% is ± 0.470, and 10% is ± 0.390.

2. Significance levels for unconditional coskewness are computed following Lin and Jerry (2003)and Mısırlı and Alper (2008). The critical value at the significance level 5% is ± 0.292 and 10% is ± 0.228.

3.. ** and * denotes significant at 5 and 10% levels, respectively.

Among all industry portfolios, only textile, wearing apparel and leather industries', manufacture of chemicals and of chemical petroleum, rubber and plastic products' and investment trusts industries' unconditional skewness coefficients are significant. From the three, two of them are positive. Similar results are obtained for size portfolios. Again, three of the size portfolios (size 1, size 5 and size 8) have significant unconditional skewness coefficients and two of them are positive. Only the unconditional skewness coefficient of size 8 portfolio is negative. For the analysis period none of the Fama French portfolios have significant unconditional skewness.

To depict the change of skewness over the analysis period, twelve month moving averages of skewness is calculated for excess return of each individual portfolio and the ISE 100 index (market portfolio). Each portfolio's twelve month moving averages of skewness are graphed with market portfolio's twelve month moving averages of skewness. These graphs are given below.

Figure 1: Twelve-Month Moving Averages of Skewness for Industry 1 and Market Portfolio

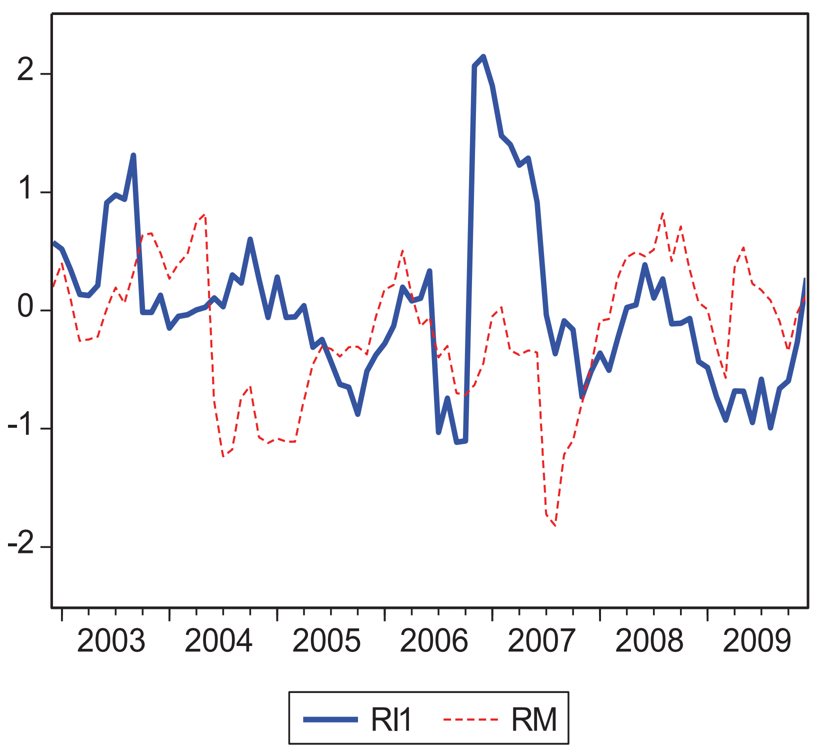


Figure 2: Twelve-Month Moving Averages of Skewness for Industry 2 and Market Portfolio

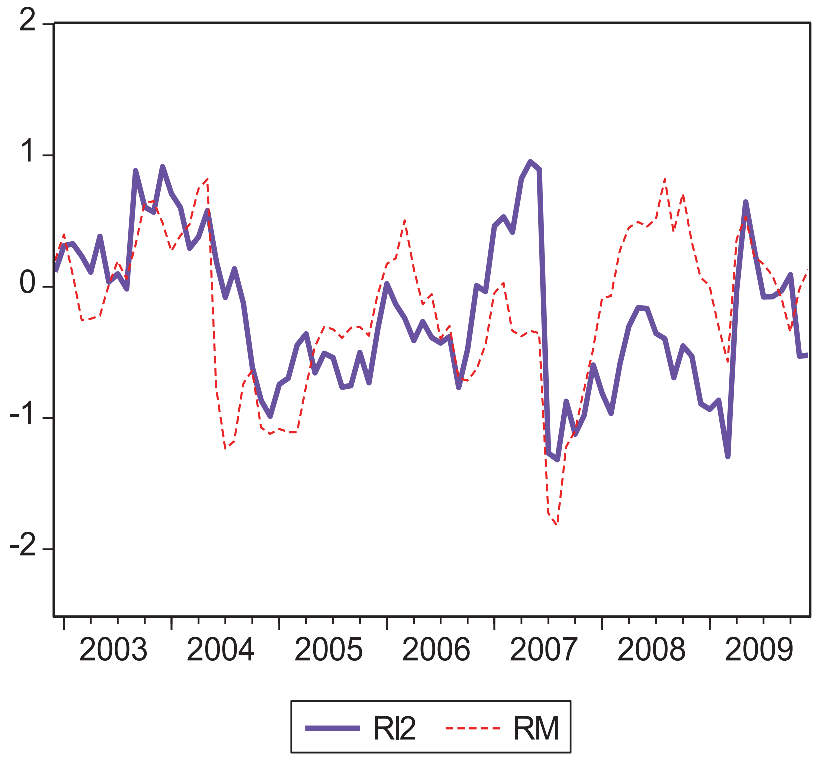


Figure 3: Twelve-Month Moving Averages of Skewness for Industry 3 and Market Portfolio

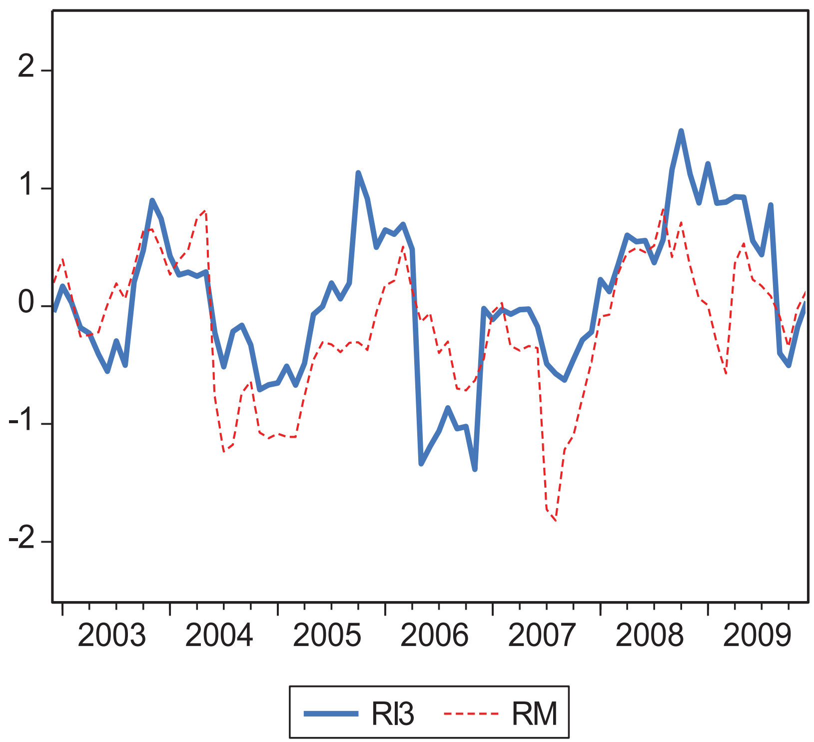


Figure 4: Twelve-Month Moving Averages of Skewness for Industry 4 and Market Portfolio

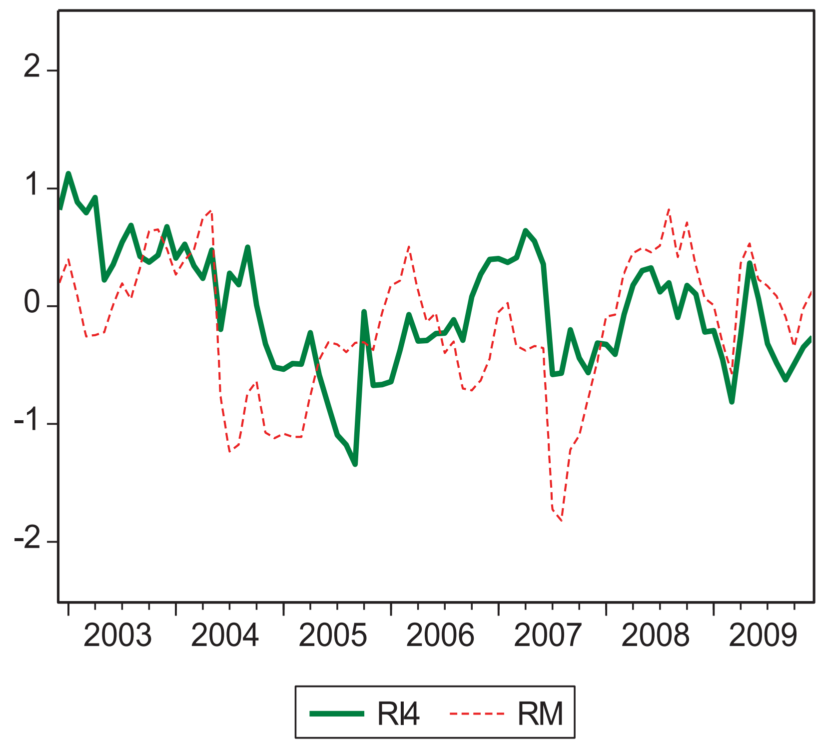


Figure 5: Twelve-Month Moving Averages of Skewness for Industry 5 and Market Portfolio

Figure 6: Twelve-Month Moving Averages of Skewness for Industry 6 and Market Portfolio

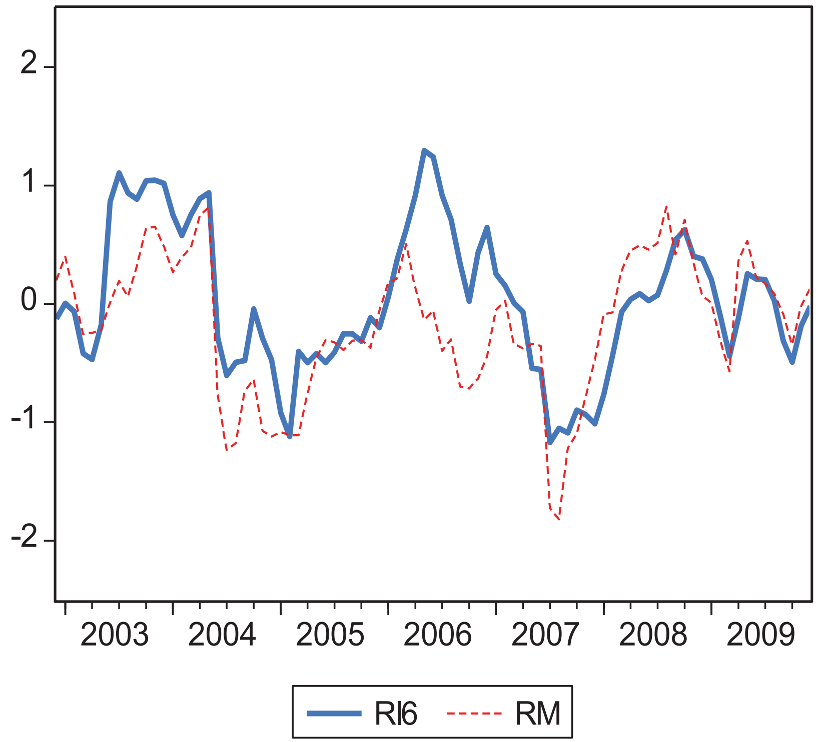


Figure 7: Twelve-Month Moving Averages of Skewness for Industry 7 and Market Portfolio

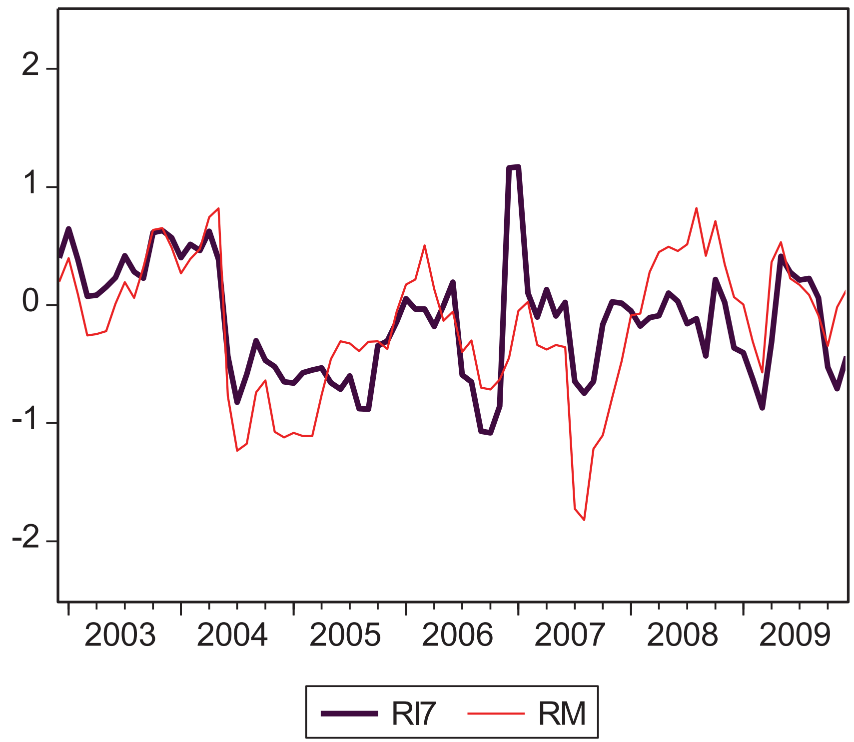


Figure 8: Twelve-Month Moving Averages of Skewness for Industry 8 and Market Portfolio

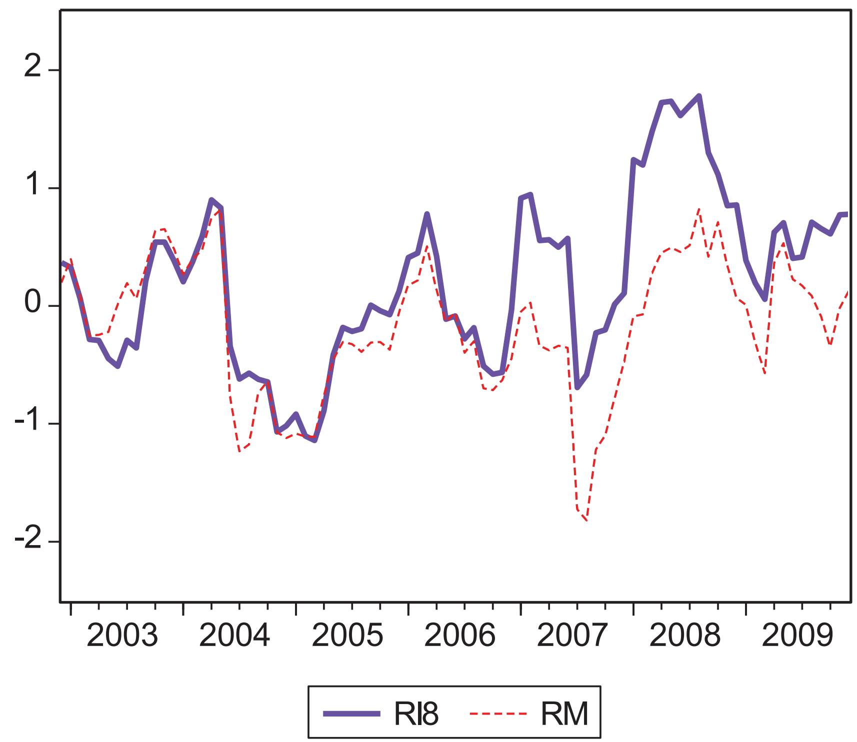


Figure 9: Twelve-Month Moving Averages of Skewness for Industry 9 and Market Portfolio

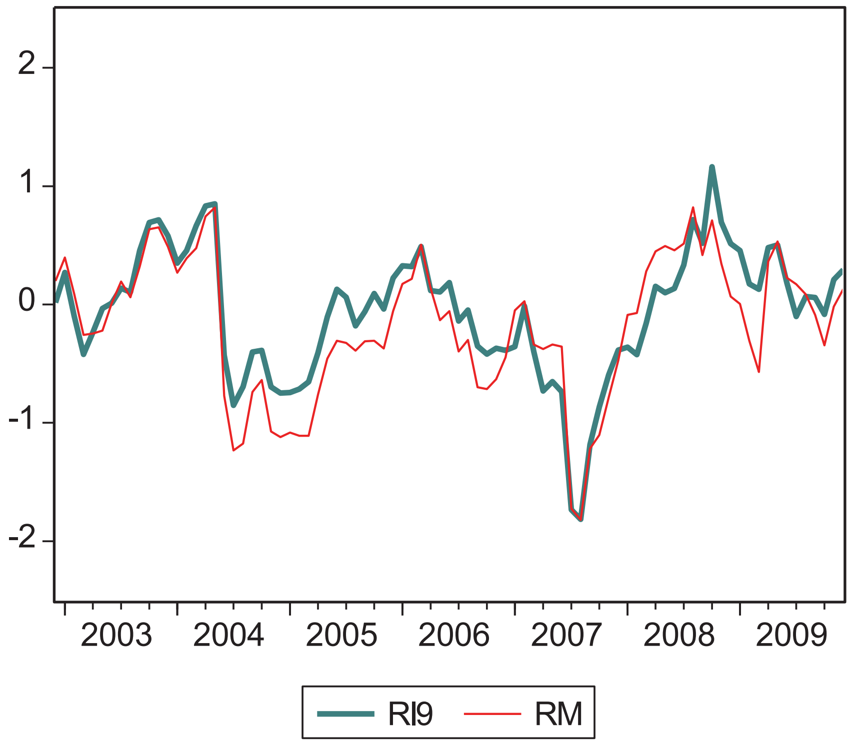


Figure 10: Twelve-Month Moving Averages of Skewness for Industry 10 and Market Portfolio

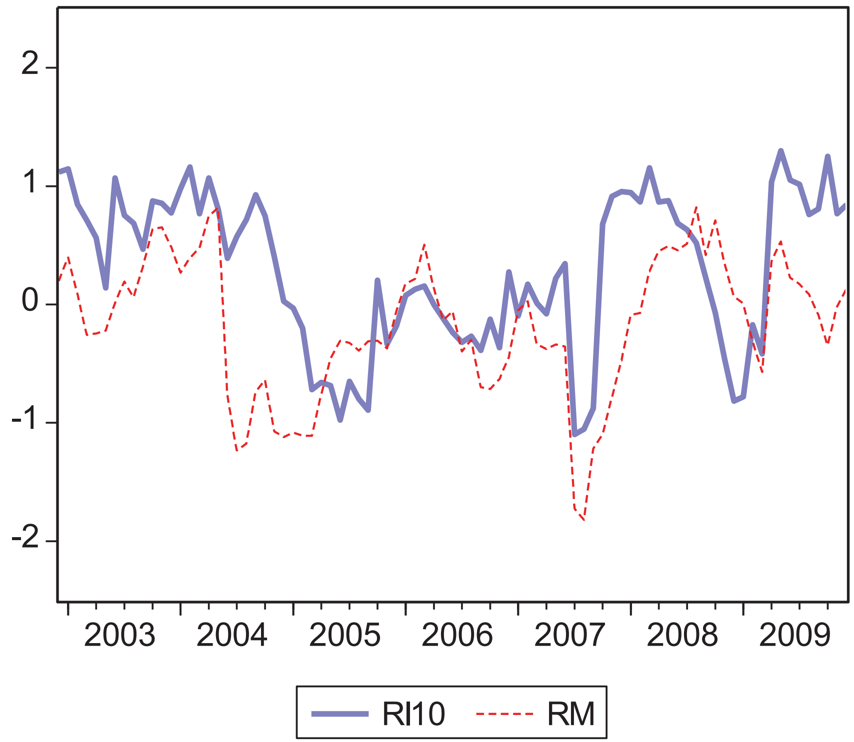


Figure 11: Twelve-Month Moving Averages of Skewness for Size 1 and Market Portfolio

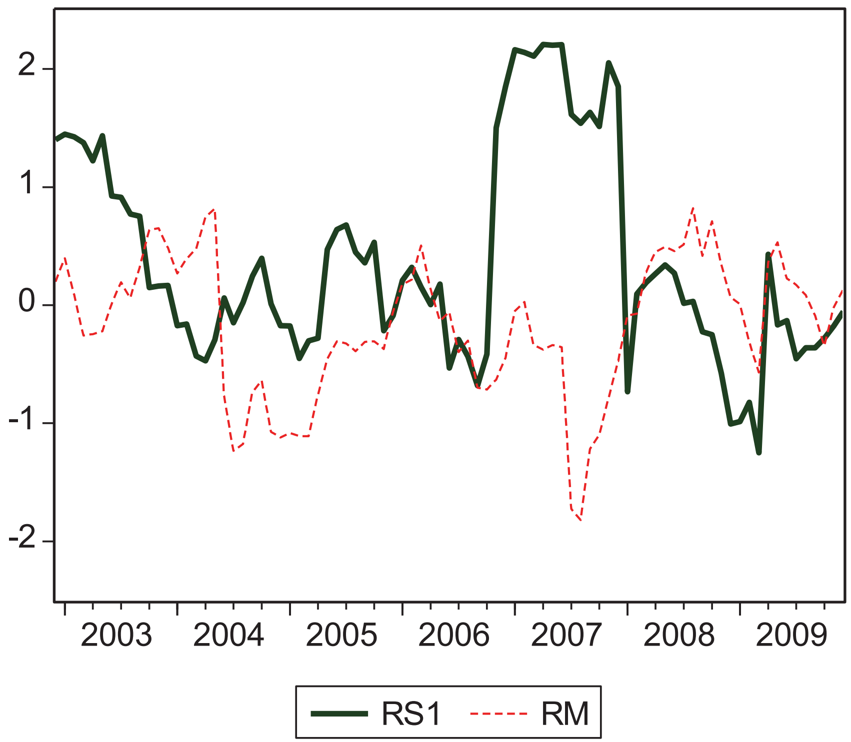


Figure 12: Twelve-Month Moving Averages of Skewness for Size 2 and Market Portfolio

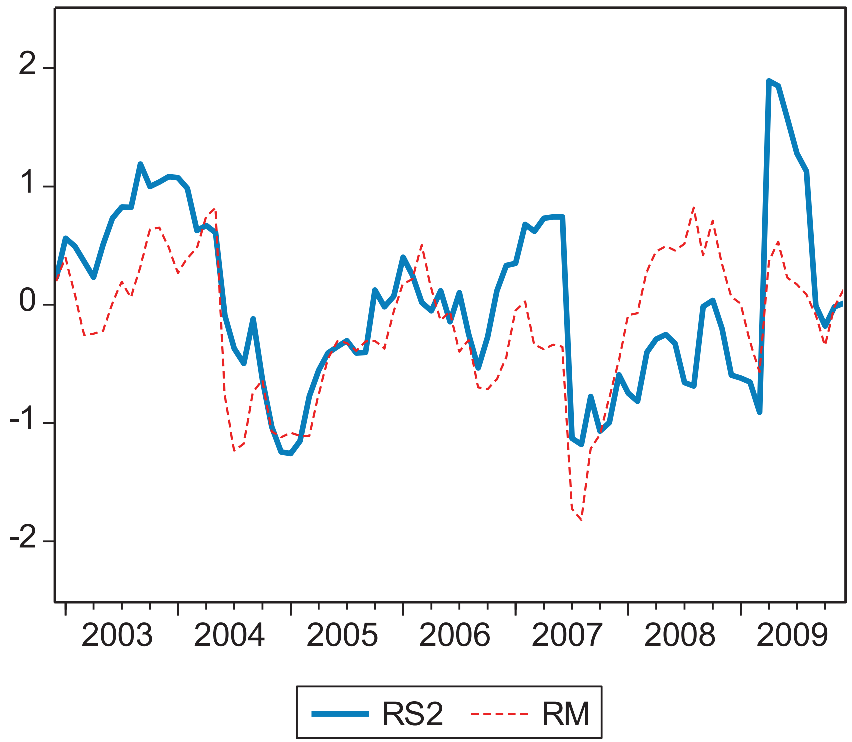


Figure 13: Twelve-Month Moving Averages of Skewness for Size 3 and Market Portfolio

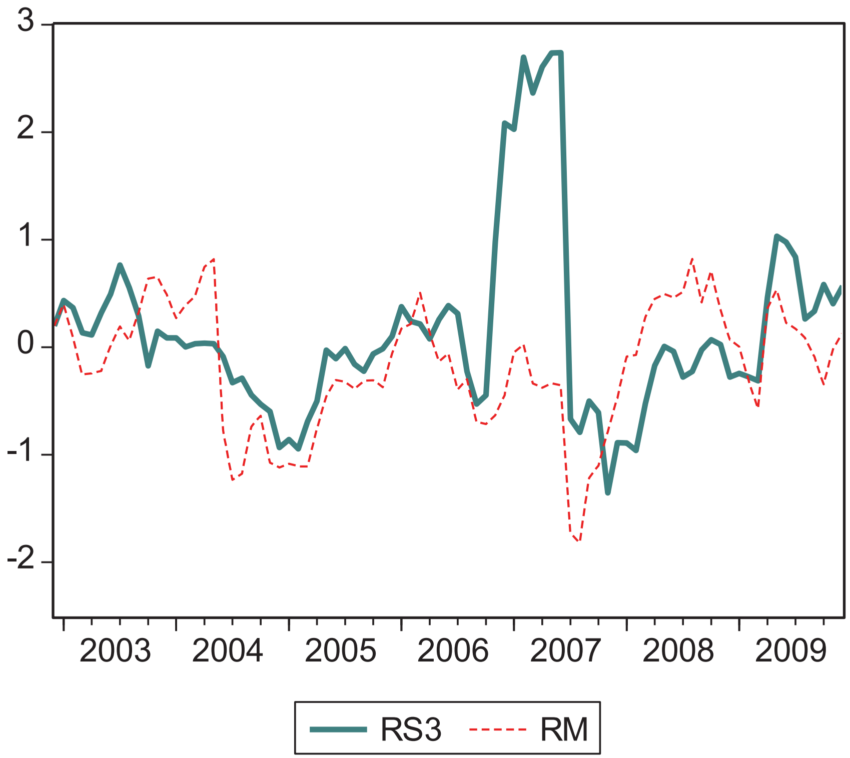


Figure 14: Twelve-Month Moving Averages of Skewness for Size 4 and Market Portfolio

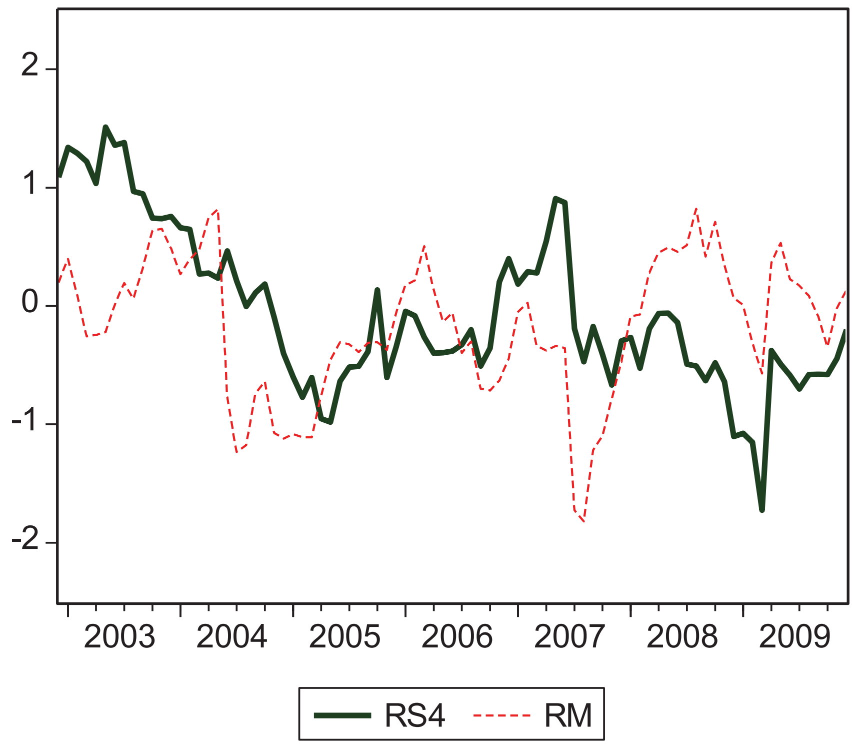


Figure 15: Twelve-Month Moving Averages of Skewness for Size 5 and Market Portfolio

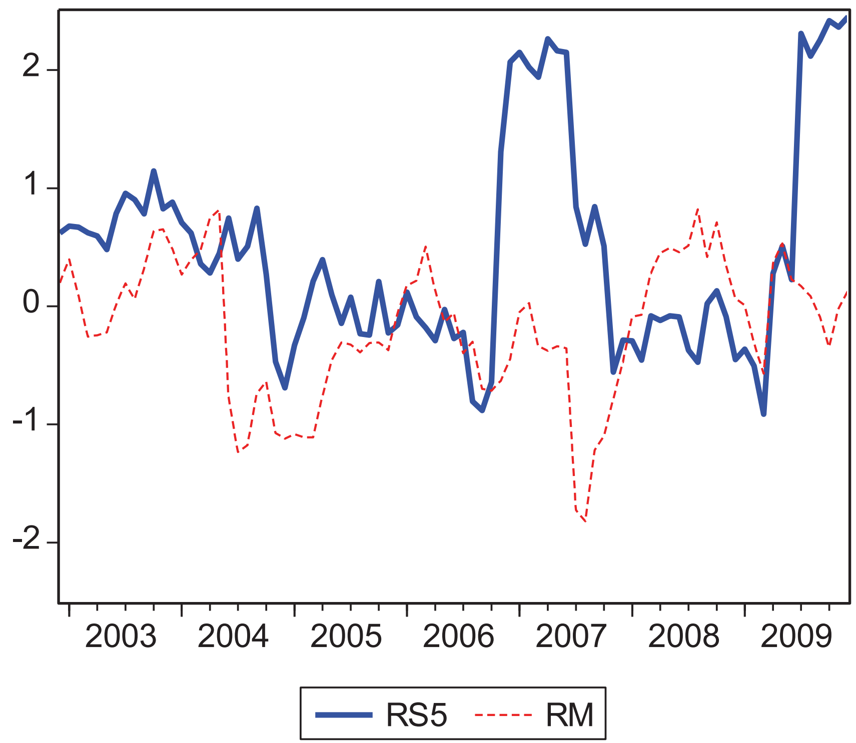


Figure 16: Twelve-Month Moving Averages of Skewness for Size 6 and Market Portfolio

Figure 17: Twelve-Month Moving Averages of Skewness for Size 7 and Market Portfolio

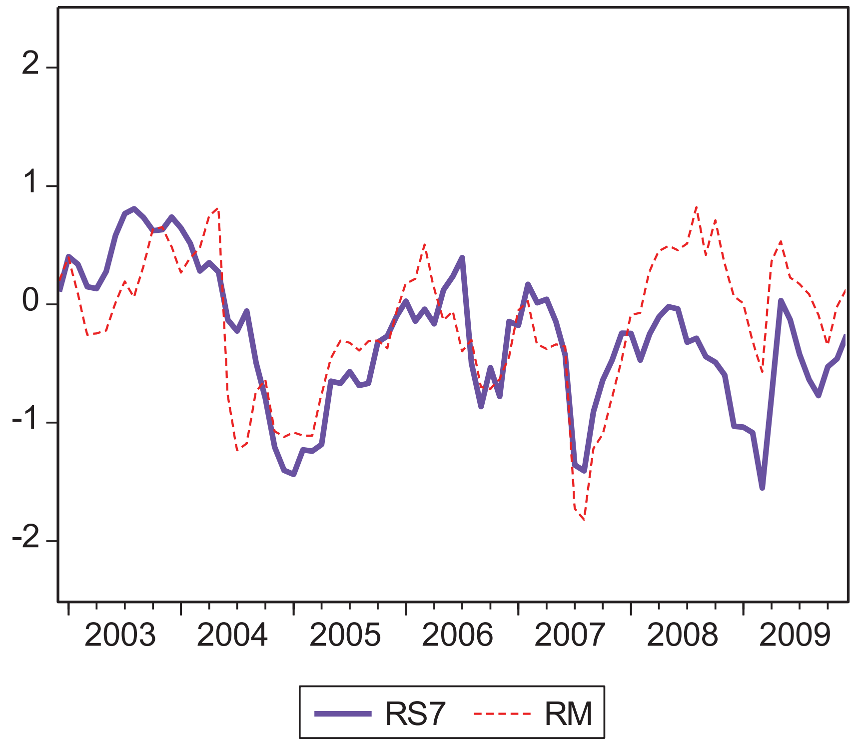


Figure 18: Twelve-Month Moving Averages of Skewness for Size 8 and Market Portfolio

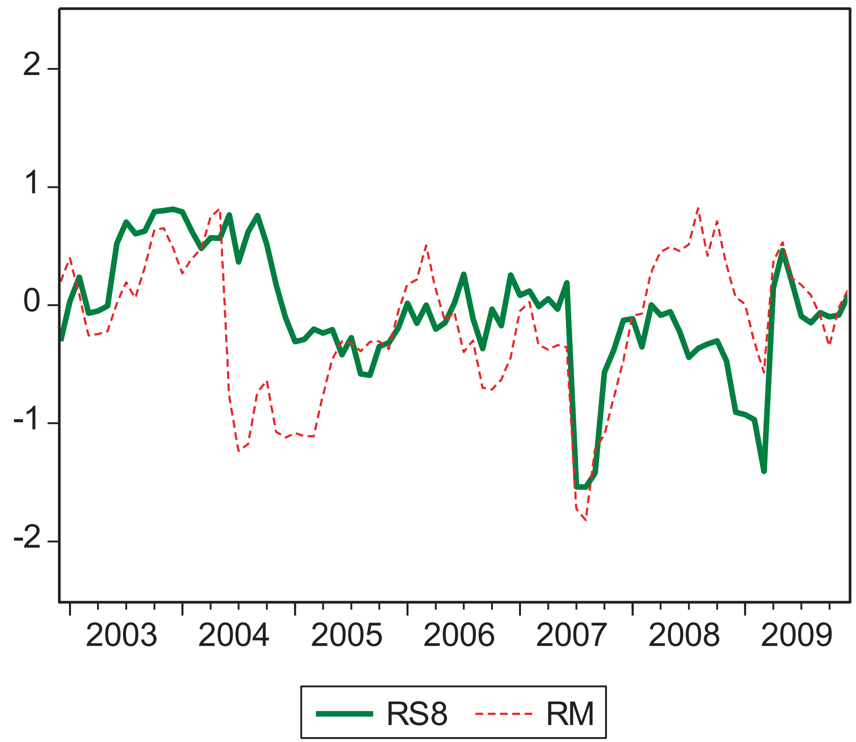


Figure 19: Twelve-Month Moving Averages of Skewness for Size 9 and Market Portfolio

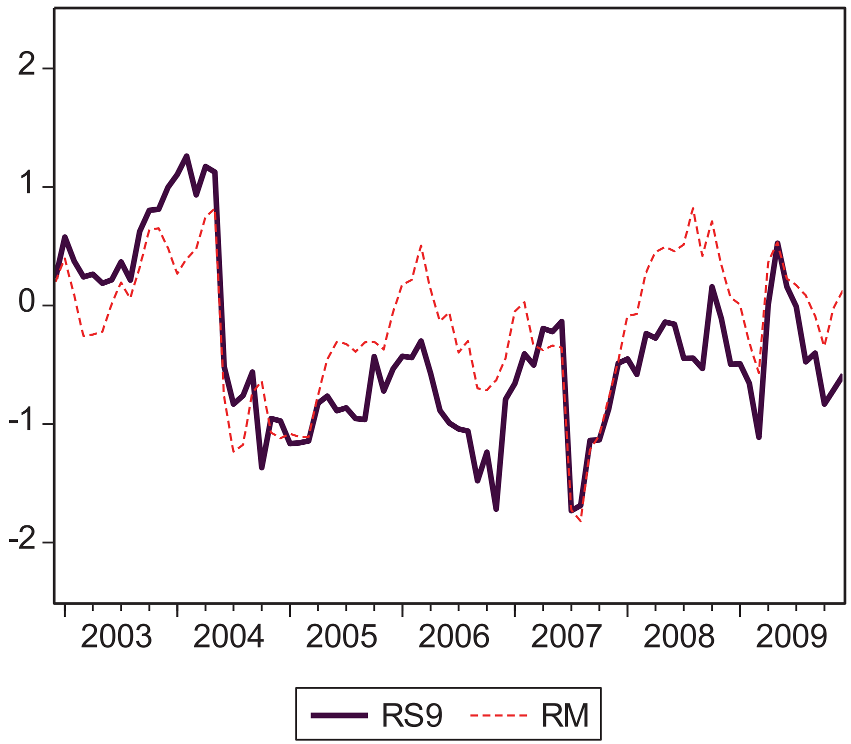


Figure 20: Twelve-Month Moving Averages of Skewness for Size 10 and Market Portfolio

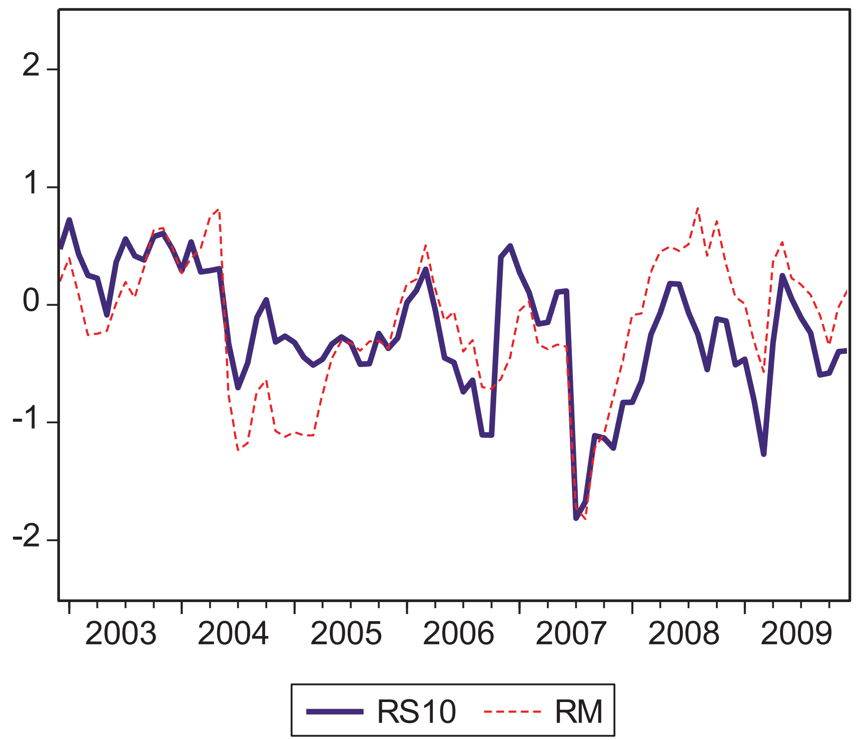


Figure 21: Twelve-Month Moving Averages of Skewness for SH (Small Size-Highest Value) and Market Portfolio

Figure 22: Twelve-Month Moving Averages of Skewness for SM (Small Size-Medium Value) and Market Portfolio

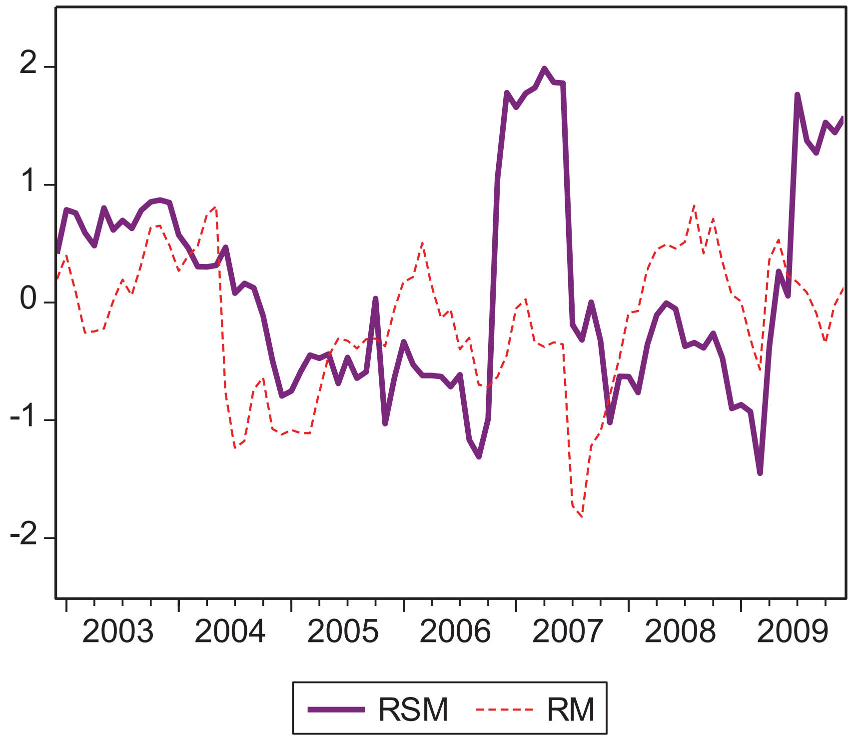


Figure 23: Twelve-Month Moving Averages of Skewness for SL (Small Size-Lowest Value) and Market Portfolio

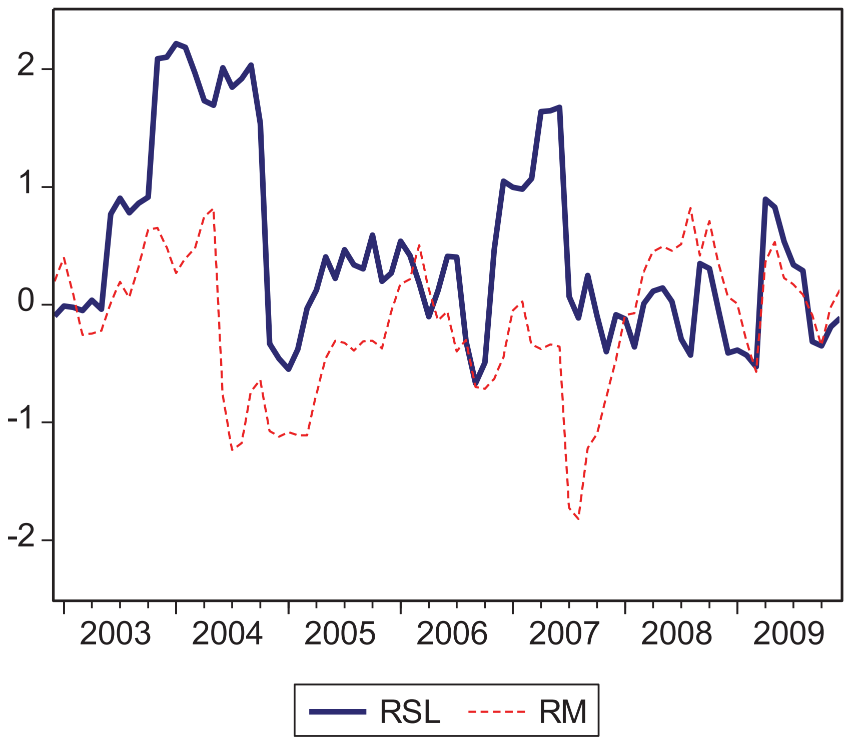


Figure 24: Twelve-Month Moving Averages of Skewness for BH (Big Size-Highest Value) and Market Portfolio

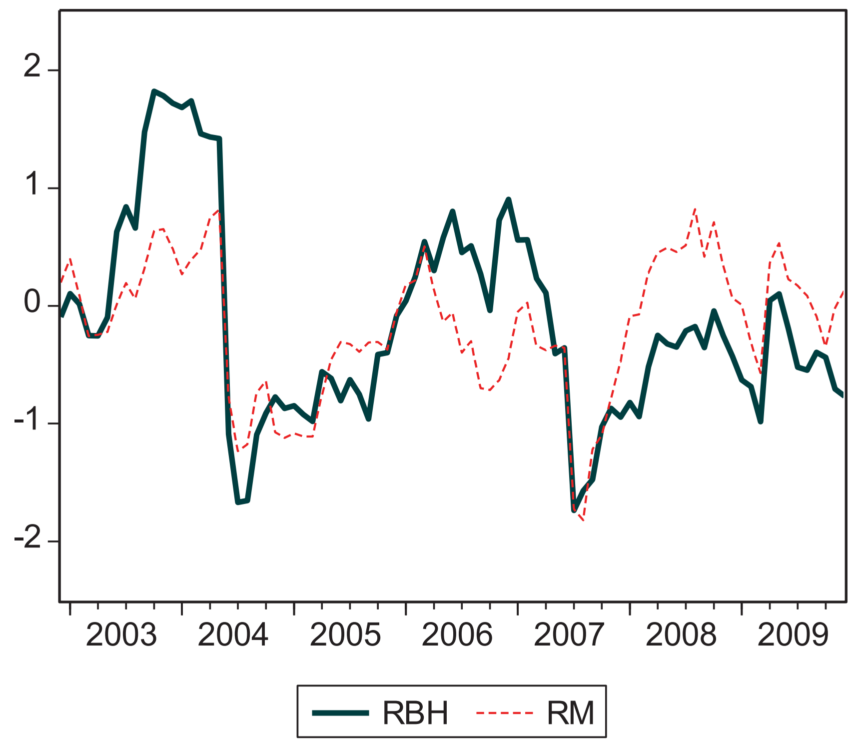


Figure 25: Twelve-Month Moving Averages of Skewness for BM (Big Size-MediumValue) and Market Portfolio

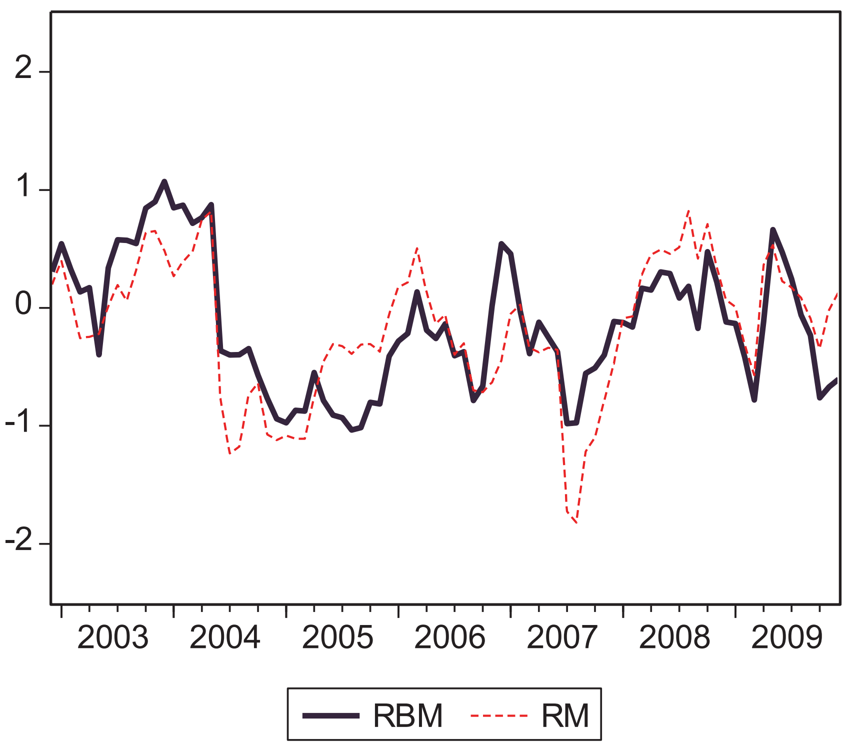
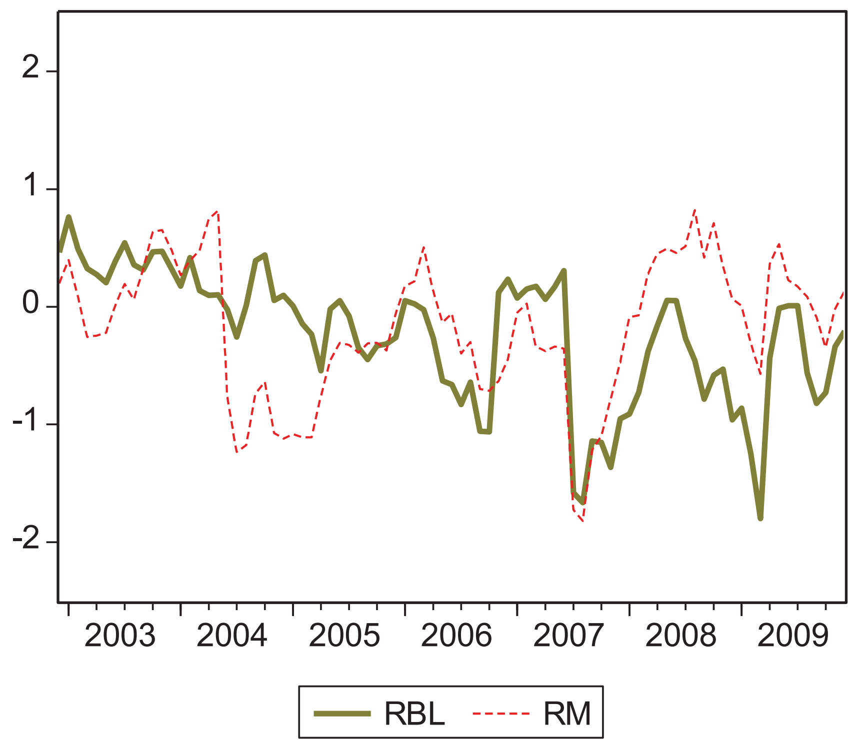


Figure 26: Twelve-Month Moving Averages of Skewness for BL (Big Size-Lowest Value) and Market Portfolio



Nearly half of the industry, size and Fama French portfolios' coefficients of two unconditional coskewness measures are significant. Four of ten industry (manufacture of food, beverage and tobacco; textile, wearing, apparel and leather industries; banks and participation banks and investment trusts) portfolios, four of ten size portfolios (size 2, size 3, size 7 and size 8) and three of six Fama French portfolios (SL, SM and BH) have significant unconditional coskewness measures. In addition to that, size 9 portfolio has significant second unconditional coskewness coefficient. The sign of the two unconditional coskewness measures are all negative for all portfolios except for banks and participation banks and investment trust industry portfolios. Hence, these portfolios with significant negative unconditional coskewness coefficients have negative contributions to the skewness of the market portfolio.

The third coskewness measure -conditional coskewness- is all insignificant for all portfolio groups while the fourth coskewness measure is all positive and significant.

The cross sectional correlations that are given in the last row of each panel show the relationships between portfolio statistics and average excess returns of each portfolio group. The sign of the correlation coefficients between average excess returns of all portfolio groups and unconditional skewness are positive in contrast to the existing literature. Especially for size portfolios, there is a strong positive relationship between skewness measure and their average excess return. The correlation coefficient between their average excess return and skewness is 0,8405. The lowest size decile portfolio (size 1) has bigger unconditional coskewness coefficient than decile 10 size portfolio (size 10), respectively. The results are opposite of the results of Harvey and Siddique (2000). They show that size 1 portfolio has a negative direct coskewness and low expected return, while size 10 portfolio has a positive coskewness. Also, again on the contrary to the studies of Harvey and Siddique (2000) and Mısırlı and Alper (2008), it is found that the lowest size decile portfolio's conditional coskewness coefficient is lower than the coefficient of the highest size decile.

There are positive relationships between all coskewness measures and mean excess returns of industry portfolios. Similar to industry portfolios, size portfolios' correlation between their average excess returns and unconditional coskewness is positive. On the other hand, there is no evidence of any significant relationship between the conditional coskewness and average excess returns of size portfolios for the analysis period. Unlike size portfolios, there are negative relationships between all coskewness measures and average excess returns of six Fama French portfolios.

Harvey and Siddique (2000) find that there is a negative correlation between the direct measures of coskewness and the mean returns and a positive association between the hedge portfolio loadings and the average returns-both as expected for industry portfolios in the US.

As for previous evidence from emerging markets, Lin and Wang (2003) find that almost all the coefficients for skewness and systematic skewness are significant for all portfolios constructed by the same criteria used in this dissertation for the Taiwan stock market. They find that, during their sample period, unconditional skewness coefficients are positive for all portfolios, whereas standardized unconditional coskewness are negative. This means that these portfolios have negative contributions of systematic skewness to the market portfolio. Even though majority of the skewness and coskewness measures are highly significant, most of the correlations are inconsistent with the prior expectations.

Mısırlı and Alper (2008) obtain similar results with Harvey and Siddique (2000) about the relation between coskewness and excess returns in the case of industry and size portfolios for ISE. But, they find little evidence of a relation between average excess returns and coskewness for Fama– French portfolios in ISE.

The descriptive statistics tables show that, majority of the coefficients for skewness and direct and systematic coskewness are insignificant for portfolios formed according to industry, size and size and book to market ratio for the period July, 2002 to June, 2010 in ISE. In addition to that, sign and magnitude of most of the correlation coefficients between portfolio excess returns and skewness and coskewness measures are inconsistent with prior expectations, whereas Mısırlı and Alper's (2008) are consistent. Possible explanations of these differences between the results of their study and this dissertation may be as follows:

- In portfolio formation, there are some differences between this dissertation and the study of Mısırlı and Alper (2008), even though same portfolio groups are formed. Mısırlı and Alper (2008) form value weighted portfolios by weighting stocks included in a portfolio by their end of month market capitalization values, while I use mid year market capitalization values of stocks. In this dissertation, the portfolio formation methodology of Fama and French (1992) is adopted. The accounting data for all fiscal year ends in calendar year t-1 is matched with the returns for July of year t to June of t+1. Firms' market equity at the end of December of year t - 1 is used to compute its book-to-market ratios for t - 1, and their market capitalizations for June of year t are used to measure their size. But, Mısırlı and Alper (2008) do not use the 6 month gap between fiscal year end and the returns of securities in portfolio formation. These data and portfolio formation differences led to obtaining different portfolios.

- Mısırlı and Alper (2008) use the period of June 1999 and December, 2005 as the analysis period, while in this dissertation, the period from July, 2002 to June, 2010 is used.

- The dramatic changes observed in portfolios' descriptive statistics in regard to changes in analysis periods may possibly be caused by the market form of ISE.

The majority of the previous studies analyzing the efficiency of ISE test weak and semi strong form efficiency of this market. Some of the studies find that ISE is a weakly efficient market (Bakirtas and Karpuz (2000), Tas and Dursunoglu (2004), etc.), while others conclude that ISE is neither weak nor semi strong form efficient.

Balaban (1995) tests informational efficiency of the ISE in terms of the Composite Index for the period January 1988-August 1994. He finds that the ISE Composite Index is neither weak-form nor semi strong form efficient. Atakan (2008) uses an extensive data set from July 3rd 1987-July 18th 2008 and test the anomalous stock market behavior for ISE. The results of this study indicate that ISE-100 daily returns on Fridays are higher than the average, while returns on Mondays are lower. The day-of-the-week anomalies can be an evidence against the weak form efficiency of ISE for the analysis period. The period analyzed in this study covers the vast majority of the analysis period of this dissertation that is from June 1998 to June 2010.

Atan et al. (2009) test the efficiency of ISE using fifteen minutes and session frequency data for the 03 January 2003 – 30 December 2005 period. They find that ISE is a weakly efficient market.

These studies imply that ISE is not an efficient market and the descriptive statistics of portfolio groups including stocks that are traded in ISE may vary from time to time due to this inefficiency. Therefore, the whole analysis period, July 1998-June 2010, is divided into seven six year sub-periods: July 1998 – June 2004, July 1999 – June 2005, July 2000 – June 2006, July 2001 – June 2007, July 2002 – June 2008, July 2003 – June 2009 and July 2004 – June 2010. For each sub period, all portfolio groups' unconditional skewness and coskewness and average excess returns are computed. Again, the cross sectional correlations between excess returns of portfolios and portfolio statistics are reported in the last row of each panel.

Table 5: Descriptive Statistics for the Period from July 1998 to June 2004

Panel A: Industry portfolios	unconditional skewness	unconditional coskewness	average excess return
i1	0,619339**	0,041668	-0,964328
i2	0,797278**	-0,205882	-1,503493
i3	0,973604**	-0,348139**	-0,326752
i4	1,092513**	0,223623	-0,796545
i5	0,613686**	-0,038173	-0,525997
i6	0,505016*	-0,300066	-0,105831
i7	0,826364**	-0,105740	0,696640
i8	1,074876**	0,244535	0,271265
i9	0,746526**	-0,252191	0,179848
i10	1,596307**	0,207522	2,090468
correlation with average excess returns	0,642478	0,287648	1

Panel B: Size Portfolios	unconditional skewness	unconditional coskewness	average excess return
s1	0,989937**	0,120073	1,765123
s2	0,150525	-0,469012**	-0,603200
s3	0,509552*	-0,257968	0,257726
s4	0,622358**	-0,138139	-0,641897
s5	0,421714	-0,281273	0,527678
s6	0,702064**	-0,121271	0,128384
s7	0,749617**	-0,160878	-0,110659
s8	0,735887**	-0,083923	-1,214786
s9	0,964727**	0,099694	-0,906659
s10	1,104649**	0,238914	-0,532076
correlation with average excess returns	0,083766	0,070231	1

Panel C: Fama French Portfolios	unconditional skewness	unconditional coskewness	average excess return
sh	0,410229	-0,308261*	0,444336719
sm	0,027795	-0,430201**	-0,562146944
sl	0,660342**	-0,1541433	0,209629185
bh	0,43583	-0,308979*	-0,093709837
bm	1,038883**	0,12907851	-0,117026321
bl	1,1458**	0,24404673	-0,831471667
correlation with average excess returns	-0,22223907	-0,3894184	1

Table 6: Descriptive Statistics for the Period from July 1999 to June 2005

Panel A: Industry portfolios	unconditional skewness	unconditional coskewness	average excess return
i1	0,768724**	0,115836	-0,055753
i2	1,117717**	-0,060099	-0,134850
i3	1,164768**	-0,453041**	1,162709
i4	1,403612**	0,336701**	-0,415012
i5	1,028953**	0,147308	0,867939
i6	0,539152*	-0,379506**	1,303526
i7	1,060152**	0,042694	1,442476
i8	1,255138**	0,219722	0,832330
i9	0,843881**	-0,358766**	0,773122
i10	1,717536**	0,320439*	2,863200
correlation with average excess returns	0,316945	-0,034848	1

Panel B: Size Portfolios	unconditional skewness	unconditional coskewness	average excess return
s1	1,351596**	0,354759**	3,024369
s2	0,174995	-0,490374**	1,332154
s3	0,591631**	-0,263534	1,070202
s4	0,763576**	-0,0780395	0,627923
s5	0,607738**	-0,163054	2,094499
s6	0,890531*	-0,057863	1,479573
s7	0,912033**	-0,119289	0,638744
s8	0,92887**	-0,059332	0,137418
s9	1,374412**	0,249609	0,533336
s10	1,355834**	0,286872	0,051468
correlation with average excess returns	-0,092817	0,045276	1

Panel C: Fama French Portfolios	unconditional skewness	unconditional coskewness	average excess return
sh	0,532047*	-0,250816	2,175353
sm	0,135508	-0,376401**	0,787353
sl	0,74456**	-0,192167	0,869016
bh	0,538061*	-0,311759*	0,999419
bm	1,293122**	0,207242	0,70406
bl	1,414055**	0,300938	-0,07424
correlation with average excess returns	-0,553075	-0,607701	1

Table 7: Descriptive Statistics for the Period from July 2000 to June 2006

Panel A: Industry portfolios	unconditional skewness	unconditional coskewness	average excess return
i1	-0,098301	-0,067484	-0,515746
i2	0,205761	-0,278721	-1,763512
i3	1,252303**	0,628288**	0,030692
i4	0,317029	-0,085198	-0,867040
i5	0,218254	0,023018	0,272558
i6	0,22874	-0,050356	-0,113076
i7	0,233607	0,059741	-0,622233
i8	0,335107	0,110916	0,050103
i9	0,304912	-0,009052	-0,590015
i10	0,49575*	0,201306	-0,117127
correlation with average excess returns	0,319167	0,631083	1

Panel B: Size Portfolios	unconditional skewness	unconditional coskewness	average excess return
s1	-0,425914	-0,271029	0,673838
s2	-0,205183	-0,334199**	-0,002899
s3	-0,435165	-0,396238**	-0,462428
s4	-0,321986	-0,384537**	-0,909132
s5	-0,461168*	-0,336298**	0,486482
s6	0,141343	-0,07592988	0,340244
s7	0,001727	-0,3570840**	-0,374434
s8	-0,099652	-0,246011672	-0,910639
s9	0,129214	-0,23675649	-1,222786
s10	0,47542*	0,090582883	-0,644051
correlation with average excess returns	-0,390717	-0,022465	1

Panel C: Fama French Portfolios	unconditional skewness	unconditional coskewness	average excess return
sh	-0,157693	-0,271467	0,692195
sm	-0,796282**	-0,456072**	-0,454269
sl	-0,162195	-0,407229**	-0,844411
bh	-0,260646	-0,410997**	-0,454471
bm	0,205238	-0,009626	-0,901214
bl	0,454512	-0,006889	-0,643512
correlation with average excess returns	-0,225069	-0,193299	1

Table 8: Descriptive Statistics for the Period from July 2001 to June 2007

Panel A: Industry portfolios	unconditional skewness	unconditional coskewness	average excess return
i1	0,02798	-0,162721	-0,064114
i2	0,235206	-0,202307	-0,862924
i3	-0,033689	0,174769	0,544756
i4	0,310937	0,067484	-0,144570
i5	0,071755	0,099807	1,063565
i6	0,177969	0,019025	1,689201
i7	0,091345	0,300834	0,482595
i8	-0,138446	-0,087730	0,472843
i9	0,132078	0,192117	0,210407
i10	0,658187**	0,376108**	0,477908
correlation with average excess returns	-0,119957	0,363785	1

Panel B: Size Portfolios	unconditional skewness	unconditional coskewness	average excess return
s1	0,365085	0,109300	0,971208
s2	0,197819	-0,128367	0,585687
s3	0,182049	-0,032116	0,754916
s4	0,023606	-0,172633	0,348966
s5	0,063636	-0,075021	1,488627
s6	0,040771	-0,097719	0,822056
s7	0,128923	-0,010104	0,653759
s8	-0,143109	-0,188810	0,035455
s9	0,250285	0,092512	0,019467
s10	0,398996	0,227443	0,221373
correlation with average excess returns	0,039744	-0,079975	1

Panel C: Fama French Portfolios	unconditional skewness	unconditional coskewness	average excess return
sh	0,151164	-0,031653	1,522945
sm	-0,096717	-0,158457	0,601442
sl	0,439974	-0,149065	0,604032
bh	0,034747	-0,085011	0,828734
bm	0,059959	0,100717	0,147293
bl	0,424551	0,158432	0,246521
correlation with average excess returns	-0,162113	-0,437131	1

Table 9: Descriptive Statistics for the Period from July 2002 to June 2008

Panel A: Industry portfolios	unconditional skewness	unconditional coskewness	average excess return
i1	-0,154785	-0,508046**	0,063152
i2	-0,346445	-0,474553**	-1,175420
i3	-0,046197	0,090245	-0,668495
i4	0,658334**	0,158103	0,520453
i5	-0,07415	0,0090539	0,743396
i6	0,01026	0,016427	2,657733
i7	0,184282	0,338434**	-0,132587
i8	0,066055	0,236552	0,890568
i9	0,007591	0,073523	-0,006411
i10	0,957895**	0,524598**	0,533282
correlation with average excess returns	0,234451	0,292685	1

Panel B: Size Portfolios	unconditional skewness	unconditional coskewness	average excess return
s1	0,511182*	0,100496	1,489604
s2	-0,116716	-0,320406*	0,359738
s3	0,501033*	-0,227912	0,38755
s4	-0,096361	-0,102049	1,043486
s5	0,045316	-0,018154	-0,144605
s6	-0,003366	-0,085070	0,64936
s7	1,243027**	-0,093108	1,040208
s8	-0,208901	-0,287025	0,530909
s9	-0,106197	-0,123458	0,237606
s10	0,344369	0,053831	0,30914
correlation with average excess returns	0,42468	0,297253	1

Panel C: Fama French Portfolios	unconditional skewness	unconditional coskewness	average excess return
sh	0,340305	0,082290	1,341311
sm	0,181953	-0,223466	0,919900
sl	-0,029033	-0,230794	0,619375
bh	-0,263944	-0,197566	-0,058622
bm	-0,167768	0,046162	-0,325572
bl	0,067505	-0,031789	0,664823
correlation with average excess returns	0,9448	0,067788	1

Table 10: Descriptive Statistics for the Period from July 2003 to June 2009

Panel A: Industry portfolios	unconditional skewness	unconditional coskewness	average excess return
i1	-0,270655	-0,404016**	0,685388
i2	-0,515578*	-0,517130**	-0,427182
i3	0,509099*	-0,173801	-0,245814
i4	-0,20917	-0,321192*	0,274891
i5	-0,586988**	-0,393205**	0,594232
i6	0,024719	-0,017892	1,786225
i7	-0,174561	0,010276	0,036111
i8	0,489604*	0,453891**	1,583964
i9	0,195929	0,271880	0,348783
i10	0,631862**	0,197273	0,624876
correlation with average excess returns	0,261984	0,496442	1

Panel B: Size Portfolios	unconditional skewness	unconditional coskewness	average excess return
s1	0,045909	-0,334463**	1,803614
s2	-0,482466*	-0,527726**	0,633331
s3	0,416712	-0,409841**	1,107463
s4	0,03517	-0,291318	1,483961
s5	-0,295053	-0,327092**	-0,410846
s6	-0,51614*	-0,227673	0,596665
s7	0,754725**	-0,457131**	1,391555
s8	-0,396553	-0,431484**	1,046147
s9	-0,161071	-0,375522**	0,524267
s10	-0,305318	-0,370837**	1,110666
correlation with average excess returns	0,498209	-0,073943	1

Panel C: Fama French Portfolios	unconditional skewness	unconditional coskewness	average excess return
sh	0,014042	-0,268708	1,481127
sm	-0,109993	-0,472042**	1,057863
sl	-0,550133*	-0,354136**	0,565881
bh	-0,362425	-0,178524	0,311421
bm	-0,528679*	-0,297781	-0,271309
bl	-0,378643	-0,439128**	0,509891
correlation with average excess returns	0,869026	-0,216039	1

Table 11: Descriptive Statistics for the Period from July 2004 to June 2010

Panel A: Industry portfolios	unconditional skewness	unconditional coskewness	average excess return
i1	-0,165387	-0,318438*	1,389044917
i2	-0,714437**	-0,551481**	0,192263579
i3	0,415096	-0,226898	0,034104308
i4	-0,320396	-0,305408*	0,925368638
i5	-0,523214*	-0,405835**	1,083446672
i6	-0,447297	-0,200440	1,316241676
i7	-0,461104*	-0,075567	0,481215772
i8	0,476018*	0,609664**	1,508596366
i9	-0,05713	0,160223	0,386265532
i10	0,144424	-0,137466	0,306690745
correlation with average excess returns	-0,013167	0,291054	1

Panel B: Size Portfolios	unconditional skewness	unconditional coskewness	average excess return
s1	-0,118179	-0,209958806	1,907573
s2	0,349468	-0,5821827**	1,646347
s3	-0,028427	-0,362338**	1,029054
s4	-0,675884**	-0,331973**	1,941195
s5	-0,470297*	-0,301190*	0,087906
s6	-0,693206**	-0,353514**	0,726829
s7	0,636354**	-0,518095**	1,789258
s8	-0,526068*	-0,463212**	1,751602
s9	-0,156448	-0,359288**	1,189153
s10	-0,429855	-0,493068**	1,392519
correlation with average excess returns	0,312797	-0,264667	1

Panel C: Fama French Portfolios	unconditional skewness	unconditional coskewness	average excess return
sh	1,769033**	-0,367599**	2,137622
sm	-0,297724	-0,405956**	1,51927
sl	-0,752922**	-0,308905*	1,025198
bh	-0,485018*	-0,437454**	1,151271
bm	-0,591609**	-0,355366**	0,295972
bl	-0,693384**	-0,461508**	0,738314
correlation with average excess returns	0,818111	0,033034	1

Based on descriptive statistics of portfolio returns for seven different periods, it is obvious that the significance of skewness and coskewness measures differs from period to period. In the period July 1998 – June 2004 standardized unconditional skewness coefficients are all significant and positive for all industry portfolios. Eight of ten size portfolios and half of Fama French portfolios have significant and positive unconditional skewness coefficients. The unconditional coskewness measure is significant for only one industry, one size and three Fama French portfolios. For the next period, July 1999 - June 2005, all portfolios have significant skewness coefficient except for only one size and one Fama French portfolio. For this period, all portfolios' skewness coefficients are positive and the increase in the number of portfolios with significant skewness coefficients are also experienced in the number of portfolios with significant coskewness coefficient. From this period to July 2003 – June 2009, there is a large decrease in the significance of skewness and coskewness measures for all portfolio groups. In the next two periods, July 2003- 2009 and July 2004- June 2010, the significance of these statistics increase gradually.

Fama French portfolios' excess returns have strong positive relationships with their unconditional skewness starting from the period of July 2002 - June 2008, although their correlation coefficients are negative during the first four six year sub-periods. The period from July 2002 to June 2008 indicates the strongest relation between unconditional skewness measure and average excess returns of Fama French portfolios. The correlation coefficient between unconditional skewness measure and average excess returns of Fama French portfolios is 0,94. There is not any evidence indicating a significant relation between average excess returns and skewness for size portfolios during all analyzed sub-periods in ISE. For industry portfolios, except for the period July 1998 – June 2004, any significant relation is not observed between average excess returns and skewness. In almost all periods, the correlation coefficients between average excess returns and unconditional coskewness are low.

2.3 TIME SERIES ANALYSIS

In this section, the effectiveness of the CAPM, the Three Factor Model and the Four Factor Model will be tested and compared. The Three Factor and Four Factor models include many factors other than the market portfolio, e.g. size, value and coskewness hedge portfolio. To test the effectiveness of multifactor models, the multifactor version of the F- statistic should be used (Mısırlı and Alper, 2008:8). From this point of view, the Gibbons, Ross and Shanken (1989) F- test will be used to test those models' effectiveness.

The GRS test is performed by running an OLS regression and computing the intercepts or alphas (α) then testing whether the alphas are jointly zero (Loran,2004: 16). The GRS test states that should all of the intercepts jointly equal zero, then the statistic will also equal zero. As the α's increase in absolute value so too will the value of the GRS statistic (Billou, 2004: 13). The F-statistic developed by GRS is

$$\left(\frac{T}{N}\right)\left(\frac{T-N-L}{T-L-1}\right)\left[\frac{\hat{\alpha}'\sum^{-1}\hat{\alpha}}{1+\bar{\bar{\mu}}'\hat{\Omega}^{-1}\bar{\bar{\mu}}}\right] \sim F\ (N,T\text{-}N\text{-}L)$$

where, $\hat{\alpha}$ is a N x 1 vector of estimated intercepts, $\hat{\Sigma}$ is an unbiased estimate of the residual covariance matrix, $\bar{\bar{\mu}}$ is a Lx1 vector of the factor portfolios' sample means and $\hat{\Omega}$ is an unbiased estimate of the factor portfolios' covariance matrix. if $\hat{\alpha}\, i = 0 \ \forall\, i$, then the GRS statistic equals zero; the larger the α' s are in absolute value the greater the GRS statistic will be (Diether, 2001:7).

Mısırlı and Alper (2008) state that previous studies that focus on a single emerging market's stock exchange have not yet applied GRS test to examine the validity of CAPM under different portfolio strategies. According to them, one possible explanation for lack of application of GRS to CAPM tests in emerging markets is that GRS test rests upon the assumption that returns and explanatory variables are normally distributed, and there is substantial evidence against this assumption for emerging markets. Nonetheless, referring to simulation evidence by MacKinlay (1985), GRS argue that F-test is fairly robust to departures from normality. After the study of Mısırlı and Alper (2008), Gokgoz (2008) use the GRS test in ISE. Grauer and Janmaat (2009) compare the power of Gibbons, Ross and Shanken (1989) and Shanken (1985) multivariate tests of the CAPM in three factor economies. They used simulated data generated from the 25 book-to-market / size portfolios on Kenneth French's website. They find that GRS test performs better than Shanken (1985) test.

The models used in time series analysis and tested hypothesis are as follows:

The regression equation is

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + \varepsilon_{it}$$

$\forall_i = 1, \ldots, N$

$$H_0 : \alpha_i = 0$$

$\forall_i = 1, \ldots, N$

for the CAPM,

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + s_i SMB_t + h_i HML_t + \varepsilon_{it}$$

$\forall_i = 1, \ldots, N$

$$H_0 : \alpha_i = 0$$

$\forall_i = 1, \ldots, N$

for the three factor model of Fama and French (1993) and

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + s_i SMB_t + h_i HML_t + \gamma_i SKS_t + \varepsilon_{it}$$

$$\forall_i = 1,..., N$$

$$H_0 : \alpha_i = 0$$

$$\forall_i = 1,..., N$$

for the Four Factor Model of Harvey and Siddique (2000).

Similar to studies of Lin and Wang (2003) and Mısırlı and Alper (2008), both SKS and S^- are used as proxies for systematic skewness. In addition to the models given above, three more models are formed and tested. These models are as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + s_i SMB_t + h_i HML_t + \gamma_i S^-{}_t + \varepsilon_{it}$$

$$\forall_i = 1,..., N$$

$$H_0 : \alpha_i = 0$$

$$\forall_i = 1,..., N$$

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + \gamma_i SKS_t + \varepsilon_{it}$$

$$\forall_i = 1,..., N$$

$$H_0 : \alpha_i = 0$$

$$\forall_i = 1,..., N$$

$$R_{it} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + \gamma_i S^-{}_t + \varepsilon_{it}$$

$$\forall_i = 1,..., N$$

$$H_0 : \alpha_i = 0$$

$$\forall_i = 1,..., N$$

In the first of the added models, S^- is used as the fourth factor in the Four Factor Model of Harvey and Siddique (2000) instead of SKS. In the last two models, only systematic skewness factors, SKS and S^-, are incorporated in to the CAPM individually.

The tested hypothesis is that $\alpha_i = 0$ for a set of N portfolios for all models used in time series analysis. The GRS test is carried out for each formed portfolio groups; industry, size and Fama French portfolios. Besides those portfolios, three momentum strategies are pursued to investigate whether momentum effects exist and whether momentum strategies are related to coskewness in ISE over the analysis period. Momentum portfolios are formed by using the methodology of Jegadeesh and Titman (1993).

Momentum strategies are based on buying past winners and selling past losers. Thus far, the existence of momentum effects has been investigated for different markets[12]. Bildik and Gulay (2002) examine the momentum effects on stock returns between years 1991 and 2000 in ISE. They select stocks based on their returns over the past 1, 3, 6 and 12 months and hold the selected stocks from 1 month to 12 months. Totally they have 16 strategies. According to their results, prior loser-stocks outperform prior winner-stocks. These findings are consistent with the predictions of the overreaction hypothesis. In this dissertation, three momentum strategies are pursued according to past performance of analyzed stocks'. For each strategy, 10 equally weighted momentum portfolios are formed. As past performance horizon, j, six months is used. As holding periods, k, one, six and twelve months are used[13]. Harvey and Siddique (2000) and Lin and Wang (2003) use (12,1) and (12,6)

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[12] For example Jegadeesh and Titman (1993) have investigated the U.S. market, Chang, McLeavey and Rhee (1995) examined the Japanese stock market, Clearly and Inglis (1998) examined the Canadian stock market. Jegadeesh and Titman (1993) and Clearly and Inglis (1998) show that abnormal returns can be obtained by pursueing momentum strategies, while Chang, McLeavey and Rhee (1995) point that short term abnormal returns are generated by the contrarian investment strategy.

[13] 12 month past performance period is not used because using a long past performance period when constructing a momentum portfolio would cause data loss. In this dissertation, the case of investors evaluating stocks according to short term return performance is handled.

as the pairs of values for j and k. In addition to those pairs, Mısırlı and Alper (2008) use (6,6) j and k pair like Rouwenhorst (1999) and Hameed and Kusnadi (2002).

The same methodology of Jegadeesh and Titman (1993) is used in formation of momentum portfolios. At the beginning of each month t, analyzed stocks are ranked in descending order in accordance with their returns in the past j months. Based on these rankings, ten equally weighted portfolios are formed. Portfolio 1 refers to the loser portfolio that includes stocks with the lowest 10 % past returns and Portfolio 10 refers to the winner portfolio that contains stocks with the highest 10 % past returns. These ten portfolios are held for k months in each strategy. All momentum portfolios' excess returns are given in Appendix-G.

For all formed portfolio strategies and implemented models, the GRS test results are given in the following table. In the table below, FF indicates SMB (size premium) and HML (value premium). SKS is the coskewness hedge portfolio. GRS test statistics and p values are computed for industry, size and Fama French portfolios. The GRS test statistic and its elements are as follows:

$$\left(\frac{T}{N}\right)\left(\frac{T-N-L}{T-L-1}\right)\left[\frac{\hat{\alpha}'\sum^{-1}\hat{\alpha}}{1+\overline{\mu}'\hat{\Omega}^{-1}\overline{\mu}}\right] \sim F\ (N,T\text{-}N\text{-}L)$$

T is the number of observations, N is the number of portfolios, L is the number of factors of a given asset pricing models, $\hat{\alpha}$ is a N x 1 vector of estimated intercepts, $\hat{\Sigma}$ is an unbiased estimate of the residual covariance matrix, $\overline{\mu}$ is a L x 1 vector of the factor portfolios' sample means. $\hat{\Omega}$ is an unbiased estimate of the covariance matrix of the factors.

$$\hat{\alpha} = \begin{bmatrix} \hat{\alpha}_1 \\ \hat{\alpha}_2 \\ \\ \hat{\alpha}_N \end{bmatrix} \qquad \overline{\mu} = \begin{bmatrix} \overline{F}_1 \\ \overline{F}_2 \\ \\ \overline{F}_l \end{bmatrix} \qquad F = \begin{bmatrix} F_{11}F_{12}...F_{1L} \\ F_{21}F_{22}...F_{2L} \\ \\ F_{T1}F_{T2}...F_{TL} \end{bmatrix} \qquad \hat{\Omega} = \frac{\left(F-\overline{F}\right)'\left(F-\overline{F}\right)}{T-1} \qquad \hat{\Sigma} = \frac{\hat{\varepsilon}'\hat{\varepsilon}}{T-L-1}$$

Table 12: Results of the Multivariate Test of Gibbons–Ross–Shanken (1989)

Portfolios	Fama French	size	industry	momentum j=6, k=1	momentum j=6, k=6	momentum j=6, k=12
CAPM	0	6,03***	8,34**	2,18**	4,14**	3,07**
p value	1	0,00	0,00	0,03	0,00	0,00
CAPM+FF	1,95*	0,92	1,93**	2,17**	10,79**	10,43**
p value	0,08	0,52	0,050	0,03	0,00	0,00
CAPM+FF+SKS	1,28	0	2,16**	2,10**	11,71**	10,40**
p value	0,27	1	0,03	0,03	0,00	0,00
CAPM+FF+S-	1807,12**	1,12	2,31**	2,52**	10,39**	10,08**
p value	0,00	0,36	0,02	0,01	0,00	0,00
CAPM+SKS	2,46**	1,46	1,17	2,10**	4,22**	9,70**
p value	0,03	0,17	0,32	0,03	0,00	0,00
CAPM+S-	2,90**	0,97	1,06	2,70**	9,29**	9,17**
p value	0,012	0,48	0,40	0,01	0,00	0,00

Notes: The GRS test statistic is distributed as F~ (N;T-N-L). **Denotes significance at 5%, * denotes significance at 10 % level.

Results of the GRS test statistics and corresponding p values are represented in the table above. According to the GRS test results, the value-weighted market portfolio is only sufficient in explaining the variation of excess returns of Fama French portfolios. The p-values associated with the F-test of one-factor model is 1 for Fama French portfolios. In the second column, the GRS test results of the Fama French Three Factor Model are reported. When Fama French factors are added into one factor CAPM, the F- statistic decreases for both industry and size portfolios, the statistic is still significant for industry portfolios. For Fama French and size portfolios, coskewness factor reduces the F-statistic, it can explain the variations of Fama French and size portfolios' excess returns better than the three and one factor CAPM. In other words, coskewness factor has some incremental power in explaining excess returns of size and Fama French portfolios over the CAPM and the three factor Fama French Model. On the other hand, adding coskewness factor to the three factor CAPM increases the F- statistic of industry portfolios. When the four factor model is formed by using S^- as the systematic skewness factor instead of SKS, it is seen that S^- factor does not have any significant contribution over the three factor Fama French Model in explaining excess returns in ISE.

The variation of industry portfolios' excess returns can only be explained by the two factor models, CAPM + SKS and CAPM + S^-. Besides industry portfolios, incorporating systematic skewness factor to the market factor reduces the F statistic of size portfolios. The GRS test results regarding the momentum portfolios reveal that the variations of these portfolios are not explained by any asset pricing models. In the next section, cross sectional analysis will be conducted to explore the relative contribution of the coskewness factor in explaining excess returns in ISE.

2.4 CROSS SECTIONAL ANALYSIS

In this section, the explanatory power of factors in the analyzed asset pricing models will be tested by means of two cross sectional asset pricing test. Following Harvey and Siddique (2000), Lin and Wang (2003) and Mısırlı and Alper (2008), two of the most popular cross- sectional asset pricing tests, the Fama- MacBeth and

Full Information Maximum Likelihood (FIML) methods will be adopted. Initially, brief introductions of these methods will be presented. Then, their application steps to the formed portfolios in this dissertation will be explained. At the end of this section, the results obtained by the two cross sectional asset pricing tests will be evaluated.

The method of Fama Mac-Beth (1973) is a two step approach that is widely used in cross- sectional asset pricing tests. In the first step of this method, betas of asset pricing models are estimated by running time series regressions for a fixed time period at a time. In the next step, excess returns of all assets are regressed against these betas to determine the risk premium for each factor in the tested asset pricing models. This method allows time-series variation in the betas.

The second adopted methodology is another two-step estimation method, FIML. In this method, it is assumed that the betas are constant over time. In other words, this method does not allow time-series variation in the betas. According to this method, firstly the beta of each portfolio is estimated over the whole empirical testing period through time series regressions. Then these betas are regressed against the average excess returns of each portfolio and the risk premia is λ_i obtained. The cross sectional regressions run in the second step is given below.

$$\hat{\mu}_i = \lambda_0 + \sum_{j=1}^{k} \lambda_j \hat{\beta}_{ij} + \varepsilon_i$$

where $\hat{\mu}_i$ are $\sum_{t=1}^{T}(ri, t / Ti)$, the unconditional mean excess returns of ith portfolio, k refers to the number of factors and λj refers to the risk premium of each factor in the regressions. It is assumed that the residuals are distributed as N(0,∑), where ∑ is an N x N heteroskedasticity and autocorrelation consistent variance and covariance matrix.

In this dissertation, in the first step of Fama- MachBeth, following time series regressions are run for 48 month periods (the length of the pre-estimation period) at a time to estimate the betas of factors included in analyzed asset pricing models.

$$R_{it} - R_{ft} = \alpha_i + \sum_{j=1}^{k} \beta_i (R_{jt} - R_{ft}) + \varepsilon_{it}$$

where R_{it} shows the excess return of ith portfolio, R_{ft} shows the risk free rate, R_{jt} shows the jth factor' s excess return in time t.

Then, the excess returns of 49th month are regressed on these betas to estimate the risk premia. These cross-sectional regressions are run for each month in the empirical testing period from July 2002 to June 2010 and averages of adjusted R^2s are computed. Panel A of Table-13 presents the adjusted R^2 for different combinations of asset pricing models when portfolios are formed by industry, size, size and book to market and momentum, using Fama- MacBeth procedure.

In performing the test of FIML method, firstly the beta of each portfolio is estimated through time series regressions over the whole empirical testing period. Then the risk premia λj in the following cross sectional regressions are estimated. These cross sectional regressions are run over the whole empirical testing period.

For the CAPM,

$$\hat{\mu}_i = \lambda_0 + \lambda_M \beta_i + \varepsilon_i$$

For the three factor model,

$$\hat{\mu}_i = \lambda_0 + \lambda_M \beta_i + \lambda_{SMB} s_i + \lambda_{HML} h_i + \varepsilon_i$$

For the four factor model with SKS as systematic coskewness factor,

$$\hat{\mu}_i = \lambda_0 + \lambda_M \beta_i + \lambda_{SMB} s_i + \lambda_{HML} h_i + \lambda_{SKS} \gamma_i + \varepsilon_i$$

For the four factor model with S- as systematic coskewness factor,

$$\hat{\mu}_i = \lambda_0 + \lambda_M \beta_i + \lambda_{SMB} s_i + \lambda_{HML} h_i + \lambda_{S^-} \gamma_i + \varepsilon_i$$

For the two factor model with SKS as systematic coskewness factor,

$$\hat{\mu}_i = \lambda_0 + \lambda_M \beta_i + \lambda_{SKS} \gamma_i + \varepsilon_i$$

For the two factor model with S- as systematic coskewness factor,

$$\hat{\mu}_i = \lambda_0 + \lambda_M \beta_i + \lambda_{S^-} \gamma_i + \varepsilon_i$$

In Panel B of Table-13, computed adjusted R^2 for each portfolio and analyzed asset pricing models pairs according to the FIML procedure is reported.

Table 13: Cross Sectional Analysis Results

Panel A: Fama Mac-Beth (1973) Algorithm	**industry (%) k=1**	**size (%) k=1**	**size and BE/ME (%) k=1**	**momentum (%) j=6 k=1**	**momentum (%) j=6 k=6**	**momentum (%) j=6 k=12**
CAPM	4,07	2,82	5,96	4,57	0,52	0,86
CAPM + FF	19,99	9,85	18,54	19,10	7,54	10,65
CAPM + FF + SKS	23,32	8,98	0,10	10,74	5,55	4,80
CAPM + FF + S^-	22,59	5,94	20,20	15,20	3,29	6,04
CAPM + SKS	15,37	8,39	3,23	8,15	1,63	2,14
CAPM + S^-	14,29	7,79	0,04	9,45	3,17	1,62
Panel B: Full Information Maximum Likelihood Method	**industry (%) k=1**	**size (%) k=1**	**size and BE/ME (%) k=1**	**momentum (%) j=6 k=1**	**momentum (%) j=6 k=6**	**momentum (%) j=6 k=12**
CAPM	-8,59	4,37	51,94	-3,84	-0,68	32,56
CAPM + FF	21,35	60,17	92,70	36,01	63,17	32,85
CAPM + FF + SKS	77,89	80,44	87,75	63,02	58,31	29,76
CAPM + FF + S^-	17,78	63,63	89,37	70,31	63,02	35,96
CAPM + SKS	24,04	-9,23	37,48	-12,21	27,03	23,13
CAPM + S^-	-23,74	-2,85	37,55	55,91	8,82	31,39

As it is seen in Table-13, The FIML method tends to present more explanatory power than the Fama- MacBeth method. There are some criticisms about the methodology of Fama-MacBeth. One of the criticisms is their OLS regressions that assume a constant beta risk (Huang and Hueng,2008:381). Harvey (1989) and Ferson and Harvey (1991,1993) suggest that a constant beta estimated by OLS may not capture the dynamics of beta.

Shanken (1992) points out that Fama–MacBeth time-series procedure fails to reflect measurement error in the betas and these errors can be important in practice. Hence, cross sectional analysis inferences are based on the FIML procedure.

According to the results of cross sectional analysis, the three-factor model has always more explanatory power than the one-factor CAPM. However, the addition of a coskewness factor increases the single-factor model's R^2 to a level for almost all portfolio groups but the level is always lower than the R^2 of the three factor model except for industry portfolios.

When market, conditional coskewness factor and Fama French factors are considered together, adjusted R^2's of industry, size, momentum j=6 k=1 portfolios increase. For other portfolios, R^2 value levels regarding the three and four factor models are almost equal. It can be interpreted that Fama–French factors capture the same financial risks that cause the conditional coskewness.

CONCLUSION

Asset pricing has been always an attractive topic both for investors and finance scholars. The CAPM which has an important place in the finance world has taken a large number of criticisms because of its unrealistic assumptions. In recent years, the criticisms are focused on the two assumptions of classical CAPM: asset returns have normal distribution and market excess return is the unique factor in explaining the variation of excess returns. Some of the studies about emerging markets have concluded that asset returns are characterized by significant skewness. Also, some other studies have found ignored firm specific factors such as size and value as significant factors. Based on these studies, the impact of coskewness and Fama French factors on the variation of portfolios that are formed according to industry, size and book to market ratio and momentum is investigated for ISE over the period July 2002 to June 2010 in this dissertation.

To investigate the impact of coskewness on the variation of portfolio returns, some descriptive statistics of these portfolio groups are computed as a preliminary analysis. Descriptive statistics of formed portfolio groups reveal that three of size and industry portfolios have significant unconditional skewness coefficient, while none of the Fama French portfolios have significant unconditional skewness. There are some increases in the number of portfolios that have significant unconditional coskewnees coefficients, but these increases cannot reach a sufficient level. Just half of the portfolios' coskewness coefficients are significant. Based on the descriptive statistics it can be stated that there is no sufficient evidence that coskewness plays an important role in explaining cross section of asset returns in ISE during the period July 2002- June 2010. Another important finding is that the difference of the significance of skewness and coskewness measures from period to period in the whole analysis period. Previous studies about ISE imply that ISE is not an efficient market. Some of these studies find that ISE is a weakly efficient market (Bakirtas and Karpuz (2000), Tas and Dursunoglu (2004), etc.), while others conclude that ISE is neither weak nor semi strong form efficient. The dramatic changes observed in portfolios' descriptive statistics in regard to changes in analysis periods may possibly be caused by the market form of ISE.

The sign of the correlation coefficients between average excess returns of all portfolio groups and unconditional skewness are positive in contrast to the existing literature. Especially for size portfolios, there is a strong positive relationship between skewness measure and their average excess return. There are positive relationships between all coskewness measures and mean excess returns of industry portfolios. Similar to industry portfolios, size portfolios' correlation between their average excess returns and unconditional coskewness is positive. On the other hand, there is no evidence of any significant relationship between the conditional coskewness and average excess returns of size portfolios for the analysis period. Unlike size portfolios, there are negative relationships between all coskewness measures and average excess returns of six Fama French portfolios.

Then, the effectiveness of the CAPM, the Three Factor Model and the Four Factor Model are tested and compared by performing the multivariate test of GRS. Time series analysis reveals that coskewness factor has some incremental power in explaining excess returns of size and Fama French portfolios over the CAPM and the three factor Fama French Model. When the four factor model is formed by using S^- as the systematic skewness factor instead of SKS, it is seen that S^- factor does not have any significant contribution over the three factor Fama French Model in explaining excess returns in ISE.

In the last part of this dissertation, the explanatory power of factors in the analyzed asset pricing models are tested by means of two cross sectional asset pricing tests: the Fama- MacBeth and FIML methods. According to the results of cross sectional analysis, the three-factor model has always more explanatory power than the one-factor CAPM. However, the addition of a coskewness factor increases the single-factor model's R^2 to a level for almost all portfolio groups but the level is always lower than the R^2 of the three factor model except for industry portfolios.

When market, conditional coskewness factor and Fama French factors are considered together, adjusted R^2's of industry, size, momentum j=6 k=1 portfolios increase. For other portfolios, R^2 value levels regarding the three and four factor models are almost equal. It can be interpreted that Fama–French factors capture the same financial risks that cause the conditional coskewness.

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APPENDICES

APPENDIX A

Table 14: Some of the Important Empirical Studies about the CAPM and its Versions

Number	Journal Name	References	Review of The Inroduction	Sample and Data
		Author(Date)	Objectives	Data-Database-Time Period
1	The International Pricing of Risk : An Empirical Investigation of the World Capital Market Structure	Solnik, B.H. (1974)	To determine the factors which affect stock price movements across the world	The data base consists of daily prices and dividend data for 234 common stocks of eight European countries and 65 American stocks. The time period covered is from March 1966 to April 1971. . For each country, market indices were selected independently and returns were computed including dividends. Interest rates on some risk free comparable securities have been collected for the 10 countries
2	The Market Model Applied to European Common Stocks: Some Empirical Results	Pogue, G.A. and Solnik, B.H. (1974)	To present the results of some initial tests of the market model for a broad crosssection of-the European common stocks.	The data base consists of daily prices and dividend data for 229 common stock of seven European countries. The time period covered is from March 1966 to March 1971. In addition, a sample of 65 American stocks was used for comparison purposes.
3	Using the CAPM and the Market Model to Predict Security Returns	Pettit, R.R. and Westerfield, R. (1974)	To examine the validity of the CAPM and the Market Model	Monthly investment relatives for all securities listed on the NYSE time during the period January, 1926 through June, 1968 are used. The risk-free rate, was the yield on Treasury Bills with one month to maturity. For a security to be included a minimum of 60 monthly relatives were required for estimating the model coefficients.
4	Insiders' Activity and Inside Information	Finnerty, J.E. (1976)	To evaluate the performance of the "average" insider by testing the entire population of insiders	The individiual, buy and sell transactions data are from the S.E.C.'s Official Summary of Stock Transactions for NYSE firms during the period January, 1969 - December, 1972 is used. For the total period, there are recorded over 30,000 individual transactions: 9,602 buy transactions and 21,487 sell transaction.
5	World, Country and Industry Relationships in Equity Returns	Lessard, D.R. (1975)	To present evidence concerning the international variance covariance structure of equity returns and discuss a few of its implications for portfolio selection.	Two sets of data are used. The first consists of monthly percentage changes in market value weighted price indexes for 16 countries and for 30 industries covering the period January 1959 to October 1973. The second includes monthly price changes for 205 individual securities from 14 countries and 14 industries for the period January 1969 to October 1973.
6	Competitive Information in the Stock Market: An Empirical Study of Earnings, Dividends and Analysts' Forecasts	Griffin, P.A. (1976)	This study asseses the joint and individual effects of published earnings-pershare numbers, dividend-per-share numbers and analysts' forecasts of earnings-pershare on security returns.	One hundred and sixty-two firms were selected considering some criteria from those listed on the NYSE. The analysts' forecasts data base was compiled from Standard and Poor's Earnings Forecaster (1968 through 1974). The one month maturity Treasury Bill yield (Rf) was obtained from Salomon Brothers, An Analytical Record of Yields and Yield Spreads (1974) for the period January 1962-May 1974.
7	The Relationship Between Risk of Default and Return on Equity: An Empirical Investigation	Arbel,A.,Kolodny,R. and Lakonishok,J. (1977)	To investigate the impact of default risk on the value of equity securities in terms of CAPM.	This sample was comprised of all companies on the CRSP tape for which continuous data were available fort he period 1965-1973. Bond ratings for unsecured debt, as published in Mood's Bond Survey, they used to group firms on the basis of default risk. Because many companies did not have unsecured debt for which bond ratings were available, the final sample consisted of 223 companies.

Table 14: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data
		Author(Date)	Objectives	Data-Database-Time Period
8	The Capital Asset Pricing Model and the Investment Horizon	Levhari, D. and Levy, H. (1977)	They illustrate that the assumed horizon plays a crucial role in empirical testing	The monthly rates of return for a sample of 101 stocks traded on the NYSE were calculated for the period 1948-68. For each security there are 240 observations.
9	A Simple Model of Non-Stationarity of Systematic Risk	Brenner, M. and Smidth, S. (1977)	To suggest a specific model of non-stationarity that employs a rather simple approach, but is, nevertheless, consistent with similar ideas suggested in recent studies.	The population studied consisted of 762 New York Stock Exchange (NYSE) stocks for which data were available on the CRSP tapes for 120 consecutive months ending in June 1968.
10	A Test of Stone's Two-Index Model of Returns	Lloyd, W.P. and Shick, R.A.(1977)	To report the results of an empirical test of Stone's model.	A sample 60 banks was taken from the Quarterly Bank Compustat tape for the period from 1969 to 1972. The rate of return on the NYSE Conposite Index was used for the equity index returns. They use Solomon Brothers' "Total Performance Index for the High Grade Long Term Corporate Bond Market" which is available from January 1, 1969, to February 1, 1974. As an additional test of the two-index model as a Standard of comparison, monthly rates of return were similarly computed fort he 30 stocks in the Doow Jones Industrial Average over the same period.
11	Bivariate Spectral Analysis of the Capital Asset Pricing Model	Goldberg,M.A. and Vora, A. (1978)	To utilize spectral analysis to investigate ex post security returns	The database includes monthly percentage returns for all common stocks listed on the NYSE during the period January 1926 through June 1972. For the risk free rate of interest , treasury bills were used when available and banker's acceptances at all other times.
12	The Inference of Tastes and Beliefs from Bond and Stock Market Data	Grauer,R.R. (1978)	To determine which of the power linear risk tolerance (LRT) economies best fits the historical record,	The common stock data consisting of annual, quarterly and monthly returns for the period 1946 to 1971 and annual market values from 1953 to 1971. The universe of stocks for which the data were continuously available (consisting of 295 and 362 companies) was divided into five portfolios based on a beta ranking, where the betas were calculated from two 60 month periods from 1949-1954 and 1954-1959 respectively. The annual return data for portfolios of bonds and stocks were taken from studies by Fisher and Weil and Fisher and Lorie respectively and covered the period 1926 to 1968.
13	The Risk-Return Relationship and Stock Prices	Bachrach, B. and Galai, D. (1979)	To find out whether there are specific and distinct characteristics pertaining to groups of securities that are in certain price ranges.	The data consists of end of month prices and percentage returns of all common stocks registered on the NYSE from 1/1926 to 6/1968.They have arbitrarily selected the data for the end of the first quarter of 1967. All stocks for which data were available were classified on the basis of their closing price for the quarter, either in the -$20 group, or in the mutually exclusive +$20 group. Fisher equally weighted arithmetic index was used as market proxy in this paper.
14	The Value of Information: Inferences from the Profitability of Insider Trading	Jerome B. Baesel and Garry R. Stein (1979)	To present the results of research investigating the profitability of insider trading activities.	The data used in the analysis were simulated trades in the common stock af any of 111 large, Toronto Stock Exchange listed industrial firms for the period of January 1968 to December 1972. The sample used in the analysis consists of three subsamples: Ordinary Insiders (OI), Bank Directors (BD), and the Control Sample (C). Also they use control sample to compare the performance of the insiders.

Table 14: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data
		Author(Date)	Objectives	Data-Database-Time Period
15	Biased Estimators and Unstable Betas	Scott, E. and Brown, S. (1980)	To evaluate the simultaneous violations of two ordinary-least-squares assumptions effects on the estimates of the CAPM.	They use all stocks that are traded on the NYSE at the analysis period and monthly Fisher Arithmetic Index as market proxy. The thirty-day treasury bill rate was used as a proxy for the riskless rate of return and only firms with fiscal years ending on December 31 were included in the sample. They use the Quarterly Compustat tapes for four overlapping two year periods from 1967-1971. These two year periods are labeled one through four and they correspond to the periods 67-68, 68-69, 69-70, and 70-71, respectively.
16	The Capital Asset Pricing Model, Inflation, and the Investment Horizon: The Isaeli Experience	Levy, H. (1980)	To re-examine empiricaly the validity of the CAPM using a sample of Israeli data.	The empirical study covered 104 stocks which are listed on the Israeli stock exchange and four representative bond groups for the period of 1965 -1976.
17	Autocorrelation , Market Imperfections and the CAPM	Brown, S.L. (1979)	To test proposition that market imperfections are associated with misspecifications of the CAPM	All firms with complete data on the CRSP tapes for the 1955-73 period, for the two subperiods 1955-64 and 1965-73 , and for immediately preseding five year period were included in the sample. The 30 day treasury bill rate was used as a proxy for the riskless rate.
18	On Estimating the Expected Return on the Market: An Exploratory Investigation	Merton, R.C. (1980)	To estimate the expected market return	The data includes the period 1926-1978. Market return and interest rate data from are used to estimate each of the three models.
19	Additional Evidence on Integration in the Canadian Stock-Market	Mittoo, U.R. (1992)	To reexamine the integration in the Canadian market employing both the CAPM and the APT frameworks.	The sample consists of those stocks that were in the TSE 35 index on May 27, 1987. Six stocks from the banking industry and four stocks from the oil and gas industry are excluded to control for any industry-wide effects. Eighteen stocks are also interlisted on the U.S. stock exchanges and NASDAQ. For each sample Canadian stock, a matched U.S. stock is selected using a four-digit SIC industry code and the asset size in 1977 for comparison. The COMPUSTAT database (1990) is used to identify the matched U.S. companies.
20	Reports of beta's death are premature: Evidence from the UK	Clare, A.D., Priestley, R. and Thomas, S.H. (1998)	To motivate further research in this area by pointing out the many estimation problems and suggesting directions for estimating the expected return on either individual stocks or the market	UK stock returns over the period 1980-1993 are used. Month-end, dividend adjusted stock return data on 100 stocks quoted on the London Stock Exchange between January 1980 and December 1993 are taken from the London Share Price Database (LSPD) tapes; the accounting data on book value (BE), earnings (E), asset value (A) and equity market values (ME) were obtained from Datastream International.
21	Empirical Tests of the Consumption-Oriented CAPM	Breeden, D.T., Gibbons, M.R. and Litzenberger, R.H. (1989)	Testing the consumption-oriented CAPM and comparing the model with the market oriented CAPM.	Their data consists the period of 1929-1982. They combine the quarterly observations on monthly income data from 1929 to 1938, the quarterly consumption expenditures from 1939 to 1958, and the quarterly observations on the monthly consumption expenditures from 1959 to 1982. Monthly returns on individual securities are gathered from the Center for Research in Security Prices (CRSP) at the University of Chicago. Twelve portfolios of these stocks are formed by grouping firms using the first two digits of their SIC numbers.

Table 14: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data
		Author(Date)	Objectives	Data-Database-Time Period
22	Tests of International CAPM with Time-Varying Covariances	Engel, C., and Rodrigues, A.P. (1989)	This paper extends the frontiers of estimation of international CAPM to consider some of the most important possibilities that have been suggested for the empirical failure of the model.	They use aggregate asset data representing the nominal obligations of six governments-France, Germany, Italy, Japan, the UK and the US-and the rates of return from Eurocurrency markets from April 1973 to December 1984. There are six aggregate assets. Each is essentially the outstanding debt at the end of period t of each of the six governments.
23	Capital Asset Pricing Model and the Risk Appetite Index (RAI): Theoretical Differences, Empirical Similarities and Implementation Problems	Pericoli,M. and Sbracia, M. (2009)	To examine the RAI both theoretically and empirically	The assets included in their analysis are the stocks of the Dow Jones Euro Stocks and those of the Standard & Poor's 500; time periods are calendar months from January 1973 to December 2008, data are end-of-month and the source is Thomson Financial Datastream. To estimate the model, they need excess returns (Rex i;t) and the covariance of asset i with the market portfolio (li,t).
24	Learning about beta: Time-varying factor loadings, expected returns, and the conditional CAPM	Adrian, T. and Franzoni, F.(2009)	Exploring the implications of long-run changes in factor loadings for the tests of conditionalmodels	They use the twenty-five portfolios that result from double-sorting the stocks of NYSE, Amex, and Nasdaq along the size and B/M dimensions. The portfolio returns are value-weighted averages of returns on the stocks in each group. (1926-2004)
25	Can An 'Estimation Factor' Help Explain Cross-Sectional Returns?	Lundtofte, F. (2009)	To analyze the importance of a derived 'estimation factor' in the pricing of crosssectional returns	They use monthly data from July 1926 to December 2006 on the real price of the S&P Composite Index (SM,t), aggregate real dividends(Dt) and aggregate real earnings ($E\ t$). They obtain monthly data on the returns on the 25 Fama–French portfolios sorted by size and book-to-market, the 30 industry portfolios, the risk-free rate, the market factor, HML (high-minus-low), SMB (small-minus-big) and MOM (momentum).
26	A Dynamic Asset Pricing Model with Time-Varying Factor and Idiosyncratic Risk	Glabadanidis, P. (2009)	To model jointly the risk–return relation of the CAPM and Fama–French models along with a multivariate generalized ARCH (GARCH) volatility model to correct for the presence of GARCH effects.	Monthly simple excess returns for the 25 size and book-to-market sorted portfolios from Fama and French (1993), the 30 industry-sorted portfolios as well as the MKT, SMB, andHMLfactor-mimicking portfolios for the sample period July 1963 to December 2007. The return series data is obtained from K. French's website. Summary statistics of this portfolios (mean, standard deviation, skewness and kurtosis) is represented in this study.

Table 14: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data
		Author(Date)	Objectives	Data-Database-Time Period
27	Can Investor Heterogeneity be Used to Explain the Cross-Section of Average Stock Returns in Emerging Markets?	Jung, C.S., Lee, D.W. and Park, K.S. (2009)	To examine the role of investor heterogeneity in an attempt to develop such an alternative approach to explaining the cross-section of average stock returns in an emerging market.	Their main sample consists of all common stocks listed on the Korean Stock Exchange. Their monthly stock returns (including dividends) are from the Korean Securities Research Institute and the monthly market capitalization data are from the FnGuide. Annual accounting information including ownership data is from TS2000, a database provided by the Korea Listed Companies Association. The sample period is from July 1992 to December 2006, since prior to 1992, there is no adequate cross-sectional dispersion in foreign ownership. Institutional ownership, as measured by one minus the ownership of domestic individual investors, is available for a shorter period ending in June 2005. As a proxy for the market portfolio, they use the KOSPI index.
28	Correlation risk	Krishnan CNV, Petkova R, Ritchken P (2009)	To investigate whether time-varying correlation between stocks carries a significant price of risk in the cross-section of stock returns.	The sample period they study is from July 1963 to December 2007. They collect data on three groups of variables: (i) assets used to construct the correlation factor, (ii) test assets used in cross-sectional regressions, and (iii) control variables that Proxy for the business cycle and represent other risk factors in the cross-section of average returns. They use 25 portfolios sorted by size and book-to-market to compute inter-asset correlation risk.They use portfolios as opposed to individual stocks to reduce the dimensionality of the problem. In addition, these portfolios represent broad asset classes that follow popular investment styles.
29	Is the Value Premium a Proxy for Time-Varying Investment Opportunities? Some Time-Series Evidence	Guo, H., Savickas, R., Wang ZJ and Yang,J. (2009)	To investigate that whether the value premium constructed from the cross-section of stocks sheds light on the ongoing debate about the intertemporal relation between stock market risk and return.	They use daily and monthly data of the Fama and French three factors Daily data are available over the period from July 2, 1963 to December 31, 2005, and monthly data are available over the period from July 1926 to December 2005. They use the sum of the squared daily returns in a quarter as a measure of realized variance for both stock market returns and the value premium. Realized covariance is measured as the sum of the cross-product of daily excess stock market returns with the daily value premium. They also construct quarterly return data by aggregating monthly returns through simple compounding.
30	News and the Cross-Section of Expected Corporate Bond Returns	Abhyankar, A. and Gonzalez, A. (2009)	To understand what drives the cross-section of expected corporate bond portfolio returns.	They use bond indices for the aggregate bond market and for different bond credit rating monthly data, for the 1988–2006 period. They use the three month T-bill rate from the CRSP and obtain the real rate as the difference between the T-bill rate and the growth rate in the CPI.
31	On the power of cross-sectional and multivariate tests of the CAPM	Grauer, R.R. and Janmaat, J.A. (2009)	To examine the power of the cross-sectional and multivariate tests of the CAPM under ideal conditions. They use reverse engineering.	They use 25 book-tomarket/ size portfolios in Kenneth French's data library. They define the weights in the market portfolio to be the time-series average of the weights of the 25 portfolios. To be internally consistent in these economies, they sort the market portfolio weight in order to form the weight in the SMB and HML portfolios. The sort is similar to the sort that FF perform on individual securities to create the returns on their SMB and HML portfolios.

Table 14: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data
		Author(Date)	Objectives	Data-Database-Time Period
32	Investor Sentiment as Conditioning Information in Asset Pricing	Ho, C. and Hung, C.H. (2009)	To assess whether incorporating investor sentiment as conditioning information in asset-pricing models helps capture the impacts of the size, value, liquidity and momentum effects on risk-adjusted returns of individual stocks.	They construct a composite sentiment index by using three survey indices that are MS, CCI and II. COMPt= 0.521MSt + 0.493CCIt + 0.192IIt ; They use the monthly equity data of the NYSE and AMEX for the period from July 1964 to December 2005. Their monthly variables are the levels of MS and CCI, II, SIZE and B/M, TURNOVER (the ratio of trading volume to the number of shares outstanding), RET2-3, RET4-6 and RET7-12 (the cumulative returns over the past second through the past third, the past ftheirth through the past sixth and the past seventh through the past ttheylfth months, respectively) and default spread (z, the return difference bettheyen Baa and Aaa bonds). They also consider market-wide macroeconomic variables of default spread and investor sentiment that the literature has shown to predict stock returns.
33	Stochastic Volatility and Time-Varying Country Risk in Emerging Markets	Johansson, A.C. (2009)	To estimate time-varying country risk using alternative multivariate SV model	The data is from the datastream database and consists of weekly excess returns for 27 different emerging markets from all major emerging market regions (Asia, Latin America, Eastern Europe, Middle East, andAfrica). The different countries are represented by their respective MSCI country indices, while the MSCI world index is used as a proxy for the market index. They also include three major developed stock markets for general comparison: the US, the UK, and Japan. The data is sampled from 30 December 1994 to 29 December 2006. They thus end up with a total of 626 weekly observations for index returns.
34	Estimation of the Consumption CAPM with Imperfect Sample Seperation Information	Semenov, A. (2008)	They propose a consumption-based capital asset pricing model consumption (CAPM), in which the pricing kernel is calculated as the average of individuals' intertemporal marginal rates of substitution weighted by the probabilities of holding the asset in question.	They use the consumption of non durables and services as the consumption measure . For asset returns, the measures of the market return are the nominal quarterly market capitalization-based decile portfolio returns (capital gain plus dividends) on all stocks listed on the NYSE, Amex, and Nasdaq. They drop from the sample non-urban households, households residing in student housing, households with incomplete income responses, and households who do not have a fifth interview.
35	On the Predictive Power of the Surplus Consumption Ratio	Ghattassi, I. (2008)	To investigate the role of surplus consumption ratio in predicting excess returns.	They use the deviation from the estimated shared trend among consumption, asset holdings and labor income, denoted by cayt , and the deviation from the estimated shared trend among consumption, dividend and labor income, denoted by cdyt , as proxies for the unobservable consumption to wealth ratio. They use annual per capital data on excess returns, consumption growth, dividend–price ratio and proxies for the consumption to wealth ratio. Annual data spans 1948–2001. They use quarterly data on the value weighted returns of 25 Portfolios sorted by size and book-to-market value. They use quarterly data on (i) the real per capita consumption growth and (ii) the cay as a proxy for the unobservable consumption to aggregate wealth ratio. Data are spanning from the first quarter of 1952 to the first quarter of 2005.
36	The Determinants of REIT Institutional Ownership: Tests of the CAPM	Below, S.D., Stansell, S.R. and Coffin M. (2000)	To examine the basic determinants of institutional investor demand for REIT common stocks within the framework of CAPM theory, to examine the predictability of REIT institutional ownership	The sample consists of daily returns for over 150 REIT common stocks from 1988 through 1996. Institutional ownership data were obtained from Control Data Advisors (CDA) Investment Technologies' Spectrum for the years 1988-1996. This data consists of end of year institutional ownership filings required by the Securities and Exchange Commission (SEC). The data set used in this study contains all year-end filings made from 1988 through 1996.

Table 14: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data
		Author(Date)	Objectives	Data-Database-Time Period
37	Robust Informational Tests on the CAPM	Terregrossa, S.J. (2001)	To make previously obtained results revealing the existence of informational content in the CAPM that financial analysts are not fully utilizing in their forecast generating mechanism, heteroscedasticity-robust	They use the same data in their analysis published in 1999. Regressions are run over a cross-section of firms for each of four adjacent five-year horizons: January 1982-1987; 1983-1988; 1984-1989; 1985-1990.
38	CAPM anomalies and the pricing of equity: evidence from the Hong Kong market	Ho, Y.W., Strange, R. and Piesse, J. (2000)	To examine empirically the independent and joint roles of the more commonly hypothesized variables in explaining cross-sectional variation in average returns on Hong Kong stock market over the period from January 1980 to December 1994.	The sample data set contains 117 common stocks traded on the Hong Kong stock market during the sample period from January 1980 to December 1994 (180 months). They use market equity (ME), book-to-market equity (BE/ME), market leverage (A/ME), book leverage (A/BE), dividend yield (DY), and earnings-price ratio (E/P) as variables. In addition, value-weighted market returns and the Hong Kong Interbank offer rates on one-month HK$ deposits are used as proxies for respectively returns on the market portfolio and risk-free interest rate.
39	Estimation and simulation of risk premia in equity and foreign exchange markets	Kim, I. and Salem, M.K. (2000)	To investigate whether a class of mean-variance optimization models can generate risk premia that embody the stylized facts reported in the literature.	Their data set comprises monthly observations for the period 1975:10 through 1992:11. They collected data for the US, Germany, the UK and Japan and combined the UK and Japanese data to produce estimates of the relevant variables for the rest of the world (ROW). For exchange rates and bill rates, they use the exchange rates and one-month Eurocurrency deposit rates for the last Friday of each month from the Harris Bank data base. For equity prices, they use the NYSE index for the US, the FAZ index for Germany, the Financial Times Industrial Ordinary Index for the UK, and the Topix Index for Japan. As measures of non-portfolio income and the price level, they chose GNP and the consumer price index from the International Financial Statistics data base.
40	Multivariate Tests of the Zero-Beta CAPM	Shanken,J. (1985)	To test Zero Beta CAPM by appllying a cross-sectional regression test (CSRT)	For each of three subperiods, the following steps are taken: (i) all securities on the CRSP monthly return tape with complete data for the subperiod are ranked on the basis of total value of all shares outstanding at the end of the month preceding the subperiod, and (ii) the securities are grouped into twenty equally-weighted portfolios. Each portfolio contains approximately the same number of securities. The portfolios are ranked from one to twenty, portfolio one containing the smallest firms and portfolio twenty the largest. The three subperiods, each of length T = 74 (months), are February 1953 to March 1959, April 1959 to May 1965, and June 1965 to July 1971. Real returns are computed using the consumer price index.
41	On the CAPM Approach to the Estimation of A Public Utility's Cost of Equity Capital	Litzenberger,R., Ramaswamy,K. and Sosin, H. (1980)	To use the CAPM to measure the cost of equity capital by using NYSE betas and risk premiums.	The raw data for this study consisted of monthly rates of returns for all NYSE securities and monthly measures of the risk-free rate of interest. Monthly returns on high grade commercial paper from 1926 to 1951 were used as a proxy for the return on a riskless asset. From 1952 to 1978, the return on a Treasury Bill with 30 days to maturity was used for this purpose. A risk free rate of interest of 9.29% per annum was used.
42	Money and the C-CAPM	Ronald, J.B. and Huang, D. (2009)	To consider asset pricing in a monetary economy where liquid assets are held to lower transaction costs. The ensuing model extends the capital asset pricing model (CAPM) and the consumption CAPM by deriving real money growth as an additional factor determining returns.	They use 25 portfolios sorted by size and book-to-market ratio that are provided by Fama and French. The three-month T-bill rate is used as the risk-free asset to generate excess returns. Nominal money growth is based on the time series of M2 and is deflated by the consumer price index, consumption is proxied by quarterly nondurables consumption and services. The sample period is between 1959Q1 and 2004Q4.

Table 14: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data
		Author(Date)	Objectives	Data-Database-Time Period
43	Improvement in Finite Sample Properties of the Hansen–Jagannathan Distance Test	Ren,Y. and Shimotsu, K. (2007)	To improve the finite sample properties of the HJ-distance test via more accurate estimation of the weighting matrix, which is the inverse of the second moment matrix of portfolio returns.	They simulate three sets of data. The first set is a simple three-factor model with independent factor loadings, where the scale of expected returns and variability of the factors are roughly matched to those of the actual market-wide returns. The second set of data is calibrated to resemble the statistical properties of the three-factor model in Fama-French (1992).They collect 330 time-series observations of monthly returns of the Fama-French portfolios and the Fama-French factors between July 1963 and December 1990. The third set of data is calibrated based on the Premium-Labor model in Jagannathan and Wang (1996). They simulate each set of the data with 1000 replications.
44	Tests of CAPM with Nonstationary Beta	Huang, H.C. (2001)	To challenge the constancy assumption of the systematic risk measure, , while testing the CAPM.	The data used in the paper are the weekly asset's returns on the stock of Liton Electronic company (code number S2301) listed in the Taiwan Stock Exchange. The risk-free rate is proxied by interest rate on the Treasury Bill with 91 days to maturity. The sample period starts on 4 January 1997 and ends on 29 May 1999. As a result, they have 125 observations in the analysis.
45	Tests of Conditional Asset Pricing Models in the Brazilian Stock Market	Garcia, R. and Bonomo, M. (2001)	To test unconditional and conditional versions of the CAPM and the APT for the Brazilian stock index during the period 1976–1992.	For the sample of individual securities provided for Brazil, they selected a total of 25 common shares which were listed on the IBOVESPA stock exchange from 1976:1 to 1992:12. They form three size portfolios. The returns are computed in the local currency in excess of the overnight rate.
46	Excess Volatility and Efficiency in French and German Stock Markets	Cuthbertson, K.and Hyde, S. (2002)	To analyse whether the French and German stock markets can be classified to be efficient or whether they exhibit excess volatility	They use French and German monthly data from January 1973 to June 1996. All data are taken from Datastream International and are end of period observations.
47	Confidence in the Familiar: An International Perspective	Li, K. (2004)	To examine the role of investors' perception of the country specific risk of foreign investment on their portfolio choices.	The monthly return data for market indices of G7 countries (Canada, France, Germany, Italy, Japan, U.K., and U.S) from Morgan Stanley Capital International (MSCI) over the period January 1970 to December 2000. The risk free rates for G7 except Japan are the T-bill rates obtained from the International Monetary Fund's International Financial Statistics (IFS). The risk free rate for Japan is the money market rate. money market rate. The excess returns in local currencies of each G7 investor are obtained by first converting the MSCI return indices into local currencies, then subtracting the local risk-free rates from them.
48	The Properties of the Equity Premium and the Risk-Free Rate: An Investigation Across Time and Countries	Canova,F. and Nicolo, G.D.(2003)	To examine the relationship between the equity premium and the risk-free rate over time for Group of Seven countries.	The data of United States, Canada, United Kingdom, Japan, Italy, Germany, and France for the period 1971:1–1999:3 and for three subperiods (1971:1–1980:4; 1981:1–1990:4; 1991:1–1999:3) are given. In computing both the real equity premium and the real risk-free rate they use the domestic CPI and calculate returns in local currencies. Returns on both stocks and risk-free securities are computed for a three-month holding period.

Table 14: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data
		Author(Date)	Objectives	Data-Database-Time Period
49	Estimation and Test of a Simple Model of Intertemporal Capital Asset Pricing	Brennan,M.J., Wang, A.W. and Xia, Y. (2004)	To estimate a simple ICAPM that allows for time variation in the real interest rate and slope of the capital market line, and evaluate the ability of the model to account for the returns on portfolios sorted according to size and book-to-market (B/M) ratio, as well as according to industry.	The primary data set consists of monthly observations of the yields on eight synthetic constant maturity zero-coupon U.S. Treasury bonds with maturities of 3 and 6 months, and 1, 2, 3, 4, 5, and 10 years for the period from January 1952 to December 2000. The returns on 25 size and book-to-market sorted value-weighted portfolios and the nominal short interest rate for the same period are used for the initial crosssectional pricing tests. The CRSP value-weighted market portfolio is used to proxy for the portfolio of total wealth. The tests are repeated using the returns on 30 industrial portfolios constructed by Fama and French (1997); these portfolios are rebalanced at the end of June each year using 4-digit SIC codes.
50	Bad Beta, Good Beta	Campbell, J.Y. and Vuolteenaho, T. (2004)	To clarify the extent to which deviations from the CAPM's cross-sectional predictions can be rationalized by Merton's (1973) intertemporal hedging considerations that are relevant for long-term investors.	The data spans the period of 1928:12-2001:12. Their main set of test assets is a set of 25 ME and BE/ME portfolios, available from Professor Kenneth French's web site. The 25 ME and BE/ME portfolios were originally constructed by Davis, Fama, and French (2000)
51	Asset Pricing with Liquidity Risk	Acharya, VV. and Pedersen, L.H. (2005)	To solve a simple equilibrium model with liquidity risk	They use daily return and volume data from July 1st, 1962 until December 31st, 1999. Also, they use book-to- market data.They form a market portfolio for each month t during this sample period based on stocks with beginning-of-month price between $5 and $1000, and with at least 15 days of return and volume data in that month.They form 25 illiquidity portfolios for each year y during the period 1964 to 1999 by sorting stocks with price, at the beginning of the year, between $5 and $1000, and return and volume data in year y-1 for at least 100 days.Similarly, they form 25 illiquidity-variation portfolios by ranking the eligible stocks each year based on the standard deviation of daily illiquidity measures in the previous year, and 25 size portfolios by ranking stocks based on their market capitalization at the beginning of the year. Finally, they form portfolios sorted first into five book-to-market quintiles and then into five size quintiles within the book-to-market groups.
52	A Variance Equality Test of the ICAPM on Philippine Stocks: Post-Asian Financial Crisis Period	Aquino, R.Q. (2006)	To look at the ability of Fama's discrete version of Merton's intertemporal CAPM to explain the negative market risk premium and the crosssectional variability of Philippine stock returns after the onset of the Asian financial crisis in July 1997.	The data used cover the crisis and post-crisis period, July 1997 to December 2001. The set of risky assets includes eight equally weighted portfolios formed from 190 stocks with continuous trading during the period covered (out of 225 listed companies in mid-2001) and two market indices. The first eight portfolios are formed using the first two-digit industry classification code of the National Economic and Development Authority, the Philippine economic planning agency, as reported in Philippine Business Profiles (1998–1999).
53	Generalized Method of Moments and Present Value Tests of the Consumption-Capital Asset Pricing Model under Transactions Costs: Evidence from the UK Stock Market	Gregoriou, A. and Ioannidis, C. (2007)	To test for the inclusion of the bid–ask spread in the consumption CAPM, in the UK stock market over the time period of 1980–2000.	Monthly data are collected for the FTSE All Share index for the time period 1980–2000. They calculate a composite FTSE index by combining the transportation and industrial indices with weights calculated to reflect the number of stocks represented by each index. They are using monthly seasonally adjusted aggregate consumption expenditure data for the UK. For the dividend–price ratio they collect data on the price and dividend yield of the FTSE All Share index. The bid–ask spread is calculated by collecting data on the bid price and the ask price on the FTSE All Share index. Nominal stock prices, dividends and consumption are deflated by the implicit consumption deflator. The time period of the data is between 1980 and 2000.

Table 14: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data
		Author(Date)	Objectives	Data-Database-Time Period
54	Cross-Sectional Tests of Conditional Asset Pricing Models: Evidence from the German Stock Market	Schrimpf, A., Schroder, M. and Stehle, R. (2007)	To evaluate several specifications of the conditional CAPM for a major European market, the German stock market.	All estimations are based on monthly data ranging from 1969:12 to 2002:12. They construct 16 Fama French portfolios. As conditioning variables they use the spread between the return on corporate bonds and government bonds (DEF), the termspread on German government bonds (TERM), short term interest rates (TB) as well as dividend yields (DIV). In order to see whether a 'January effect' plays a role on the German stock market, they use a dummy variable JAN which allows for different parameters of the SDF in January and other months. And also they use a variable intended to capture the cyclical component of industrial production (CY).
55	Sorting, Firm Characteristics, and Time-varying Risk: An Econometric Analysis	Fan, X.T. and Liu, M. (2008)	To demonstrate the effectiveness of the sorting methodology with an empirical exercise that tests the conditional capital asset pricing model	They use size (lnME), book-market ratio (lnB/M), book leverage ratio (lnA/BE), and interest coverage ratio (lnIE/I). They also use various short-term profitability ratios, including operating income over assets (I/A), earnings over book equity (E/BE), net cash flow over assets (C/A), various long-term average profitability ratios (E/BE av., C/A av., average of E/BE and C/A over the past five years, subject to data availability), and R&D expenditure (R&D/A) for the period fron July 1965 to June 2005. And also they use such monthly macroeconomic variables as dividend yield, default premium, term premium, and the short-term interest rate. The past-month observations of these variables are used to control market-wide changes that affect the investment opportunity sets.
56	Extending the Capital Asset Pricing Model: the Reward Beta Approach	Bornholt, G. (2007)	To offer the reward beta approach as an alternative method for estimating expected returns.	They usemonthly portfolio returns, market returns, Fama-French factor returns, and one month risk-free returns for the period July 1963 to December 2003.
57	Conditional Risk-Return Relationship in a Time-Varying Beta Model	Huang, P. and Hueng, C.J. (2008)	To check the robustness of Pettengill, Sundaram, and Mathur (PSM)'s argument by incorporating a time-varying beta, in order to see whether PSM's success is based on an incorrectly specified constant beta.	The data used in this paper are daily returns of the stocks during the period from November 1987 to December 2003. There are a total of 358 stocks and 4079 observations for each stock. These 385 stocks are classified into ten industries, which are energy, material, industrials, consumer discretionary, consumer staples, health care, financials, information technology, telecom services, and utilities. The market return is defined as the value-weighted return on all NYSE, AMEX, and NASDAQ stocks.
58	Return Predictability of Higher-Moment CAPM Market Models	Hung, C.H. (2008)	To examine the relative performance of the higher-moment CAPM market models and the CAPM in explaining realised returns and predicting one-period-ahead returns on individual stocks and (both equally- and value-weighted) portfolios of momentum, size and country sorts.	The sample covers nineteen countries: Canada, the United States, Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, Australia, Hong Kong, Japan, Singapore and Taiwan; and covers the 954-weeks from 22 September, 1987 to 27 December, 2005. The dataset includes both listed and delisted firms to mitigate any survivorship bias but excludes all non-common equities and companies listed outside of their domestic exchanges and all stocks with prices below $1. Ten momentum portfolios are formed by ranking and sorting all the sample stocks based on their past 24-week compounded returns. In total, each momentum and size portfolio has 930 observations of weekly portfolio returns from 8 March, 1988 to 27 December, 2005.
59	Asset Pricing When Returns are Nonnormal: Fama-French Factors vs. Higher-order Systematic Co-Moments	Chung, Y.P.,Johnson,H. and Schill, M.J. (2006)	To test whether SMB and HML proxy for higher order co-moments	They explore the cross-sectional return characteristics of portfolios based on size and also based on book-to-market value over the 1930 to 1998 sample period. At the end of each calendar year, they rank all ordinary common stocks included on the CRSP file by market capitalization and divide the sample into 50 portfolios of equal size. The size portfolios increase from about 15 stocks per portfolio in the 1930s to about 140 stocks in the 1990s. They repeat this procedure for the stratification using book-to-market value. For this sort, they use the universe of both CRSP and Compustat firms.

APPENDIX B

Table 15: Studies about Multifactor Models for the Developed Markets

Number	Journal Name	References	Review of The Inroduction	Sample and Data	Conclusions
		Author(Date)	Objectives	Data-Database-Time Period	Findings
1	Investment performance of common stocks in relation to their price-earnings ratios: a test of the efficient market hypothesis	Basu, S (1977)	To determine empirically whether the investment performance of common stocks is related to their P/E ratios.	The data base used covers over 1400 industrial firms, which actually traded on the NYSE between September 1956-August 1971. Their data base represents over 1400 industrial firms, which actually traded on the NYSE between September 1956-August 1971. (1956-1971)	The results reported in this paper are consistent with the view that P/E ratioinformation was not "fully reflected" in security prices in as rapid a manner as postulated by the semi-strong form of the efficient market hypothesis. But the hypothesis that capital markets are efficient in the sense that security price behavior is consistent with the semi-strong version of the "fair game" model cannot be rejected inequivocally.
2	The relationship between return and market value of common stocks	Banz, R. W. (1981)	To examine the empirical relattonship between the return and the total market value of NYSE common stocks.	The sample includes all common stocks quoted on the NYSE for at least five years between 1926 and 1975. Three different market indices are used. Two of the three are pure common stock indices - the CRSP equally- and valueweighted indices. The third is more comprehensive: a value-weighted combination of the CRSP value-weighted index and return data on corporate and government bonds from Ibbotson and Sinquetield (1977) The weights of the components of this index are derived from information on the total market value of corporate and government bonds in various issues of the Survey of Current Business (updated annually)and from the market value of common stocks m the CRSP monthly index file. A time series of commercial paper returns is used as the risk-free rate. (1936-1975)	The evidence presented in this study suggests that the CAPM is misspecified. On average, small NYSE firms have had significantly larger risk adjusted returns than large NYSE firms over a fourty year period. This size effect is not linear in the market proportion (or the log of the market proportion) but is most pronounced for the smallest firms in the sample. The effect is also not very stable through time. An analysis of the ten year subperiods show substantial differences in the magnitude of the coefficient of the size factor.
4	Misspecification of Capital Asset Pricing Empirical Anomalies Based on Earnings' Yields and Market Values	Reinganum, M. R. (1981)	To test the validity of the CAPM and efficient market hypothesis	He uses the model of Latant, Jones and Rieke (1974) and Latane and Jones (1977) about standardized unexpected earnings (SUE) to test whether abnormal returns can be earned during the period from 4th quarter of 1975 to 3rd quarter of 1977.	The simple one-period capital asset pricing model is misspecified. The set of factors omitted from the equilibrium pricing mechanism seems to be more closely related to firm size than E/P ratios.
5	The relationship between earnings' yield, market value and return for NYSE common stocks: Further evidence	Basu, S.(1983)	To examine the empirical relationship between earnings' yield, firm size and returns on the common stock of NYSE firms	He ranks stock first on E/P, creating five quintiles. For the securities within a given E/P quintile, he then ranks on size, creating five size quintiles. His sample includes the common stocks of NYSE firms during the period 1963-1979.	The common stock of high E/P firms earn, on average, higher risk-adjusted returns than the common stock of low E/P firms and that this effect is clearly significant even if experimental control is exercised over differences in firm size.
6	Persuasive evidence of market inefficiency	Rosenberg, B., Kenneth,R. and Ronald L. (1985)	To examine the relationship between stock returns and book-to-market ratio for the common stocks of NYSE firms	They use the stocks of NYSE firms during the period January 1973- September 1984.	They find that firms with high ratios of book value of common equity to market value of common equity (BE/ME) have higher returns than firms with low BE/ME ratios.

Table 15: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data	Conclusions
		Author(Date)	Objectives	Data-Database-Time Period	Findings
7	Size-related anomalies and stock return seasonality : Further empirical evidence	Keim, D. B. (1983)	To examine the empirical relation between abnormal returns and market value of NYSE and AMEX common stocks month by month over the period 1963-1979.	He uses the returns and market values of common stocks traded on NYSE and AMEX month by month over the period 1963-1979.	His findings show that daily abnormal return distributions in January have large means relative to the remaining eleven months, and that the relation between abnormal returns and size is always negative and more pronounced in January than in any other month.
8	Debt/Equity Ratio and Expected Common Stock Returns: Empirical Evidence	Bhandari, L.C. (1988)	To investigate the effect of debt to equity ratio on the expected common stocks returns during the period 1948- 1981	He divides the difference between the book value of total assets and common equity to the market value of common equity and uses it as debt to equity ratio during the period of 1948- 1981.	Expected common stock returns are positively related to the ratio of debt (non-common equity liabilities) to equity, controlling for the beta and firm size and including as well as excluding January, though the relation is much larger in January.
9	Earnings Yields, Market Values, and Stock Returns	Jaffe, Keim, Westerfield (1989)	To examine the relation between stock returns and the effects of size and earnings to price ratio for the period 1951-1986	Data on returns, price, and shares outstanding are taken from the University of Chicago Center for Research in Security Prices (CRSP) monthly stock return and master files for the 1951-1962 period and from the CRSP daily return and master files for the 1963-1986 period. Earnings per share are obtained from the Compustat PST files. They construct 30 portfolios as a result of the intersection 6 portfoios formed with respect to earning per share and 5 portfolios with respect to market value.	E/P and size effects are significant for the 35 year sample period. They find a difference between January and the rest of the year; the coefficients on both E/P and size are significant in January, but only the E/P coefficient is significant outside of January and their portfolio formation procedures do not affect the results on E/P. They also find evidence of consistently high returns for firms of all sizes with negative earnings.
10	Structural and Return Characteristics of Small and Large Firms	K. C. Chan and Nai-Fu Chen (1991)	To examine differences in structural characteristics that lead firms of different sizes to react differently to the same economic news.	They evaluate the firms on the NYSE and NASDAQ. For the NYSE firms, they use different time periods to analyse the difference between small and large capitalization stocks (1966-1984, 1956-1985). They rank the stocks based on their market capitalization and compute some financial leverage ratios. For the NASDAQ firms, they collect data over the period of 1973 to 1985.	They find that a small firm portfolio contains a large proportion of marginal firms-firms with low production efficiency and high financial leverage. According to their results, the explanatory power of the size proxy is reflected in the risk exposures to the size-matched return indices.
11	Fundamentals and Stock Returns in Japan	L.K.C. Chan, Yasushi Hamao, and Josef Lakonishok (1991)	To examine the cross-sectional differences in returns on Japanese stocks to the underlying behavior of four fundamental variables: earnings yield, size, book to market ratio, and cash flow yield.	The data set contains the period of 1971 to 1988. The sample includes both manufacturing and non-manufacturing firms, companies from both sections of the Tokyo Stock Exchange, and also delisted securities.	Their findings reveal a significant relationship between fundamental variables and expected returns in the Japanese market. Of the four fundamental variables considered, the book to market ratio and cash flow yield have the most significant positive impact on expected returns.
12	The Cross Section of Expected Stock Returns	Eugene F. Fama and Kenneth R. French (1992)	To investigate the roles of market beta, size, leverage, book to market equity and earnings-price ratios on the cross sectional variation in average stock returns.	All nonfinancial firms in the intersection of (a) the NYSE, AMEX, and NASDAQ return files 1963 - 1990 are used.	The beta does not seem to help explain the cross-section of average stock returns and the combination of size and book to market equity seems to absorb the roles of leverage and E/P in average stock returns during their analysis period.

Table 15: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data	Conclusions
		Author(Date)	Objectives	Data-Database-Time Period	Findings
13	Common risk factors in the returns on stocks and bonds	Eugene F. Fama and Kenneth R. French (1993)	To identify five common risk factors in the returns on stocks and bonds.	They use the data during the period 1963 to 1991. The proxy for the factor that arises from unexpected changes in interest rates, TERM, is the difference between the monthly long-term government bond return (from Ibbotson Associates) and the one month Treasury bill rate measured at the end of the previous month (from the Center for Research in Security Prices, CRSP). The proxy for the default factor, DEF, is the difference between the return on a market portfolio of long-term corporate bonds (the Composite portfolio on the corporate bond module of Ibbotson Associates) and the long-term government bond return.	the three stock-market factors, RMO, SMB. and HML are largely uncorrelated with one another and with the two term-structure factors, TERM and DEF. The regressions that use RMO, SMB. and HML, TERM, and DEF to explain stock and bond returns thus provide a good summary of the separate roles of the five factors in the volatility of returns and in the cross-section of average returns.
14	International Value and Growth Stock Returns	Carlo Capaul, Ian Rowley and William F. Sharpe (1993)	To analyze the returns obtained from portfolios of stocks with high price/book ratios and those obtained from portfolios of stocks with low price/book ratios for France, Germany, Switzerland, U.K., Japan and U.S	Monthly returns and values for both value and growth indexes for all six countries from January 1981 to June 1992 are used. They use three indexes these are the value stock index, the growth stock index and a market index and also construct two additional indexes	A value-growth factor related to the ratio of stock price to book value per share exists over the period from January 1981 to June 1982 in six major security markets. For this period, portfolios with low price to book ratios provide superior risk adjusted performance to those of portfolios with high price to book ratios.
15	Contrarian Investment, Extrapolation, and Risk	Josef Lakonishok, Andrei Schleifer and Robert W. Vishny (1994)	To try to make potential statements for why value strategies outperform the market	The sample period covers the period from the end of April 1963 to the end of April 1990. They use portfolios formed every year starting at the end of April 1968. They obtain the returns data from the CRSP and accounting data from COMPUSTAT. The universe of the stocks is the NYSE and AMEX.	Their results establish three propositions. First, a variety of investment strategies that involve buying out of favor stocks have outperformed glamour strategies over the analysis period. Second, the market participants appear to have consistently overestimated future growth rates of glamour stocks relative to value stocks. Third, using conventional approaches to fundamental risk, value strategies appear to be no riskier than glamour strategies.
16	The Cross-Section of Stock Returns: Evidence of Emerging Markets	Claessens, S., Dasgupta, S. and Glen, J. (1995)	To examine the cross-sectional pattern of returns in 18 developing countries empirically. They use data compiled by the International Finance Corporation (IFC) for analysed countries	The data come from the Emerging Markets Database maintained by IFC, which contains asset prices, dividends, exchange rates, trading volume and accounting ratios for a number of firms in each of 20 countries during the period of 1986-93, which provides 96 monthly observations for each country.	According to their results, in addition to beta, two factors, size and trading volume have significant explanatory power in a number of these markets; dividend yield and earnings/price ratios are also important, but in slightly fewer markets.
17	Size and Book-to-Market Factors in Earnings and Returns	Eugene F. Fama and Kenneth R. French (1995)	To study whether the behavior of stock prices, in relation to size and book-tomarket-equity (BE/ME), reflects the behavior of earnings.	They form six size- book to market intersection portfolios by using the same procedure and databases of Fama French (1993) for each year during the period from 1963 to 1992. As a measure of profitability, they use earnings on book equity.	Firms with high BE/ME have low ratios of earnings to book equity, vice versa for firms with low BE/ME. Small stocks within book-to-market groups tend to be less profitable than big stocks. There are market, size and book to market factors in fundamentals that are similar to those in stock returns.
18	Firm Size, Book-to-Market Ratio, and Security Returns: A Holdout Sample of Financial Firms	Barber, B.M. and Lyon, J.D. (1997)	To investigate whether the relationship between firm size, book-to-market ratios, and security returns for financial and nonfinancial firms is similar or not during the period July 1973-December 1994	They use the firms with available returns data on the Center for Research in Security Prices (CRSP) NYSE/AMEX/Nasdaq monthly returns files from July 1973 through December 1994 in their analysis.	They find a similar relation between firm size, book-to-market ratios, and security returns for financial and nonfinancial firms. In addition, they present evidence that survivorship bias does not significantly affect the estimated size or book-to-market premiums in returns.

Table 15: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data	Conclusions
		Author(Date)	Objectives	Data-Database-Time Period	Findings
19	On the Robustness of Size and Book-to-Market in Cross-Sectional Regressions	Knez and Ready (1997)	To reveal whether the size and value effect are driven by extreme observations.	They use the same data as in Fama and French (1992)	The estimated relation between size and returns is significantly affected by using a robust FM procedure. The negative relation between firm size and average returns is driven by a few extreme positive returns in each month.
20	Size and Book-to-Market Factors in Earnings and Returns	Eugene F. Fama and Kenneth R. French (1998)	To examine whether there is a value premium in markets outside the United States (twelve major EAFE) and whether a risk model that describes the U.S. returns can describe an other market returns.	They construct value and growth portfolios for analysed markets during the period of 1975 to 1995.	Their results indicate that value stocks tend to have higher returns than growth stocks in twelve of thirteen major markets during the analysis period.
21	Reports of beta's death are premature: Evidence from the UK	Clare, Priestley and Thomas (1998)	To test for a linear and positive relationship between beta and expected returns for a sample of UK stock returns over the period 1980-1993.	They investigate the relationship between expected returns and market and Fama French factors for UK market. Fama French factors data in this paper is obtained from two sources: month-end, dividend adjusted stock return data on 100 stocks quoted on the London Stock Exchange between January 1980 and December 1993 are taken from the London Share Price Database (LSPD) tapes; while the accounting data on book value (BE), earnings (E), asset value (A) and equity market values (ME) were obtained from Datastream International.	When they estimate the CAPM by using one step approach, they find that beta has a significant and powerful role and Fama and French variables do not have any significant role for in explaining expected returns in contrast to US findings. When they consider Fama MacBeth t statistics, price effect is found as a significant factor in the UK stock market.
22	The reliability of the book-to-market ratio as a risk proxy	Ralph R. Trecartin Jr. (2000)	To examine whether the book equity-to-market equity ratio and other value/growth variables predict returns consistently from 1963 to 1997 using monthly intervals.	He uses all firms on NYSE, AMEX, and NASDAQ in the study if they meet the criteria chosen by the author. He uses the criteria mentioned in the study of Fama and French (1993) and additional two criteria: A firm must have sales in at least two adjacent years during the five years preceding year t in order to calculate sales growth rates, and the firm must also record earning	He finds that the book-to-market effect (BE/ME) is statistically related to return as predicted in less than 50% of the monthly time periods examined. Also, the variable is not always significant in five-year subperiods. However in ten-year periods BE/ME is significantly related to return. Thus the data supports the view that the BE/ME variable is not a reliable predictor of return over short time horizons.
23	Capturing the Value Premium in the U.K.	Elroy Dimson, Stefan Nagel, Garrett Quigley (2003)	To investigate the UK stock market by using a new dataset of accounting information that covers virtually all UK firms ever listed on the London Stock Exchange (LSE) during the period of 1995- 2001.	They investigate all UK firms ever listed on the LSE during the period of 1995- 2001. The source of share price and listing information is the London Share Price Database (LSPD) maintained at London Business School. They compute monthly returns and market capitalizations from share prices, dividends, and capital changes in the LSPD files. They constuct six portfolios as the intersection of two size and three book to market stock groups.	They find that there is a strong value premium in the UK for the period 1955-2001. The value premium exists within the small-cap as well as the large-cap universe. They also find that dividend yield as a measure of value produces strikingly similar results.
24	Alternative Valuation Techniques For Predicting UK Stock Returns	Christian L. Dunis and Declan M. Reilly (2004)	To analyse the investment returns obtained from the best decile portfolios of "growth" stocks and "value" stocks and to identify significant differences, in terms of profitability, between value stocks and growth stocks.	They use daily data over the period 31st December 2000 to 31st December 2002. They use 5 variables to categorise a panel of 689 stocks from the FTSE All-Share index. These variables are price/book value ratio, price/earnings ratio, cash flow/price ratio, dividend yield and value of firms.	Their results suggest that a “value-growth” factor is significant in the UK stock market no matter which of the five relative valuation techniques are used. Value stocks also outperform the market, on average, for all five relative valuation techniques, both absolutely and after adjustment for risk.

Table 15: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data	Conclusions
		Author(Date)	Objectives	Data-Database-Time Period	Findings
25	Size and Book-to-Market Factors in Earnings and Stock Returns: Empirical Evidence for Japan	Andreas Charitou and Eleni Constantinidis (2004)	To provide evidence that would contribute to the effort of explaining the 3FM in a country that differs substantially from the US not only with regards to its financial reporting system but also as it relates to its economic characteristics.	Their dataset consists of all industrial firms with ordinary common equity included in the Global Vantage database . Their final sample consists of 2271 firms. They use data for the period 1991 – 2001. As a proxy for risk-free rate they use the call money rate of Japanese market adjusted monthly.	They find that the size and BE/ME effect are not very clear in Japan. When the testing portfolios consist of small stocks, the explanatory power of the size factor (SMB) dominates the explanatory power of the BE/ME factor (HML) The opposite occurs when the testing portfolios consist of big stocks. In US the explanatory power of the HML factor always dominates the explanatory power of the SMB factor.
26	Is the Book-to-Market Ratio a Measure of Risk?	Robert F. Peterkort and James F. Nielsen (2005)	To evaluate whether the book-to-market ratio acts as a proxy for risk.	They use only ordinary common shares and firms traded on the New York Stock Exchange (NYSE), the American Stock Exchange (AMEX), or the NASDAQ over the period 1978 - 1995. They measure market leverage (MLEV) as debt to total assets D/(D + ME), and book leverage (BLEV) as debt to book value of total assets D/(D + BE). They define size and price control variables as ln(ME) and 1/(price per share).	They find no relation between average stock returns and the book-to-market ratio in all-equity firms after controlling for firm size, and an inverse relation between average stock returns and the book-to-market ratio in firms with a negative book value of equity.
27	Value versus Growth: Movements in Economic Fundamentals	Yuhang Xing and Lu Zhang (2005)	To evaluate the empirical relevance of recent rational theories of the value premium.	Their data include all manufacturing firms in Compustat that contains monthly prices, shares outstanding, dividends, and returns for firms listed on NYSE, AMEX, and NASDAQ, over the period 1963- 2002.	They find that value firms are more affected by negative business cycle shocks than growth firms respond more mildly. They also find some evidence that value firms have less real fexibility than growth firms in smoothing negative aggregate shocks. Consequently, their results suggest that economic fundamentals are important determinants of the cross section of returns.
28	Extending the capital asset pricing model: the reward beta approach	Bornholt G. (2007)	To compare the CAPM, the Fama–French three-factor model and the reward beta approach for US market	All monthly portfolio returns, market returns, Fama-French factor returns, and risk-free returns used in the present study were sourced from Kenneth French's website, and covered the period July 1963 to December 2003.	The CAPM and the three factor models are not supported by the empirical evidence. On the other hand, the reward beta approach is strongly supported by the empirical evidence reported in this paper.
29	Investor Sentiment as Conditioning Information in Asset Pricing	Ho, C. and Hung, C.H. (2009)	To investigate whether incorporating investor sentiment as conditioning information in asset-pricing models helps capture the impacts of the size, value, liquidity and momentum effects on risk-adjusted returns of individual stocks.	They use the monthly equity data of the NYSE and the AMEX from the CRSP and COMPUSTAT datasets for the period from July 1964 through December 2005. They use MS, CCI, and II investor/consumer sentiment indices compiled by the University of Michigan, Consumer Conference Board, and Investor's Intelligence, respectively	Their findings indicate that investor sentiment plays an important role in conditional asset-pricing models for capturing the anomalies.

APPENDIX C

Table 16: Studies about Multifactor Models for the Emerging Markets and Turkey

Number	Journal Name	References	Review of The Inroduction	Sample and Data	Conclusions
		Author(Date)	Objectives	Data-Database-Time Period	Findings
1	Risk and Return of Value Stocks	Chen, N. and Zhang, F. (1998)	To compare the return experience of value stocks across the six countries (The United States, Japan, Hong Kong, Malaysia,Taiwan and Thailand)	They use return and accounting data for stocks in Japan, Hong Kong, Malaysia, Taiwan and Thailand from the Pacific-Basin Capital Markets databases.	Their findings reveal that strong value stock effects persist in the United States, are less persistent in Japan, Hong Kong, and Malaysia; and are undetectable in Taiwan and Thailand.
2	Local Return Factors and Turnover in Emerging Stock Markets	Rouwenhorst, K. G. (1999).	To examine the sources of return variation in emerging stock markets.	20 emerging markets with 1750 individual stocks are analysed during the period 1982 to 1997.	The return factors in emerging markets are qualitatively similar to those in developed markets. Small stocks outperform large stocks, value stocks outperform growth stocks and emerging markets stocks exhibit momentum. According to a Bayesian analysis of the return premiums in developed and emerging markets, the empirical evidence favors the hypothesis that size, momentum, and value strategies are compensated for in expected returns around the world.
3	CAPM anomalies and the pricing of equity: evidence from the Hong Kong market	Ho, Y. W., Strange, R. and Piesse, J. (2000).	To test the independent and joint roles of the more commonly hypothesized variables in explaining cross-sectional variation in average returns for Hong Kong stock market during the period of January 1980 to December 1994.	The sample data set contains 117 common stocks of nonfinancial companies traded on the Hong Kong stock market during the period from January 1980 to December 1994. They use market equity (ME), book-to-market equity (BE/ME), market leverage (A/ME), book leverage (A/BE), dividend yield (DY), and earnings-price ratio (E/P) as independent variables in their tests.	Beta, book leverage, earnings-price ratio and dividend yield are not priced, whereas relatively strong book-to-market equity and market leverage effects and marginally significant size and share price effects are observed.
4	A Closer Look at the Size and Value Premium in Emerging Markets: Evidence from the Kuala Lumpur Stock Exchange	Drew, M.E. Veeraraghavan,M. (2002)	To examine whether there is a size and value premium in markets outside the USA and the multifactor model of Fama-French (1996) can capture the cross-section of average stock returns for the Malaysian setting.	The firms with available returns data, on the Datastream return files from December 1992 through December 1999 are used.	They find that size and value premium exist in markets outside the USA andt the multifactor model of Fama and French (1996) is a parsimonious representation of the risk factors for Malaysia, explaining returns in an economically meaningful manner. Their findings also reject the claim that the multifactor model results can be explained by the turn-of-the-year effect.

Table 16: (Continued)

Number	Journal Name	References	Review of The Inroduction	Sample and Data	Conclusions
		Author(Date)	Objectives	Data-Database-Time Period	Findings
5	Cross Section of Expected Stock Returns in ISE	Akdeniz, L., Altay, A. and Aydoğan, K. (2000)	To investigate the cross section of stock returns in the Turkish market for the period 1992-98.	The data covers all nonfinancial companies during the period between January 1992 and December 1998.	Market beta does not have any significant effect on the stock returns while book to market factor has direct and size factor has inverse effect on stock returns. According to the Fama-MacBeth algortihm results, they obtain the same results but the significant factors cease to have an explanatory power during the second period that covers between 1995 and 1998.
6	Do Value Stocks Earn Higher Returns than Growth Stocks in an Emerging Market? Evidence from Istanbul Stock Exchange	Gonenc, H. and Karan, M.B. (2001)	To study the comparison of returns between value and growth, and between small and big portfolios for the Istanbul Stock Exchange (ISE).	Their sample covers more than 80 percent of the capitalization of the ISE for the sample period from 1993 to 1998. They construct three book-to-market and two size portfolios by using a similar portfolio formation methodology with Fama and French (1993).	They find that growth portfolios have superior performance over value portfolios and big stocks have more both monthly and annually returns than small stocks in the ISE. Size and B/M risk factors along with market risk premium produce better descriptions of the returns on value and growth portfolios
7	Profitability of Contrarian vs Momentum Strategies: Evidence from the Istanbul Stock Exchange	Bildik, R. And Gülay,G.(2002)	To examine the momentum and contrarian effects on stock returns in Istanbul Stock Exchange (ISE) between years 1991 and 2000.	They use all stocks traded in National Market of the ISE by extracting shares of investment trusts, REITs, other stocks delisted or halted by the Exchange by the time and also the stocks which has less than 12 month-data for the period from January 1991 to December 2000. They analyse both whole sample period and two equal sub-periods to reveal time variation.	There is significant price, size, B/M and E/P effects in stock returns in ISE, consistent with the previous empirical work. It İs found that stocks which have lower price, smaller size, lower past-return, higher-B/M and E/P are significantly provide higher returns than others. On the other hand, findings show that losers are riskier than the winners because they are more sensitive to all three Fama-French factors.
8	Testing the Asset Pricing Models in Turkish Stock Markets: CAPM vs Three Factor Model	Gokgoz, F.(2007)	To investigate the viability of the CAPM and the Three-Factor Model on basic indices on Istanbul Stock Exchange (Real Estate, Securities, Industrials, Services and Technology) within 2001-2006.	The daily returns of the 30 days based Turkish Government Internal Loan Index (GIL) return is used as risk free rate. He uses the same portfolio forming approach with the Fama and French (1993,1996).	All the ISE indices indicated similar results in the time series regression tests and in the cross sectional regression analyses for the CAPM and the Three Factor Model. Regarding the results of the time series and cross sectional regression tests, both the CAPM and the Three Factor Model is found applicable and viable on the ISE indices.
9	The Size and Book-to-Market Effects and Their Role as Risk Proxies in the Istanbul Stock Exchange	Aksu, M.H. And Önder, T. (2003)	To examine the size and book-to-market effects on stock returns and their rational risk explanation in the Istanbul Stock Exchange (ISE).	They use the same stock selection and portfolio formation methodology of Fama and French (1993). Their sample includes only non-financial firms that traded in the ISE during the 1993-1997 period.	Their results show that, on average, high book-to-market and small capitalization stocks provide significant excess returns and this predictability is largely related to firm specific and macro-economic distress. For the individual stock returns, they find that only the market and the size factors are significant. Also size and BE/ME have a relationships with profitability.

APPENDIX D

Table 17: Studies about Higher Moments in Asset Prices

Number	Journal Name	References	Review of the Introduction	Sample and Data		Conclusions
		Author (Date)	Objectives	Assets	Time Periods	Findings
1	Risk and the Required Return on Equity	Arditti, F.D.(1967)	To identify the required return on equity and its relation to various types of investment risks.	Standard and Poor's Composite Index of industrials, railroads, and utilities.	1946-1963 Annualy	The second and third moments are found as reasonable risk measures while the market correlation coefficient of returns is not. The dividend-earnings ratio is negatively and significantly related to the required return. Investors like high dividend-payout
2	The Speculative Behavior of Mutual Funds	Simonson, D.G. (1972)	To make an extension of portfolio theory by quantifying the speculative risk incurred by managers of mutual funds.	quarterly rates of return for ninety two mutual funds over the period 1961-70 and subperiods 1961-65 and 1966- 70	1961-1970 Quarterly	The quantification of speculative risk is a useful and necessary extension of the measurement of risk in diversified portfolios. The systematic skewness appears to explain the alleged shift among mutual fun
3	Diversification in a Three-Moment World	Simkowitz, M.A. and Beedles, W.L. (1978)	To show that diversification is not necessarily desirable for investors who base their decisions on the first three moments of return distributions.	NYSE common stocks	1945-1965 Monthly 1962-1976 Daily	They find that portfolio dispersion decreases with diversification. Raw portfolio skew decreases as the number of assets in the portfolio increases. Moreover skew is diversified away rapidly.
4	Arbitrage Equilibrium with Skewed Asset Returns	Barone-Adesi, G. (1985)	To investigate market equilibrium with skewed security returns empirically by using the quadratic form of the covariance-coskewness model by Kraus and Litzenberger and APT.	securities in the monthly CRSP file	1926-1970 Monthly 1931-1975 Monthly	Their empirical estimates give some support to the Kraus and Litzenberger hypothesis on skewness preference. However, there is some evidence that the tested arbitrage equilibrium is not a complete description of security pricing.
5	Skewness Persistence in Common Stock Returns	Singleton, J.C. and Wingender, J. (1986)	To investigate the persistence of skewed returns over time.	securities in the monthly CRSP file	1961-1980 Monthly, Semi yearly, Annually	The frequency of positive skewness is found to be relatively stable over varying time periods from 1961 to 1980. However, the skewness of individual stocks and portfolios of stocks does not persist across different time periods. Positively skewed equity p
6	Portfolio selection and skewness" Evidence from international stock markets	Chunhachinda, P., Dandapani, K. and Prakash, S.H..A.J. (1997)	To test the return distributions of 14 international stock markets for normality. To investigate inter-temporal stability of these stock markets. To apply empirically portfolio selection with skewness is to the sample of international stock markets.	14 major stock markets	1989-1993 Monthly, Weekly	5 of the 14 weekly return distributions, and 11 of the 14 monthly return distributions exhibit significant skewness. This finding sets the stage for multi-objective portfolio selection (with skewness), and confirms their argument that higher moments canno
7	Day of the Week Effects, Information Seasonality, and Higher Moments of Security Returns	Aggarwal, R.and Schatzberg, J.D. (1997)	To investigate if day of the week variations in higher order moments of the return distribution can explain day of the week patterns in security returns.	stocks	1980-1993 Daily	Significant day of the week variation in deviations from normality, and the inverse relationship of such deviations with firm size, are documented. They also find that the market model residuals around dividend and earnings announcements to be significant
8	Skewness in financial returns	Peiro, A. (1998)	To investigate the symmetry of the unconditional distribution (probability density function) of daily financial returns	stocks, currency	1980-1983 Daily	With the sample skewness test statistic and its asymptotic distribution under normality, symmetry is rejected in eight of the nine series of stock returns and in the three series of exchange rate returns. While under normality symmetry was rejected for 11

APPENDIX E

Table 18: ISE 100 Index Monthly Return over the Analysis Period

Date	ISE 100 index monthly return (%)
2002M7	9,13
2002M8	-6,69
2002M9	-7,33
2002M10	15,94
2002M11	29,74
2002M12	-22,03
2003M1	6,38
2003M2	4,92
2003M3	-17,94
2003M4	22,39
2003M5	-0,66
2003M6	-4,37
2003M7	-2,87
2003M8	9,86
2003M9	12,44
2003M10	20,67
2003M11	-7,22
2003M12	27,42
2004M1	-7,33
2004M2	9,44
2004M3	7,23
2004M4	-10,14
2004M5	-4,76
2004M6	5,61
2004M7	7,87
2004M8	4,37
2004M9	8,58
2004M10	4,31
2004M11	-1,81
2004M12	11,05
2005M1	9,45
2005M2	3,90

Date	ISE 100 index monthly return (%)
2005M3	-9,58
2005M4	-7,44
2005M5	9,09
2005M6	6,82
2005M7	9,86
2005M8	4,37
2005M9	7,94
2005M10	-4,11
2005M11	19,16
2005M12	4,46
2006M1	12,10
2006M2	5,44
2006M3	-8,47
2006M4	2,59
2006M5	-12,00
2006M6	-7,03
2006M7	1,74
2006M8	3,38
2006M9	-0,87
2006M10	9,90
2006M11	-5,95
2006M12	2,49
2007M1	5,28
2007M2	0,60
2007M3	5,68
2007M4	3,66
2007M5	5,67
2007M6	0,03
2007M7	12,17
2007M8	-4,88
2007M9	7,66
2007M10	6,70

Date	ISE 100 index monthly return (%)
2007M11	-5,90
2007M12	2,44
2008M1	-23,12
2008M2	4,87
2008M3	-12,54
2008M4	11,89
2008M5	-6,41
2008M6	-12,20
2008M7	20,27
2008M8	-5,58
2008M9	-9,52
2008M10	-22,74
2008M11	-7,61
2008M12	4,47
2009M1	-3,46
2009M2	-7,36
2009M3	7,64
2009M4	23,77
2009M5	12,10
2009M6	5,56
2009M7	15,41
2009M8	9,17
2009M9	3,07
2009M10	-1,44
2009M11	-3,81
2009M12	16,48
2010M1	3,46
2010M2	-9,05
2010M3	14,01
2010M4	4,93
2010M5	-6,89
2010M6	0,84

APPENDIX F

Table 19: Monthly Risk Free Rate over the Analysis Period

Date	Monthly Risk Free (RF) Rate (%)
2002M7	4,65
2002M8	4,22
2002M9	4,11
2002M10	4,23
2002M11	3,60
2002M12	3,42
2003M1	3,82
2003M2	3,73
2003M3	3,99
2003M4	3,86
2003M5	3,50
2003M6	3,20
2003M7	3,21
2003M8	2,77
2003M9	2,35
2003M10	2,16
2003M11	2,12
2003M12	2,07
2004M1	1,91
2004M2	1,81
2004M3	1,84
2004M4	1,75
2004M5	2,13
2004M6	2,05
2004M7	1,97
2004M8	1,87
2004M9	1,91
2004M10	1,73
2004M11	1,73
2004M12	1,75
2005M1	1,49
2005M2	1,36

Date	Monthly Risk Free (RF) Rate (%)
2005M3	1,32
2005M4	1,33
2005M5	1,34
2005M6	1,22
2005M7	1,25
2005M8	1,25
2005M9	1,16
2005M10	1,14
2005M11	1,11
2005M12	1,11
2006M1	1,10
2006M2	1,10
2006M3	1,09
2006M4	1,09
2006M5	1,17
2006M6	1,40
2006M7	1,64
2006M8	1,56
2006M9	1,61
2006M10	1,67
2006M11	1,59
2006M12	1,63
2007M1	1,56
2007M2	1,45
2007M3	1,52
2007M4	1,47
2007M5	1,45
2007M6	1,43
2007M7	1,36
2007M8	1,43
2007M9	1,41
2007M10	1,27

Date	Monthly Risk Free (RF) Rate (%)
2007M11	1,26
2007M12	1,28
2008M1	1,26
2008M2	1,30
2008M3	1,35
2008M4	1,41
2008M5	1,50
2008M6	1,64
2008M7	1,57
2008M8	1,46
2008M9	1,44
2008M10	1,57
2008M11	1,63
2008M12	1,43
2009M1	1,26
2009M2	1,17
2009M3	1,12
2009M4	1,05
2009M5	0,92
2009M6	0,96
2009M7	0,88
2009M8	0,76
2009M9	0,73
2009M10	0,61
2009M11	0,68
2009M12	0,66
2010M1	0,64
2010M2	0,64
2010M3	0,70
2010M4	0,76
2010M5	0,70
2010M6	0,66

APPENDIX G

Table 20: Monthly Excess Returns of Industry Portfolios

DATE	industry 1	industry 2	industry 3	industry 4	industry 5	industry 6	industry 7	industry 8	industry 9	industry 10
2002M7	-3,39	4,07	9,88	11,52	8,71	12,91	6,56	-11,58	11,32	-4,60
2002M8	-16,44	-2,36	-22,71	-7,28	-1,01	-2,51	-14,95	-8,11	-15,06	-7,60
2002M9	-1,32	-6,12	-14,14	-14,77	-10,97	-18,63	-15,95	-9,58	-10,21	-8,62
2002M10	7,95	19,97	7,59	10,41	11,78	6,73	13,40	14,28	10,98	8,07
2002M11	-1,95	4,30	28,32	41,35	27,56	20,03	30,41	34,66	27,42	40,19
2002M12	-23,99	-21,25	-21,01	-24,58	-24,83	-27,39	-25,77	-24,87	-28,01	-26,50
2003M1	-0,56	-4,12	1,87	4,92	4,78	10,99	4,14	3,14	-0,15	-0,97
2003M2	3,24	-2,44	-1,49	1,61	-0,47	-9,74	0,77	5,41	2,87	-0,61
2003M3	-13,17	-31,36	-29,45	-12,62	-11,26	-17,22	-19,82	-28,79	-25,94	-13,78
2003M4	23,61	24,63	18,72	21,97	15,68	21,83	21,41	17,41	12,65	24,28
2003M5	-6,85	-7,91	14,34	-4,55	-9,77	-2,07	-4,20	-5,39	-3,80	-3,39
2003M6	-8,28	-14,08	-6,95	-17,19	-7,33	-4,39	-9,94	0,36	-8,33	-2,72
2003M7	-1,25	-6,60	-4,81	-8,18	-9,31	1,53	-8,12	-7,58	-5,67	-13,53
2003M8	0,64	-3,06	-1,92	8,22	2,11	1,03	5,22	8,82	10,03	10,86
2003M9	8,29	-1,19	0,73	0,45	-0,84	17,30	8,75	19,31	15,91	2,69
2003M10	8,73	11,37	17,92	3,61	11,56	11,22	23,50	22,11	28,19	17,35
2003M11	-5,70	-9,83	-3,93	-11,32	-1,04	-11,72	-9,65	-8,30	-12,80	-6,05
2003M12	4,47	12,55	22,63	16,58	14,55	41,62	23,73	27,36	27,68	39,59
2004M1	-4,20	-7,20	-13,72	-2,52	-5,29	-7,78	-12,33	-10,78	-11,41	15,87
2004M2	4,22	3,35	11,90	-4,40	5,95	8,33	7,55	9,60	4,72	4,37
2004M3	-0,90	4,23	-1,02	6,17	5,33	18,33	9,40	2,65	2,32	20,52
2004M4	5,39	-6,56	-13,51	-9,29	-3,91	-16,02	-7,54	-10,95	-14,01	1,02
2004M5	-6,88	-5,08	-9,21	-7,49	-7,71	-8,08	-7,54	-7,10	-8,41	-6,10
2004M6	-4,90	-5,85	1,66	0,64	-1,34	-0,81	-0,13	7,65	3,18	-10,32
2004M7	8,10	1,25	8,63	3,68	1,99	15,05	4,69	6,08	8,24	0,94
2004M8	-1,44	-0,08	4,63	3,76	6,78	11,04	0,48	1,18	5,02	0,79
2004M9	8,69	8,02	-0,26	5,30	8,03	8,09	11,02	6,42	5,20	21,34
2004M10	2,96	1,99	12,90	7,57	3,86	4,63	0,89	1,76	-0,63	3,10
2004M11	-3,92	-4,02	-7,93	-4,49	4,85	1,37	-15,37	2,71	-12,28	-14,99
2004M12	9,93	0,64	8,61	-1,08	1,28	-0,58	3,00	15,99	12,10	-2,99
2005M1	-0,63	5,66	10,94	15,22	8,28	5,38	4,76	9,01	5,83	5,37
2005M2	-1,26	-0,57	-4,33	-0,19	6,94	3,85	-2,47	5,81	-0,59	-0,96

Table 20: (Continued)

DATE	industry 1	industry 2	industry 3	industry 4	industry 5	industry 6	industry 7	industry 8	industry 9	industry 10
2005M3	-7,65	-11,81	-14,12	-6,95	-7,83	-7,81	-10,03	-14,30	-14,40	-11,40
2005M4	-5,42	-15,48	-17,77	-14,55	-10,73	-10,04	-16,81	-4,44	-13,32	-18,31
2005M5	6,16	5,02	5,68	11,26	13,90	4,59	13,00	5,36	11,31	7,56
2005M6	10,30	9,45	15,15	8,26	8,77	3,49	6,06	4,99	5,97	8,19
2005M7	-1,47	12,65	6,91	4,18	12,47	10,37	5,79	12,89	8,91	3,18
2005M8	8,19	-1,26	-0,72	2,39	2,37	7,40	-2,22	5,89	3,62	11,88
2005M9	9,06	-2,95	6,37	5,50	7,97	15,71	-0,08	9,37	2,39	0,00
2005M10	-9,15	-0,45	-2,17	-1,33	-5,19	-14,88	0,24	-4,86	-10,76	0,42
2005M11	10,05	7,32	26,43	10,23	16,80	16,79	12,73	22,75	23,66	16,03
2005M12	4,10	15,34	5,55	6,49	8,14	1,82	5,39	1,90	0,77	9,11
2006M1	12,08	10,75	1,90	1,88	6,80	2,32	13,96	11,01	18,10	-5,26
2006M2	3,46	7,67	1,97	1,56	6,65	-1,20	6,80	5,05	9,85	3,94
2006M3	-8,62	-10,87	-9,07	-2,92	-5,78	-8,05	-8,74	-12,11	-9,21	-4,99
2006M4	1,34	0,14	-3,47	5,27	7,40	-1,94	2,76	0,27	0,27	0,23
2006M5	-9,29	-17,54	-11,42	-7,74	-13,95	-12,60	-9,93	-12,60	-17,83	-14,64
2006M6	1,76	-9,59	-20,95	-10,05	-11,89	6,97	-11,91	-10,80	-10,72	-15,23
2006M7	-4,75	-11,26	1,33	3,27	1,07	-1,19	-0,29	-0,31	4,19	-6,17
2006M8	1,71	4,62	0,71	-3,00	2,67	-4,71	0,34	4,50	3,87	2,75
2006M9	-3,51	0,61	3,28	-9,46	-1,46	-6,34	-0,09	-2,65	-5,88	-0,82
2006M10	0,95	9,64	5,80	5,65	3,98	20,82	4,57	9,04	12,10	8,50
2006M11	1,91	0,43	-3,13	-3,50	-6,79	0,86	-3,15	-8,20	-12,34	-9,39
2006M12	-0,90	-0,33	-6,21	-1,38	3,53	3,01	-0,51	1,02	-2,10	-0,33
2007M1	1,88	-0,82	5,94	1,70	1,10	11,96	5,27	2,41	3,64	-3,29
2007M2	-5,16	-2,42	-5,31	7,11	4,24	4,92	-1,68	-0,80	-2,35	5,87
2007M3	2,78	0,71	7,83	7,78	-0,65	14,05	-0,20	2,45	0,66	-2,06
2007M4	0,62	-7,28	-3,90	-5,75	-4,51	9,35	1,76	2,99	3,58	-6,87
2007M5	17,59	10,19	8,35	14,77	4,44	-5,48	8,70	-1,49	5,48	4,51
2007M6	-2,94	-1,17	-7,45	-1,03	0,70	-5,22	-1,60	-2,92	-2,36	-5,36
2007M7	5,81	11,72	3,30	3,14	3,74	14,99	-0,66	16,22	8,75	6,06
2007M8	-7,98	-7,49	-9,31	-6,83	-5,82	3,49	-8,29	-7,79	-6,56	-2,78
2007M9	1,14	3,01	4,84	3,81	-0,28	8,40	3,33	7,43	5,93	2,40
2007M10	4,14	-2,88	3,57	0,95	-1,13	-1,81	-0,15	8,60	0,80	0,45

Table 20: (Continued)

DATE	industry 1	industry 2	industry 3	industry 4	industry 5	industry 6	industry 7	industry 8	industry 9	industry 10
2007M11	-5,09	-3,58	-9,88	-6,09	-3,93	-13,69	-7,82	-8,90	-11,74	-6,07
2007M12	6,97	0,79	-1,55	3,31	-1,33	3,31	-2,51	-1,09	-0,58	-2,35
2008M1	-17,57	-27,05	-19,24	-18,51	-16,27	-28,95	-15,54	-23,49	-27,59	-18,58
2008M2	10,54	8,03	-3,10	8,29	1,66	16,06	4,19	-4,22	4,03	-4,80
2008M3	-10,44	-14,30	-23,05	-7,52	-5,49	4,96	-17,60	-13,53	-21,69	-5,62
2008M4	3,16	8,04	12,42	11,74	8,10	17,97	13,68	12,55	14,66	20,98
2008M5	3,29	-6,15	-6,16	-3,66	-7,32	-3,97	-3,98	-14,85	-8,83	-12,97
2008M6	-13,69	-18,43	-22,34	-13,78	-17,56	21,28	-20,24	-21,93	-11,05	-9,02
2008M7	11,89	1,06	19,74	4,04	6,07	-3,59	8,06	41,04	10,17	6,35
2008M8	-2,94	7,04	-4,44	-4,21	-1,38	-16,28	-3,58	-3,99	-4,00	-0,31
2008M9	-8,25	-13,65	-6,41	-15,60	-14,54	-19,73	-25,83	-9,08	-9,20	-9,60
2008M10	-18,01	-24,02	-23,83	-18,17	-25,51	-28,31	-31,90	-23,37	-22,32	-23,01
2008M11	-5,91	-9,56	-7,30	-11,74	-8,90	-21,47	-18,32	-9,91	-9,10	-6,49
2008M12	-8,69	1,49	-1,92	1,82	4,01	8,75	5,10	4,08	-2,45	4,82
2009M1	5,78	2,17	-4,21	-0,43	-6,64	-13,51	-5,83	-6,74	-8,13	-2,77
2009M2	-4,22	0,66	-21,19	-1,75	2,38	-4,31	-1,01	-11,76	-12,82	-0,72
2009M3	5,92	8,97	42,16	5,44	10,23	-8,84	9,92	14,12	9,98	14,05
2009M4	8,62	14,08	-4,59	15,23	14,88	22,27	28,82	29,88	27,16	15,64
2009M5	11,71	15,05	13,46	14,65	7,97	9,45	17,42	9,50	18,42	7,77
2009M6	7,76	13,91	13,93	3,83	3,56	3,36	15,34	3,11	1,57	4,62
2009M7	10,09	2,80	1,67	3,54	5,81	6,85	15,35	21,29	19,97	3,89
2009M8	6,71	2,81	14,01	12,26	7,86	18,93	15,98	6,31	11,42	26,66
2009M9	-1,92	2,84	-8,08	7,07	8,37	5,43	0,64	1,04	-4,65	4,00
2009M10	4,42	-3,62	12,56	-4,72	-1,79	-9,40	0,36	-2,01	-2,28	-0,32
2009M11	-6,08	-0,40	-3,72	-4,35	-4,86	-4,26	-4,17	-6,30	-4,45	-2,00
2009M12	9,70	10,95	19,41	14,60	13,21	11,18	10,17	17,77	13,17	11,35
2010M1	-1,96	11,38	5,66	13,26	22,07	5,73	11,15	-0,47	11,80	8,99
2010M2	10,73	0,18	-12,99	-7,82	-1,19	-12,61	5,05	-4,26	-9,06	-4,97
2010M3	-0,49	7,89	8,58	10,15	3,26	11,19	15,22	16,34	10,33	12,65
2010M4	12,35	7,15	0,33	4,62	4,47	2,23	5,36	2,07	4,65	2,32
2010M5	-5,17	-10,89	-11,95	-10,80	-13,64	-11,88	-11,34	-7,38	-6,36	-10,98
2010M6	20,19	-0,37	1,40	1,47	1,73	-2,29	1,10	2,97	-2,12	1,77

Table 21: Monthly Excess Returns of Size Portfolios

DATE	size 1	size 2	size 3	size 4	size 5	size 6	size 7	size 8	size 9	size 10
2002M7	-0,77	10,16	4,04	5,98	-2,01	4,95	9,79	8,22	10,54	7,80
2002M8	-5,35	-1,99	-4,61	-10,34	-0,51	-6,01	-2,29	1,20	-4,98	-12,25
2002M9	-7,57	-12,77	-9,61	-9,93	-6,89	-6,72	-12,01	-12,14	-9,16	-13,44
2002M10	1,34	1,84	6,29	5,41	5,92	8,44	11,23	9,31	12,24	10,63
2002M11	24,32	14,43	20,50	14,00	27,68	16,20	25,55	16,29	21,32	30,64
2002M12	-5,43	-26,85	-22,26	-21,18	-20,02	-21,21	-27,77	-26,35	-21,13	-25,89
2003M1	-1,75	1,01	6,39	-3,09	5,19	1,87	3,52	1,06	1,09	3,26
2003M2	3,72	2,69	0,62	-0,34	2,64	-1,60	5,08	1,65	-2,81	0,04
2003M3	-12,47	-20,28	-12,18	-16,88	-13,75	-18,09	-17,24	-15,75	-19,64	-15,96
2003M4	21,50	29,26	24,05	32,49	21,48	28,01	27,18	17,58	18,40	20,23
2003M5	-1,44	-1,78	4,68	-6,72	0,63	-3,21	-5,12	-8,23	-7,11	-3,43
2003M6	-3,32	-9,26	-8,79	-7,46	-7,75	-6,69	-11,55	-8,17	-10,25	-12,09
2003M7	-5,88	-9,26	-13,57	-5,14	-6,32	-8,55	-8,26	-10,25	-7,98	-5,61
2003M8	-2,20	1,22	-1,18	-4,52	-0,04	-1,72	1,31	-8,10	4,30	6,84
2003M9	0,79	-2,70	3,64	-2,97	-2,94	2,06	1,50	3,44	-1,60	1,61
2003M10	6,17	9,30	7,41	13,11	7,02	7,62	12,70	6,47	9,27	12,64
2003M11	2,09	-3,35	-5,17	-6,57	-7,39	-2,82	-6,41	-4,88	-2,73	-8,07
2003M12	11,80	18,65	12,61	17,62	20,70	25,40	17,38	14,35	15,95	21,31
2004M1	-7,28	-4,11	-4,38	-6,10	-0,82	-5,82	-8,62	-5,94	-4,82	-7,72
2004M2	7,64	2,83	7,96	16,97	4,36	6,44	3,52	4,93	2,87	5,79
2004M3	12,74	8,51	10,99	10,56	13,60	9,07	10,93	3,29	3,29	6,38
2004M4	8,80	-4,89	-4,77	1,76	-4,49	-1,20	-4,04	-7,35	-7,03	-12,26
2004M5	-5,71	-5,70	-9,80	-7,06	21,27	-8,37	-6,62	-6,90	-4,99	-5,21
2004M6	-3,82	0,21	-3,80	-5,76	-4,45	-7,38	-2,36	-6,35	-2,00	4,27
2004M7	7,41	5,64	5,08	1,06	7,01	0,92	2,23	-0,30	-0,17	3,04
2004M8	-3,08	3,43	1,05	-2,37	3,87	2,72	4,76	2,17	1,50	-1,23
2004M9	10,26	8,16	2,87	11,47	9,04	25,50	8,39	9,51	5,50	11,05
2004M10	7,67	8,08	7,20	12,34	9,44	3,80	6,89	15,36	3,97	11,04
2004M11	-5,61	-5,38	-4,40	0,81	-2,53	-3,15	1,33	-3,83	-0,21	-6,85
2004M12	-6,09	1,32	4,03	0,70	-1,12	1,61	-0,18	1,68	2,39	3,29
2005M1	3,59	10,03	1,90	7,49	10,66	8,72	8,44	10,42	5,52	4,37
2005M2	2,61	5,90	3,30	5,92	-0,46	-3,26	0,33	-1,91	1,36	-0,12

Table 21: (Continued)

DATE	size 1	size 2	size 3	size 4	size 5	size 6	size 7	size 8	size 9	size 10
2005M3	-3,35	-4,41	-8,98	-9,36	-5,75	-7,19	-11,48	-8,35	-8,41	-7,27
2005M4	-9,98	-12,84	-11,83	-10,09	-13,26	-18,41	-15,28	-12,16	-15,69	-10,45
2005M5	7,71	8,80	10,43	3,45	11,37	9,89	4,66	5,91	12,07	9,37
2005M6	0,97	8,13	3,90	3,72	1,53	6,23	8,23	3,94	11,15	2,91
2005M7	6,21	7,77	8,66	8,31	16,69	12,76	8,35	13,07	6,83	4,57
2005M8	3,26	1,10	3,14	1,64	-3,83	3,23	-1,02	1,64	1,30	1,77
2005M9	-3,50	-3,40	-2,67	-1,35	-1,55	8,24	3,30	5,05	4,64	3,43
2005M10	0,74	-0,47	-0,57	1,11	2,75	0,20	1,50	-0,76	-3,92	-4,24
2005M11	16,51	16,48	17,81	8,28	14,61	12,41	16,06	16,36	14,35	12,81
2005M12	20,60	17,94	14,15	13,98	16,70	16,17	15,64	9,60	7,21	1,87
2006M1	2,43	7,49	-1,17	2,93	2,20	-0,14	3,88	3,55	4,60	7,79
2006M2	9,04	10,72	15,11	10,09	13,77	10,12	15,96	12,83	3,91	4,09
2006M3	-7,30	-5,62	-10,97	-6,05	-4,03	-9,36	-10,58	-8,85	-7,56	-6,99
2006M4	6,05	-2,15	-1,24	-3,62	2,45	-0,02	1,59	3,14	2,37	2,21
2006M5	-17,32	-11,94	-13,56	-14,68	-15,77	-15,68	-9,75	-9,40	-13,58	-10,05
2006M6	-11,54	-13,81	-13,79	-12,37	-13,42	-13,23	-12,93	-10,41	-14,24	1,05
2006M7	-7,14	-9,52	-2,32	-3,71	-4,98	-7,95	3,34	0,85	1,38	-2,53
2006M8	-0,87	6,76	9,03	2,94	3,85	9,72	4,87	7,19	1,65	-0,38
2006M9	3,10	5,37	-1,56	4,36	1,53	1,92	-0,22	0,50	-0,30	-0,40
2006M10	6,61	2,03	4,56	7,48	7,52	5,06	5,86	5,39	4,75	4,83
2006M11	-0,75	-1,33	-4,52	6,93	-4,51	-1,17	-6,16	-6,59	-5,59	-5,25
2006M12	-3,90	-2,78	-1,40	-5,04	0,39	-0,16	-2,56	-0,13	0,19	3,41
2007M1	-4,93	-3,73	0,93	0,98	0,54	1,80	-0,62	-2,81	2,38	5,35
2007M2	-1,41	1,44	-1,25	-6,20	-2,45	-6,08	0,08	-1,22	3,26	-0,51
2007M3	6,13	1,97	-1,20	5,50	6,87	2,21	5,28	-0,65	0,98	3,07
2007M4	-7,70	-9,02	-3,02	-8,10	-4,46	0,83	-5,48	-4,70	-4,39	3,22
2007M5	23,44	14,34	19,69	16,49	25,34	12,07	7,57	6,95	4,84	10,66
2007M6	-1,53	1,70	-0,36	2,54	0,37	0,78	-0,48	0,41	-0,29	-1,30
2007M7	46,76	12,94	1,73	3,55	2,58	3,48	4,49	3,80	5,72	3,23
2007M8	2,95	-1,34	-2,01	-7,44	-6,49	-4,68	-5,26	-7,26	-5,52	-4,91
2007M9	-6,73	6,76	5,01	4,61	3,73	11,01	2,32	5,07	0,96	3,95
2007M10	0,56	-0,97	0,90	0,37	-3,88	-1,93	2,80	1,30	-2,28	4,48

Table 21: (Continued)

DATE	size 1	size 2	size 3	size 4	size 5	size 6	size 7	size 8	size 9	size 10
2007M11	0,08	-1,91	-2,89	-6,57	-6,58	-5,26	-8,01	-7,56	-5,90	-0,86
2007M12	0,20	-2,90	-0,46	-2,01	0,86	-1,49	2,28	-5,40	-0,92	3,30
2008M1	-20,46	-25,76	-25,19	-20,93	-20,02	-21,36	-18,86	-23,46	-20,10	-19,12
2008M2	4,07	8,16	3,64	3,26	9,05	10,76	3,71	4,25	4,23	10,24
2008M3	-11,02	-12,63	-14,39	-5,68	-9,79	-7,35	-12,63	-4,05	-11,29	-10,72
2008M4	5,36	12,69	13,10	12,83	8,47	10,41	13,65	17,82	7,23	5,37
2008M5	-13,22	-4,36	0,89	-5,92	-7,30	6,57	-2,59	-2,56	-6,67	-1,09
2008M6	-19,91	-17,78	-20,32	-15,24	-17,58	-15,71	-16,51	-17,02	-15,70	-13,15
2008M7	4,17	5,17	6,26	7,73	3,98	6,52	6,38	2,94	6,63	5,77
2008M8	19,36	2,29	1,60	1,31	-1,31	-0,86	3,36	1,78	-1,67	-11,05
2008M9	-14,25	-17,64	-21,06	-18,27	-16,81	-18,31	-21,46	-10,70	-18,14	-11,90
2008M10	-25,26	-29,57	-23,07	-24,28	-25,90	-21,65	-26,83	-28,01	-27,24	-21,87
2008M11	-3,40	-4,10	-11,00	-6,59	-8,07	-6,26	-11,91	-8,87	-11,02	-10,24
2008M12	4,51	5,60	4,10	7,49	5,94	1,23	6,21	4,60	0,81	4,02
2009M1	-0,25	-0,15	-1,54	8,15	-3,22	-8,98	-2,94	-2,28	-4,98	-1,12
2009M2	2,88	4,85	-0,53	4,73	0,30	3,44	0,61	-0,93	-1,51	-0,35
2009M3	15,29	29,25	23,05	13,60	20,95	14,52	15,29	15,95	9,94	-1,20
2009M4	8,16	6,34	19,36	17,65	17,56	14,70	11,56	18,36	21,52	12,64
2009M5	16,29	10,87	23,31	18,08	19,67	10,63	11,38	8,96	10,21	10,40
2009M6	10,59	10,63	9,28	10,03	9,56	10,90	10,88	9,54	7,86	3,30
2009M7	19,48	6,72	4,42	5,90	-0,25	0,90	7,50	4,01	6,18	10,16
2009M8	-2,93	4,08	3,18	4,69	5,63	12,28	7,90	3,82	11,88	11,42
2009M9	4,71	-0,12	0,42	6,31	9,25	2,89	0,96	6,42	7,56	3,98
2009M10	-1,30	1,67	3,86	-4,77	-0,39	-2,15	-0,64	-3,12	-1,35	-3,24
2009M11	-11,78	-4,53	0,99	-8,01	-3,57	-0,58	-0,68	-4,99	-3,05	-4,02
2009M12	22,79	11,89	6,55	15,99	16,37	20,70	12,92	13,12	16,86	12,05
2010M1	12,23	12,91	10,98	15,46	68,13	13,31	12,45	18,04	11,90	3,99
2010M2	-1,72	-3,22	-9,29	-7,66	-7,57	-7,31	-4,92	-4,14	-9,04	-6,17
2010M3	17,29	18,63	24,84	15,94	14,77	10,16	10,57	9,11	7,64	8,17
2010M4	5,30	11,30	8,17	10,64	0,82	5,54	4,01	6,64	6,23	6,02
2010M5	-15,33	-7,10	-10,61	-12,77	-14,17	-9,15	-8,61	-9,56	-12,79	-9,05
2010M6	5,05	9,27	4,30	0,49	-1,24	1,34	2,65	3,86	3,34	3,10

Table 22: Excess Returns of Fama French Portfolios

DATE	SH	SM	SL	BH	BM	BL
2002M7	0,17	8,96	-3,94	8,66	6,24	9,08
2002M8	-3,64	-6,79	-1,31	-0,30	-8,13	-11,19
2002M9	-11,44	-8,27	-4,73	-14,28	-10,46	-13,05
2002M10	5,15	4,64	5,36	16,14	11,05	9,99
2002M11	23,62	17,59	20,02	13,19	31,37	27,53
2002M12	-22,37	-16,65	-25,48	-23,25	-29,03	-23,70
2003M1	4,16	0,67	0,84	5,30	4,83	1,54
2003M2	1,07	1,22	3,02	-8,37	-0,41	0,97
2003M3	-12,82	-17,22	-14,98	-25,36	-15,45	-16,11
2003M4	31,55	21,98	19,87	21,91	18,55	20,80
2003M5	-0,33	-2,48	1,25	-5,25	-2,86	-5,00
2003M6	-11,00	-5,32	-5,14	-7,51	-13,33	-10,94
2003M7	-6,24	-8,93	-8,59	-3,24	-7,22	-6,79
2003M8	1,44	-4,98	-0,76	4,58	4,53	5,37
2003M9	-2,67	0,64	-3,47	1,92	2,01	0,72
2003M10	11,94	9,75	1,02	4,61	8,29	15,00
2003M11	-6,67	-4,59	-4,87	-3,25	-8,83	-6,62
2003M12	21,28	15,07	13,63	33,53	20,06	16,87
2004M1	-3,09	-2,48	-4,57	-11,23	-5,20	-7,27
2004M2	13,61	3,45	6,67	3,69	-0,19	8,51
2004M3	11,22	12,33	10,76	2,87	4,95	7,28
2004M4	1,41	-5,43	-3,97	-14,68	-9,05	-10,31
2004M5	-5,87	-6,24	39,97	-1,04	-7,33	-5,45
2004M6	-5,25	-2,64	-3,92	1,76	-0,63	3,54
2004M7	2,94	9,04	2,20	-0,06	4,21	1,87
2004M8	0,19	1,87	2,83	2,81	3,98	-2,52
2004M9	8,69	4,69	10,97	10,25	5,87	12,60
2004M10	7,88	9,82	11,59	5,47	6,84	11,89
2004M11	0,35	-2,70	-5,98	-1,47	-5,89	-5,74
2004M12	0,53	-1,18	-0,16	1,26	0,90	3,90
2005M1	4,58	8,91	11,62	2,63	10,67	2,95
2005M2	5,39	1,69	-0,03	2,69	-0,21	-0,27

Table 22: (Continued)

DATE	SH	SM	SL	BH	BM	BL
2005M3	-4,73	-9,30	-6,21	-7,68	-13,09	-5,33
2005M4	-10,28	-11,23	-15,27	-13,29	-15,25	-9,80
2005M5	20,47	8,24	3,80	10,77	11,69	8,24
2005M6	8,61	4,96	-0,34	5,09	8,04	2,52
2005M7	12,49	10,10	10,22	12,14	6,79	4,04
2005M8	2,62	-1,88	-1,90	5,14	0,52	1,54
2005M9	-2,68	0,86	-7,51	6,23	6,68	1,89
2005M10	-0,05	4,05	-2,76	-6,27	-4,64	-2,66
2005M11	11,29	14,14	19,25	13,72	13,13	13,44
2005M12	19,06	11,81	17,80	9,90	5,07	2,32
2006M1	4,17	1,03	1,53	-2,15	8,37	7,56
2006M2	9,24	11,30	22,49	7,07	2,68	6,21
2006M3	-6,56	-4,30	-10,29	0,16	-8,11	-8,40
2006M4	0,39	0,33	-3,09	-4,47	4,44	2,32
2006M5	-9,31	-18,09	-20,03	-11,23	-12,04	-9,77
2006M6	-11,91	-13,47	-15,32	-5,24	-9,57	1,33
2006M7	-5,65	-4,90	-2,99	1,70	1,54	-4,15
2006M8	3,38	5,31	3,62	-0,16	-1,15	2,13
2006M9	-1,67	4,44	4,95	-1,66	-4,97	3,04
2006M10	6,15	4,08	12,15	14,33	5,12	3,07
2006M11	0,43	-2,04	-1,93	-2,72	-5,61	-5,48
2006M12	0,47	-1,83	-5,98	1,72	-0,52	4,37
2007M1	0,56	-2,06	1,78	5,95	3,15	4,38
2007M2	-4,97	0,35	-2,93	4,88	4,60	-3,73
2007M3	4,91	4,18	6,55	10,43	2,08	1,52
2007M4	-2,27	-7,21	-8,36	4,72	-1,99	2,64
2007M5	19,73	22,11	20,96	0,12	10,65	10,83
2007M6	-0,54	2,27	0,89	-3,58	-0,69	-0,62
2007M7	9,57	5,77	0,97	8,16	2,79	2,79
2007M8	-3,67	-4,44	-8,47	-1,07	-9,28	-4,69
2007M9	4,97	3,59	2,71	7,48	3,79	2,69
2007M10	-2,33	0,16	-3,30	-1,33	-0,86	5,81

Table 22: (Continued)

DATE	SH	SM	SL	BH	BM	BL
2007M11	-4,45	-5,56	-5,23	-8,03	-8,02	1,26
2007M12	1,75	-0,98	-3,79	0,85	1,75	2,38
2008M1	-17,34	-23,92	-24,74	-25,26	-18,54	-18,49
2008M2	2,48	6,10	13,32	10,71	5,10	9,67
2008M3	-7,93	-9,95	-13,06	-4,74	-14,25	-10,37
2008M4	9,82	12,24	8,57	14,90	11,00	3,20
2008M5	-1,50	-6,57	-10,64	-4,86	-5,50	0,36
2008M6	-13,25	-20,22	-19,20	-1,26	-15,40	-16,76
2008M7	4,79	5,47	6,46	-1,61	3,96	7,50
2008M8	0,75	1,45	1,47	5,43	-7,76	-10,42
2008M9	-16,63	-19,50	-17,66	-17,54	-17,45	-9,96
2008M10	-24,76	-25,38	-26,34	-20,43	-25,45	-21,82
2008M11	-6,46	-9,83	-6,43	-5,20	-16,00	-7,39
2008M12	6,67	6,91	3,51	2,66	5,70	2,67
2009M1	-4,27	1,54	6,75	-4,42	-5,85	0,74
2009M2	3,74	0,60	0,38	-1,19	-3,16	1,27
2009M3	16,73	16,06	30,29	9,28	2,06	1,10
2009M4	14,06	16,88	19,37	18,60	21,02	9,42
2009M5	24,43	14,67	14,75	13,72	11,63	9,24
2009M6	7,69	9,18	14,07	13,29	4,49	3,78
2009M7	0,85	3,69	5,13	8,01	4,87	10,44
2009M8	8,84	4,35	3,63	11,42	13,37	9,95
2009M9	6,88	8,01	-1,67	4,13	4,43	4,63
2009M10	-3,94	1,08	-4,08	-2,40	-5,69	-2,53
2009M11	1,61	-4,19	-7,70	-3,68	-2,29	-4,10
2009M12	8,44	14,84	14,33	11,58	11,27	14,15
2010M1	17,82	44,47	14,10	14,27	10,84	0,66
2010M2	-0,23	-8,38	-5,63	1,84	-8,96	-10,82
2010M3	16,04	19,61	15,56	5,80	7,11	10,03
2010M4	0,29	5,79	8,58	4,61	14,06	5,07
2010M5	-16,56	-11,06	-12,13	-11,02	-14,16	-7,64
2010M6	-1,46	0,68	6,12	7,88	2,42	0,37

Table 23: Excess Returns of Momentum (6,1) Portfolio

DATE	1 (lowest)	2	3	4	5	6	7	8	9	10 (highest)
2002M7	-8,63	-3,78	-0,19	-11,57	-0,17	-2,80	-8,57	-3,80	0,46	-9,25
2002M8	-9,06	-8,37	-13,65	-7,29	-13,48	-5,45	-10,82	-13,80	-12,83	-19,57
2002M9	8,98	3,41	10,19	3,72	10,26	7,79	8,37	6,20	-2,32	-5,59
2002M10	20,65	21,20	30,23	16,93	19,32	18,27	13,52	25,56	20,34	4,48
2002M11	-12,74	-12,50	-23,30	-21,56	-25,44	-28,64	-19,39	-36,53	-33,55	-28,62
2002M12	-2,77	1,77	5,32	3,88	4,14	3,52	5,17	0,20	3,03	-3,67
2003M1	-5,57	2,51	1,88	-3,61	1,69	8,77	-1,49	-3,15	-2,50	5,43
2003M2	-14,70	-11,68	-13,31	-16,14	-14,62	-16,00	-14,88	-17,34	-23,30	-23,94
2003M3	15,47	30,78	20,46	21,23	22,16	21,11	17,98	17,63	17,33	9,05
2003M4	-9,55	-6,32	-8,65	-3,36	-6,42	-18,71	-4,93	-9,51	-9,20	0,42
2003M5	-12,88	-11,05	-11,46	-4,80	-7,03	-11,47	-8,37	-14,01	-18,28	-4,42
2003M6	-13,11	-14,05	-8,43	-6,70	-10,29	-6,99	-8,32	-7,96	-14,15	-8,09
2003M7	2,20	3,25	-2,60	-3,73	-0,89	2,35	-7,65	-2,94	-3,16	-10,79
2003M8	0,84	-0,34	-1,51	2,59	-0,16	1,75	-4,57	0,63	-1,14	-6,44
2003M9	11,55	9,66	8,34	7,66	10,84	5,87	9,74	7,47	8,92	10,13
2003M10	-3,36	-5,97	-2,37	-4,99	-9,12	-3,67	-5,65	-4,70	-13,28	-12,44
2003M11	14,37	14,06	10,07	5,39	21,52	1,86	3,36	23,23	12,97	18,04
2003M12	-9,56	-8,82	-1,58	-6,99	-4,61	-10,07	-13,41	-9,48	-14,26	-15,06
2004M1	1,54	3,49	10,88	5,00	2,96	7,88	10,31	3,84	5,06	7,67
2004M2	5,25	2,05	10,89	9,64	7,63	8,21	8,85	13,16	9,98	5,96
2004M3	-5,28	-3,75	-8,94	-4,34	-11,62	-6,18	-10,70	6,95	-1,44	-8,68
2004M4	-12,25	-9,19	-10,09	-5,82	-15,38	-9,36	-11,31	-3,49	-5,78	-28,71
2004M5	-9,51	-6,34	-3,11	-6,94	-9,59	-1,31	-4,10	-4,01	-5,46	-11,41
2004M6	10,96	3,01	-1,10	2,87	2,08	2,96	0,66	-3,22	-14,95	-10,85
2004M7	1,05	6,07	0,44	4,84	0,37	-1,38	-0,07	2,13	-0,54	-1,81
2004M8	27,95	4,08	12,11	8,83	5,33	10,87	6,00	4,75	7,92	2,79
2004M9	5,32	3,66	8,02	2,81	7,48	7,24	7,77	7,58	15,12	3,24
2004M10	-9,42	-2,90	-7,98	1,05	-3,31	-5,03	1,44	-5,31	4,83	-12,38
2004M11	-1,90	-2,92	-4,63	-1,51	-5,31	2,57	0,78	-0,23	2,16	-0,86
2004M12	-96,51	-101,64	-101,64	-96,09	-101,64	-101,64	-101,64	-101,64	-101,64	-101,64
2005M1	1,56	-0,18	-2,21	-0,07	1,69	4,14	2,03	2,61	1,51	-2,12
2005M2	-10,98	-9,50	-9,31	-13,03	-8,84	-6,39	-7,64	-9,70	-4,75	-4,64

Table 23: (Continued)

DATE	1 (lowest)	2	3	4	5	6	7	8	9	10 (highest)
2005M3	-13,16	-16,60	-11,26	-12,32	-16,26	-12,62	-12,08	-12,29	-16,41	-12,16
2005M4	2,80	8,42	6,48	3,14	6,30	2,80	5,68	4,12	-2,70	12,91
2005M5	5,02	0,72	5,89	-1,06	2,08	8,24	-3,42	8,88	1,73	9,34
2005M6	4,33	10,47	7,15	7,29	8,20	4,45	7,80	9,81	9,62	18,30
2005M7	-4,59	-1,76	-0,35	-0,43	0,07	-1,57	2,75	7,60	6,49	-0,04
2005M8	-3,44	-3,30	1,88	0,28	4,17	4,79	0,23	3,63	-2,29	-9,71
2005M9	0,41	-3,24	-0,55	0,68	0,62	-1,88	4,32	1,91	-9,54	-5,28
2005M10	15,47	10,23	12,80	20,34	9,06	20,55	20,06	11,52	10,92	9,95
2005M11	14,98	14,96	13,90	18,86	13,95	12,57	12,94	12,26	9,24	10,31
2005M12	-2,88	0,39	0,05	2,71	1,37	3,75	6,02	5,46	5,41	5,73
2006M1	6,10	10,67	6,73	10,71	11,73	7,61	12,93	8,79	6,40	5,93
2006M2	-6,43	-7,89	-4,54	-6,58	-10,47	-8,04	-7,88	-9,47	-7,86	-8,71
2006M3	-2,97	-0,31	2,01	-5,85	-3,16	1,61	-2,91	2,46	0,26	1,60
2006M4	-14,58	-15,63	-14,66	-16,97	-18,06	-11,41	-12,60	-16,80	-13,61	-15,14
2006M5	-16,15	-10,77	-12,28	-12,97	-15,14	-13,48	-13,41	-8,72	-9,06	-10,43
2006M6	-3,02	1,21	3,03	-2,57	-1,79	-0,06	-4,76	-4,29	-8,69	-8,87
2006M7	9,35	6,06	5,65	2,81	6,81	2,32	3,74	3,69	2,63	4,37
2006M8	5,50	-1,40	-0,50	6,37	1,75	-2,05	-5,21	-3,08	-5,15	1,88
2006M9	6,98	7,42	7,51	4,27	6,08	4,61	3,81	4,67	5,25	3,00
2006M10	-3,22	0,24	-4,43	0,23	-6,11	-3,94	-3,70	-0,95	-3,06	-5,67
2006M11	-3,98	-4,98	-2,18	-0,80	1,75	-1,74	-2,53	-0,34	1,96	-1,20
2006M12	-0,86	-0,91	-4,31	2,74	-2,15	-0,90	2,49	-2,92	-0,01	1,54
2007M1	-4,24	-4,57	-0,16	0,76	2,09	-0,26	0,91	1,77	-7,72	-5,72
2007M2	1,01	2,19	2,82	2,17	-0,19	2,89	-0,63	6,44	-0,53	3,13
2007M3	-0,83	-8,75	-2,48	-6,13	-7,13	-4,17	-7,12	-5,74	-6,11	-0,97
2007M4	10,76	17,51	10,16	16,17	7,76	3,94	11,64	11,93	8,86	9,25
2007M5	0,22	-3,17	-3,69	-1,55	0,74	2,81	-2,62	-2,22	-6,74	-4,38
2007M6	23,97	16,79	8,74	9,05	2,12	6,83	0,50	5,49	15,14	-0,95
2007M7	-7,34	-8,63	-7,32	-4,30	-6,99	-7,37	-3,89	-2,57	4,01	1,40
2007M8	5,10	3,48	3,96	-1,39	6,55	1,36	4,81	2,32	2,92	0,84
2007M9	-1,59	-5,04	-5,84	2,05	-0,50	-7,60	-4,37	0,76	-0,27	1,49
2007M10	-6,20	-3,86	-4,35	-6,13	-3,18	-4,23	-5,02	-5,21	-6,67	-5,04

Table 23: (Continued)

DATE	1 (lowest)	2	3	4	5	6	7	8	9	10 (highest)
2007M11	-1,33	-2,18	-2,30	-2,71	2,25	4,59	-3,27	-3,24	-3,19	1,02
2007M12	-25,71	-25,61	-21,67	-24,33	-25,03	-18,12	-24,09	-19,28	-15,84	-13,54
2008M1	9,26	9,25	6,14	4,29	7,47	7,40	5,11	1,43	1,29	-0,28
2008M2	-16,54	-15,13	-10,10	-13,46	-4,26	-12,98	-9,88	-8,43	-10,12	-3,69
2008M3	11,36	20,21	12,66	13,71	8,59	7,44	7,88	5,36	6,67	6,04
2008M4	-9,79	-10,61	-0,14	-4,77	-5,94	-2,39	-9,24	-5,13	-9,05	-0,19
2008M5	-22,87	-17,08	-21,35	-17,95	-22,80	-12,48	-16,83	-23,94	-18,62	-21,29
2008M6	6,69	8,81	10,64	10,56	2,56	5,33	0,75	5,90	1,14	-4,51
2008M7	5,43	9,61	1,96	2,57	3,85	2,56	1,67	16,50	-3,53	-1,78
2008M8	-16,37	-24,35	-24,30	-20,09	-19,84	-20,44	-15,83	-19,67	-14,37	-12,56
2008M9	-33,71	-28,86	-30,90	-29,07	-26,43	-27,24	-26,42	-29,06	-21,71	-20,54
2008M10	-6,92	-10,64	-8,23	-11,98	-6,70	-9,49	-10,85	-13,90	-4,66	-0,16
2008M11	5,92	6,33	5,27	6,68	6,91	4,83	6,68	6,10	4,15	3,14
2008M12	-4,43	-3,10	-3,80	-5,67	-0,57	-0,73	-2,21	-7,93	-7,33	-12,64
2009M1	-6,96	-0,68	3,78	5,41	-0,39	4,44	0,48	2,37	-1,11	2,38
2009M2	15,53	16,82	17,00	18,23	16,41	17,73	14,70	23,45	5,37	4,06
2009M3	7,48	21,49	15,79	16,24	26,35	16,31	9,65	16,65	6,62	7,56
2009M4	6,35	19,33	12,12	18,48	1,92	12,77	17,62	9,01	17,29	13,64
2009M5	7,39	5,36	8,25	6,74	1,19	14,99	6,63	18,24	7,32	13,61
2009M6	1,48	4,11	7,64	11,90	9,43	6,85	1,43	5,88	0,04	4,28
2009M7	5,14	6,43	6,80	7,10	1,61	12,81	4,74	3,63	11,90	0,76
2009M8	3,11	7,46	2,61	0,24	10,18	2,47	7,14	4,27	4,17	-0,04
2009M9	-0,12	3,86	9,37	-1,38	-0,11	-0,97	-1,01	-1,06	-1,70	-6,13
2009M10	-7,08	4,81	-5,21	-4,99	-4,57	-4,65	-7,61	-2,65	-2,33	6,41
2009M11	20,37	12,52	15,00	13,77	17,24	19,22	10,05	13,76	10,99	19,12
2009M12	8,87	15,95	14,46	15,73	16,12	12,43	9,76	9,36	13,61	0,64
2010M1	-9,03	-10,40	-5,07	-2,69	-6,70	-1,65	-0,50	-8,23	-7,40	-5,43
2010M2	14,19	11,71	15,15	23,52	12,38	17,52	15,64	13,72	16,29	6,38
2010M3	1,69	11,59	5,75	9,53	5,77	15,74	4,03	6,95	0,54	-1,29
2010M4	-12,10	-12,11	-11,74	-11,61	-15,44	-11,40	-12,65	-8,21	-17,16	-12,08
2010M5	1,26	0,81	3,19	2,47	0,73	-0,35	-1,41	5,66	6,23	16,84

Table 24: Excess Returns of Momentum (6,6) Portfolio

DATE	1 (lowest)	2	3	4	5	6	7	8	9	10 (highest)
2002M7	-4,53	4,99	-5,52	10,10	2,80	-2,98	-5,46	-2,82	-11,77	-32,42
2002M8	8,91	19,41	3,65	4,06	17,83	37,53	-1,78	-16,43	-16,57	-29,33
2002M9	-3,35	-8,75	-0,85	28,55	9,41	-4,70	-6,20	-4,89	-27,78	-27,78
2002M10	36,79	11,64	23,72	1,34	2,19	12,33	-7,61	16,26	11,82	-23,03
2002M11	-1,58	7,19	-5,26	-10,06	-9,85	-25,16	-11,71	-29,48	-22,17	-34,42
2002M12	-16,44	24,18	10,21	21,27	13,78	-2,92	20,34	-13,99	-8,93	-10,75
2003M1	-21,19	34,22	-17,33	-7,72	0,87	-0,52	-23,07	-2,86	-37,82	-20,80
2003M2	-20,01	-3,32	-5,79	-3,04	-13,94	-7,38	-24,88	-11,43	-23,63	-33,52
2003M3	-3,31	0,38	-4,39	17,77	10,73	1,15	2,41	-17,91	0,10	-7,05
2003M4	-6,81	-4,08	-5,95	-6,70	4,04	-19,04	-12,46	-21,99	-16,58	-6,84
2003M5	-8,58	-5,45	-10,50	-2,80	8,71	-17,18	1,43	-24,87	-17,48	-17,92
2003M6	30,03	5,55	39,50	26,49	-6,62	2,20	8,67	15,60	10,70	4,73
2003M7	27,63	35,31	8,46	2,23	14,76	25,50	0,15	8,32	7,52	-4,23
2003M8	39,20	19,24	14,75	42,57	10,42	17,28	16,77	32,36	5,33	9,92
2003M9	58,79	49,38	37,13	22,72	27,18	31,52	11,28	33,96	26,51	16,06
2003M10	25,34	19,91	33,38	19,20	10,03	6,70	11,87	9,07	11,42	-8,38
2003M11	-7,12	1,36	29,62	1,56	11,46	-9,30	13,51	24,67	-3,91	-5,31
2003M12	-6,36	1,74	3,92	-18,14	-7,49	-5,78	-11,84	-17,98	-14,24	-32,52
2004M1	-1,53	1,98	5,56	8,46	-1,96	5,35	9,11	-18,81	-22,80	-24,01
2004M2	0,52	-11,16	-5,40	3,23	-2,43	-13,03	-8,40	0,43	-26,48	-21,72
2004M3	1,28	-2,14	-12,62	2,69	-4,48	-10,67	-16,87	-2,58	-15,68	-27,37
2004M4	0,70	10,75	20,18	18,80	1,73	11,34	-1,62	19,33	0,45	-27,03
2004M5	23,10	14,06	13,79	23,68	33,35	22,67	12,71	11,96	7,95	-21,49
2004M6	37,88	24,82	6,22	22,55	24,58	33,51	33,07	28,34	4,97	-5,59
2004M7	-101,83	-101,84	-101,84	-101,82	-101,82	-101,84	-101,85	-101,83	-96,30	-101,84
2004M8	-101,73	-101,75	-101,73	-101,74	-101,73	-101,72	-96,17	-101,75	-101,73	-101,75
2004M9	-101,80	-101,80	-96,25	-101,81	-101,78	-101,80	-101,79	-101,79	-101,78	-101,80
2004M10	-101,64	-96,38	-101,64	-101,64	-101,63	-101,63	-101,63	-101,63	-101,64	-101,63
2004M11	-101,64	-101,64	-96,09	-101,63	-101,64	-101,63	-101,63	-101,62	-101,63	-101,64
2004M12	-96,21	-101,67	-101,64	-96,10	-101,65	-101,62	-101,64	-101,64	-101,65	-101,66

Table 24: (Continued)

DATE	1 (lowest)	2	3	4	5	6	7	8	9	10 (highest)
2005M1	-9,05	2,58	3,12	-13,55	-0,09	19,58	34,97	15,07	-3,28	-1,99
2005M2	-14,80	-6,98	-0,49	-11,84	-0,97	0,56	31,98	2,63	24,75	9,10
2005M3	-4,86	6,51	-5,44	4,83	5,20	4,84	14,57	20,42	9,90	27,34
2005M4	7,88	33,35	25,33	32,81	25,63	18,78	11,17	33,22	25,30	18,85
2005M5	23,00	21,09	44,82	36,73	29,98	56,10	20,84	45,78	44,41	17,34
2005M6	40,41	51,48	36,25	35,20	67,51	50,56	51,75	48,52	63,69	14,70
2005M7	37,69	30,32	42,64	60,62	39,07	39,41	54,76	31,35	45,28	13,30
2005M8	65,94	57,17	34,63	45,08	60,96	37,09	84,11	55,78	41,15	24,88
2005M9	35,06	31,91	31,56	57,29	54,00	43,76	50,38	34,05	39,98	14,43
2005M10	36,02	39,46	23,67	53,22	34,77	42,20	71,39	52,18	27,61	22,82
2005M11	-4,43	3,99	14,59	12,70	-5,63	2,60	10,37	8,51	1,29	-3,37
2005M12	-25,53	-24,60	-17,92	-22,23	-20,02	-20,39	-18,28	-3,12	-17,82	-21,90
2006M1	-30,41	-17,41	-18,78	-11,43	-31,36	-23,12	-14,21	-22,32	-31,36	-37,77
2006M2	-23,48	-18,51	-25,52	-29,51	-31,39	-26,04	-23,85	-27,14	-31,97	-29,20
2006M3	-13,60	-25,77	-14,52	-28,91	-24,31	-20,09	-13,99	-20,75	-21,25	-22,91
2006M4	-7,77	-13,84	-16,10	-15,22	-13,84	-15,61	-16,14	-13,80	-17,94	-22,22
2006M5	-3,29	11,68	3,21	-8,47	6,97	-6,95	1,18	-12,69	0,17	-11,00
2006M6	11,38	13,44	11,97	16,71	24,96	39,60	-3,24	7,79	-6,43	-3,07
2006M7	15,27	8,96	28,30	13,07	28,58	10,31	13,28	17,89	5,15	1,18
2006M8	1,54	8,55	-2,31	23,88	9,66	9,78	3,90	9,73	7,63	-2,43
2006M9	4,22	3,51	8,29	8,55	10,96	14,18	8,64	10,76	12,68	6,16
2006M10	-9,65	4,98	-3,00	1,12	1,38	0,14	1,44	-0,41	2,03	-16,91
2006M11	5,13	10,44	-2,54	13,70	17,57	10,93	9,58	29,91	5,88	6,10
2006M12	7,11	6,19	-7,12	13,13	11,99	22,87	21,29	8,64	1,21	14,15
2007M1	18,82	16,98	22,77	29,32	36,06	20,19	18,16	13,28	6,99	5,92
2007M2	39,61	15,77	13,18	26,36	21,77	12,07	26,80	3,08	-0,35	17,70
2007M3	50,90	28,70	35,31	18,82	-3,51	25,57	2,06	7,21	9,96	2,50
2007M4	64,56	28,60	22,03	20,39	19,77	4,65	25,93	12,96	15,78	7,42
2007M5	15,67	7,10	20,55	10,13	-8,65	0,69	1,86	-3,35	3,90	-4,94
2007M6	14,46	11,63	2,06	10,18	-4,96	0,54	-7,53	10,68	11,89	8,17

Table 24: (Continued)

DATE	1 (lowest)	2	3	4	5	6	7	8	9	10 (highest)
2007M7	-20,40	-23,77	-29,37	-29,60	-25,43	-27,90	-26,98	-17,01	-13,38	-8,48
2007M8	-9,90	-12,42	-18,01	-18,57	-20,38	-16,15	-7,55	-21,34	-20,66	-12,49
2007M9	-24,67	-31,59	-32,86	-16,41	-19,70	-39,72	-27,58	-8,86	-36,84	-24,22
2007M10	-18,68	-19,71	-19,78	-8,44	-13,25	-26,25	-19,40	-12,58	-15,61	-24,73
2007M11	-29,47	-25,64	-17,28	-21,99	-20,64	-12,64	5,59	-21,30	-10,39	-20,50
2007M12	-36,99	-32,93	-35,34	-43,37	-38,53	-22,78	-40,99	-11,76	-30,14	-27,74
2008M1	-3,56	-11,53	-21,85	-7,81	-6,29	-11,45	-18,14	-22,26	-18,90	-4,22
2008M2	-15,88	-9,59	-19,85	-2,04	-19,65	-1,76	-14,92	-23,17	-19,50	-10,79
2008M3	-23,26	-19,59	-19,99	-16,20	8,97	-17,51	-25,81	-34,26	-20,20	-28,37
2008M4	-51,06	-45,37	-52,78	-42,19	-20,94	-39,30	-57,44	-44,77	-53,19	-47,62
2008M5	-48,88	-11,93	-52,14	-47,03	-44,28	-40,26	-49,66	-51,10	-53,83	-56,09
2008M6	-29,71	-32,00	-36,01	22,32	-30,62	-23,47	-43,92	-40,00	-43,71	-27,35
2008M7	-36,40	-43,71	-43,40	-34,46	-43,25	-33,97	-35,21	3,67	-42,44	-48,92
2008M8	-41,52	-45,01	-47,84	-48,03	-33,66	-43,55	-40,08	-40,59	-35,52	-33,93
2008M9	-13,07	-18,69	-13,58	-18,57	-5,48	-12,01	-23,06	-35,62	-24,28	-17,15
2008M10	35,33	25,26	45,37	40,56	33,15	31,43	29,31	5,17	17,35	-0,39
2008M11	104,36	66,83	63,20	75,66	59,08	45,20	60,19	37,53	46,36	0,46
2008M12	132,60	78,29	76,37	54,35	79,38	67,10	59,72	38,43	54,57	-11,85
2009M1	95,19	92,44	103,69	87,61	85,61	89,69	79,95	84,86	44,65	24,54
2009M2	112,62	104,24	108,21	116,58	116,54	75,80	72,29	70,88	63,07	51,12
2009M3	57,72	70,73	77,81	97,61	71,82	57,89	79,35	81,02	48,70	65,54
2009M4	28,78	51,37	44,94	79,93	29,57	37,60	40,04	47,66	52,47	52,06
2009M5	4,63	29,30	24,32	33,40	51,10	20,59	19,34	25,38	41,39	32,11
2009M6	16,52	30,67	42,00	28,44	37,75	59,40	26,84	53,20	28,10	41,81
2009M7	28,64	43,84	45,63	57,38	62,31	52,47	40,26	51,30	38,01	12,20
2009M8	23,69	24,02	25,49	31,33	27,62	39,67	35,53	50,22	12,24	2,50
2009M9	26,80	22,85	73,68	40,55	48,26	39,76	23,23	47,05	55,68	6,29
2009M10	34,67	60,49	46,78	48,45	58,24	45,65	51,29	25,96	50,08	31,93
2009M11	48,26	37,35	40,29	35,99	38,56	29,68	25,52	30,72	9,35	21,66
2009M12	38,14	25,92	48,57	49,31	15,42	20,85	-4,06	6,89	21,13	-5,71

Table 25: Excess Returns of Momentum (6,12) Portfolio

DATE	1 (lowest)	2	3	4	5	6	7	8	9	10 (highest)
2002M7	-6,70	-19,77	-9,34	-2,96	-18,02	-14,91	-8,48	-8,41	10,74	-40,21
2002M8	-0,70	-1,47	-9,91	-12,87	4,13	10,89	-16,30	-17,10	-28,84	-39,65
2002M9	14,45	-5,56	21,36	13,80	5,05	-3,94	14,43	-5,84	-39,47	-37,63
2002M10	17,96	17,44	14,57	10,87	-6,55	13,03	-17,68	6,17	-17,67	-31,66
2002M11	-21,20	10,65	-17,33	-21,03	-11,19	-20,40	-14,56	-38,48	-45,51	-38,13
2002M12	-16,03	10,51	14,75	51,38	40,74	19,63	32,22	12,60	5,49	-8,71
2003M1	-23,42	8,15	-8,02	-4,61	21,28	19,69	24,61	-6,31	-23,84	-8,06
2003M2	-24,02	25,26	15,08	7,83	7,10	35,04	8,14	0,77	1,27	-20,70
2003M3	4,13	50,02	30,31	55,31	46,68	43,10	39,64	15,63	43,90	16,53
2003M4	-1,10	27,78	-6,28	-2,23	-7,99	-6,55	36,90	-17,54	-0,75	9,19
2003M5	-4,73	-9,40	12,10	8,88	-15,47	-10,06	17,27	-28,25	-9,01	-9,40
2003M6	10,21	-8,25	13,00	-6,34	-19,71	-2,61	-5,35	8,40	16,45	-15,05
2003M7	34,71	22,38	9,85	-1,23	4,55	-10,35	5,75	0,85	0,50	-10,53
2003M8	43,42	21,31	10,65	22,37	11,44	-2,62	5,41	6,21	-1,32	-26,84
2003M9	63,35	48,88	24,26	-9,17	11,70	37,60	7,94	30,92	-8,63	-24,47
2003M10	65,45	31,81	37,40	2,37	-4,50	11,49	11,17	32,80	16,13	-31,92
2003M11	9,95	15,50	39,73	15,64	34,76	7,89	48,58	19,40	10,33	-11,01
2003M12	13,79	3,81	18,22	5,71	26,02	12,69	1,10	18,49	13,13	-41,90
2004M1	-101,79	-101,79	-96,24	-101,78	-101,79	-101,76	-101,73	-101,82	-101,79	-101,80
2004M2	-101,68	-101,71	-101,69	-96,12	-101,69	-101,68	-101,68	-101,67	-101,70	-101,70
2004M3	-101,73	-96,19	-101,74	-101,74	-101,73	-101,72	-101,74	-101,73	-101,73	-101,75
2004M4	-101,67	-101,65	-101,65	-101,66	-95,79	-101,64	-101,65	-101,65	-101,64	-101,68
2004M5	-102,01	-102,02	-102,03	-102,03	-101,99	-96,13	-102,01	-102,00	-102,03	-102,06
2004M6	-101,91	-101,92	-101,93	-101,90	-101,92	-101,92	-96,34	-101,91	-101,93	-101,95
2004M7	-101,82	-101,85	-101,83	-101,80	-101,81	-101,83	-101,84	-101,80	-96,29	-101,84
2004M8	-101,72	-101,75	-101,74	-101,74	-101,71	-101,65	-96,17	-101,75	-101,73	-101,75
2004M9	-101,77	-101,81	-96,22	-101,81	-101,77	-101,78	-101,78	-101,76	-101,78	-101,78
2004M10	-101,62	-96,37	-101,64	-101,62	-101,60	-101,61	-101,60	-101,61	-101,61	-101,61

Table 25: (Continued)

DATE	1 (lowest)	2	3	4	5	6	7	8	9	10 (highest)
2004M11	-101,62	-101,61	-96,07	-101,60	-101,62	-101,58	-101,58	-101,57	-101,59	-101,61
2004M12	-94,86	-101,62	-101,59	-96,08	-101,60	-101,58	-101,60	-101,57	-101,61	-101,60
2005M1	22,90	34,48	53,59	14,96	48,53	80,34	39,09	43,74	26,89	50,55
2005M2	19,38	58,86	55,27	31,67	34,81	50,53	58,00	65,90	56,86	66,52
2005M3	26,04	50,51	25,19	66,08	43,85	38,46	52,00	70,44	66,82	56,28
2005M4	29,45	100,43	90,06	71,14	80,50	72,59	59,09	95,45	70,55	52,48
2005M5	20,13	29,16	40,78	27,55	68,94	51,49	46,76	49,21	46,61	18,51
2005M6	4,18	28,98	30,66	11,70	31,16	10,86	23,80	14,76	59,16	-12,67
2005M7	-15,59	16,61	3,41	26,18	4,90	4,09	22,59	5,93	10,57	-11,83
2005M8	0,12	23,62	5,08	22,35	31,88	-8,30	25,39	21,75	-4,85	-1,73
2005M9	2,65	-6,61	4,62	23,54	24,66	25,92	7,15	4,17	19,33	6,76
2005M10	13,39	7,90	14,05	30,68	9,26	30,98	35,62	5,46	21,27	17,96
2005M11	-17,50	4,88	0,94	6,04	-12,34	28,60	6,46	4,41	2,43	0,36
2005M12	-8,88	-11,80	-9,43	-12,81	0,87	-14,06	-16,74	-7,61	2,06	-21,90
2006M1	-12,63	-13,69	-10,11	12,47	-23,68	-20,80	-8,62	-12,21	-12,43	-20,20
2006M2	-6,68	-17,65	-15,72	-14,30	-32,58	-20,38	-20,66	-29,79	-29,25	-14,58
2006M3	-3,57	-12,19	-9,07	-15,88	-22,28	-8,30	-1,99	-8,82	-24,06	-13,76
2006M4	-9,28	-17,66	-19,16	-14,84	-9,97	-21,97	-7,02	-16,93	-12,50	-23,05
2006M5	5,17	28,57	16,59	-4,90	14,07	13,15	18,39	6,52	6,80	-3,67
2006M6	12,76	37,62	25,47	19,28	38,81	60,21	28,97	26,36	-0,38	-1,80
2006M7	24,83	59,42	42,63	31,49	57,77	40,42	34,98	44,60	28,53	-3,31
2006M8	39,61	56,17	14,40	43,46	4,27	36,04	18,61	12,36	31,73	2,01
2006M9	10,17	53,44	17,75	32,87	19,75	39,07	16,91	17,61	40,96	14,39
2006M10	12,14	29,33	27,73	24,88	20,18	12,47	1,97	24,56	17,24	18,49
2006M11	-0,90	12,82	26,86	22,71	9,71	9,64	21,07	25,49	15,93	9,42
2006M12	5,44	16,90	-2,09	31,55	16,01	19,30	17,35	29,43	9,27	9,11
2007M1	3,76	-19,92	-4,98	4,37	-0,40	-7,79	-15,03	3,84	-16,54	-13,70
2007M2	34,40	2,75	-6,93	4,18	-2,43	-11,83	25,83	-15,27	-15,23	-11,03

Table 25: (Continued)

DATE	1 (lowest)	2	3	4	5	6	7	8	9	10 (highest)
2007M3	18,83	-12,81	-0,32	-23,56	-37,09	17,62	-22,09	-24,76	-0,02	-23,09
2007M4	24,32	1,73	-11,71	5,56	-6,92	-11,92	33,31	-0,74	-9,41	-1,42
2007M5	-7,17	-26,98	3,77	-21,29	-28,14	-6,59	-13,86	-21,06	-2,13	-1,90
2007M6	-23,65	-25,98	-41,14	-24,63	-40,09	-28,65	-32,61	-28,26	-14,80	-5,16
2007M7	-24,01	-33,55	-38,29	-37,22	-33,61	-53,20	-36,26	-31,84	-20,25	-8,82
2007M8	-23,15	-24,56	-32,01	-31,65	-42,21	-34,30	-13,51	-19,09	-32,65	-8,26
2007M9	-37,70	-45,14	-53,87	-37,91	-44,58	-55,79	-37,33	-21,76	-50,79	-21,09
2007M10	-59,77	-53,03	-53,64	-55,29	-56,71	-60,30	-58,02	-52,48	-58,77	-48,84
2007M11	-63,36	-56,03	-50,01	-61,02	-66,99	-59,01	-48,70	-28,82	-63,03	-62,83
2007M12	-52,91	-52,20	-44,94	-61,79	-34,15	-46,88	-62,29	-46,78	-66,57	-58,69
2008M1	-48,17	-47,71	-56,83	-31,85	-28,39	-47,18	-12,48	-61,85	-49,17	-47,05
2008M2	-52,75	-48,16	-44,00	-14,48	-52,87	-30,44	-50,87	-55,14	-51,71	-52,30
2008M3	-45,85	-30,85	-38,69	-33,14	17,15	-21,66	-30,79	-44,50	-40,37	-53,54
2008M4	-46,76	-31,73	-36,42	-32,36	-0,68	-21,28	-40,68	-34,78	-44,80	-41,49
2008M5	-30,68	-5,22	-18,74	-11,27	-20,28	-21,75	-29,11	-23,28	-29,03	-31,01
2008M6	4,67	3,01	10,81	60,12	9,04	14,44	-16,86	3,10	-14,24	-14,53
2008M7	13,70	9,69	-2,84	11,67	16,49	2,75	-11,68	30,26	-9,94	-17,82
2008M8	12,57	32,51	13,37	-10,32	14,70	5,55	-9,46	2,78	2,35	-17,42
2008M9	68,00	27,79	71,84	53,11	50,43	23,62	11,70	17,22	20,26	4,14
2008M10	122,44	86,62	100,84	136,61	101,66	93,94	79,72	65,34	66,42	11,42
2008M11	277,03	118,22	120,12	113,49	109,20	76,83	84,97	70,41	115,79	-2,53
2008M12	328,85	156,48	125,30	123,36	126,58	122,08	117,93	123,18	96,59	-13,43
2009M1	199,60	190,07	177,29	175,96	152,21	208,56	159,30	148,62	91,95	55,63
2009M2	163,74	157,95	159,59	181,41	207,53	109,71	112,64	133,02	75,05	90,07
2009M3	99,71	142,38	150,99	130,85	137,90	155,57	146,45	129,90	116,68	118,16
2009M4	46,97	135,75	109,24	140,99	124,44	93,90	86,02	141,34	127,07	116,27
2009M5	39,27	74,73	60,67	87,56	74,40	64,81	80,88	64,50	64,76	50,23
2009M6	38,73	62,86	99,21	51,66	51,20	129,70	41,61	77,66	32,46	33,09