

THE MOMENTUM – EFFECT ON THE ISTANBUL STOCK EXCHANGE 2012-2016 period

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**Abstract**

Capital market has been developing particularly in developing markets in recent years. Depending on these developments, performance evaluation of increasing number of investors and growing investment fund portfolios is a necessity. To this end, it is of great importance to predict stock returns. There are many models in the literature developed to predict stock returns. Of them, three models stand out: CAPM, Fama French three factor model, and Carhart’s four factor model. In this study, the performance of these three models are discussed between 2012-2016 using 32 companied listed in Borsa Istanbul.

**APPENDIX 7 - DISSERTATION (PGBM82) DECLARATION**

**Statement of Originality and Authenticity**

I confirm that the dissertation I am submitting is an original and authentic piece of work written by myself that satisfies the University rules and regulations with respect to Plagiarism and Collusion. I further confirm that I have fully referenced and acknowledged all material incorporated as secondary resources in accordance with the Harvard system.

I also certify that I have taken a copy of the dissertation, which I will retain until after the Board of Examiners has published the results, and which I will make available on request in pursuance of any appropriate aspect of the marking and moderation of the work within the University Regulations.

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**List of Abbreviations**

BV: Book Value

CAPM: Capital Asset Pricing Model

EMH: Efficient Market Hypothesis

MV: Mean Variance

MV: Market Value

IPS: IM Pesaran Shin

ISE: Istanbul Stock Exchange

VIF: Variance Inflation Factor

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**1. Introduction**

## Background and Context

Asset pricing models and the validity of these models for investors are of great importance. The Capital Assets Pricing (CAPM) model is a balance model developed by Sharpe (1964) and Lintner (1965), which takes into account the expected return and risk relationship under certain assumptions. When the empirical studies are examined, it is seen that the CAPM has been used intensively in the evaluation of portfolio performance since 1970s with the advantage of easy applicability in measuring capital cost. Depending on the development of capital markets in the 1980s and 1990s, this model failed to explain stock returns and some researchers state that CAPM cannot foresee the anomalies. As the CAPM is insufficient, the focus was on multi-factor models for capital markets. These models presented empirical results that firm-specific factors were successful in explaining share returns.

In order to properly address this issue, Fama French (1993 and 1996) develop three factor model. This model can predict return better than the traditional CAPM. This is the most widely accepted model in academic circle. Carhart (1997) decide to extend this three factor model as to include momentum factor in that he denotes that well-performing funds in the past can perform well in the future. Therefore, he incorporates one more factor to the three factor model to predict better the stock return.

## Aim and Objectives

CAPM, three-factor model, and the four-factor model can explain the portfolio returns. Thus, both stock returns prediction and existence of market efficiency are tested and compared.The other aim of this study is to test whether momentum effect is present or not. By doing this, validity and usefulness of CAPM and Fama-French model is discussed and conclude which model fits better to Borsa Istanbul data. Besides, market efficiency in Borsa Istanbul is tested by Carhart model. In this respect, chracteristics of the stocks listed in Borsa Istanbul as well as Borsa Istanbul’s own dynamics are examined.

Research questions of the study are:

* What are the advantages and disadvantages of the models in explaining the stock returns?
* Which of the model is the most useful?
* How do these model perform in the presence of anomalies?
* Does the momentum effect exist?
* Can the momentum strategy explain by adjusting the Fama and French three-factor model.

## 1.3. Scope and Importance

This study is conducted on stocks listed in Borsa Istanbul between 2012-2016. The empirical study is carried out by using CAPM. Fama-French three-factor model, and four-factor asset model of Carhart. In this respect, Fama-French factors were calculated for the ISE between 2006-2010. The reason for using Fama-French factors is to purify the negative or positive effects of the fluctuation in the crisis periods of the ISE and to determine the actual return.

## 1.4. Rationale of the Study

One of the most important problems of capital markets is to estimate the relationship between return and risk. Estimation of share certificates; portfolio management, budgeting and performance appraisal, it is important for institutional investors and individual investors as well.

Models developed to explain the relationship between expected return and risk are gathered in two groups as single index models and multiple index models (multi-index or multi-factor model). The capital asset pricing model (Capital asset pricing model) developed as a single index model aims to make satisfactory estimates of how to measure risk by establishing a relationship between expected return and risk (Cuthbertson, 1996: 22). However, this model is very weak in practice due to the many simplifying assumptions it bases on.

To eliminate the deficiencies in the CAPM model, the three-factor model developed by Fama and French which is a multi-index model commonly used in recent years. In practice, CAPM is recommended for the return of a single stock, while the three-factor Fama-French (FF) model is recommended for estimating portfolio return.

To summarize, these two models are employed to estimate the stock returns. However, estimating stock return is not the sole issue of the study. To test the existence of market efficiency is another motivation of this study.

The striking debate is the market efficiency theory developed by Fama (1970). It explains that stock prices incorporate all available information and investors cannot develop trading rules that create systematic profits above transaction cost. Evidence appeared to support the concept of market efficiency until the-mid 1970s. However, some researchers question the empirical validity of stock market efficiency. Consequently, stock return prediction cannot be separately handle with the market efficiency.

To do that Carhart model is utilized. Carhart (1997) developed a model, so-called four factor model, by adding a momentum factor to the three-factor Fama-French model revealing that this model can explain the change in returns to a large extent.

## 1.5. Oveview of Dissertation

The remainder of the study is as follows. In the second part, literature review is provided including theory of behavioral finance. In this part, theoretical background of the models and ideas used in the study is discussed. To do that first Random Walk hypothesis together with the Efficient Market Hypothesis are introduced. Then CAPM and Fama French Three factor model which is a somewhat an extension of CAPM are presented with necessary details. In the third part, research methodology is provided. This section includes a discussion of research purpose, method, ethics, and limitations. In the fourth part, data used in the study and its preliminary analysis is conducted. Fifth part is about preparation to the empirical analysis. To do that first descriptive analysis is done and then pre-test, namely unit root test and multicollinearity test are performed. In the sixth part, empirical analysis is done and results are discussed and in the seventh part concludes.

# 2. Theoretical Background

## 2.1. Literature Review

#### 2.1.1. Random Walk and Efficient Market Hypothesis

Different theories have been proposed to explain stock returns. As the forecasting the stock prices amounts to the arbitrage opportunity and reduction of risk, one of the most important factors of the financial sector, it is of considerable importance in finance circle. In addition, if the return of stocks can be estimated, this will help investors to know when and how much to invest.

Different theories about the movements of the stock prices have been proposed as well. Random walk and Efficient Market Hypothesis (EMH) are the most prominent of these theories. Bachelier (1900) is known as the first researcher to stand for the random walk hypothesis. According to Bachelier, investors take into account past, present and future expectations and the market equilibrium is formed accordingly. If the market is at equilibrium, the price adjusts itself. As a result, prices do not rise or fall when the market reaches an equilibrium. Therefore, the current price is the best estimator of the future price.

In the market with the same characteristics, prices reflect all available information and the resulting changes in prices are theoretically caused by the emergence of unexpected news. Accordingly, stock return statistical terms are defined as random variables. The random walk hypothesis has been extensively studied in order to confirm this situation. Accordingly, prices follow random movements and changes in prices are independent of each other. Strategies based on historical evidence cannot be followed in such cases.

According to the random walk hypothesis, the price level of a security is not as predictable as the behavior of a series of cumulative random numbers. Prior period information from changes in share prices cannot be used in estimating future price movements. The independence of successive prices means that at any given moment the average price of that stock is equal to or close to its real value. The fact that different investors are deviating from the real value is due to different evaluations of the same information.

The first study to test the random walk in developed country markets was conducted by Roberts (1959). Later, Fama (1965) carried out independence tests by applying the serial test, run test and Alexander's filter rule at the prices of 30 stocks included in the Dow index. All three tests confirmed that the successive independent price changes are independent of each other, that is, Dow was efficient in weak form.

Eugene Fama is one of the most prominent researchers who applied Random Walking Hypothesis to finance theory. Fama has made an important contribution to the literature by using the random walk model through the Efficient Market Hypothesis, and after Fama many studies have studied the behavior and predictability of markets. The market is called the effective market, where prices contain all the information at hand and new information quickly adapts to it. In other words, according to this hypothesis, any information that will appear on the market (such as dividend distribution or disclosure of unemployment data etc.) affects the price and the price is redefined to include this information almost instantaneously. He also assumed that the successive price changes of a security in the Efficient Markets Model is independent and that successive price changes and returns are equally distributed (Chew, 2001).

Fama explains the efficient market hypothesis by dividing the entire efficient market hypothesis into three sub-hypotheses, taking into account the sources of available information in the first one. Hypotheses in the Fama's theory are Fama are Weak Form, Semi-Strong Form, Strong Form (Konuralp, 2006). These three hypotheses are:

* Weak form of efficient: In this form of efficiency, future prices cannot be predicted by simply using past prices. As historical prices cannot be utilized to predict the future prices, it is another way of saying that technical analysis[[1]](#footnote-1) does not work properly. Fundamental analysis[[2]](#footnote-2), however, can still create excess return. Share prices is assumed to be no serial dependencies meaning that there is no pattern in asset prices.
* Semi-strong form: In this type of the form, stock prices reflect all the publicly available information. In another word, stock prices adjust itself to publicly available information instantaneously so that no trader can create excess return. Fama (1970) examines the market efficiency via two different types of information. These are splits and stock price adjustments as well as other public announcements. In the stock split analysis, it is important to examine the stock return around split announcement dates. As for the public announcement, the work of Ball and Brown (1968) suggests that firm’s earning can be separated as increased or decreased compared to the market. Findings indicates that cumulative average residuals increase prior to the announcement of earnings increased or vice versa. The upshot, therefore, is that evidence on semi-strong form on the effect of public announcement support the market efficiency model.
* Strong form of efficiency: This type of efficiency implies that stock prices reflect all information regarding both public and private so that insider trading cannot generate profit.

Depending on the announcement and the reaction of the market, type of market efficiency is determined. In this study, event study is employed and event studies are often used for the semi-strong efficiency test. An event test studies the security both before and after an event. The idea behind this test is that an investor will not be able to gain an above average return by trading on an event (Timmermans, 2011:4).

At this point, it is worth discussing some researches about market efficiency. According to Emery (1998), effective markets are the markets on which prices fully reflect the resulting information. In an efficient market, no one, including companies, can sell capital stocks in excess of their true value or buy a price below its actual value. In this case, there is no such thing as the actual costs exceeding the costs, so there will be no alternative to finance managers to increase the richness of their bosses.

Ross et al. (2001) stated that when the market is efficient, the net present value of all investments in the market is zero. The result is not complicated, if the prices are low or not high, then the difference between the market value and the cost of an investment will be zero. As a result, in an efficient market, investors buy bonds and stocks at the price they will sell.

According to Ross (2002), the Efficient Market Hypothesis has implications for firms and investors:

* Since the information is reflected in the prices immediately, investors should only expect a normal rate of return. A researcher does not benefit when the research of knowledge is realized. The price is formed before the trader trades with him.
* Firms should expect fair value for the shares they sell. Indeed, the intent is the true value they represent of the shares they are selling. In this case, financial opportunities created by deceiving investors do not occur at effective markets.

In other studies, related to weak efficiency; Fama (1970) expresses the validity of Weak Efficiency in the markets examined by applying Cham, Gup, and Pan (1992)’s the unit root and cointegration tests and Poterba and Summers (1987)’s variance ratio test. In addition, Panas (1990) examined Athens (ASE) stock market, Boumahdi and Thomas (1991) looked into the Singapore, Malaysia and Indonesia, and McQueen (1992) confirmed that US stock markets are efficient in weak form.

Frenberg and Hansson (1993) found long-term negative correlation in Swedish stock market studies and found that the relevant markets were not efficient in a weak form.

Chan, Lima and Tabak (2003) found that Asian stock indices do not have random walk characteristics, whereas the Latin American stock indices have a random walking characteristic outside of Chile, while developing countries have tested the weak form of capital markets Maher Asal (1996) concluded that the Egyptian Stock Exchange was not weak efficient until 1996. However, according to 1997 data, the market indicated that no predictions could be made about the future, and as a result, it could be concluded that in 1997, there was "informational" activity.

One of the frequently raised critics about the Efficient Market Hypothesis is about its inability to explain the market anomalies. Hong and Stein (1999), De Bondt, (2000), and Abreu and Brunnermeier (2003) some of the researchers who argue this topic.

#### 2.1.2. CAPM

In the modern portfolio theory, Financial Asset Pricing Model (CAPM) is used to estimate the relationship between expected return and risk. CAPM suggest that a portfolio is created to maximize the profit of an investor who is risk averse and rational:

* Given the return level, minimize the risk
* Given the risk level, maximize the expected return

In such a model, portfolio variance is used as a measure of the portfolio risk and this model is called the mean-variance model (Fama and French, 2004). In this case, in order to test the relationship between expected return and risk, in other words, the prices of financial assets in the market must be open to all investors.

* When prices of financial assets are open to all investors in period t-1, investors agree on the compound distribution of period t of asset returns.
* There is a risk-free rate in the market, which is the same for all investors and does not depend on the amount of debt received.

In such a market, investors would have to accept a higher volatility or risk if they want to raise the expected yield. Such markets are efficient markets based on information. CAPM in an efficient market; the portfolio should be at the minimum variance limit (Levy, 1978). The strongest part of the CAPM is its easy-to-apply property which attracts many researchers but this property comes with a cost that are strong assumption upon which model is based. These assumptions are (Copeland and Shastri, 1983):

* There are numerous buyers and sellers in the market, and the transactions of any of them are not strong enough to affect the prices on the market, that is, investors are price takers.
* All investors want to maximize utility functions and avoid risk. If there are two investment opportunities with the same expected return, investors will prefer the one with the small variance.
* There are no transaction costs and no tax,
* Investors have all the information about alternative opportunities and there is no cost to obtain this information.
* Investors have single-period homogeneous expectations about the expected value, standard deviation and correlation structure of the returns.
* For all investors, the investment periods are the same and the securities assets are held for the same period.
* There are risk-free securities in the market. There is a possibility to borrow or lend as much as you want on risk-free securities.
* Short sale opportunities for investors are unlimited.
* The assets to be invested are infinitely divisible. That is, every investor can invest as small as he wants any securities.
* All investors take investment decisions based on the probability distribution of the securities assets. This probability distribution is assumed to approximate the normal distribution,
* Investors are risk averse. The marginal utility of the investor's wealth is diminishing. In this case the utility function is assumed to be "quadratic".

Although the model is developed for securities, it can also be used for fixed asset investments. The Capital Assets Pricing Model (CAPM) is based on two main risks: systematic and non-systematic. CAPM was developed by William Sharpe, John Lintner and Jan Mossin, based on the modern portfolio theory developed by Harry Markowitz. The CAPM model can be mathematically expressed as:

E(Ri )= αi+βi E(Rm)

where Ri  is the expected excess return, αi  is constant term, βi slope coefficient, rm is the expected market return.

Or differently,

ri (t)-rf=αi+βI[rm(t)-rf]+ei(t)

where ri (t) is the stock return, rf is the risk free rate, finally, ei(t) is the disturbance term.

The negative alpha indicates poor technical performance, whereas the positive alpha shows analyst performs well. The most important parameter, β, is the relationship between the excess return from the market index and the excess return of the stock.

Beta is an indicator merging from the association between market return and stock return. However, it is also known that the risk of the stock is decided with the combination market characteristics and the characteristics of the stock. Beta can be defined as:

βi = Cov(ri, rm)/Var(rm)

Beta coefficient gives the ratio of covariance between stocks and market portfolio returns to the variance of market portfolio return. Beta coefficient is a systematic risk indicator that shows whether a stock return has shown a change in parallel with the stock market return. In other words, the beta coefficient indicates how sensitive the introduction of the financial asset is to changes in the market portfolio.

Differently,

If β= 1.0, the security has the same volatility with the market

If β> 1.0, the security has more volatility than the market as a whole

If β< 1.0, the security has less volatility than the market as a whole

The Capital Market Line is a line through the risk free rate and the CAPM market portfolio. According to the Two Fund Separation Theorem, all investors should hold portfolios on the Capital Market Line. Any portfolio on the Capital Market Line dominates all portfolios on the Efficient Frontier. The relationship between CAPM and the Two Fund Separation Theorem comes into the scene at this point in that market portfolio formed by CAPM is the only one that being on the efficient frontier and on the Capital Market Line (Povolenko, 2017:4).

**Figure 1:** The Association Between Capital Market Line and Efficient Frontier



CAPM and similar asset pricing models provide managers with a practical way to learn about how investors value the potential investment opportunities. The capital budget has been a central topic in the finance theory. Theory suggests a simple rule for managers, capital expenditure decisions: maximizing firm value. Some shareholders may sell their shares in cases where the management disagrees with their decisions. This idea forms the basis of classical theoretical advice for managers to invest only in positive net present value projects. However, in practice, the simple rule is not so simple to apply in that the net present value of each project may not be known. One of the most important inputs of this process is capital cost. The concept implies that investors expect to invest in a particular financial asset or project (Jagannathan and McGrattan, 1995).

CAPM is one of the methods most frequently used by practitioners and financial advisors in calculating the cost of firms' capital (King, 2009). CAPM is one of the most used models for calculating capital cost. The main feature of the CAPM is to establish a direct relationship with treasury bills that determine the risk-free interest rate, which is used to calculate the cost of capital and debt. In contrast, discounted cash flows (DCF) and risk premium analysis (RPA) have a weaker relationship between the required return and treasury bills. CAPM is mostly used in Europe, DCF is preferred in America (Gentzoglanis, 2004).

It is also important to note that the tests for CAPM in the literature give mixed results. Initial tests have mostly produced results that support the model. Although some researches show a positive relationship between beta and asset returns, they found that the beta curve was lower than hypothesized and that other factors systematically affected the return.

Empirical studies show that the relationship between beta and average return is more stable than the Sharpe-Lintner approach. In this case, CAPM estimates the capital cost as high for stocks with high beta and low for stock with lows beta. Similarly, the CAPM’s capital cost estimate remains fairly low while implies that the average returns of the stocks are high (those with high book-to-market value) and the expected returns are high (Fama and French, 2004: 44).

It has been revealed by numerous authors that CAPM does not explain the returns of the stocks. Because the model consists of strong assumptions, failures that may arise from assumptions also make the model unsuccessful. CAPM is a static model because of the given the stock returns assumption. However, in the case where the expected return may change over time, the return on assets need to be taken into account not only in terms of market returns and covariance but also in the covariance with other variables used in the estimation of market inputs (Guo, 2004: 23).

In his work Basu (1977) found that stocks with high earnings per share had more profit than CAPM predicted. Similarly Banz (1981)’s study of the relationship between firm size and average return shows that small firms have a higher return than the CAPM does, relative to their size. Bhandari (1988), on the contrary, predicts that firms with high debt have higher returns than market betas. Statman (1980) and Rosenberg, Reid and Lanstein (1985) have found that firms with a higher per-share-to-market value ratio have higher average returns than can be accounted for by their own statements.

Ball (1978) suggests that price-earnings ratio, debt-to-capital ratio and book-to-market ratio are determinants of the expected return in the face of the inability of the beta to explain the expected change in demand. Fama and French (2004) stated that firm size, leverage, book-to-market ratio and price-to-earnings ratio can be used when beta is inadequate for expected returns (Elbannan, 2015: 222). DeBondt and Thaler (1985) found that in the past three to five years, the loss of badly-held stocks and the return of good-returning equity holders have had a higher return over the next three to five years than those of lost winners (Sandberg, 2005: 18). The above and other similar studies have raised doubts about the CAPM’s capabilities. This has led to the derivation of various models on which CAPM is based.

Some of the researchers tried to extend the CAPM to better predict the stock returns. Of them, Giannakopoulos (2013), Dempsey (2013), Antoniou et al. (2014), Gilbert et al. (2014), and Carelli et al. (2014) stand out with their unique approach.

#### 

#### 2.1.3. Fama & French Three Factor Model

The CAPM model has proposed a new way to explain the asset returns. The new risk factors included in the literature, including the new risk factors and the asset price volatility asset pricing models yield successful results. Of the multi-factor asset pricing models, the most widely accepted model is the three-factor model of Fama and French (1993, 1996). Fama and French have developed a three factor model, which is one of the multi-factor models in their work in 1993. Fama and French (1992) reported that firm size and book value / market value (BV/MV) ratio factors can also be effective when examining the time dependent divergence of share denominations. Because of this, Fama and French (1993, 1996) developed a three-factor asset pricing model by adding two new factors (Firm Value and D/P ratio) to the FVF model.

The size of the firm is one of the criteria used to measure the market value of the relevant share and is obtained by multiplying the share price by the number of shares of the company in question. Fama and French (1995) state that the average returns of low-market firms are higher than the average returns of firms with high market value. The BV/MV ratio, which is another new factor used in creating the three factor model, is the ratio of the value of a firm's book value to the market value. Fama and French (1995) stated that firms with higher BV/MV ratios are higher than firms with lower D/P ratios, and also if ratios are priced rationally, firm size and BV/MV ratio should be sensitive to risk factors. Fama and French (1995) also stated that firm size and BV/MV ratio risk factors are discretionary variables for unexplained economic reasons (Kaya and Gungor, 2017: 223).

Fama / French (1992) posited that beta and price earning ratio has no power to explain stock returns, but only the portfolio size and BV/MV ratio can account for the return variability. In other words, according to Shefrin / Statman (1995), the portfolio size and BV/MV ratio are seen as the most important variables that significantly indicate the change in stock returns. As a result of studies on the effects of the variables mentioned by Fama / French (1992) on the expected stock returns, it was determined that the expected returns of stock returns were negatively affected by portfolio size and positively by BV/MV.

Thus, in the Three-Factor Model, asset return is affected from following factors:

* Excess market return higher than the risk-free interest rate,
* The return difference between stock with high market capitalization and stocks with small market capitalization (SMB)
* The difference between the return of the portfolio with high PD / DD ratio and the return of the portfolio with low portfolio (HML)

In the three factors model, the investors create return to the extent that they are exposed to three risk factors, market risk, firm size risk and BV/MV ratio risk. Fama and French (1993) have stated that size and BV/MV ratio risk factors after the 1960s actually explain the US share market market better than the FVF model.

It is, therefore, true to say that Fama-French Three Factor Model is basically an extension of the Capital Asset Pricing Model considering the outperformance of small-cap companies relative to the large-cap companies and again outperformance of high-book-to-market companies against low book-to-market companies.

The mathematical representation of the Three Factor Model is as follows:

ri=rf+β1(rm-rf)+ β2(SMB)+β3(HML)+ε

where r is the expected rate of return, rf risk free rate, β is the factor’s coefficient, (rm-rf) represents market risk premium, SMB (Small Minus Big) denotes excess returns of small-cap companies over large-cap companies, and finally HML (High Minus Low) is the excess returns of values stocks (high book-to-price ratio) over growth stocks (low book-to-price ratio).

The general consensus about the Fama and French Three Factor Model is that it is tested in the developed markets and the model validity in capital markets is verified. Fama and French (1993) argue that there is a negative correlation between the size of the firm and the relationship between the asset returns and firm size in some of the emerging markets but invalidate in some advanced markets. A similar situation exists for the BV/MV ratio effect. That is to say, in the studies for the advanced markets, findings that the positive relationship between the BV/MV rate and the asset returns is negative or that the effect of the BV/MV ratio is not even present is obtained for some capital markets.

Fama and French (1998) studied the relationship between asset returns and risk factors for 13 developing and 16 developing countries. While companies with higher BV/MV ratios than the share certificates included in the scope of the examination are called value shares; The low BV/MV rate shares are called growth shares. As a result, the existence of the risk premium at the relevant markets is accepted for the period 1975-1995 in other words, the value shares in the world capital markets, obtained higher returns than the growth shares. Ajili (2003) tested the Fama and French model for the French capital markets in the period 1976-2001 and stated that the model was quite successful in explaining the change in the asset return in terms of French capital markets. Walid and Ahmad (2008) tested the three factor model on the Japanese capital market for the period 2002-2007 and stated that the model discloses the change in asset returns for the Japanese share market in a successful manner. Chou et al. (2012) have worked on the Fama-French model for Japanese capital markets between 1978-2006.

Researchers stated that the Fama-French model reveals more successful anomalies in the 1990s, but its validity will yield more successful results. Hahn and Yoon (2016) examined the model of Three factor model for the period 1992-2012 on Korea and stated that the model was unsuccessful in explaining the share of the relevant time interval. Allen and Cleary (1998) studied the Malaysian capital market for the 1978-1992 and tested the Fama-French model on the developing countries. The researchers found a reverse relationship on the market beta and asset returns and the size effect did not exist in Malaysia. Rouwenhorst (1998) studied the effect of BV/MV ratio for 20 developing countries in the period covering 1982-1997 time period and found that the portfolio of firms that are based on the high BV/MV ratio in 16 countries is higher than that of firms with low BV/MV ratios. Drew and Veeraraghavan (2002) and Connor and Sehgal (2001) investigated the validity of the Three Factor model of Fama and French for Maleysian and Indian capital market; and it turned out that the model accounts for the change in the stock returns of Kuala Lumpur Malaysia and the Indian stock market.

As for the validity of the Fama-French model in Turkish capital markets, Aksu and Leader (2003) test the validity of the model using data from 1993 to for the companies listed in Istanbul Stock Exchange. The researchers concluded that firm size and BV/MV ratio effects holds for Istanbul Stock Exchange; they also stated that the explanatory power of firm size is quite high. On the other hand, Yolsal (2005) investigated the effects of firm value and BV/MV ratio in Istanbul Stock Exchange for the period of 1999-2004 by means of time series and cross-section regression analysis in order to investigate the factors affecting asset returns. The results of the survey indicated that the value of the firm's value was statistically insignificant and that the BV/MV ratio had a statistically significant effect on the share of the stocks. In addition, the authors have concluded that there is not a strong correlation between firm size and BV/MV ratio factors added to the Fama-French model, ie, the relative risk factors and shareholder returns. Doğanay (2006) investigated the relationship between market risk premium, firm size and BV/MV ratio factors for the period 1995-2005, and the shareholder returns by time series regression analysis. Doğanay has concluded that the risk factors used are significant risk factors affecting Turkish capital markets positively.

#### 2.1.4. Carhart’s Four-Factor Model

In 1997, Carhart added a fourth factor to Fama-French's three-factor asset assessment model from its work on investment funds. This fourth factor is momentum. The reason why it does not add momentum is that the CAPM does not fully cover the risk of non-variability beyond the second moment (skewness and kurtosis) and therefore results in empirical failure. Fama-French argues that non-market risk factors are priced and proposes a three-factor model that includes a volume factor, SMB, and a value factor, HML, in addition to the market factor. In this study, multifactor models including skew factor were compared with Carhart's 4 Factor Model and Fama-French's 3 Factor Model with cross-sectional and time series analysis for various portfolio groupings (Öndeş and Balı, 2010).

The four-factor asset assessment model used by Carhart is described in the first three-factor Fama-French factors section. For this reason, it is explained in this chapter how to calculate the momentum element added only by Carhat.

Momentum is an indicator that reflects the change between the present price and the price of X days before (Serttalı, 2005: 81). In order to calculate the momentum factor used in our model, we first listed the returns on the previous month based on the highest yields from the lowest. After the ranking, the shares were divided into three groups and their average returns were calculated. From the average of the highest yield group, the average of the lowest yield group was deducted and the momentum value was reached. These procedures were repeated for each month.

#### 2.1.5. Behavioral Finance

Traditional Finance focuses on how individuals should behave. Individuals are regarded as "Rational Economic Individuals" and from this point, it is stated that prices incorporate all the information in the market.

Behavioral Finance acknowledges the way by which information is presented to the investor affects investors' decisions. This can lead to emotional and cognitive prejudice. Therefore, the discussion of these two approaches is important for clarifying the decision processes in financial markets. Thus before proceeding, it is important to compare traditional or rational finance theories with behavioral finance theories. In this framework, we discuss main behavioral finance theories such as representativeness, availability, adjustment and anchoring theories.

The emergence of the behavioral finance models rest upon the inability of the traditional finance models to explain some remarkable issues. Behavioral finance models have been developed to explain investor behavior or market anomalies, unlike rational finance models, without using simplifying assumptions. Rational investors and utility maximization have found inadequate to account for many market anomalies in the context of effective market theories, which have recently become a source of interest in behavioral finance.

Unlike rational finance theories, investor behavior is at the heart of behavioral finance. Therefore, empirically supported social psychology is used in behavioral finance analysis. When all of these are considered together, contrary to behavioral finance, contrary to rational finance theories, markets are not efficient. The most important indicators of market inefficiency are event day announcement, stock splitting, and under- and overreaction.

##### 2.1.5.1. Representativeness

The representation approach is an approach that evaluates based on the fact that it represents something rather than a possibility. The assumption that a good corporate investment is a good investment is a good example for this approach (Byrne and Brooks, 2008: 4). Another example is given by Tversky and Kahneman (1974: 1124) as follows: Assuming that A and B are two events, and A, B represent high order, A is considered highly likely to come from B. On the other hand, if A is not similar to B, the probability of A being from B is considered low.

It is evident that the Representative approach operates the decision process based on how much something resembles something, without using the possibilities as rational theories do. However, similarities and decision-making approaches based on representation lead to serious errors. In the brain of the situation, the perception and representation is distorted and distorted, leading to forgetting factors that really affect the situation (Hayta, 2014: 334). Accordingly, the basic investment rule dictates to invest in a well-performing stock or vice versa.

##### 2.1.5.2. Availability

There are situations in which humans evaluate the frequency of a class or the likelihood of an event in terms of the ease with which instances and events can be remembered. (Tversky and Kahneman, 1974: 1127). In simpler terms, the Availability approach recognizes that events that are more easily remembered are likely to occur more frequently.

For example, a person evaluates the failure of an enterprise to take into account the difficulties previously encountered. Another example is given by Plous (1993). According to the study conducted in the USA, it was asked whether the plane crash or shark attack was deadlier, and most of the respondents were given the attack of the turkey attack. This is attributed to the fact that more shark attacks take place at the beginning of the attack.

##### 2.1.5.3. Adjustment and Anchoring Approach

In many cases, people make predictions starting from the initial value set to give the final answer. The initial value or the starting point may be suggested by formulation of the problem or may be the result of a partial calculation (Tversky and Kahneman, 1974: 1128). Accordingly, different starting points can lead to different results. This approach is called adjustment and anchoring approach.

In this method, which is applied as a cognitive rule in case of uncertainty, individuals try to reduce ambiguity by creating a reference point in decision processes. As Hayta (2014) notes, stock prices are referred to as "reference points" in financial markets and the fixing of these prices as "anchoring".

# 3. Research

## 3.1. Research Motivation and Aim

One of the most important problems of capital markets is to estimate the relationship between return and risk. Estimation of stock returns, portfolio management, budgeting and performance appraisal is quite important for institutional investors and individual investors as well. Models developed to explain the relationship between expected return and risk are gathered in two groups as single index models and multiple index models (multi-index or multi-factor model). The financial asset pricing model (Capital asset pricing model) developed as a single index model aims to make satisfactory estimates of how to measure risk by establishing a relationship between expected return and risk (Cuthbertson, 1996). However, this model is very weak in practice due to the many simplifying assumptions it based on. The most important criticism of the model is that it tries to explain the expected return based on a single risk factor and therefore it is inadequate. Thus, multiple index models have been developed with the addition of other risk factors. At this point, two major theoretical approaches have been developed in order to rationally price financial assets in a market. Arbitrage pricing theory (APT), which is based on arbitrage elements, and intertemporal CAPM-ICAPM model based on international equilibrium elements (Campbell, Lo, MacKinley, 1997). The three-factor model developed by Fama and French is also a multi-index model commonly used in recent years. In practice, CAPM is recommended for the return of a single stock, while the three-factor Fama-French (FF) model is recommended when it comes to estimating portfolio turnover.

The striking debate is the market efficiency theory developed by Fama (1970). It explains that stock prices incorporate all available information and investors cannot develop trading rules that create systematic profits above transaction cost. Evidence appeared to support the concept of market efficiency until the-mid 1970s. However, some researchers question the empirical validity of stock market efficiency. Consequently, stock return prediction cannot be separately handle with the market efficiency.

Together with this, advocates of market efficiency have discussed that alternative investment strategies challenging the market efficiency are not satisfied with these alternative models in that even if an investment strategy could generate abnormal return, other investors would exploit any inefficiency rapidly and their arbitrage transactions quickly proved to be inefficient.

The momentum effect is one of several stock market anomalies that have contradicted market efficiency as pointed out by Jegadeesh and Titman (1993). Accordingly, a strategy that buys the best performing stocks over the previous medium period (3 to 12 months) and short sell the worst performing stocks over the past medium-term horizon (3 to 12 months) can generate abnormal profits of around 1% per month.

However, supporters of the efficient market have criticised the findings of momentum profit, stating that the methodology employed for the studies are based on incorrect specifications or the amendment of data.

In this study, it is aimed toexamine the model by which stock returns are predicted. Prediction of the stock return is of considerable importance in that investor adjust their position to this prediction. There is no unique model proposed by researcher which accounts for the stock return in a perfect way. Some of the prominent models, therefore, analyze and advantages and disadvantages are presented to provide a clear picture about financial model. To do that, CAPM, Fama French Three Factor model, and Carhart’s Four Factor model are conducted to compare and find which model predict the stock returns better.

## 3.2. Research Objectives

The research objectives of this study are:

* To introduce widely used asset return prediction model in a single framework
* To compare their pros and cons
* To empirically observe which model predicts the stock return better and moreover to address that whether Carhart’s model capture the momentum effect by which the presence of market efficiency is tested.

**3.3. Research Questions**

Questions addressed in this study are:

* What are the advantages and disadvantages of the models in explaining the stock returns?
* Which of the model is the most useful?
* How do these model perform in the presence of anomalies?
* Does the momentum effect exist?
* Can the momentum strategy explain by adjusting the Fama and French three-factor model.

## 3.4. Research Methodology

In this study, first CAPM model is performed by using panel data method in that I have several stocks and time series dimensions. After running CAPM, Fama-French three factor model is done. To do that first, small minus big and high minus low factors are calculated simply by market capitalization and Book Value/Market Value data. Finally, Carharts’ four factor model is conducted by adding momentum factor labeled as Up minus Down (UMD).mmonthly data covers the period of 2012-2016.

## 3.5. Methods of Data Collection

In this study, second source data is used. This type of sources discusses comment analyze, evaluate, describe, and process prımary sources. Secondary sources often lack the freshness and immediacy of the original material.

To summarize, secondary data is the data collected by someone else other than the researcher herself. Secondary data sources for common social sciences include surveys, surveys, organizational records and data collected through qualitative methods or qualitative research. On the contrary, the primary data was collected by the researcher. Secondary data analysis, in other cases, especially quantitative data, saves time when data collection is going to take place and provides larger and higher quality databases that any individual researcher will be unfeasible for its own aggregation. In addition, analysts of social and economic change need secondary data, because it is impossible to change and / or develop new research that can adequately catch up.

* Bibliographies
* Biographical works
* Reference books,
* Textbooks

## 3.6. Research Ethics

In this research, it is believed that required ethics codes are followed. Quality and integrity of your research is ensured by running original study with unique conclusions and properly citing to the references.

As the time, data coverage, and the way of handing the data are unique, our research is independent and impartial.

## 3.7. Research Limitations

Due to the fact that the Borsa Istanbul is young, the time span of the data is restricted to 2012-2016. The other reason to choose is interval is the interruptions in stock trades.

In our examination period, there are few numbers of winner stocks causing to drop some of the companies from the research.

It is not an easy task to find historical BV/MV as well as market capitalization which is another factor to restrict the time period.

# 4. Data Presentation and Analysis

In this study, I use stocks listed in Borsa Istanbul (BIST) stock exchange for all models. IT is monthly return data covering the period of 2002/02-2016/12. First I extract all stocks from BIST-100[[3]](#footnote-3) and then sort depending on the frequency of their transaction. Accordingly, if the number of transaction of the stock is low during the examination period of 2002-2016 then it is dropped. After this process, it turns out that 50 stocks remain.

The interest rates of three-month treasury bills are used to represent risk-free assets. In calculating the monthly interest rates of treasury bills, weighted interest rates of three-month treasury bills are utilized. Interest rates of the shortest-term bond issues are taken when the three-month Treasury Bills were not revealed. Thus, quarterly treasury bonus rates;

Rmonth=(1+Rquarterly)1/3-1

where Rquarterly is the interest rate of quarterly treasury bills and Rmonth is the interest rate of monthly treasury bills. By these data, we can estimate the parameter of CAPM model given below:

Ri (t)-Rf=αi+βI[Rm(t)-Rf]+ei(t)

In CAPM, it is aimed to estimate the systematic risk measure beta. In the estimation the equation, the expected excess returns are used. However, as the values are realized in practice, the real returns of the stocks (Ri) or the realized excess returns (Ri-Rf) are used in the models.

CAPM shares are expected to be estimated:

• whether the correction of dividends and divisions in stock prices was made,

• whether raw returns or excessive returns are used as stock returns,

• data frequency and time period used,

• which index is used to represent the market portfolio is important.

In the framework of CAPM, it is assumed that dividend payments and share divisions are reflected in the prices of bills. Therefore, generally adjusted stock prices are used in the studies.

When making the estimation of CAPM, it is recommended that the examination period be as long as possible and thus increase the number of observations. The long-term use of predicting beta leads to the deviation of the estimation to be made since the changes in the actual beta during the forecast period cannot be projected to the estimate. To prevent this, the forecast period is shortened. In this case, the number of observations will decrease. In order to eliminate this problem, the frequency of data is increased. For example, instead of using monthly data in a five-year period, daily data is used in a two-year period or weekly data. However, in this case, the period is shortened and the frequency of data increases; the data are moving away from the station and the effectiveness of the estimation decreases. In the studies, it is seen that the most reasonable one is the five year monthly data usage within the various periods and data frequencies (Bartholdy, Peare, 2003).

In the CAPM, the market index includes securities all over the world as well as real estate, human capital, consumer goods, etc. it is quite difficult to find an appropriate representative. As the market index representative, the stock exchange index is usually selected in the respective countries. In this case, return of Borsa Istanbul is used as market index (Yolsal, 2005).

In this study, a method similar to the portfolio creation method used by Fama and French (1996) is used. The studies conducted in the literature are examined and the D/P ratio and firm size factors whose effects on share returns are determined as the criteria for creating portfolio. Market value is used for the criterion of firm size at the stage of creating portfolios. Market value is obtained by multiplying the number of shares in circulation and share price. The D/P ratio is calculated by dividing the book value per share by the market price of the share certificate. The first condition in the creation of portfolios is that the accounting data to be used is announced on the date of portfolio creation. Because the 12-month balance sheets are usually completed within six months of the following year (Canbaş, Kandır and Erişmiş, 2008). Portfolios are created as of December of each year.

The market value of the stocks for each year t is calculated by measuring the market values ​​corresponding to June. Following the measurement of the June market values, first of all, all the share certificates with the yield data for each year of December are sorted from small to large according to the firm values ​​of the related companies. Then, the listed stocks are included in these two different size portfolios. The average value is taken into account in the realization of this distinction. Market value of equities with a market value of less than the mean value and a market value below the mean value is included in the small portfolio group. Market value of stocks, whose market value is measured above the mean value, is included in the large portfolio group. Then, the time series was created with the returns of both portfolios. Portfolio returns are calculated by taking the equivalent-weighted averages of the stocks in the portfolio.

Another factor, which is assumed to have a significant effect on share returns, is the D / P ratio, which is calculated by dividing the book value of t-1 by the market value of t-1 in December. After calculating the D / P ratios in this way, the calculation of the portfolios created according to the D / P ratio was performed in three steps. In the first step, all the shares of the related companies are ranked from the largest to the lowest according to the D / P ratio. In the next stage, with the listed shares; three (30%), medium (40%) and high (30%) portfolios were created. In the last step, the returns of all three portfolios were converted into time series and the portfolio returns were obtained by calculating the equivalent weighted averages of the shares in the portfolio.

In this study, a similar method was followed with Fama and French (1996), and firm size and D / P ratio were used as criterion and six intersection portfolios were formed. The returns of the stocks included in the scope of the research exceeding the risk free interest rate were used as a dependent variable in the model. For the three-factor model, two (Small and Large) for the firm size effect, for the D / P ratio effect (Low = 30%, Medium = 40%, Large = 30%), the six portfolios with the intersection of the three portfolios are as follows: it is possible to:

S / L: Small portfolio with low market value and low D / P ratio.

S / M: Small portfolio with a small market value, D / P ratio of medium size stocks,

S / H: Portfolio of small market shares with high D / P ratio,

B / L: A portfolio of large market shares with low D / P ratio,

B / M: The portfolio of market shares of large size, D / P ratio of medium size shares,

B / H: Represents a portfolio of large market shares with a high D / P ratio.

Equity-weighted stock returns are used to obtain the six intersections portfolio returns, and the related portfolio returns are calculated for each year-to-year period beginning from December to the year of t + 1 December. Six intersection portfolios for market value and D / P ratio effect are used to calculate SMB and HML risk factors.

Three factors are identified to explain stock returns. Risk-free rate (The difference between the return of the market and the risk-free interest rate), SMB (the difference between the return of the portfolio consisting of small market shares and the return of the portfolio consisting of large market shares), HML (return on the portfolio obtained with high D / P stocks and the difference between the D / P ratio and the return of the portfolio obtained with the D/P ratio). A summary of the risk factors used in the model is summarized below.

SMB denotes the size premium, HML value premium. The specified SMB and HML factors are calculated as follows:

SMB: ((S/L- B/L) + (S/M-B/M) + (S/H- B/H)) /3

HML: ((S/H - S/L) + (B/H - B/L))/2

To create a risk-free interest rate variable, interest rates of treasury bills is converted to quarterly values and included in the analyzes.

The hypotheses to be tested in this Fama French model are as follows:

* Company size factor has an effect on stock returns.
* D / P ratio risk factor has an effect on stock returns.
* Fama and French FIF model are listed in the Istanbul Stock Exchange.  
  can be used to explain returns.

To calculate small minus big (SMB) and high minus low (HML) following procedure is followed. All the stocks are sorted by company size as of June 30 of each year t. The firm size is determined by the market value (PD), which is the number of stocks traded with the price of the stock. Accordingly, depending on the median PD value, the shares are divided into two groups, big (B) and small (S) portfolios. Then, according to book value / market value (BV/MV), stocks are divided into three. Then estimation is done by using Panel Data model by using following equation:

Rit-Rf=αi+β1(rm-rf)+ β2(SMB)+β3(HML)+εit

Some researchers suggest that it is likely to increase earning simply by buying and selling stocks over the last six months. Buying stocks that just lost a lot of value and selling stocks that increased in value tends to give good results. The reason behind this is that the market always corrects itself. Theory says that after a (large) increase in value, the stock may be overpriced and will quickly return to its real value. UMD is short for Up Minus Down. The UMD measures the (historical) excess returns of the „winners‟ that went up minus the „losers‟ that lost value. The UMD representing winners minus losers, the winner stocks belong to the top 20% percentile of the data and losers belong to the bottom 20% percentile of data. This resulted in the following formula:

This is the basics of Carhart’s model and the equation used for estimation is as follows:

Rit-Rf=αi+β1(rm-rf)+ β2(SMB)+β3(HML)+ β4UMD+εit

Before proceeding to the application part, it is worth discussing some of the variables used in this study which are risk free rate, market value, and book value/market value

**Risk free interest rate:** is the theoretical [rate of return](https://www.investopedia.com/terms/r/rateofreturn.asp) of an investment with zero risk. The risk-free rate represents the interest an investor would anticipate to get from an investment which is deemed risk-free.

In practice, however, the risk-free rate does not exist in that there is no investment with zero risk. However, T-bills issued by governments are by and large used as the risk free rate.

**Market value:** The market value of the company (MV) is the value found after multiplying all of its shares by the current market price (Kara, 2005: 16).

Market Value (MV) = (Current Stock Price) x (Total Number of Stocks)

**Book Value:** The book amount of a company is determined by dividing the total equity by the number of shares. equity; Paid-in capital, reserves, retained earnings, revaluation surplus funds, and other funds and provisions of this type are included (www.imkb.gov.tr, 15.04.2011)

Book Value (BV) = (Company's Equity) / (Total Number of Shares)

**Book Value/Market Value:** This ratio is an indication of whether the company's shares are valued higher or lower than their balance sheet values. It is calculated as follows (Kara, 2005: 57):

Book Value / Market Value Ratio (BV/MV) = (Company's Book Value) / (Company's Market Value)

The low level of BV/MV ratio of a share indicates that the market value of the company has increased compared to the balance sheet value and therefore the stock value is overestimated and the expectation that the stock price will decrease. On the contrary, the high share of the stock BV/MV ratio shows that the market value of the company is low compared to the balance sheet value and therefore traded at a price lower than the value of the stock and expects the price of the stock to rise (Kara, 2005: 57).

# 5. Empirical Application

In this part, first descriptive statistics and then pre-tests are conducted to correct observe characteristics of the data and correct if necessary.

## 5.1. Descriptive Statistics

Typical values that reflect certain characteristics of the data, such as the central tendency and the distribution of the variable, which provide easy information about the data, are called descriptive statistics. Some of the statistics frequently used in descriptive statistics are mean, standard deviation, minimum, and maximum.

Excess market return has the highest mean value and excess stock return, HML have negative means. Likewise, excess market return has the highest volatility and SMB has the lowest one.

**Table 1:**Descriptive Statistics

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Mean** | **Standard Dev.** | **Min** | **Max.** |
| **Excess stock return** | -0,006 | 0,0294 | -0,1986 | 0,2003 |
| **Excess market return** | 0,0115 | 0,0854 | -0,8633 | 0,1700 |
| **SMB** | 0,00055 | 0,01546 | -0,0651 | 0,08280 |
| **HML** | -0,0010 | 0,01781 | -0,0934 | 0,08658 |
| **UMD** | 0,00385 | 0,02195 | -0,1033 | 0,14993 |

## 5.2. Pre-Tests

#### 5.2.1. Unit Root

Time series analysis is important because it develops models that predict future variables. Time series data is usually compiled and collected in daily, weekly, monthly, quarterly, yearly and longer term intervals (Chatfield, 2016).

It is important to make sure that the time series is stationary in an empirical study. In the time series analysis, in the presence of the non-stationarity, the results of the regression would be unrealistic and the use of non-stationary series causes a spurious relationship between the variables in the regression.

Even if there is no significant relationship between the variables, it seems as if there is a statistically significant relationship. Therefore, when working with time series, it is necessary to first check the stationarity of the series (Gujarati, 2009).

If the mean, variance and covariance of a time series remain constant over time, it is said that the series is stationary. The difference between two successive values in a stationary time series is not due to time itself, but only to the time interval. Therefore, the mean of the series does not change over time (Hadri, 2000).

The most valid method used to determine whether a variable is stationary or the degree of stationarity is the unit root test. The unit root concept and unit root tests in macro-economic and financial time series are of great importance in terms of applied and theoretical researches (Cilyavuz, 2015).

There are many tests to determine the existence of the unit root and this number is increasing every day. As I have panel data structure, panel data unit root test is applied. One of the widely used unit root test in panel data is the one developed by Im, Pesaran, and Shin. In this test, the establishment of hypotheses and calculation of test statistics are based on Augmented Dickey Fuller (ADF) unit root tests. In the Im, Pesaran and Shin (IPS) (2003) test, the coefficient is allowed to be heterogeneous. In the IPS test, a unit root test is applied to the time series for each unit without combining the data and IPS test statistics are obtained by taking the average of the statistics obtained (Im, Pesaran, Shin, 2003: 53).

The null hypothesis is that series contains the unit root indicating non-stationary and the alternative hypothesis is that the unit does not contain the unit root indicating stationarity. Below all IPS unit root test results are provided. Unit root test are separately conducted for CAPM, six different Fama French portfolios, and Carhart’s momentum model.

Results indicates that none of the variables have non-stationarity. Therefore, all the variable can be included into the regression without taking first difference which is the prominent method to detrend the variable.

**Table 2:** IPS Unit Root Test for CAPM

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **p-value** | **t-bar** | **1%** | **5%** | **10%** |
| **Excess stock return** | 0.0000 | -8.1223 | -1.810 | -1.730 | -1.680 |
| **Excess market return** | 0.0000 | -7.3287 | -1.810 | -1.730 | -1.680 |

**Table 3:** IPS Unit Root Test for SL

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **p-value** | **t-bar** | **1%** | **5%** | **10%** |
| **Excess stock return** | 0.0000 | -8.5176 | -2.420 | -2.160 | -2.020 |
| **Excess market return** | 0.0000 | -7.3976 |  |  |  |
| **SMB** | 0.0000 | -8.4576 |  |  |  |
| **HML** | 0.0000 | -7.7814 |  |  |  |
| **UMD** | 0.0000 | -7.3132 |  |  |  |

**Table 4:** IPS Unit Root Test for SM

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **p-value** | **t-bar** | **1%** | **5%** | **10%** |
| **Excess stock return** | 0.0000 | -7.3392 | -2.280 | -2.060 | -1.940 |
| **Excess market return** | 0.0000 | -8.0329 |  |  |  |
| **SMB** | 0.0000 | -7.2117 |  |  |  |
| **HML** | 0.0000 | -7.9867 |  |  |  |
| **UMD** | 0.0000 | -7.2117 |  |  |  |

**Table 5:** IPS Unit Root Test for SM

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **p-value** | **t-bar** | **1%** | **5%** | **10%** |
| **Excess stock return** | 0.0000 | -8.2804 | -2.420 | -2.160 | -2.020 |
| **Excess market return** | 0.0000 | -7.4888 |  |  |  |
| **SMB** | 0.0000 | -8.4682 |  |  |  |
| **HML** | 0.0000 | -6.9123 |  |  |  |
| **UMD** | 0.0000 | -6.9870 |  |  |  |

**Table 6:** IPS Unit Root Test for BL

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **p-value** | **t-bar** | **1%** | **5%** | **10%** |
| **Excess stock return** | 0.0000 | -8.1752 | -2.420 | -2.160 | -2.020 |
| **Excess market return** | 0.0000 | -7.1805 |  |  |  |
| **SMB** | 0.0000 | -8.5275 |  |  |  |
| **HML** | 0.0000 | -6.9029 |  |  |  |
| **UMD** | 0.0000 | -7.5478 |  |  |  |

**Table 7:** IPS Unit Root Test for BH

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **p-value** | **t-bar** | **1%** | **5%** | **10%** |
| **Excess stock return** | 0.0000 | -7.5601 | -2.280 | -2.060 | -1.940 |
| **Excess market return** | 0.0000 | -7.3763 |  |  |  |
| **SMB** | 0.0000 | -8.0715 |  |  |  |
| **HML** | 0.0000 | -7.9578 |  |  |  |
| **UMD** | 0.0000 | -7.2618 |  |  |  |

#### 5.2.2. Multicollinearity

The multicollinearity is a linear relationship between two or more explanatory variables. In some cases, multiple linear regression may produce conflicting results, while the model is statistically significant, all independent variables can produce insignificant results. This means that the model is sufficiently suitable for the data but the independent variables cannot explain the dependent variable statistically. When there is a high correlation between the two variables, both of them are actually transmitting the same information. In this case, when both variables are together in the model, their effects are very high, both of them may not make a significant contribution when added to the model after the other. If both variables are subtracted from the model, the fit of the model will decrease. Thus, while the model is significant, none of the independent variables make a significant contribution even if added to the model. In this case, the independent variables are linear between them and this is called multicollinearity (Paul, 2006).

One of the widely used method in finding the multicollinearity is the VIF (Variance Inflation Factor). The diagonal elements of the inverse matrix of independent variables are called VIF. VIF is calculated to determine the degree of association of an independent variable with other independent variables. If the VIF is equal to or greater than 10, one can conclude that there is a multicollinearity problem. The other method used to identify the multicollinearity is the correlation table. In this study, correlation table is used to detect multicollinearity.

At this stage of the study, CAPM, Fama-French three factor models, and Carhart momentum model are applied to compare the estimation performances. All the stocks considered in this study are listed in BIST, established in 1986, is a public institution that uses its powers under its responsibility independently and has a legal entity under the supervision and control of the Capital Markets Board.

In the selection period of the stocks, it is paid attention to the fact that they are traded in the national market continuously in all periods and the market value and book values are fully published shares.

**Table 8:** Correlation Table for SL portfolio

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Excess market** | **SMB** | **HML** |
| **Excess market** | 1.0000 |  |  |
| **SMB** | 0.0393 | 1.0000 |  |
| **HML** | 0.1318 | 0.0318 | 1.0000 |

**Table 9:** Correlation Table for SM portfolio

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Excess market** | **SMB** | **HML** |
| **Excess market** | 1.0000 |  |  |
| **SMB** | -0.0738 | 1.0000 |  |
| **HML** | 0.0293 | -0.1653 | 1.0000 |

**Table 10:** Correlation Table for SH portfolio

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Excess market** | **SMB** | **HML** |
| **Excess market** | 1.0000 |  |  |
| **SMB** | 0.0692 | 1.0000 |  |
| **HML** | -0.1124 | -0.0691 | 1.0000 |

**Table 11:** Correlation Table for BL portfolio

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Excess market** | **SMB** | **HML** |
| **Excess market** | 1.0000 |  |  |
| **SMB** | 0.2198 | 1.0000 |  |
| **HML** | 0.0719 | -0.0741 | 1.0000 |

**Table 12:** Correlation Table for BM portfolio

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Excess market** | **SMB** | **HML** |
| **Excess market** | 1.0000 |  |  |
| **SMB** | 0.0893 | 1.0000 |  |
| **HML** | 0.0363 | 0.3749 | 1.0000 |

**Table 13:** Correlation Table for BH portfolio

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Excess market** | **SMB** | **HML** |
| **Excess market** | 1.0000 |  |  |
| **SMB** | 0.0908 | 1.0000 |  |
| **HML** | -0.0614 | 0.3749 | 1.0000 |

**Table 14:** Correlation Table for Carhart’s Model in SL

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Excess market** | **SMB** | **HML** | **UMD** |
| **Excess market** | 1.0000 |  |  |  |
| **SMB** | 0.0393 | 1.0000 |  |  |
| **HML** | 0.1318 | 0.0318 | 1.0000 |  |
| **UMD** | -0.0132 | 0.0053 | 0.0561 | 1.0000 |

**Table 15:** Correlation Table for Carhart’s Model in SM

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Excess market** | **SMB** | **HML** | **UMD** |
| **Excess market** | 1.0000 |  |  |  |
| **SMB** | -0.0738 | 1.0000 |  |  |
| **HML** | 0.0293 | -0.1653 | 1.0000 |  |
| **UMD** | 0.0340 | -0.0043 | -0.0056 | 1.0000 |

**Table 16:** Correlation Table for Carhart’s Model in SH

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Excess market** | **SMB** | **HML** | **UMD** |
| **Excess market** | 1.0000 |  |  |  |
| **SMB** | 0.0692 | 1.0000 |  |  |
| **HML** | -0.1124 | -0.0691 | 1.0000 |  |
| **UMD** | 0.0134 | -0.2017 | 0.1388 | 1.0000 |

**Table 17:** Correlation Table for Carhart’s Model in BL

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Excess market** | **SMB** | **HML** | **UMD** |
| **Excess market** | 1.0000 |  |  |  |
| **SMB** | 0.2198 | 1.0000 |  |  |
| **HML** | 0.0719 | -0.0741 | 1.0000 |  |
| **UMD** | 0.0485 | -0.0365 | 0.1229 | 1.0000 |

**Table 18:** Correlation Table for Carhart’s Model in BM

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Excess market** | **SMB** | **HML** | **UMD** |
| **Excess market** | 1.0000 |  |  |  |
| **SMB** | 0.0893 | 1.0000 |  |  |
| **HML** | 0.0363 | 0.3749 | 1.0000 |  |
| **UMD** | 0.0038 | 0.5534 | 0.6292 | 1.0000 |

**Table 19:** Correlation Table for Carhart’s Model in BH

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Excess market** | **SMB** | **HML** | **UMD** |
| **Excess market** | 1.0000 |  |  |  |
| **SMB** | 0.0908 | 1.0000 |  |  |
| **HML** | -0.0614 | 0.3749 | 1.0000 |  |
| **UMD** | -0.0266 | 0.5534 | 0.6292 | 1.0000 |

# 6. Results and Discussions

## 6.1. CAPM Model Result

By using panel data technique, CAPM results are obtained and presented below. This result suggests that there is a positive relationship between excess stock return and excess market return. Estimated beta coefficient is found to be 0.0085 indicating that the volatility of the individual stock returns are less volatile than that of market return. However, the estimated slope coefficient is not statistically significant at conventional level. Moreover, R2 is quite low.1

**Table 20:** Regression Result for CAPM

|  |  |
| --- | --- |
|  |  |
| Variables | Excess stock return |
|  |  |
| Excess market ret. | 0.00847 |
|  | (0.0235) |
| Constant | 640.7\*\*\* |
|  | (19.94) |
|  |  |
| R-squared | 0.0001 |

Note: Dependent variable is excess stock returns for all stock. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

## 6.2. Fama French Three Factor Model

In this part, Fama French three factor model is estimated separately for each portfolio. First result, based on the SL portfolio, reveals that excess stock returns of SL portfolio and excess market returns shows positive and insignificant association. On the contrary, SMB indicates negative correlation with the excess stock return and again the estimated coefficient of SMB is not significant.

The only statistically significant variable is HML and it exerts negative relationship with the excess stock returns. Accordingly, 1-unit increase in HML causes 0.16 unit decrease in excess stock returns.

**Table 21:** Regression Result for SL Portfolio of French Fama

|  |  |
| --- | --- |
|  |  |
| Variables | SL |
|  |  |
| Excess market ret. | 0.00765 |
|  | (0.00988) |
| SMB | -0.0411 |
|  | (0.0523) |
| HML | -0.161\*\* |
|  | (0.0649) |
| Constant | 139.1\*\*\* |
|  | (13.65) |
|  |  |
| Adjusted R-squared | 0.0233 |

Note: Dependent variable is excess stock return for SL portfolio. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

The estimation result for SM portfolio is different than that of SL portfolio. The sign of the estimated coefficient of excess market return and excess stock returns is negative and insignificant. However, both SMB and HML have positive estimated coefficient but only SMB has statistically significant coefficient.

**Table 22:** Regression Result for SM Portfolio of French Fama

|  |  |
| --- | --- |
|  |  |
| Variables | SM |
|  |  |
| Excess market ret. | -0.00443 |
|  | (0.0124) |
| SMB | 0.263\*\*\* |
|  | (0.0547) |
| HML | 0.0255 |
|  | (0.0673) |
| Constant | 112.4\*\*\* |
|  | (19.34) |
|  |  |
| Adjusted R-squared | 0.06 |

Note: Dependent variable is excess stock return for SM portfolio. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Regression result for SH portfolio shows that the estimated coefficient of HML is statistically significant and positive. Nevertheless, excess market returns and SMB do not have significant coefficients.

**Table 23:** Regression Result for SH Portfolio of French Fama

|  |  |
| --- | --- |
|  |  |
| Variables | SH |
|  |  |
| Excess market ret. | 0.00241 |
|  | (0.00775) |
| SMB | 0.0356 |
|  | (0.0343) |
| HML | 0.185\*\*\* |
|  | (0.0416) |
| Constant | 35.23\*\*\* |
|  | (12.27) |
|  |  |
| Adjusted R-squared | 0.1046 |

Note: Dependent variable is excess stock return for SH portfolio. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

The regression result for BL portfolio is quite similar to SH portfolio in that only estimated coefficient of HML is statistically significant and positive indicating that 1 unit increase in HML leads to increase 0.111 unit in excess return in BL portfolios.

**Table 24:** Regression Result for BL Portfolio of French Fama

|  |  |
| --- | --- |
|  |  |
| Variables | BL |
|  |  |
| Excess market ret. | 0.00699 |
|  | (0.00796) |
| SMB | 0.00103 |
|  | (0.0446) |
| HML | 0.111\*\* |
|  | (0.0518) |
| Constant | 53.89\*\*\* |
|  | (11.41) |
|  |  |
| Adjusted R-squared | 0.03 |

Note: Dependent variable is excess stock return for BL portfolio. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Regression result for BM is different from the rest of the portfolio results in that none of the estimated coefficient in BM portfolio is statistically significant. Besides all the estimated coefficients are positive meaning that all independent variables and excess stock returns moves in the same direction.

**Table 25:** Regression Result for BM Portfolio of French Fama

|  |  |
| --- | --- |
|  |  |
| Variables | BM |
|  |  |
| Excess market ret. | 0.00102 |
|  | (0.0128) |
| SMB | 0.0169 |
|  | (0.0727) |
| HML | 0.0530 |
|  | (0.0889) |
| Constant | 147.2\*\*\* |
|  | (22.58) |
|  |  |
| Adjusted R-squared | 0.0006 |

Note: Dependent variable is excess stock return for BM portfolio. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

The result for BH portfolio indicates that both SMB and HML are statistically significant. The magnitude of the HML is quite high showing that 1 unit increase in HML leads to 0.455-unit increase in BH. The estimated coefficient of SMB is negative and as in all other regressions, estimated coefficient of excess market returns is not statistically significant.

**Table 26:** Regression Result for BH Portfolio of French Fama

|  |  |
| --- | --- |
|  |  |
| Variables | BH |
|  |  |
| Excess market ret. | 0.0104 |
|  | (0.0104) |
| SMB | -0.107\* |
|  | (0.0593) |
| HML | 0.455\*\*\* |
|  | (0.0724) |
| Constant | 79.51\*\*\* |
|  | (18.71) |
|  |  |
| Adjusted R-squared | 0.1014 |

Note: Dependent variable is excess stock return for BH portfolio. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

All these results indicate that except for the SL and BH portfolios, the estimated coefficient of SMB positive and, on the contrary, except for the SL portfolio the estimated coefficient of HML are positive.

## 6.3. Carhart’s Model

As is introduced, Carhart’s model basically extends Fama-French’s model to include momentum effect. Following the work ofCarhart on investment funds in 1997, the annual returns of the related stocks are calculated. Based on the stock returns, they are ranked from high to low. After this ranking, ten best-weighted portfolios are created from the best to the worst. These portfolio groups are the base portfolios of the following year. Monthly returns of these base portfolios are calculated. For each year, the monthly returns of the portfolios are calculated by taking the base portfolios of the previous year and the related year returns. As a result of these studies, the regression model is applied with four factor evaluation model. By calculating the alpha values ​​of these funds with the 4-factor asset price model, the contribution of fund managers to fund performance is tried to be calculated.

The regression result for SL portfolio shows that momentum factor captured by UMD is positive meaning that in the presence of momentum excess stock returns are positively affected from it.

Shortly, the BM and BL portfolio are the only portfolios which have statistically significant coefficients. All the estimated coefficients of all portfolios are positive except for SM portfolio meaning that momentum factor is positively related with the excess stock returns.

**Table 27:** Regression Result for SL Portfolio of Carhart Model

|  |  |
| --- | --- |
|  |  |
| Variables | SL |
|  |  |
| Excess market ret. | 0.00785 |
|  | (0.00987) |
| SMB | -0.0419 |
|  | (0.0522) |
| HML | -0.168\*\* |
|  | (0.0650) |
| UMD | 0.0820 |
|  | (0.0643) |
| Constant | 129.4\*\*\* |
|  | (15.60) |
| Adjusted R-squared | 0.0267 |

Note: Dependent variable is excess stock return for SL portfolio. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 28:** Regression Result for SM Portfolio of Carhart Model

|  |  |
| --- | --- |
|  |  |
| Variables | SM |
|  |  |
| Excess market ret. | -0.00432 |
|  | (0.0124) |
| SMB | 0.263\*\*\* |
|  | (0.0548) |
| HML | 0.0263 |
|  | (0.0675) |
| UMD | -0.0148 |
|  | (0.0554) |
| Constant | 114.9\*\*\* |
|  | (21.41) |
| Adjusted R-squared | 0.06 |

Note: Dependent variable is excess stock return for SM portfolio. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 29:** Regression Result for SH Portfolio of Carhart Model

|  |  |
| --- | --- |
|  |  |
| Variables | SH |
|  |  |
| Excess market ret. | 0.00183 |
|  | (0.00769) |
| SMB | 0.0486 |
|  | (0.0346) |
| HML | 0.174\*\*\* |
|  | (0.0416) |
| UMD | 0.170\*\* |
|  | (0.0845) |
| Constant | 22.04 |
|  | (13.82) |
| Adjusted R-squared | 0.12 |

Note: Dependent variable is excess stock return for SH portfolio. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 30:** Regression Result for BL Portfolio of Carhart Model

|  |  |
| --- | --- |
|  |  |
| Variables | BL |
|  |  |
| Excess market ret. | 0.00548 |
|  | (0.00761) |
| SMB | 0.00577 |
|  | (0.0426) |
| HML | 0.0863\* |
|  | (0.0499) |
| UMD | 0.166\*\*\* |
|  | (0.0397) |
| Constant | 9.192 |
|  | (15.28) |
| Adjusted R-squared | 0.1220 |

Note: Dependent variable is excess stock return for BL portfolio. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 31:** Regression Result for BM Portfolio of Carhart Model

|  |  |
| --- | --- |
|  |  |
| Variables | BM |
|  |  |
| Excess market ret. | 0.00182 |
|  | (0.0124) |
| SMB | 0.0393 |
|  | (0.0710) |
| HML | 0.0288 |
|  | (0.0868) |
| UMD | 0.377\*\*\* |
|  | (0.0846) |
| Constant | 77.28\*\*\* |
|  | (27.02) |
| Adjusted R-squared | 0.0137 |

Note: Dependent variable is excess stock return for BM portfolio. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 32:** Regression Result for BH Portfolio of Carhart Model

|  |  |
| --- | --- |
|  |  |
| Variables | BH |
|  |  |
| Excess market ret. | 0.0105 |
|  | (0.0104) |
| SMB | -0.101\* |
|  | (0.0593) |
| HML | 0.449\*\*\* |
|  | (0.0725) |
| UMD | 0.0982 |
|  | (0.0706) |
| Constant | 61.31\*\*\* |
|  | (22.81) |
| Adjusted R-squared | 0.1060 |

Note: Dependent variable is excess stock return for BH portfolio. Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

Empirical results indicate that adjusted R2 of Fama French model have a higher value than that of CAPM model. On the other hand, the adjusted R2 of the Carhart’s momentum model is higher than those of other two models, namely Capm and Fama French three factor model.

It amounts to conclude that Fama French model is overall better in predicting variation in excess return over Rf than CAPM over the time horizon examined. Moreover, adjusted R2 of the Carhart’s model indicates that Carhart’s model is best in predicting variation in excess return among the model examined.

This study verifies the findings of Chui and Wei (1998), and Fama and French (1992 and 1993) in that CAPM is not able to predict stock returns especially when focusing on a region and/or a time period. CAPM’s inability to produce significant abnormal returns is confirmed by Kim (1995).

The supremacy of Fama French three factor model to the CAPM is confirmed by Gaunt (2004) who examine the Australian market and indicate that Fama French’s model outperforms the CAPM.

Additionally, the fact that bigger firms earn on average higher returns than smaller firms in Fama French model is in line with the result of Aguenaou, Abrache and El Kadiri (2011).

However, our results contradict with the study of Loughran (1997) in which he discovers that book-to-market has no explanatory power in the higher size.

# 7. Conclusion

## 7.1. Summary

In this study, it is aimed to compare the performance of the stock returns prediction models. To do that first literature review is provided to theoretically discuss the model used in the study. Then, detailed methodology and data description are given.

After these steps, empirical analysis is conducted. The models used in the study are CAPM, Fama-French three factor model, and finally Carhart’s four factor model. This study conducted for the stocks listed in Borsa Istanbul over 2012-2018 indicates that Carhart’s four factor model performs better than Fama French three factor model and CAPM.

## 7.2. Evaluation of Results

The capital market, which is continuing its development, is an alternative for the savings holders to use their savings efficiently. Thus, the capital market is an important source for long-term funds and fixed asset investment for the firms traded on the stock exchange. Due to this feature, determining the factors that can guide the capital market can be important for investors. Therefore, the aim of this study is to determine whether the Fama and French PPF models are valid in Borsa Istanbul.

According to the findings obtained from panel data analysis, Fama and French FFF model applied for the period of 2012:01-2016:12 was determined to be valid in Borsa Istanbul.

Fama and French (1993) state that the returns of the market value of the portfolio consisting of small firms is higher than the returns of the market value of the portfolio of large firms. According to the findings, the fact that the SMB risk factor has a negative coefficient indicates that small firms have high returns. However, findings, in this study, presents that estimated coefficients of SMB are by and large positive which contradicts to the findings of Fama and French.

On the other hand, Fama and French (1993) state that there is a positive relationship between D/P ratio and stock returns. They are consistent with their findings when the coefficient of HML risk factor is positive. Our findings suggest that firms with high D/P value tend to have higher returns.

The fact that the change in stock returns in Borsa Istanbul is not partially accounted for the Fama French three factor model is an evidence that the non-systematic risk arising from the factors such as management, operating leverage, financial leverage and industry risk is high. Turkey has not high volume and deep capital markets as much as the developed countries. Turkey is more vulnerable to the macroeconomic instability than the developed economies and this triggers the financial crisis by increasing the riskiness of non-systematic risk level. Especially in times of crisis, the high level of financial activity and financial leverage and corporate governance problems are added to the height of non-systematic risk for Turkish capital markets.

## 7.3. Recommendations

Despite the fact that CAPM is quick and empirically easy-to-apply and provide a beneficial intuition about the stock returns, other models, namely Fama-French three factor and Carhart’s four factor models, overweigh the CAPM.

As this study shows, Carhart’s model performs better than other two models examined in this research. Thus, it makes sense to employ only Carhart’s four factor model to predict stock returns.

This study can apply other markets which has higher transaction volumes as well as large number of stocks listed.

However, it is recommended that researchers to be delicate when using these models in times of economic crisis since it is highly likely that these models may not work well under shocks. This is partly because of the uncertainty as well as huge excess returns which make these models unreliable.

## 7.4. Future work

In the studies to be carried out in the following periods, Fama and French FIF should take into account the risk factors such as momentum, liquidity and accrual from other return anomalies which are not included in this study. and the integration of developed countries with developed and developing countries. It is considered that different findings may be beneficial to our capital markets.

The possible future research area can try to tackle the question of how an economic crisis affects the stock market and how the current financial theories accounts for. Moreover, researchers can focus on the anomalies not yet fully researched.

One of the possible future avenue may be to include liquidity factor and taking advantage of different econometric methods to deal with it. As it is highly acknowledged that liquidity is one of the most important risk factor in the financial market especially after 2008 financial crisis.

## 7.5. Personal Development Plan

My personal development plan consists of three stages: Short-term, medium term, and long-term.

In the short term, I plan to improve my understanding the empirical models and their theoretical backgrounds. In order to do that all continue to read relevant studies and try to mimic their empirical applications.

In the medium term, I plan to assess where exactly I am. To be more specific, I assess my endowment whether I am able to conduct robust individual empirical analysis and extend recent models to propose a better empirical model. Therefore, What are your strengths? What do you need help doing? What can be the things that drive you away from your target? What kind of feedback do you receive from your surroundings to help you achieve your goals? are the questions needed to be tackled in the medium term.

In the long term, I plan to publish a peer-reviewed paper in a decent journal by proposing better empirical model in which stock returns are predicted better both in an empirical and theoretical ways. Besides, to help myself with self evaluation of my strong and weak points and build upon the ability to sustain continuous growth and keep growing.

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**Appendix**

**Table 33:** List of Companies

|  |
| --- |
| GARAN.IS |
| AKBNK.IS |
| TCELL.IS |
| EREGL.IS |
| AEFES.IS |
| CCOLA.IS |
| KRDMD.IS |
| VESTL.IS |
| AKSA.IS |
| CIMSA.IS |
| BRSAN.IS |
| ECZYT.IS |
| GUBRF.IS |
| KONYA.IS |
| ANACM.IS |
| ISGYO.IS |
| NETAS.IS |
| CLEBI.IS |
| ZOREN.IS |
| KARTN.IS |
| AFYON.IS |
| KARSN.IS |
| TATGD.IS |
| ALKIM.IS |
| PRKME.IS |
| VKGYO.IS |
| ALGYO.IS |
| GOLTS.IS |
| BAGFS.IS |
| ERBOS.IS |
| GOODY.IS |

# Proposal

**1. Background**

One of the most important problems of capital markets is to estimate the relationship between return and risk. Estimation of stock returns, portfolio management, budgeting and performance appraisal is quite important for institutional investors and individual investors as well. Models developed to explain the relationship between expected return and risk are gathered in two groups as single index models and multiple index models (multi-index or multi-factor model). The financial asset pricing model (Capital asset pricing model) developed as a single index model aims to make satisfactory estimates of how to measure risk by establishing a relationship between expected return and risk (Cuthbertson, 1996). However, this model is very weak in practice due to the many simplifying assumptions it based on. The most important criticism of the model is that it tries to explain the expected return based on a single risk factor and therefore it is inadequate. Thus, multiple index models have been developed with the addition of other risk factors. At this point, two major theoretical approaches have been developed in order to rationally price financial assets in a market. Arbitrage pricing theory (APT), which is based on arbitrage elements, and intertemporal CAPM-ICAPM model based on international equilibrium elements (Campbell, Lo, MacKinley, 1997). The three-factor model developed by Fama and French is also a multi-index model commonly used in recent years. In practice, CAPM is recommended for the return of a single stock, while the three-factor Fama-French (FF) model is recommended when it comes to estimating portfolio turnover.

The striking debate is the market efficiency theory developed by Fama (1970). It explains that stock prices incorporate all available information and investors cannot develop trading rules that create systematic profits above transaction cost. Evidence appeared to support the concept of market efficiency until the-mid 1970s. However, some researchers question the empirical validity of stock market efficiency. Consequently, stock return prediction cannot be separately handle with the market efficiency.

Together with this, advocates of market efficiency have discussed that alternative investment strategies challenging the market efficiency are not satisfied with these alternative models in that even if an investment strategy could generate abnormal return, other investors would exploit any inefficiency rapidly and their arbitrage transactions quickly proved to be inefficient.

The momentum effect is one of several stock market anomalies that have contradicted market efficiency as pointed out by Jegadeesh and Titman (1993). Accordingly, a strategy that buys the best performing stocks over the previous medium period (3 to 12 months) and short sell the worst performing stocks over the past medium-term horizon (3 to 12 months) can generate abnormal profits of around 1% per month.

However, supporters of the efficient market have criticised the findings of momentum profit, stating that the methodology employed for the studies are based on incorrect specifications or the amendment of data.

**2. Motivation**

Stock returns have always been at the core in finance since the existence of the stock market. Being able to explain the stock returns may likely to provide a prediction power about the future perfomance of the stock return

In the last decades, asset pricing models have turned out to be a one of the beneficial tool to examine the stock return.

In this study, it is aimed toexamine the model by which stock returns are predicted. Prediction of the stock return is of considerable importance in that investor adjust their position to this prediction. There is no unique model proposed by researcher which accounts for the stock return in a perfect way. Some of the prominent models, therefore, analyze and advantages and disadvantages are presented to provide a clear picture about financial model.

Stock return heavily depends on the market characteristic. Because if the market is efficient, then it is theoretically not likely to generate abnormal return however it is not the case if there is momentum effect. In the presence of momentum effect, investors find a strategy to exploit abnormal returns due to the market inefficiency.

To this end, CAPM, Fama&French Three Factor Model, and Momentum Strategy are investigated. It is believed that this study sheds light on the unambiguity about when and how to use financial models in predicting stock returns.

**3. Research Questions**

* What are the advantages and disadvantages of the models in explaining the stock returns?
* Which of the model is the most useful?
* How do these model perform in the presence of anomalies?
* Does the momentum effect exist?
* Can the momentum strategy explain by adjusting the Fama and French three-factor model.

**4. Research Objectives**

The research objectives of this study are:

* To introduce widely used asset return prediction model in a single framework
* To compare their pros and cons
* To empirically observe momentum effect by which the presence of market efficiency is tested.

**5. Methodology**

In this study, it is aimed to examine the CAPM, Fama French Three Factor model, and Momentum strategy via Carhart model to discuss which model fits best to the market conditions. These return prediction model and the presence of momentum effect are empirically tested in Borsa Istanbul (BIST) over 2012-2016.

1. Technical analysis is used to assess securities for predicting their future pattern by simply analyzing stock movement statistics. [↑](#footnote-ref-1)
2. Fundamental analysis is a tool to assess a security to get information about its intrinsic values. To do that, analyst examines the economic, financial, political, and other variables. [↑](#footnote-ref-2)
3. The BIST 100 Index is used as the base index for the ISE Stock Market. The stock exchange was established to measure the joint performance of 100 shares, which are traded in Istanbul markets and have the highest market value and transaction volume. [↑](#footnote-ref-3)