THE NEGLECTED STOCK EFFECT IN BORSA ISTANBUL

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DECLARATION OF ORIGINALITY

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ABSTRACT

The Neglected Stock Effect in Borsa Istanbul

In this study, we tested the presence of the neglected stock effect in Borsa Istanbul from July 2005 through June 2013. While other studies on Borsa Istanbul use trade volume as the neglect measure, we employed analyst coverage as proxy. Controlling for firm size, we investigated the presence of the neglected stock effect in two steps. First, we used a t-test to see whether the means of neglected and popular stocks' returns were significantly different from each other. Next, we used the capital asset pricing model, Fama-French three factor, and Fama-French-Carhart four factor models to explain portfolio returns. Then we added a fifth factor for the neglected stock effect premium. The results show that neglected stock premium exists in Borsa Istanbul independent of size effect.

ÖZET

Borsa İstanbul’da İhmal Edilmiş Hisse Senedi Etkisi

Bu çalışmada, Borsa İstanbul’da Temmuz, 2005- Haziran, 2013 yılları arasında ihmal edilmiş hisse senedi etkisinin varlığı test edilmiştir. Borsa İstanbul üzerine yapılan diğer çalışmalar ihmal edilme ölçüsü olarak işlem hacmini kullanırken, bu çalışmada ihmal edilme ölçüsü olarak hisse senedini takip eden analist sayısı kullanılmıştır Çalışmada büyüklük etkisi kontrol altına alınarak, ihmal edilmiş hisse senedi etkisi iki aşamada incelenmiştir. İlk aşamada ihmal edilen ve popular hisselerden oluşan portföylerin getiri ortalamalarının istatistiksel olarak birbirinden farklı olup olmadığını araştırmak için t-testi uygulanmıştır. İkinci aşamada ise portföylerin getirilerini açıklamak için sermaye varlıkları fiyatlandırma modeli, Fama-French üç faktörlü ve Fama-French-Carhart dört faktörlü varlık fiyatlandırma modeli uygulanmıştır. Ardından, ihmal edilmiş hisse senedi etkisini yansıtan ilave bir beşinci faktör ekelenmiştir. Sonuçlar Borsa Istanbul’da büyüklük etkisinden bağımsız bir ihmal edilmiş hisse senedi etkisinin olduğunu göstermektedir.

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DEDICATION

This dissertation is dedicated to

my father, İsmet, to my mother, Nalan, to my lovely sister, Pınar, to my little brother, Osman, and to my fiancé, Abdullah.

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION 1
CHAPTER 2: LITERATURE REVIEW 4
2.1 The definition of efficient market concept 4
2.2 Background and development of emh 7
2.3 Evidence of inefficiencies and anomalies 11
2.4 Theoretical impossibility of emh and rise of behavioral finance 26
2.5 The neglected stock effect as an anomaly 31
2.5.1 Definition and reason 32
2.5.2 Empirical analyses on the neglected stock effect 37
2.6 Asset pricing models 45
2.6.1 Capital asset pricing model (CAPM) 46
2.6.2 Multifactor asset pricing models 48
2.6.3 Empirical tests on multifactor asset pricing models 51
CHAPTER 3: DATA AND METHODOLOGY 56
3.1 Data scope 56
3.2 Methodology 60
3.2.1 Returns to be explained 60
3.2.2 First step: t-test 64
3.2.3 Second step: asset pricing model analysis 67
CHAPTER 4: RESULTS 79
4.1 Result of t-test 79
4.2 Results of asset pricing model 80
4.2.1 Summary statistics 80
4.2.2 Results of the regression analysis 87
CHAPTER 5: CONCLUSION 99
REFERENCES 102

LIST OF TABLES

Table 1. Number of Stocks with and without Analyst Coverage Information........... 57

Table 2. Monthly Average Stock Number, Return and Market Capitalization 58

Table 3. The Summary Statistics for Analyst Coverage 59

Table 4. Correlation Table for Market Capitalization and Analyst Coverage 60

Table 5. Top Ten Stocks Frequently Identified As the Most Neglected and the Most Popular For Each Size Group... 65

Table 6. The Result of Levene's Test 67

Table 7. Result of Welch's T-Test (Unpaired, Unequal Variances T-Test) 80

Table 8. Monthly Average Stock Numbers of Sixteen Cross Portfolios 81

Table 9. Monthly Average Numbers of Zero Coverage Stocks................................ 83

Table 10. Summary Statistics of Returns to Be Explained (%) 84

Table 11. Summary Statistics of Factor Returns (%).. 86

Table 12. Correlations among Factors 87

Table 13. Regression Results of Asset Pricing Models For Smallest Stock Group: (S_1AC_1, S_1AC_2, S_1AC_3, S_1AC_4) 88

Table 14. Regression Results of Asset Pricing Models For Moderately Small Stock Group: (S_2AC_1, S_2AC_2, S_2AC_3, S_2AC_4)... 91

Table 15. Regression Results of Asset Pricing Models For Moderately Big Stock Group: (S_3AC_1, S_3AC_2, S_3AC_3, S_3AC_4)... 93

Table 16. Regression Results of Asset Pricing Models for Biggest Stock Group: (S_4AC_1, S_4AC_2, S_4AC_3, S_4AC_4) 95

LIST OF ABBREVIATIONS

BH: portfolio consisting of stocks with big size and high B/M ratio

BL: portfolio consisting of stocks with big size and low B/M ratio

BLs: portfolio consisting of stocks which are big according to size and loser according to 6-month momentum

BM: portfolio consisting of stocks with big size and medium B/M ratio

BMd: portfolio consisting of stocks which are big according to size and medium according to 6-month momentum

BMdm: portfolio consisting of stocks which are big according to size and medium according to analyst coverage

BN: portfolio consisting of stocks which are big according to size and neglected according to analyst coverage

BP: portfolio consisting of stocks which are big according to size and popular according to analyst coverage

BW: portfolio consisting of stocks which are big according to size and winner according to 6-month momentum

CAPM: Capital Asset Pricing Model

EMH: Efficient Market Hypothesis

S_1AC_1: Portfolio which consists of stocks with smallest and most neglected stocks.

S_1AC_2: Portfolio which consists of smallest and moderately neglected stocks.

S_1AC_3: Portfolio which consists of smallest and moderately popular stocks.

S_1AC_4: Portfolio which consists of smallest and most popular stocks.

S_2AC_1: Portfolio which consists of moderately small and most neglected stocks.

S_2AC_2: Portfolio which consists of moderately small and moderately neglected stocks.

S_2AC_3: Portfolio which consists of moderately small and moderately popular stocks.

S_2AC_4: Portfolio which consists of moderately small and most popular stocks.

S_3AC_1: Portfolio which consists of moderately big and most neglected stocks.

S_3AC_2: Portfolio which consists of moderately big and moderately neglected stocks.

S_3AC_3: Portfolio which consists of moderately big and moderately popular stocks.

S_3AC_4: Portfolio which consists of moderately big and most popular stocks.

S_4AC_1: Portfolio which consists of biggest and most neglected stocks.

S_4AC_2: Portfolio which consists of biggest and moderately neglected stocks.

S_4AC_3: Portfolio which consists of biggest and moderately popular stocks.

S_4AC_4: Portfolio which consists of biggest and most popular stocks.

SH: portfolio consisting of stocks with small size and high B/M ratio

SL: portfolio consisting of stocks with small size and low B/M ratio

SLs: portfolio consisting of stocks which are small according to size and loser according to 6-month momentum

SM: portfolio consisting of stocks with small size and medium B/M ratio

SMd: portfolio consisting of stocks which are which are small according to size and medium according to 6-month momentum

SMdm: portfolio consisting of stocks which are small according to size and medium according to analyst coverage

SN: portfolio consisting of stocks which are small according to size and neglected according to analyst coverage

SP: portfolio consisting of stocks which are small according to size and popular according to analyst coverage

SW: portfolio consisting of stocks which are small according to size and winner according to 6-month momentum

CHAPTER 1

INTRODUCTION

One of the important questions that the finance literature focuses on is why returns of the stocks differ from one another. Research shows that risk and return are strongly related, in other words, higher level of risk brings higher return. However, the source of this risk remains to be discussed. Capital asset pricing model (CAPM hereby), which is offered by Sharpe (1964) and Treynor (1961) and is one of the most celebrated models that presents risk and return relationship, explains the differences in stock returns with market risk. Therefore, according to CAPM, market risk adjusted returns of all stocks should be equal. However, empirical studies conducted in several markets during 1980s report excessive returns which cannot be explained by market risk and called as anomalies. The reported anomalies are either time specific such as Monday effect and January effect, or firm specific such as size effect, value effect, momentum effect, overreaction effect, and neglect effect.

In this study, we test the existence of the neglected stock effect in Borsa Istanbul. Research shows that some stocks are neglected in the market because they are considered as speculative and risky (Arbel, Carvell, & Strebel, 1983). These stocks are followed less by news agencies, financial analysts, and institutional investors (Bhardwaj & Brooks, 1992b). However, the neglected stocks may have a superior performance than the popular ones and bring higher return at the end of the day, which is called the neglected stocks effect (Arbel & Strebel, 1982). Together with this, some studies reveal that neglected stocks are usually those with smaller size and the neglected stock premium may actually stem from small firm effect (Arbel & Strebel, 1982, 1983; Arbel et al., 1983; Beard & Sias, 1997). Therefore, eliminating size bias by forming size neutral portfolios becomes an indispensable part of the neglected stocks effect methodology.

In our study, we compare the performance of the neglected stocks with the popular ones in order to investigate the presence of the neglected stock effect in the Turkish equity market, Borsa Istanbul. Our study contributes to the neglected stock effect literature in four aspects. First, there are a low number of studies which test the neglected stock effect in Turkey. Besides, although they are low in number, these studies offer contradicting results. Therefore, our study will provide further insights regarding the scope of the neglected stock effect in Borsa Istanbul.

Second, similar to the most of the studies on U.S. markets, we employ analyst coverage as the neglect proxy. Studies on Borsa Istanbul generally use trade volume or number of contracts traded as the neglect measure. Although low trade volume can also be regarded as an indicator of neglect, considering neglected stock definition by Bhardwaj and Brooks (1992b), analyst coverage may be a more appropriate measure to decide which stocks are neglected in the market. Thus, our study contributes to the neglected stock literature by introducing analyst coverage as a measure of neglect for the Turkish equity market.

Third, unlike the other studies that use Turkish data, our study follows the size neutral portfolio construction methodology as offered by the literature. Although some studies on the Turkish market also control for the size effect, they do not form size neutral portfolios. Rather, they apply different methodologies. For example, in order to see the possible interaction between size and trade volume (which is used as the neglect proxy), Karan (2000) run regressions with and without size variable. On the other hand, Hepsen and Demirci (2007) report the correlation between trade volume and return and then size and return separately.

Finally, our study apply different asset pricing models in order to explain the excess return of size neutral portfolios. Starting from one factor asset pricing model, CAPM, we use the three factor model, which is offered by Fama and French (1993), and the four factor model, which is offered by Carhart (1997). Finally we add a fifth factor which is for the neglected stock effect premium in order to test for the neglect effect.

This paper is organized as follows. Chapter 2 reviews the literature on EMH, empirical anomalies and specifically neglected stock anomaly. Chapter 3 describes the data scope and methodology that we follow to test the neglected stock effect. Chapter 4 includes the empirical results of the study. Finally, Chapter 5 concludes the research by summarizing the study, discussing results and suggesting further implications.

CHAPTER 2

LITERATURE REVIEW

The neglected stock effect is one of the deviations from the maintained asset-pricing theories. Like the other anomalies, it contradicts with efficient market hypothesis (EMH hereby). In Chapter 2, we cover EMH concept and its critics in details. The chapter starts with section 2.1 which gives the definition of EMH concept. Section 2.2 mentions the background and the development of EMH. Subsequent three sections cover the criticisms towards EMH. While section 2.3 overviews empirically reported anomalies, section 2.4 summarizes theoretical oppositions towards EMH. Section 2.5 covers the literature on the neglected stock effect which is one of the reported anomalies contradicting with EMH. Finally section 2.6 overviews the asset pricing models CAPM, Fama-French three factors asset pricing model, and Fama-French-Carhart four factors asset pricing model.

2.1 The definition of efficient market concept

In economics, efficiency is one of the most significant concepts. Efficiency concept in economics is defined as a broad term which refers to “the value assigned to a situation by some measure designed to capture the amount of waste or ‘friction’ or other undesirable economic features present” (StateMaster - Encyclopedia, n.d.). For instance, according to modern portfolio theory, efficiency of a portfolio implies the highest expected return for a given level of risk. In microeconomic theory, allocative efficiency is optimal distribution of scarce resource among individuals. As for efficiency of a market, its widely known definition is made by Fama (1970) as “[a]

market in which prices always fully reflect available information is called efficient" (p. 358).

The reason that Fama's definition in 1970 is the most famous one is probably because it is simple and precise. It gives the core point of the market efficiency concept by relating market prices with the information retrieval of markets. One of the very first definitions of efficient market is also offered by Fama in 1965 as "a market where there are large numbers of rational, profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants" (Fama, 1965b, p. 56). To put it in different way, an efficient market "adjusts rapidly to new information" (Fama, Fisher, Jensen, & Roll, 1969, p. 1) and "[does not] allow investors to earn above-average returns without accepting above-average risks" (Malkiel, 2003, p. 60). Taken all together, in an efficient market, there is no place for consistent profit stemming from mispriced assets since all assets are correctly priced. Therefore, no investors can beat the market consistently.

Together with this, some offer a more realistic efficient market concept by defining efficiency with respect to some sort of information set. Jensen (1978) offers "[a] market is efficient with respect to information set θ_t if it is impossible to make economic profits by trading on the basis of information set θ_t" (p. 3). Malkiel (1992) proposes the market is efficient with respect to some information set, φ, if security prices remains unchanged although that information reaches to each and every market participant, which implies no trader can beat the market by trading based on φ. Timmermann and Granger (2004) explain efficient markets with respect to the information set, Ωt, search technologies, St, and forecasting models, Mt. They argue that a market is efficient "if it is impossible to make economic profits by trading on the basis of signals produced from a forecasting model in M_t defined over predictor variables in the information set X_t and selected using a search technology in S_t." (Timmermann & Granger, 2004, p.26).

Roberts (1967) suggests that market efficiency should be categorized as weak and strong and should be tested accordingly. Following the suggestion of Roberts, Fama (1970) categorizes the market efficiency into three levels as weak, semi-strong and strong for the first time and Fama (1991) revisit this categorization. Final version of the taxonomy is as follows:

Weak form of efficiency: In a weakly efficient market, the information contains only historical price. It is not possible to generate an excess return with the help of any technical analysis[1] since the past information is already reflected in prices and there is no hope for predicting the future price with the help of past price pattern.

Semi-Strong form of efficiency: In a semi-strongly efficient market, prices reflect the all publicly available information. Hence, it is not possible to consistently outperform the market portfolio by using a trading strategy based on public information. Apart from the technical analysis, fundamental analysis[2] does not help to beat the market.

Strong form of efficiency: In a strongly efficient market, "investors or groups have a monopolistic access to any information relevant for price formation" (Fama, 1970, p. 383), implying that information known by any participant is reflected in market prices. If a market is strongly efficient, technical and fundamental analysis

[1] Technical analysis includes using time series of past prices and returns on a stock for acquiring a certain pattern which may be helpful in the future to make profitable predictions of future prices (Brown & Jennings, 1989).

[2] Fundamental analysis includes analyzing all publicly available information (e.g. financial statements, news on media, announcement of annual earnings, stock split etc.) of a stock in order to catch helpful insights that can be used of making a profit in market (Kothari, 2001).

are useless similarly to semi-strong form. Furthermore, since prices reflect all possible information, even insider trading on private information will not be able to beat the market.

These three forms of efficiency are not independent from each other. In other words, a market should have the properties of weak and semi-strong form of efficiency in order to be strongly efficient. Similarly, semi-strongly efficient markets should be weakly efficient as well. As we see in Figure 1, Ross, Westerfield and Jaffe (2002) illustrate this capturing pattern among efficiency types.

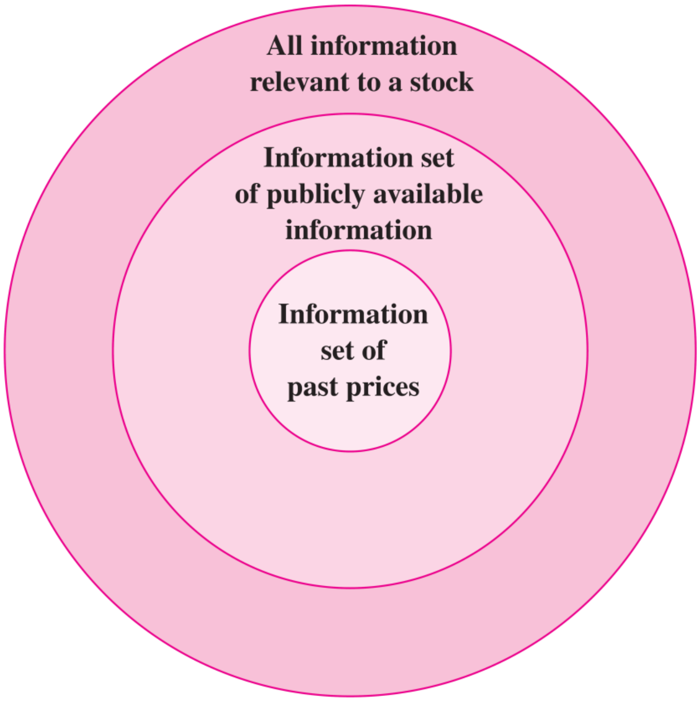

Figure 1. Relationship among three forms of market efficiency (Source: Ross et al., 2002)

2.2 Background and development of emh

As Malkiel (2003) states, EMH asserts that financial markets are efficient in terms of reflecting information about individual stocks and about market as a whole. In other words, EMH claims financial markets function as an efficient markets functions.

Although conceptualized during 1960s and 1970s by means of Fama's great contributions, basic structure of EMH comes from random walk model which dates back to nineteenth century.

The inspirer of random walk model is a Scottish botanist, Robert Brown. When he looks through the microscope, he observes particles suspended in water have an apparent random movement (Brown, 1828), today called Brownian motion. Lord Rayleigh, who is a British physicist, has core concept of random walk while studying on sound vibrations (Rayleigh, 1880). British logician and philosopher, John Venn, has an awareness of both random walk concept and Brownian motion in his study in 1888 as well (Venn, 1888).

However, there are three important works contributing crucially to development of random walk model after Brown first notices it in 1828. First, Regnault (1863) report that if you hold a security for longer period of time, you are more likely to lose or win based on its price variations. The basic argument of Regnault's work is the deviation of stock price is proportional to the square root of time. Second, Bachelier (1900) models the stochastic process of the motion that Brown (1828) catches with his microscope. Bachelier's work has been ignored at its time and rediscovered when Samuelson (1965) builds the martingale concept based on Bachelier model. After five years, Einstein (1905) also builds equations on Brownian motion similar to work of Bachelier (1900) since he was unaware of existence of Bachelier's equations. And third important work is Karl Pearson random walk hypothesis based upon mosquito infestation (Pearson, 1905). Random walk term is used for the first time by Pearson through this study in 1905.

Starting with 1930s, it is argued that security prices follow a random walk and they have an unpredictable pattern as well. Several studies report that market professionals are not able to predict future price in their forecasts; thus they cannot beat the market (Cowles, 1933, 1944; Jensen, 1968; Working, 1949).Working (1934) documents that stock prices move in a similar way the lottery numbers move. Kendall and Hill (1953) works on 22 price-series and finds that they behave randomly. Roberts (1959) reports that actual stock price moves in a very similar way with random walk model. Osborne (1959) observes prices behave in accordance with Brownian motion and obeys the square root of time rule, first reported by Regnault (1863). Later on, Osborne and Murphy (1984) report the square root of time rule is observed in earnings as well.

Efficient market concept is defined and conceptualized during 1960s and 1970s. Fama (1965a) reviews the existing literature and concludes his paper as follows: "[i]t seems safe to say that this paper has presented strong and voluminous evidence in favor of the random-walk hypothesis" (p. 98). Subsequently, Fama (1965b) defines term “efficient market” for the first time as mentioned before. Additionally Samuelson (1965) contributes crucially to concept of efficient market by focusing on martingale concept derived from Bachelier model rather than random walk. Later, he makes his model more comprehensive by including stocks paying dividends (Samuelson, 1973). Mandelbrot (1966) works on the theoretical issue of efficiency concept and indicates returns are impossible to predict and follow a martingale in a market which has rational, competitive and risk-neutral investors. Fama et al (1969) find that stock market is efficient as a result of their event study. Fama (1970) provides a comprehensive review by bringing together the theory and evidence of market efficiency in his famous paper “Efficient capital markets: A review of theory and empirical work”. Scholes (1972) observes how secondary offerings effects the price and finds that although there is evidence for a slight postevent price drift, the market seems efficient. Malkiel (1973) publishes the first edition of his book called Random Walk Down Wall Street, which is one of the most essential works that reinforces the EMH excitement.

As the section 2.3 comprehensively explains, EMH is highly criticized starting from 1980s. A lot of studies present empirical inefficiencies. However, some propose that there is no way to empirically test market efficiency in a correct sense. Thus, EMH may empirically be rejected not because the markets are inefficient but because of the methodological issues. For example, Marsh and Merton (1986) claim that variance-bound methodology cannot be used to test market rationality. Summers (1986) reports vast majority of statistical tests used to test market efficiency actually have very low power. Additionally, Fama (1998a) clearly states that most of the long-term inefficiencies seem to disappear when some reasonable changes made in the technique.

Despite of the increasing number of studies reporting inefficiencies, some of the recent studies still report the evidence of informationally efficient markets (Chan, Gup & Pan, 1997; Eun & Shim, 1989; Malkiel, 2005; Metcalf & Malkiel, 1994). More importantly, it seems that proponents of EMH admit the existence of some irrational behavior of investors and price inefficiencies. However, they think the evidence of inefficiencies does not really challenge EMH. Some of them think that it is almost impossible to exploit the reported anomalies and make profit (Bernstein, 1985; Lewellen & Shanken, 2002; Roll, 1994) while some think practitioners exploit reported anomalies in the short-run, which ensures the long-run efficiency of the market (Schwert, 2003; Timmermann & Granger, 2004; Tóth & Kertész, 2006; Wilson & Marashdeh, 2007).

Furthermore, supporters of EMH argue that EMH is still the best model that reflect how market works despite of all observed inefficiencies. Jensen (1978) defends EMH by stating “I believe there is no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Market Hypothesis” (p. 1). Also, Fama’s reviews on EMH in 1991 and 1998 give the base argument of those who support EMH due to all criticisms. Fama (1991) says although we cannot make precise inferences regarding market efficiency, it is clear that EMH literature increases our ability to understand the behavior of stock prices. Fama (1998a) concludes that what is called anomalies disappear in the long run; thus there is not enough evidence to disprove EMH. Malkiel (2003) also believes markets are efficient in the long-run and famously states that “[i]f any $100 bills are lying around the stock exchanges of the world, they will not be there for long” (p. 89). More recently, Yen and Lee (2008) and Ball (2009) argue that EMH survives up until today and seems to be here to stay longer.

2.3 Evidence of inefficiencies and anomalies

The studies with opposing results with EMH may be encountered since it has been first offered. Even Fama (1970) reports the existence of some anomalies not obeying EMH. Still, EMH dominates the academic environment during 1970s. Shiller (2003) argues that since EMH is regarded as the one of the most celebrated achievement of finance literature, studies which have opposing results with EMH are not regarded as significant evidence against the theory and overlooked during 1970s.

The first significant market inefficiency is reported by Cowles and Jones (1937). The authors report positive serial correlation between successive price changes. Cowles (1960) revisits the finding in Cowles and Jones (1937) and remarks the reported serial correlation may stem from averaging prices before computing changes. Working (1960) and Alexander (1961) also say taking average may cause some autocorrelations which does not exist in the original series to occur. However, Cowles (1960) still reports some sort of dependency even after correcting the averaging error. Another study reporting serial correlations is study of Moore (1962). Houthakker (1961) and Alexander (1961) observes leptokurtosis in the return distribution. Moreover, several studies document that prices either do not follow a rondom walk or show some important deviations from random walk (Alexander, 1964; Cootner, 1962; Granger & Morgenstern, 1963; Haugen, 1995; Kemp & Reid, 1971; Lo & MacKinlay, 1988, 1999; Osborne, 1962; Steiger, 1964). Ball and Brown (1968) find consistent excess returns after the public announcement of earning, which is probably one of the most important inefficiencies reported before 1970s. Ball (1978) subsequently confirms the existence of excess return after earning announcement. Shiller (1979, 1981), LeRoy and Porter (1981) and Roll (1984) report excess volatility in the stock market although French and Roll (1986) argues that excess volatility may stem from trading on private information. More recently, Lo and MacKinlay (1999) publish their book called "A Non-Random Walk Down Wall Street" which includes studies finding stock price are not random and there are trends in the stock market. Additionally, Lee, Lee and Lee (2010) examine thirty two developed and twenty six developing markets; and report that stock markets are not efficient.

Currently, the empirical results which seem not to be consistent with the asset-pricing behavior theories are called anomalies (Schwert, 2003). Additionally, Tversky & Kahneman (1986) argue that some deviations from EMH are "too widespread to be ignored, too systematic to be dismissed as random error, and too fundamental to be accommodated by relaxing the normative system" (p. 252). Their point implies that anomalies should be consistent deviations which are not time or sample specific. Some of the most important anomalies that are persistently observed in different markets and during different time periods are as follow:

Monday Effect (Days of Week Effect): Also called weekend effect, Monday effect is defined as the tendency of stocks to bring relatively lower returns on Mondays than other days of the week. Firstly, Cross (1973) implies that return for Monday follow a different pattern than returns on other days of the week. Later on, French (1980) clearly states that average return for other days of week positive except for Monday and average return for Monday is significantly negative. Then, it is revealed that in some markets not only Monday but also other days of week may show contradicting pattern to EMH. Several studies empirically test days of week effect for American market (Arsad & Coutts, 1997; Apolinario, Santana, Sales, & Caro, 2006; Berument, Coskun & Sahin, 2007; Gibbons & Hess, 1981; Harris, 1986; Kamara, 1997; Keim & Stambaugh, 1984; Smirlock & Starks, 1986; Wang, Li & John Erickson, 1997). Subsequently, days of week effect is measured in other developed markets than American market (Agrawal & Tandon, 1994; Baker, Rahman & Saadi, 2008; Bessembinder & Hertzel, 1993; Dubois & Louvet, 1996; Jaffe & Westerfield, 1985a; Kiymaz & Berument, 2003; Lenkkeri, Marquering & Strunkmann-Meister, 2006; Lucey, 2000) and in developing markets (Agrawal & Tandon, 1994; Balaban, 1995a; Bhattacharya, Sarkar & Mukhopadhyay, 2003; Cai, Li & Qi, 2006; Chandra, 2006; Chen, Chuck & Kwok, 2001; Choudhry, 2000; Dicle & Hassan, 2007; Hussain, Hamid, Akash & Khan, 2011; Ke, Chiang & Liao, 2007; Kenourgios, Samitas, 2008; Sutheebanjard & Premchaiswadi, 2010; Ulussever, Yumusak & Kar, 2011; Yalcin & Yucel, 2006).

To explain empirically reported Monday effect, various explanations are offered. According to Lakonishok and Levi (1982) weekend holidays cause a delay between trading and settlements in stocks and in clearing checks, which effect stock returns in a more complex way than other days of week. Hence, the authors propose that Monday return would not be an anomaly that contradicts with EMH with a proper risk adjustment. Patell and Wolfson (1982) and Penman (1987) say that firms are likely to announce bad news during the weekend, but Damodaran (1989) argues that this reasoning cannot explain the Monday effect fully. Rogalski (1984) proposes that Monday effect actually a non-trading day weekend effect and is related to January effect and size effect. Lakonishok and Maberly (1990) offer that increasing sell transaction relative to buy transaction on Mondays may explain the Monday effect. Connolly (1989, 1991) and Chang, Pinegar and Ravichandran (1993) conclude the strength of Monday effect is related with estimation and testing method. Abraham and Ikenberry (1994) argue that return in Monday tend to be negative if Friday's return is negative and vice versa. Brusa, Liu and Schulman (2000, 2005) and Mehdian and Perry (2001) find that while Monday effect exist in the portfolios of the small size stocks, a reverse Monday effect is observed in the portfolios of the medium and large size stocks. Chen and Singal (2003) argue that speculative short sales plays a role in the existence of Monday effect. However, Blau, Van Ness and Van Ness (2009) and Christophe, Ferri and Angel (2009) do not observe any relationship between short sales and Monday effect

The other reasons offered to explain days of week effect can be cited as institutional behavior (Chan, Leung & Wang, 2004; Sias and Starks, 1995), settlement effect (Coutts & Hayes, 1999), data mining (Sullivana, Timmermann &

White; 2001), market-wide news arrivals (Steeley, 2001). Additionally, Doyle and Chen (2009) argue that there is no Monday effect but a general fixed day effect.

January Effect: January effect is the hypothesis that the return on January is higher than the other months. Seasonality in stock returns is first implied by Bonin and Moses (1974) and Officer (1975). However, Rozeff and Kinney (1976) conduct the first major study that observes Januarys have larger returns. Following them, Keim (1983), Reinganum (1983), and Roll (1983) find that average return on especially small firms in January is consistently and significantly higher than rest of the year. Several studies empirically confirm the existence of January effect for American markets (Al-Khazali, 2001; Easterday, Sen, & Stephan, 2009; Haugen & Jorion, 1996; Lakonishok & Smidt, 1984, 1988; Lamoureux and Sanger, 1989; Moosa, 2007; Pearce, 1996; Peavy, 1995; Rendon & Ziemba, 2007; Tinic & West, 1984) while some studies observe either no January effect (Mehdian & Perry, 2002; Ritter & Chopra, 1989; Schultz, 1985; Sun & Tong, 2010) or a declining pattern in January effect (Gu, 2003; Szakmary & Kiefer, 2004).

Empirical test for January anomaly are conducted also for the non-American developed markets (Agrawal & Tandon, 1994; Athanassakos, 1992; Berges, McConnell & Schlarbaum, 1984; Boudreaux, 1995; Cheung & Coutts, 1999; Choudhry, 2001; Gultekin & Gultekin, 1983; Jaffe & Westerfield, 1985b; Kato & Schalheim, 1985; Raj & Thurston, 1994; Tinic, Barone-Adesi & West, 1987) and for emerging markets (Aggarwal & Rivoli, 1989; Ahsan & Sarkar, 2013; Balaban, 1995b; Balint & Gica, 2012; Chien & Chen, 2007; Fountas & Segredakis, 2002; Marrett & Worthington, 2011; Mylonakis & Tserkezos, 2008; Nassir & Mohammad, 1987; Onyuma, 2009; Tong, 1992). Recently, Cooper, McConnell and Ovtchinnikov (2006) introduces other January effect which proposes January return is precursor of returns over next eleven months. Following them, many others test other January effect as well (Easton, & Pinder, 2007; Marshall & Visaltanachoti, 2010; Stivers, Sun & Sun, 2009; Sturm, 2009).

The high correlation of size and excess return in January may imply that there is a causal relationship between these two. However; some argue that January anomaly is not specific for only small firms (Berges et al., 1984; Choudhry, 2001; Gu, 2003; D'Mello, Ferris & Hwang, 2003; Gultekin & Gultekin, 1983; He & He, 2011; Hillier & Marshall, 2002; Lakonishok and Smidt, 1984). On the other hand, a vast majority of studies on January anomaly implies that excess January return is driven by tax loss selling (Bhabra, Dhillon, & Ramirez, 1999; Branch, 1977; Chen & Singal, 2001, 2004; Constantinides, 1984; D'Mello et al., 2003; Dyl, 1977; Jones, Lee & Apenbrink, 1991; Reinganum, 1983; Rozeff, 1986; Peavy, 1995; Poterba & Weisbenner, 2001; Schultz, 1985; Sikes, 2008, 2014; Starks, Yong & Zheng, 2006; Tong, 1992; Wachtel, 1942). Ritter (1988) supports tax loss selling argument by stating that there is increase in buy/sell ratio in early January, meaning institutional trading activity is responsible for nearly half of the January effect. Ritter's argument is confirmed by several studies (Athanassakos, 1992; Athanassakos & Schnabel, 1994; Dyl & Maberly, 1992; Eakins & Sewell, 1993; Johnston & Cox, 1996; Porter, Powell & Weaver, 1996; Sias and Starks, 1997). However, some argue that tax loss selling does not explain higher return in January completely (Berges et al., 1984; Brown, Keim, Kleidon, & Marsh, 1983; Choudhry, 2001; Cox & Johnston, 1998; Easton, & Pinder, 2007; Fountas & Segredakis, 2002; Haug & Hirschey, 2006; Jones, Pearce & Wilson, 1987; Kato & Schalheim, 1985; Raj & Thurston, 1994; Tinic, Barone-Adesi & West, 1987). Roll (1983) even says that tax loss selling argument is patently absurd since it implies that investors behave quite irrationally.

Together with the tax loss selling, one of the other widely known explanation of January effect is windows dressing. First offered by Haugen and Lakonishok (1988), window dressing hypothesis claims that managers include profitable stocks at the end of year, which causes January anomaly. Although Ng and Wang (2004) support window dressing hypothesis, it is generally opposed by various studies (Lee, Porter & Weaver, 1998; Ligon, 1997; Sikes 2008, 2014). As another explanation for January anomaly, Keim (1983) and Rozeff and Kinney (1976) offer accounting-information hypothesis which explains January anomaly with the new information provided by the firms at the end of the year. However; accounting-information hypothesis is criticized by Reinganum and Gangopadhyay (1991).

In addition to the reasons mentioned above, some studies argue that January effect may be related to dividend yield (Keim, 1985, 1986), earnings information (Kang, 2010), behavioral reasons (Anderson, Gerlach & DiTraglia, 2007; Chien & Chen, 2008; Ciccone, 2011), data mining (Sullivan, Timmermann & White, 2001), value premium (Chou, Das & Uma Rao, 2011, Das & Uma Rao 2011), risk proxies (Keamer, 1994; Kim, 2006; Seyhun, 1988, 1993); liquidity premium (Griffiths & Winters, 1997; Keim, 1989), low-price phenomenon (Bhardwaj & Brooks, 1992a), and trade volume (Ligon, 1997).

Size Effect (Small Firm Effect): Banz (1981) and Reinganum (1981) finds that small sized firms have higher risk adjusted returns than larger firms on average, which is called as size effect or small firm effect currently. Since then, various studies tests the size effect in developed markets (Brown, Kleidon & Marsh, 1983; Dimson & Marsh, 1986; Friend & Lang, 1988; Gharghori, Lee & Veeraraghavan, 2009) and developing markets (Ali, Salleh, & Hassan, 2008; Chen & Chien, 2011; Chui & Wei, 1998; Herrera and Lockwood, 1994; Rhee & Wang, 1997; Wong &

Lye, 1990). However; some studies find size effect is not as strong as implied by previous literature and diminishes over time (Dimson & Marsh, 1999; Fama & French, 2008, Horowitz, Loughran & Savin, 2000a, 2000b; Knez & Ready, 1997, Van Dijk, 2011)

As mentioned in January effect part, many studies observe that January effect is realized more strikingly in the return on the small firms, and small firms' abnormal returns are found to be higher in January (Brown et al, 1983; Easterday et al, 2009; Horowitz et al., 2000a; Kato & Schalheim, 1985; Keim, 1983, 1986; Lamoureux & Sanger, 1989; Lakonishok & Smidt, 1984; Reinganum, 1983; Rogalski & Tinic, 1986; Roll, 1983) Thus, during 1980s January and size effect are examined together. Moreover, tax loss selling, which is the main reason offered to explain January effect, is assumed to explain this combined effect of January and size together (Keim, 1983). However, some studies reveal that tax-loss selling cannot fully explain the size effect and small firms seems to be bring higher return in other months as well (Berges et al., 1984; Brown et al., 1983; Keim, 1986; Reinganum, 1983; Schultz, 1985).

In addition to tax loss selling argument, it is argued that small firm effect may be driven from misestimated betas; thus, precisely estimated betas can explain size effect (Chan & Chen, 1988; Handa, Kothari, & Wasley, 1989; Roll, 1981).However; Reinganum (1982) argue that even Dimson betas cannot explain small firm anomaly. However; even if beta cannot explain size anomaly, a lot of studies agree that small firms are riskier and that is the reason why they bring higher return compared to larger firms (Barry & Brown, 1984; Berk, 1995; Chan & Chen, 1991; Chan, Chen & Hsieh, 1985; Friend & Lang, 1988). Fama and French (1993, 1996) also believe that small size implies more risk and include a size factor, SMB (Small minus Big), in their three factors asset pricing model.

Other studies explain size anomaly with transaction cost (Stoll & Whaley, 1983), liquidity risk (Amihud & Mendelson, 1986; Blume & Stambaugh, 1983; Liu, 2006), behavioral arguments (Chen & Chien, 2011), data snooping (Black, 1993; Lo & MacKinlay, 1990a), other properties of firm (Levis, 1989), low-price phenomenon (Bhardwaj & Brooks, 1992; Kross, 1985), and delisting bias (Shumway & Warther, 1999; Wang, 2000).

Price- Earning (P/E) Ratio Effect: P/E ratio and return relationship is firstly examined by Nicholson (1960). Later, Basu (1977) observe that stocks with low P/E ratio have higher risk-adjusted return compared to stocks with high P/E ratio. This phenomenon challenges the EMH and is called as P/E ratio anomaly. Basu (1978) shows inappropriate responses to information as the core reason of P/E effect. He states that market's initial reaction to earning information is exaggerated. Therefore, a corrective price movement is realized to balance the exaggeration. Several studies provide further empirical tested for P/E effect (Aggarwal, Rao & Hiraki, 1990; Brouwer, Van Der Put & Veld, 1997; Gharghori, et al., 2009; Johnson, Fiore & Zuber, 1989; Keim, 1990; Levis, 1989; Sharma, 2011; Shen, 2000; Weigand & Irons, 2007).

P/E effect and its relation with the size effect is discussed in the several studies. While some argue that seems P/E ratio effect is a proxy for size effect (Reinganum, 1981), others imply that size is proxy for P/E effect (Basu, 1983, Levis, 1989). Ball (1978) even suggests that P/E ratio catches all proxies for unrecognized factors in returns. However, there are also studies claiming that size effect and P/E ratio effect are two independent anomalies challenging EMH separately (Cook &

Rozeff, 1984; Goodman & Peavy, 1986; Keim, 1990). Besides, Kross (1985) argues that both size and P/E ratio effect are proxy for price since the premium stemming from them are only low-price issue. In addition to size effect, Fama and French (1992) assert that the observed P/E ratio is dominated by Book-to Market effect. However, Lakinishok, Shleifer and Vishny (1994) imply that conventional risk factors are unable to explain P/E effect completely. Morever, Bernard, Thomas & Wahlen (1997) report that P/E ratio effect reflects risk premium.

Another set of studies work on the use of P/E ratio for predicting future earnings. If P/E ratio can be used predict the future earnings, it means EMH does not function properly. Findings generally indicate that P/E ratio is positively related with the future earning and negatively related with the current earning (Fuller, Huberts & Levinson, 1992; Malkiel & Cragg, 1970; Ou & Penman, 1989; Penman, 1996). Wong, Chew and Sikorski (2001) even assert that P/E ratio enables investors not only to make profit but also to escape from critical crushes.

Book-to-Market (B/M) Ratio Effect (Value Effect): Book-to-Market effect corresponds that there is a positive relationship between stock return and Book-to-Market ratio which is calculated as book value divided by market value. This relationship is first realized by Stattman (1980), and later confirmed by Rosenberg, Reid and Lanstein (1985). Barber and Lyon (1997) document that B/M effect is robust cannot be tied to data snooping or selection bias.

Fama and French (1992, 1995) argue that higher B/M ratio is a sign of financial distress; thus, it is a measure for higher risk. For example, Fama and French (1992) argue higher risk which Chan and Chen (1991) observe at some of the firms is actually associated with the B/M ratio. According to Chan and Chen (1991), firms having higher leverage, lower accessibility to external financing, and less efficient production are more risky. At this point, Fama and French (1992) report that B/M ratio can capture the risk implied by these characteristics. Together with this, according to Lakonishok, Shleifer, and Vishny (1994), the reason of B/M premium is inability of market to understand convergence of earning growth. The authors put that the market expect high earning growth from stocks with low B/M ratio, and low earning growth from stocks with high B/M ratio. At the end, stocks with higher B/M ratio have higher average return than expectation to correct irrational pricing of market. Similiarly, Liu (2006) finds that the firms having weak science and technology base, high B/M ratio or larger size seem more likely to be mispriced. However, Fama and French (1995) claims that B/M anomaly is not about irrational pricing, rather, it is a proxy for financial distress and implies risk.

In addition to Fama and French (1992, 1995), Chan, Hamao and Lakonishok (1991) report that B/M ratio has explanatory power in cross-section returns. Moreover, Bernard et al. (1997) agree that value anomaly seems to reflect risk premium. Consistent with this, Fama and French (1993, 1996) eventually include HML factor (corresponding High B/M stock minus Low B/M stocks) in their three-factor asset pricing model. After contribution of Fama and French (1993, 1996), B/M ratio and its ability in explaining return are highly investigated. There are several studies that find value premium in the several markets (Asness, Moskowitz, & Pedersen, 2013; Auret & Sinclaire, 2006; Banko, Conover & Jensen, 2006; Bagella, Becchetti & Carpentieri, 2000; Barber & Lyon, 1997; Dennis, Perfect, Snow & Wiles, 1995; Garza-Gómez, 2001).

Unlike risk premium argument, some studies assert that B/M ratio is tied to leverage effect (Peterkort & Nielsen, 2005) or investment effect (Xing, 2008). On the other hand, some studies argue the different properties of B/M ratio. For example, Beaver and Ryan (1993) find that B/M ratio is highly related with current and lagged changes in the market value. Moreover, Ryan (1995) claims the reason of B/M effect is the high variance of market value and small variance of book value. Beaver and Ryan (2000) divide the sources of B/M into two as bias and lags and document that bias component is more related with the future book return on equity. Jiang and Lee (2007) offer that combination of B/M raito and dividend yields have a stronger explanation power in comparison to the value effect.

Overreaction Effect (Winner-Loser Effect): Inspired from excess volatility that Shiller (1979) observes, De Bondt and Thaler (1985) investigate the reaction of investors to dramatic events in the market level. To this end, the authors compose portfolios based upon market-adjusted cumulative abnormal returns and observe that loser portfolio beat the winner one in the subsequent three years. The results show that investors overreact to unexpected new information. De Bondt and Thaler (1985) believe that investors overreact both bad and good news, which makes past loser stock underpriced and past winner stocks overpriced. Consistent with this, Barberis, Shleifer and Vishny (1998) build a model of investor sentiment which includes investors' overreaction to good or bad news. However, Veronesi (1999) offer a model in which investors' overreact bad news in good times and underreact good news in bad times.

In their next study, De Bondt and Thaler (1987) find that winner-loser effect does not stem from well-known size or January effect but it is an independent anomaly driven by overreaction of investors. Additionally, De Bondt and Thaler (1990) observe overreaction in the expectation of security analysts who should be among most rational players of market according to EMH. Seyhun (1990) supports overreaction hypothesis by observing that U.S market crash in 1987 is highly tied to overreaction. Hong and Stein (1999), Jegadeesh (1990), and Lehmann (1990) provide further support by stating that behavior of security returns are predictable. Jegadeesh and Titman (1995) argue that most of the profit gained from contrarian portfolio strategies is related to overreaction behavior. Agosin & Huaita (2012) report that capital boom can predict future sudden stops in emerging markets, which implies overreaction. There are several studies encounter overreaction effect in various markets (Antoniou, Galariotis & Spyrou, 2005; Baytas & Cakici, 1999; Bowman & Iverson, 1998; Chiao & Hueng, 2005; Chopra, Lakonishok & Ritter, 1992; Duran & Caginalp, 2007; Goetzmann & Massa, 2002; Howe, 1986; Larson & Madura, 2002; Lobe & Rieks, 2011; Ma, Tang & Hasan, 2005; Mahani & Poteshman, 2001; Michayluk & Neuhauser, 2007; Mun, Vasconcellos & Kish, 2000; Nam, Pyun & Avard, 2001; Poterba & Summers, 1988; Spyrou, Kassimatis & Galariotis, 2007; Wang, Burton & Power, 2004; Wu, 2011).

The studies which examine why market overreacts generally offer psychological reasons. Some of these reasons are overconfidence and biased self-attribution (Daniel, Hirshleifer & Subrahmanyam, 1998), margin constraints (Aiyagari & Gertler, 1999), psychological influences (Dreman & Lufkin, 2000), and overestimation of autocorrelation in the series (Offerman & Sonnemans, 2004). Additionally, Potehsman (2001) find that investors underreact (overreact) to current daily changes with instantaneous variances which are followed by daily changes of the opposite sign. Massey and Wu (2005) conclude that overreaction is most common in stable environments with noisy signals.

Together with this, there are some studies opposing overreaction hypothesis. It is argued that profitability in the contrarian investment is not directly related with overreaction of markets (Abarbanell & Bernard, 1992) but driven by short-term autocorrelations (Lo, 1989), cross effects among securities (Lo & MacKinlay, 1990b), size effect (Zarowin, 1989, 1990), January effect (Conrad & Kaul, 1993), and tax avoidance (George & Hwang, 2007). Kim, Nelson and Startz (1991) claims that mean reverting behavior of prices is actually a pre-World War II phenomenon. Brailsford (1992) and Gaunt (2000) follow Conrad and Kaul (1993) and find no overreaction effect after employing buy and hold strategy. However, Loughran and Ritter (1996) argue that methodology of Conrad and Kaul (1993) introduces a survivor bias. Another opposition to overreaction effect comes from Fama (1998a). He discusses overreaction is as common as underreaction, in the long run overreactions and underreactions will eliminate each other which ensures that market efficiency in the long-run.

Momentum Effect: Jegadeesh and Titman (1993) observe that past winner stocks continues to be winner and past loser continues to be loser in the short-run, which is called momentum effect. Rouwenhorst (1998) supports strong evidence for momentum effect by reporting it is observed in twelve countries and although it is negatively correlated with size, it is not specific to only small sized firms. Additionally, Grinblatt, Titman and Wermers (1995) report that most of the mutual funds following momentum strategies perform significantly better than those not following, implying that momentum effect can be exploited.

Subsequently, various studies confirm the momentum effect (Amin, Coval & Seyhun, 2004; Asness et al., 2013; Caginalp, Porter & Smith, 2000; Chan, Hameed & Tong, 2000; Coval, Hirshleifer & Shumway, 2005; Fama & French, 2012; Forner & Marhuenda, 2003; Goetzmann & Massa, 2002; Van der Hart, Slagter & Dijk, 2003; Hon & Tonks, 2003; Hurn & Pavlov, 2003; Kang, Liu & Ni, 2002; Moskowitz, Ooi & Pedersen, 2012; Muga & Santamaria, 2007). However, Hameed and Kusnadi (2002) and Liu and Lee (2001) do not encounter momentum effect. Together with this, some studies imply that buying stocks from past winner industries and selling stocks of past winner industries produces a more strong and higher profit (Chen & Hong, 2002; Moskowitz & Grinblatt, 1999). Grundy and Martin (2001) offer such a stock-specific return momentum strategy brings higher profit than a total return momentum strategy.

Griffin, Ji and Martin (2003) argue that momentum effect is a source of the risk that contributes to explain the asset return. Chan, Jegadeesh and Lakonishok (1996) assert that Fama- French three factors asset price model does not cover momentum effect. Fama and French (1996) agree that three factors asset pricing falls short of explaining momentum effect. Subsequently, Carhart (1997) adds momentum as a fourth risk factor to three factors of Fama and French (1993, 1996) and creates a four-factor asset pricing model. Together with this, Wu (2002) offers that one way to catch momentum effect is the incorporation of conditioning information into an asset-pricing model.

As for reason of momentum effect, it is argued that generally psychological factors have a role in observed momentum. For example, Chan et al. (1996) argue that momentum drift is driven by gradual respond of market to the new information. Hong, Lim, and Stein (2000) add that especially bad news diffuses gradually in the market, which causes momentum effect. Together with that, Daniel and Titman (1999) argue that investors'' overconfidence generates momentum. Several studies confirm that behavioral reasons can explain the momentum effect (Chui, Titman, & Wei, 2010; Jegadeesh & Titman, 2001; Grinblatta & Han, 2005),

The other main reasons offered for the momentum effect are mispricing (Bernard et al., 1997), macroeconomic variables (Chordia & Shivakumar, 2002; Liu

& Zhang, 2008), excess covariance among stocks (Lewellen, 2002), trading cost (Lesmond, Schill & Zhou, 2004), systematic skewness (Harvey & Siddique, 2000), stochastic growth rates (Johnson, 2002), state of the market (Cooper, Gutierrez & Hameed, 2004), and small traders' behavior (Hvidkjaer, 2006). Additionally, Lee and Swaminathan (2000) documents that past trade volume fuels momentum for losers while it contributes to information diffusion for winners. Sadka (2006) document that some portion of the momentum stems from the unexpected variations in the aggregate ratio of informed traders to noise traders. Chordiaa and Shivakumar (2006) assert that price momentum can be captured by earnings momentum. Sagi and Seasholes (2007) offer that momentum is related with firm's revenues, costs, and growth options.

On the other hand, some studies investigate the interaction of momentum effect with some properties of firm and other anomalies. Asness (1997) study on the relationship between B/M ratio effect and momentum effect. He argues that marginal power of momentum strategies reduces in the high value (expensive) stocks while marginal power of value strategies reduces in the high momentum (winner) stocks. Nagel (2001) even claims that momentum effect is actually B/M ratio effect. Moreover, Avramov, Chordia, Jostova and Philipov (2007) report that momentum and credit rating is related and momentum profit is higher in low-grade firm.

2.4 Theoretical impossibility of emh and rise of behavioral finance

Together with the empirical contradiction, there are also some oppositions regarding the theoretical foundation of EMH. Grossman and Stiglitz (1980) and Grossman (1976) discuss that it is theoretically impossible for a market to be informationally efficient. According to their view, investor would need some form of incentive or premium in order to spend money and time for reaching information. However, no reward will be realized as a result of an attempt to collect information in an efficient market because all information is readily available in the market and already reflected in the price. Therefore, there is almost no reason to trade and market would collapse consequently. Beja (1977) also argues that the efficiency of a real market does not seem possible.

Moreover, Cutler, Poterba and Summers (1989) oppose defining efficient market only based on information since the authors argue that stock price movements do not reflect only information. LeRoy (1973) argues that martingale property of efficient market fails when expected return is explained with portfolio optimization of risk-averse investors. Laffont and Maskin (1990) document that in the case of an imperfect competition, EMH will fail. Zhang (1999) offer a theory that regard economies as a web of agents and measure marginal inefficiency of the markets.

Apart from these, probably one of the main criticism towards EMH is about its rational investment assumption. As Fama (1965a) and Mandelbrot (1966) clearly states, EMH is based on the assumption that investors make their trade decisions rationally and they make the best possible choice in a given circumstance to earn the highest profit. Examination of rationality assumption eventually gives a rise to behavioral finance. The idea that people may make irrational decisions occurs with the heuristic concept introduced by Tvserky and Kahneman, who are the psychologists interested in cognitive psychology. Tvserky and Kahneman (1974) conclude that when people make decisions or judgments under an uncertain environment, they use three heurstics which are availability, represenatative, and anchoring and adjustment. Later, Gilovich, Griffin and Kahneman (2002) revisit the heuristics and idendify six general heuristics as affect, availability, causality, fluency, similarity, and surprise. The authors also define six special purpose heuristics as attribution-substitution, outrage, prototype, recognition, choosing by liking, and choosing by default.

Subsequently, Kahneman and Tversky (1979) question directly the rational behavior of investor and challenge EMH. They argue that people tend to underweight outcomes having probability to occur in comparison to certain outcomes. Additionally, the authors find that people hate losing more than they love winning, which makes them risk averse. Therefore, Kahneman and Tversky (1979) developed a prospect theory in which losses and gains are treated differently. Thaler (1980) argues that prospect theory stands as one of the strongest alternative to expected utility theory. Later, Tversky and Kahneman (1992) augment prospect theory and introduce cumulative prospect theory which allows cumulative and more flexible decision weights. More recently, Barberis, Huang and Santos (2001) offer an asset pricing model which incorporates prospect theory. In addition to prospect theory, Tversky and Kahneman (1981) introduces the term framing and argue that people tend to behave based on framework in which the situation is presented. Subsequently, Tvserky and Kahneman (1986) conduct studies from simple-life events and note that people do not behave rationally in daily life decisions. Thus, people may act irrational while making investment decision as well. Moreover, the authors conclude rational investment assumption is strongly challenged by framing and prospect theory.

It can be said that together with overreaction observed by De Bondt and Thaler (1985, 1987), contribution of Kahneman and Tversky (1979) and Tversky and Kahneman (1986) lay the foundation of behavioral finance. Following them, momentum effect realized by Jegadeesh and Titman (1993) reinforce the idea that investors' reactions are not fully rational but have some psychological and social base. As we mention at section 2.3, starting with 1980s, behavioral models are increasingly offered to explain almost all anomalies but especially overreaction and momentum. Furthermore, Benartzi and Thaler (1995) offer that myopic loss aversion is the reason for equity premium puzzle. Bikhchandani, Hirshleifer and Welch (1998) argue that informational cascades and learning by observing past decisions of others may explain the market crashes.

Several studies conduct further research to understand humans' decision-making process. Plous (1993) discusses social aspects of the decision making process while Basu (1997) argues conservatism principle in investing. Several studies conclude that in the decision making process, people are overconfident (Barber & Odean, 2001; Camerer & Lovallo, 1999; Daniel et al., 1998; Daniel & Titman, 1999; Odean 1999), loss-averse (Holt & Laury, 2002; Kahneman, Knetsch & Thaler, 1990, 1991; Tversky & Kahneman, 1991), and tend to engage in heuristics (Finucane, Alhakami, Slovic, & Johnson, 2000) and herding (Grinblatt et al., 1995; Nofsinger & Sias, 1999; Wermers, 1999). Also decisions made by people is affected by disposition effect (Odean, 1998, 1999), mental accounting effect (Barberis & Huang, 2001; Thaler, 1985, 1999), endowment effect (Kahneman et al., 1990, 1991) and has a strong status-quo bias (Fernandez & Rodrik, 1991; Kahneman et al., 1991; Samuelson & Zeckhauser, 1988). Additionally, Grinblatt and Keloharju (2001) report that investors are reluctant to realize their losses, they tend to do tax-loss selling, and they are affected by past returns and prices when trading. Huberman (2001) documents that people are likely to invest in the familiar. On the other hand, Gigerenzer (1991, 1993, 1996) criticizes the studies about heuristic engagement in decision making process. His criticisms deeply argued and replied by Kahneman and Tversky (1996).

During 2000s, the number of those who oppose the rationality assumption and support behavioral aspect increases. Shefrin (2002), Shilefier (2000), and Shiller (2000) publish their book on behavioral finance and irrational parts of decision making process. Moreover, Rabin (2000) and Rabin and Thaler (2001) assert that expected utility theorem does not reflect the real behavior of the investors and thus it is dead. However, some argue that markets are not as irrational as proponents of behavioral finance claim. Rubinstein (2001) overviews studies on behavioral aspect of decision making and eventually claim that the actors of market are actually rational. Gigerenzer and Selten (2001) offer the real human behavior can be captured by assuming bounded rationality. More importantly, according to proponents of EMH even the evidence of irrational investors is not enough to challenge EMH. As Fama (1998a) implies because the probability of a random irrational sale and a random irrational purchase is the same, these individual irrational decisions would cancel out each other and price would be unchanged. However, Shleifer (2000) argues that most investors are noise traders, which mean they do not behave individually. Rather than deciding individually, they follow the market and invest as similar way the market does. For example they buy or sell the stocks that many investors buy or sell. Moreover, Ariely (2008) argues that people behave fundamentally in irrational ways in most of their decision and more importantly, these irrational decisions are not random but follow a pattern. Hence, we may not be able to observe randomness of irrational trade decisions. However Malkiel (2003) states that if the behavior of irrational investors is not random, then several arbitrage opportunities occurs in the market. Eventually rational investors will exploit these arbitrage opportunities and ensure the efficiency of the market.

In spite of explicit disagreement of supporters of EMH and behavioral finance, Lo's (2004, 2005) adaptive market hypothesis partially pacified both sides. Lo proposed that irrational behavior of investors pursue an evolution path. The investors learn to trade rationally from their mistakes. Those failing to adapt would be alienated from the market. This sort of natural selecting absorb inefficiencies in the short run and ensure market efficiency in the long unless there is some kind of shock that causes market ecology to change.

All in all, it can be asserted that both EMH and behavioral finance have valuable attempts to understand capital markets, price movements, and investors' decision-making process. Although behavioral finance arises from the criticisms towards EMH, Shiller (2003) argues that behavioral approach does not claim that markets are completely inefficient. Rather, it tries to catch the inside of the decision making process and explain inefficiencies that are proven to exist by means of numerous researches up until today.

2.5 The neglected stock effect as an anomaly

Neglected stock anomaly is one of the reported inefficiencies which challenge EMH and rational behavior assumption. In this section, we first give definition of the neglected stock effect and the possible underlying reasons offered by various studies. Later we include empirical studies which test the neglected stock effect both in international markets and in Turkey.

2.5.1 Definition and reason

Arbel and Strebel (1982) define the neglected stock effect as the phenomenon of neglected stocks having a superior performance compared to more popular ones. Bhardwaj and Brooks (1992b) state that neglected stock are "under less scrutiny by news agencies, financial analysts, and institutional investors than other firms" (p. 101). Hessel and Norman (1992) aims to explore what distinguishes neglected stocks from popular ones. The authors find that four variables – Research and Development Expenditure, current assets to total assets ratio, debt to total asset ratio, and market capitalization- are consistent predictors of proportion of outstanding shares held by financial institutions. Zhao, Cheng and Kang (2013) find that neglected stock display anti-persistence while the popular stocks uniformly display random-walk returns, suggesting there is a connection between the persistence feature of stock return series and the levels of 'neglect'. Chichernea, Ferguson, and Kassa (2015) report that neglected stocks have higher idiosyncratic risk premiums stocks.

The studies that aim to understand why some stocks get more attention while others are neglected offer various reasons. Arbel, Carvell, and Strebel (1983) argue that the strategy corporate investors develop while they create their portfolio affect popularity of stocks. According to their reasoning, corporate investors may find small and lesser-known stocks as more speculative and may think their futures are more uncertain. Therefore, they do not prefer to bear the risk these kinds of stocks have and they include stocks which they are able to reach more accurate information in their portfolios. Trigger (1960) also argue that investors find the profit offered by lesser- known stock not enough to compensate the risk of loss; thus, they do not prefer these stocks. Additionally, Edelman and Baker (1987) argue that some external constraints and self-imposed policies may prevent investors from investing in some stocks and neglect them.

Another possible reason why some stocks are preferred more can be the doubling effect of analysts' reaction. Research show that investors value analysts' view and reaction very strongly and make their decision accordingly. For example, several studies show that firm specific forecasts of analysts contribute considerably to asset pricing (Bhattacharya, 2001; Brennan, Jegadeesh & Swaminathan., 1993; Elgers et al, 2001; Givoly & Lakonishok, 1979, 1980; Gleason & Lee, 2003; Griffin, 1976; Imhoff and Lobo, 1984; Walther, 1997). Elton, Gruber and Gultekin (1981) documents that foreknowledge of analyst revisions effect value more than foreknowledge of the reported earnings themselves. Li, Mahani, and Sandhya (2011) report that investor attention causes prices to increase in the short run. Bhushan (1989) and Alford and Berger (1999) argue that stocks with more analyst coverage are traded more heavily in the market. Nichols (1989), Schipper (1991) and Lang and Lundholm, (1996) imply that reaction of analysts can be regarded as an influencing factor to investors' views and it provides insight to judgements and reactions of investors. Hepşen and Demirci (2007) discuss that legal issues and lack of time prohibits the investors from reaching information that would affect their trade decision. Eventually investors end up with trusting analyst preferences and have a strong tendency to invest in stocks followed by high number analyst. All these arguments show that investors mimic the reactions' of analysts and they tend to invest in the stocks followed by them, which doubles the reactions' of analyst in the market. In other words, when analysts do not follow some stocks because of several reasons such as lack of public information (Lang & Lundholm, 1996) or private information (Veldkamp, 2006) (Yung, Rahman & 2013), these stocks are neglected not only by analysts but also by investors. Furthermore, Arbel (1985) proposes that there is a positive correlation between popularity of a stock and consensus among analysts for that stock. He says that since higher consensus implies lower estimation risk, investors tend to invest more in stocks with higher analyst coverage.

The price co-movement of some stocks with the price of the rest of the industry could be another reason why some stocks are popular among others. Several studies indicate that stocks followed by many analysts are priced more accurately and have a higher comovement with the market (Chan & Hameed, 2006; Hameed, Morck, Shen & Yeung, 2015; Piotroski & Roulstone, 2004). Based on these empirical evidences, Hameed et al (2015) claim that since investors use firm specific information not only for relevant stock but also to trading and valuing similar stocks in the industry. Hence, they pay a closer attention to highly followed stocks of which prices are more accurate and co-move more with the market price.

Asymmetry in the reaction to positive and negative news in the media is regarded as another reason why some firms are neglected. Gaa (2009) reports that negative news about neglected stocks seems to catch greater attention than positive news. In other words, positive news does not increase analyst coverage as much as negative news decreases it. This finding is consistent with the finding that downgrades generally have a greater price impact than upgrades (Dugar & Nathan, 1996; Hirst, Koonce & Simko, 1995; Walker & Claassen, 2006).

In addition to the reason why some stocks are neglected, the reason why neglected stocks bring higher returns than other stocks is of interest as well. One explanation is information deficiency premium. Arbel et al (1983) and Arbel (1985) explain it by giving the example of risk perceived in the case of buying a tangible product: While purchasing a tangible product, customers would be willing to pay more for products which they can reach more accurate information. For example, they would not be willing to pay for a generic product as much money as they would for a product with a known brand name. In case they buy a generic product they would have to either reduce information deficiency via do-it-yourself research or bear the extra risk resulting from lack of information. Since these two options are both costly, they demand a premium. Same applies for investing. Neglect occurs when there is less professional analysis available on stocks and thus less public information (Elfakhani & Zaher, 1998). Additionally limited information and lower visibility are regarded as source of risk in investing (Arbel, 1985; Arbel et al., 1983; Barry & Brown 1986; Baker, Powell & Weaver, 1999; Merton, 1987; Edelman & Baker, 1987). Hence, as Arbel et al. (1983) and Arbel (1985) put, neglected stocks can be regarded as generic products. Investors are willing to pay more for stocks having more accurate and available information, which increases their prices. Higher prices results in lower return, eventually making neglected stocks more profitable than popular ones. Arbel et al. (1983) and Arbel (1985) also argue that abnormal returns on neglected stocks are actually a result of a missing variable or incomplete measure of risk in Capital Asset Pricing Model. Moreover, the authors argue this missing variable is responsible for not only neglect premium but other anomalies such as P/E effect, small firm effect, and January effect.

Later, some studies support generic product explanation by underlining the information asymmetry between managers and outside investors. This asymmetry sometimes comes to a point that investors may even not be aware of the existence of the some of the stocks. Therefore, the investors demand a premium in the case that they realize and decide to invest them (Easley, Hvidkjaer & O'hara 2002; Merton, 1987).

Several studies discuss how information deficiency premium can practically be reduced. While some argue that analysts' recommendations can reduce the information deficiency (Atiase, 1985), others say information deficiency does not stem from lack of public information but private information (Yung et al, 2013). Hirshleifer, Subrahmanyam and Titman (1994) propose that the exact timing of reaching the relevant information may have a greater importance than the accuracy of the information since there will be differences in the reactions between the investors informed earlier and later.

Another explanations to neglected stock premium is inefficient pricing. As an outcome of information efficiency, Arbel et al. (1983) and Arbel (1985) define price inefficiency as the premium that remains after eliminating the information deficiency premium. The authors argue that if the information deficiency premium is eliminated, then the market would correct price by increasing demand for underpriced stock. Higher demand would increase the price of underpriced stock, and eventually decrease their return. However, information deficiency prevents investors from realizing and exploiting inefficient prices. However, Bhardwaj and Brooks (1992b) propose that information deficiency premium is discounted almost fully in the price.

On the other hand, Dowen and Bauman (1987) search whether the premium stemming from small firm effect, P/E effect, and neglect effect can be explained via extra market risk; yet result show the extra market risk is not a contributing reason for these premiums.

2.5.2 Empirical analyses on the neglected stock effect

Starting from 1960s, several studies explore the empirical evidence on the neglected stock effect. Especially during 1980s and 1990s, there is a dramatic increase in the number of studies testing the neglected stock effect. The literature on the neglected stock effect is abound with the articles having contrasting results. While some studies show the existence of the neglected stock effect, other studies propose that there is no sign of such effect. According to Beard and Sias (1997), there can be two explanations for this incompatibility: First, the investors may realize the existence of the neglected stock effect by the way of previous studies and exploit it. Second, studies finding neglected stock premium may be sample specific. As the number of articles accumulates, independent presence of the neglected stock effect from other anomalies -such as small firm effect (size effect), January effect, P/E effect and price effect- is discussed. In this section, we first mention the studies from the foreign markets, namely other markets than Borsa Istanbul. Then, we overview the studies which test the neglected stock effect in Borsa Istanbul.

Among the first studies to discuss that popular stocks may be over-priced or less profitable than others are Crane (1960), Molodovsky (1961) and Thurlow (1961). However, first empirical studies on the neglected stock effect are conducted by Bauman (1964, 1965). Bauman (1964) emphasizes there are two contradicting investment strategies which are widely used. While first strategy advises to invest in well-known companies in major industries, the second strategy proposes that smaller and lesser-known companies bring higher returns. He shows this discrepancy of two investment strategies as the motivation for empirical test for the neglected stock effect. In analysis part, he uses the data of investment companies in the United States

1954 through 1961. He divides the stocks into two and names them as most popular stocks and least popular stocks based on the frequency of their appearance in the portfolios of the investment companies. As a result, he observes that least popular stocks, which are regarded as risky and thus are not frequently included in the portfolios, bring better annual return than most popular stocks. Bauman (1965) covers the data of investment companies in the United States during years between 1954 and 1963 and divides the stocks into three group. He again finds that least popular stocks beat the most popular ones.

Arbel and Strebel (1982) discuss the possible interaction between small firm effect and neglected firm effect. The authors use the companies listed in S&P 500 during the period 1972-1976. The neglect level measure is the number of analysts following securities regularly. Stocks are divided into three grouped based on their neglect level. The authors report that neglected group brings more return. In order to eliminate the possible interaction with size effect, stocks are grouped into ten based on their market value, and the analysis is repeated. The conclusion is that outperformance of neglected stocks cannot be tied to small firm effect since excess return still persists in the absence of size differences. After this study, eliminating size effect becomes an indispensable part of the methodology.

In their next study, Arbel and Strebel (1983) use all companies in S&P 500 between 1970 and 1979. The stocks are first categorized into three based on the number of analyst. The authors find that neglected stocks bring higher annual returns. Then each stock group is divided into four in terms of their size to prevent size effect. The results show that the neglected stock effect exists independently from size effect.

Arbel et al. (1983) confirm the previous findings. They analyze a random sample of 510 companies from New York Stock Exchange, the American Stock Exchange and the over-the-counter markets from 1971 to 1980. The measure for neglect is the financial institutions' holdings. Stocks are cross groped (3x3) based on size and neglect, resulting in nine portfolios. The authors conclude that neglected stocks still have higher performance while eliminating size factor.

Peterson, Peterson and Ang (1986) provide further evidence on the presence of the neglected stock effect during the years 1976 through 1981. The authors use analyst coverage as the neglect measure. According to analyst coverage, the stocks are grouped into three. This study considers the size effect like the previous studies. However, rather than creating subgroups in terms of size, regression analysis is conducted with and without size variable. Eventually, the analysis indicates that unlike analyst attention there is a weak relationship between size and abnormal return.

Li and Fleisher (2004) find the neglected stock effect in China's stock market during the period between 1998 and 2001. The authors remark that there are two types of stocks in the China market, named as A shares and B shares. While A shares are permitted to be purchased by only Chinese investors, until 2001 B shares was only was only traded by foreign investors. Findings indicate that the neglect effect is a significant contributor to lower prices and higher return on B stocks since the information asymmetry is higher for the case of B stocks.

In addition to size effect, some studies analyze the relationship between neglect effect and other anomalies like January effect, P/E effect and price effect. Firstly, Arbel (1985) observes the relationship among neglect, size, January, and P/E effect. In the study, he uses American stocks between 1978 and 1982. For neglect, institutional holding is used. As a result, he finds that all four anomalies exists due to lack of information variable in capital asset pricing model (CAPM hereby), which affects investor's perceived risk level.

Carvel and Strebel (1987) examine whether the neglected stock effect statistically distinctive from January and size effect. The authors use monthly data through 1976-1981. Similar to previous studies, they proceed by first dividing the stocks into three groups based on number of analyst, then into three sub-groups based on size. In order to exclude January effect, January returns are omitted. The result of the analysis approves the independent presence of the neglected stock effect from both January and small firm effect.

Edelman and Baker (1987) finds that when the number of institutional owners of a stock exceeds eight, the return on that stock decreases significantly. He also indicates that average P/E ratio of the portfolio increases just before and after time the number of institutional owners reaches eight, implying wider ownership increases P/E ratio while decreases return. Miller (1990) reports January effect is greatest for small stocks, low priced stocks and stocks neglected by analysts.

Dowen (1989) proposes that size and neglect may be the proxies of the analyst bias, which is defined as overestimation of analysts since they are on the sell side of the market. While neglect and size are measured with analyst coverage and market capital respectively, analyst bias is measured by the difference between analyst forecast and the actual return. As result, he finds that all of three factors- analyst bias, neglect, and size- show an unstable pattern with respect to years.

Elfakhani and Zaher (1998) explore the relationship of return with neglect, size and January effect. The study covers the companies traded in New York (NYSE) and American Stock Exchanges (AMEX) between 1986 and 1990. As neglect measure, number of analyst following the firm is used. The result of their regression analysis demonstrates that the neglected stock effect exists independently from January and size effect. Besides, the neglect effect stands more strongly for larger firms, implying that larger firms provides higher returns in case they are neglected while small firms tend to earn excess return regardless of their neglect level.

There is also indirect evidence on the neglected stock effect. Ajinkya and Gift (1985) propose that there may be a relationship between forecast of analyst, firm size and return. Downs and Guner (1999) propose a significant information premium exists in the market, which is an indicator of neglect effect. Doyle, Lundholm and Soliman (2006) report that firms with extreme earnings surprises are usually neglected firms which have high book to market ratios, low analyst coverage and high forecast dispersions.

Another interesting set of studies explore the effect of first analyst coverage on return. It is well-established that return maximization oriented investors pay for additional information as long as their expected revenue from marginal information exceeds their cost (Diamond & Verrecchia, 1981; Grossman & Stiglitz, 1980; Shleifer & Vishny, 1997). As the number of informed investors increases, prices become more informative, thus the value of the information decreases (Hirshleifer et al, 1994). Considering analyst research improves informational efficiency, we can expect that the first coverage has the highest informational marginal benefit (Kelly & Ljungqvist, 2007). Additionally, we know that an analyst tend to cover a stock if he or she believes it is undervalued (McNichols & O'Brien, 1997). Considering all these, we may expect analyst initiations result in positive price impacts and thus immediate higher returns. Consistent with this, several studies empirically report the excess return after first analysis coverage (Demiroglu & Ryngaert, 2010; Kelly & Ljungqvist, 2007).

However, some studies claim that neglect effect is dominated by other anomalies. First Dowen and Bauman (1986) report that there is no sign of independent the neglected stock effect. Their study focuses on relative significance of three anomalies: capitalization, price-to-earnings ratio and neglect. The authors use market capitalization and frequency in institutional holding for measuring capitalization and neglect respectively. Their analysis covers stocks that are traded in American and New York Stock Exchange in the period between 1968 and 1983. The results show that among the three effects, size effect is more dominant and consistent. While P/E ratio effect is independent from both size and neglect effect, neglect effect is highly dominated by size effect.

A study conducted by Bhardwaj and Brooks (1992b) proposes that price effect is a better control variable than size effect while investigating the neglect effect. The authors use the monthly data of stocks traded in New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) in year between 1977 and 1988. The neglect proxy is the number of analysts following the stock. The stocks are divided sixteen portfolios in two sets. While in the first set, the stocks are cross classified by their price and analyst coverage, in the second set, the stocks are cross classified by their size and analyst coverage. Regressions are run for both sets. In order to examine the degree of interaction between the neglected stock effect and January effect, the analysis is repeated by eliminating January data. Consequently, the authors propose that almost all of the deficit is discounted in the price and there is no the neglected stock effect resulting from an information deficiency premium. Rather, premium results from covering higher transaction costs of the generally lower priced neglected stocks.

Beard and Sias, (1997) conclude that neglect premium stems mainly from size effect. The authors carry out the neglected stock analysis with a wider sample, by including monthly data of the stocks traded in New York Stock Exchange, in American Stock Exchange and in the over-the-counter markets from 1982 to 1995. The neglect measure is analyst coverage. For neglect effect, stocks are divided into four groups. In order to control the size effect, the stocks divided into 10 groups based on their market capitalization. Results show that after eliminating size effect, the premium between popular and neglected stocks is statistically insignificant and hard to exploit.

After reviewing the studies from international markets, we cover the studies which explore the neglected stock effect in the domestic market via using data from Borsa Istanbul. Although the studies which test the neglected stock effect in Turkish market are low in number, there are contradicting results. Furthermore, following the same methodology with international studies, the size effect is eliminated in order to prevent any interactions between size and neglect effect. However, while studies from international markets use analyst coverage or number of financial institutions' holding the stock as neglect measure, studies on Borsa Istanbul use usually trade volume.

Gerçek (1999) is among the first to test the neglected stock effect in Borsa Istanbul. The author cover clearing data of ten agencies with the highest trade volume acting as intermediator in Borsa Istanbul in the years between 1996 and

1998. In the study, number of trade contracts is used as neglect proxy. Results show that the neglected stock effect exists in Borsa Istanbul and it is an independent anomaly from size and January effects.

Karan (2000) includes monthly data of stocks that are traded in Borsa Istanbul in two years between 1996 and 1998. The stocks are classified as neglected, normal, and popular based on average trade volume, which is employed as proxy for neglect. To observe any possible interaction between size effect and neglect effect, he runs three regressions: In the first regression, return is explained only by firm size. In the second regression, independent variable is only trade volume. Finally, in the third regression, both size and trade volume is used to explain return. Results show that while the second regression provides a statistically significant inverse relationship between trade volume and return; it is not the case for size and return in the first regression. Additionally, third regression implies a strong inverse relationship between trade volume and return and weak relationship between size and return. Therefore, he concludes that there is a neglected stock effect in Borsa Istanbul.

Hepşen and Demirci, (2007) cover daily data of Borsa Istanbul through 2004; yet they do not encounter any evidence of the neglected stock effect. The authors conduct their analysis in two sets: In the first set, total trade volume is the proxy for neglect. The stocks that take place in BIST 30 index are considered as popular stocks. The thirty stocks which have the least trade volume and do not take place in BIST 100 are taken as neglected ones. When the authors compare the daily return on the popular stocks with the neglected ones, they find that neglected stocks do not provide higher return. For the second set, size is the proxy for the neglect. The popular and neglected stocks are selected by using the same way as the first set except for the size is determinant factor this time. Results do not provide any evidence of a neglected stock effect, either.

Akkoç, Kayalı and Uluköy (2009) explore the independent existence of the neglected stock effect from January effect. The authors cover the monthly data of stocks trading in Borsa Istanbul in years between 1998 and 2008. Monthly trade volume is used as neglect proxy. Each month, three stock groups are constituted based on monthly trade volume. The results indicate that neglected stock group does not provide better return than popular ones. Also, to make sure that this result is not tied to January effect, analysis is repeated by omitting the January data. The result do not change when controlled for January effect, implying there is no the neglected stock effect.

2.6 Asset pricing models

It is of a great importance to have a sound model which can explain and measure the relationship between asset risk and asset return. One of the most major and oldest asset pricing model serving for this purpose is CAPM. Structured based on the assumptions of EMH, CAPM is criticized for measuring the risk with only one factor and for not catching the reported anomalies. As response to these criticisms, multifactor asset pricing models, which measure the risk with more than one risk factor, are offered. Among the multifactor asset pricing models, Fama-French three factors model and Fama-French-Carhart four factors model are two important and widely-accepted models.

2.6.1 Capital asset pricing model (CAPM)

Basically, CAPM is an equilibrium model which explains the differences in stock returns with the one factor, which is market risk. The model is developed by Sharpe (1964) and Treynor (1961); and subsequently extended and clarified with works of Lintner (1965a, 1965b), Mossin (1966), Fama (1968), and Long (1972). Morevover, Treynor (1965), Sharpe (1966), and Jensen (1968, 1969) develop portfolio evaluation models that augment the CAPM implantation and understanding.

CAPM is based on the assumptions of EMH. Morevover, CAPM "explicitly assumes that investors follow the prescriptions of Markowitz' portfolio theory" (Sharpe, 1991, p. 491). According to portfolio theory developed by Markowitz (1952, 1959), investors select a portfolio at time t-1, and expose the stochastic return on that portfolio at time t. Besides, in Markowitz model, investors are mean-variance optimizers who are assumed to seek minimizing the portfolio variance at a given return or maximizing the return at given variance. Considering all these, Black (1972) and Jensen, Black, and Scholes (1972) summarize the main assumptions of CAPM as follows:

1.) All of investors have common opinions regarding the possibility of asset values at the end of the periods. Given market clearing asset price at t-1, investors' agree on joint distribution of asset returns from t-1 to t.

2.) The common probability distribution of possible returns on available asset is joint normal.

3.) All investors are mean-variance optimizers and choose among portfolios only based upon mean and variance.

4.) There is no transaction or tax cost.

5.) There is a borrowing and lending opportunity at risk-free rate, which is the same for every investor regardless amount that is borrowed or lent.

Contributed by EMH assumptions, CAPM proposes that the differences in the return stem from the risk premiums and thus the risk adjusted returns on any asset should be equal. Although it is one of the most celebrated asset pricing model, CAPM is also widely criticized due to its non-realistic assumptions and some empirical issues occurred during its application. For example, Roll (1977) proposes that CAPM has never been tested and never will be because it is tough to reach true market portfolio of all assets, meaning it is almost impossible to find market return in the model. Besides, some empirical studies observe that real price behavior deviates significantly from CAPM predictions: According to CAPM regression, intercept should be risk-free rate and coefficient on beta should be market return minus risk-free rate. However, various CAPM studies consistently find a higher intercept than the average risk-free rate and a lower coefficient on beta than the average excess market return. (Black, Jensen & Scholes, 1972; Blume & Friend, 1973; Douglas, 1968; Fama & French, 1992; Fama & MacBeth, 1973; Friend & Blume, 1970; Lakonishok & Shapiro, 1986; Miller & Scholes, 1972; Reinganum, 1981; Stambaugh, 1982). Based on these empirical findings, Fama and French (2004) argue that although beta is an important determinant of security, the relationship between beta and average return is too flat.

Despite all criticisms, CAPM is widely used by both academicians and practitioners throughout for asset pricing purposes because it is simple and easy to implement. More importantly, Black (1972) relaxes the limitless risk-free asset assumption and show that CAPM is still valid in the absence of risk-free assets. Black’s version of CAPM, known also as zero-beta CAPM, is more robust against empirical tests. Therefore, it is influential in extending CAPM validity and its widespread adoption. However, together with the gradual growth in the capital markets through 1980s and 1990s, the empirical tests challenge even the zero-beta CAPM developed by Black (1972). CAPM is not able to predict and explain the most of reported anomalies which are discussed in the section 2.3 and 2.5.

Jensen (1968) offers that Sharpe-Linter CAPM can be treated as a time-series regression test as well and derives a risk-adjusted measure of asset return, called as Jensen's alpha currently. The derivation of Jensen (1968) implies that if the expected value of excess return (expected return minus risk-free rate) can be fully explained by beta times expected risk premium, then Jensen's alpha should be zero for each asset. Currently, Jensen's alpha helps to estimate asset pricing anomaly, which is defined by Brennan and Xia (2001) as the statistically significant difference between the realized return on a portfolio and the return which is predicted by CAPM. In order to explain excess return represented in Jensen's alpha, additional risk factors are offered to CAPM's beta.

2.6.2 Multifactor asset pricing models

As discussed in section 2.3, several studies argue that most of the reported anomalies are actually sources of risks. Additionally, as mentioned in section 2.5, Arbel (1985) offers that several anomalies including the neglected stock effect stem from a missing risk factor in CAPM. Together with this, Fama and French (1992a) work on the joint roles of market beta, firm size, P/E ratio, leverage level, and B/M ratio in predicting the average stock returns. Consistent with recent empirical studies which find relationship between market beta and return is too flat, Fama and French (1992) conclude that market beta has a little explanatory power on the average stock return.

Moreover, the authors report that although all anomalies tested in the study have an explanatory power in explaining average return, size and B/M ratio absorb apparent roles of leverage level and P/E ratio in explaining the average returns when used in combinations.

Subsequently, Fama and French (1993, 1996) contribute to asset pricing literature essentially by labelling size and value effect as additional risk factors to beta. The authors argue that size effect and value effect, which are explained in section 2.3 comprehensively, are observed on a regular basis in the market. Moreover, size and value effects dominate other empirically observed anomalies. Therefore, Fama and French (1993, 1996) offer that an asset pricing model that includes these two effect as risk factors may predict portfolio return better. The authors add SMB factor (size factor) and HML factor (value factor) to CAPM's market factor and create Fama-French three factor asset pricing model.

Fama and French (1993) form 25 cross portfolios based on size and B/M ratio and explain the portfolio returns with size factor (SMB: Small Minus Big), and value factor (HML: High Minus Low) through 1963-1991. The authors report that the three factor asset pricing model explain asset returns better than CAPM. In other words, SMB, and HML factors contributes to the explanatory power of CAPM. Additionally, Fama and French (1995) discuss the characteristics of SMB and HML factors. Fama and French (1995) state that HML factor acts as a proxy for financial distress. The authors find that weak firms which have low profitability for a long time tend to have high book to market ratios; and thus, they have positive slopes on HML. On the other hand, strong firms which have high profitability for a long time tend to have low book to market ratios; meaning they have negative slopes on HML. The same pattern is valid for the size effect as well. Shortly, Fama and French (1995) conclude that firms that bring high return for a long period of time (past winners) have negative slopes on SML and HML. Therefore, they are expected to bring lower return in the next periods. Similarly firms that bring lower return for a long period of time (past losers) have positive slopes on SML and HML. Thus, they are expected to bring higher return in the future.

Fama and French (1996) provide a comprehensive summary and discussion about Fama-French three factors asset pricing model. The authors also report that three factors model can also explain returns on portfolios created based on P/E ratio, cash flow/price ratio and sales growth which are variables recommended by Lakonishok, Shleifer, and Vishny (1994). Furthermore, considering that past winners have negative slopes and past losers have positive slopes on SML and HML, Fama and French (1996) discuss that three factors model captures the reversal pattern reported by DeBondt and Thaler (1985). Therefore, Fama and French (1996) conclude that three factors model is robust and successful in catching the return patterns of the assets.

On the other hand, some studies argue that relationship between return and B/M ratio is weaker than Fama-French offer. Therefore, several studies claim that HML factor that Fama and French report (1993, 1996) may be affected by selection bias (Kothari, Shanken and Sloan, 1995) or data mining bias (Black, 1993; MacKinlay, 1995). Additionally, Daniel and Titman (1997) argue that stocks characteristic have a more crucial role in explaining return patterns than additional risk factors. Thus, Daniel and Titman (1997) offer characteristic-based pricing model and indicate that characteristics rather than the covariance structure of returns have more role in explaining stock returns.

However, probably the most significant blind side of three factor model is its inability to capture continuation of short-term returns, which is documented firstly by Jegadeesh and Titman (1993). As section 2.3 covers in details, the stock return movements show different patterns in the long and short run. DeBondt and Thaler (1985) proposes that there is a reversal pattern in the stock return in the long run (3-5 years): Prior losers beat prior winners in the long run, which is known as overreaction anomaly. However, Jegadeesh and Titman (1993) report that there is continuation pattern in the stock in the short run (3-12 months): Prior winners continue beating prior losers in the short run; which is called as momentum effect. As Fama and French (1995, 1996) states, three factors model can capture the reversal pattern in long run by means of SML and HML factors. However, Fama and French (1996, 2004) admit that Fama-French three factors model does not contain any risk factor that can capture momentum effect.

Considering that Fama-French three factor falls short of capturing the short-run continuation patterns of stock return, Carhart (1997) suggests a four factor asset pricing model by adding momentum factor (WML: Winner Minus Loser) to Fama-French three factor model. By means of four factors asset pricing model, Carhart (1997) explain diversified equity funds between 1962 and 1993. The author concludes that momentum factor provides important information in explaining stock return.

2.6.3 Empirical tests on multifactor asset pricing models

While presenting and testing the Fama-French three factors model, Fama and French (1993, 1996) use only American markets data between specific years. This may imply that the success of the model may be case specific and may cause the validity of the model to be questioned. Thus, in order to proof validity of the three factors model, it is crucial to test factors of the model in different markets through different period of times.

2.6.3.1 International studies on multifactor asset pricing models

Several empirical studies find that Fama-French three factors asset pricing model explain stock returns better than CAPM. Fama and French (1998b) report that value stocks (having high ratios of book-to-market equity, earnings to price, or cash flow to price) outperform growth stocks in the twelve of the major thirteen markets in years between 1975 and 1995. Additionally studies shows that Fama-French three factor model is successful in explaining return in Indian stock market through 1989-1999 (Connor & Sehgal, 2001); in Hong Kong stock market through 1980-1997 (Lam, 2002); in French stock market through 1976-2001 (Ajili, 2002); in Malaysian stock market through 1992-1999 (Drew & Veeraraghavan, 2002); in Japanese stock market through 2002-2007 (Walid & Ahlem, 2009); in Pakistani stock market through 1999-2005 (Iqbal & Brooks, 2007); in Amman stock market through 1999-2010 (Al-Mwalla & Karasneh, 2011); in Australian stock market through 1982-2006 (Brailsford, Gaunt & O'Brien, 2012); in Croatian stock market through 2007-2013 (Dolinar, 2013); and in Chinese stock market through 2005-2012 (Meng & Ju, 2013).

As for Fama-French-Carhart four factor asset pricing model, empirical tests show that it is valid in several markets as well. The results of various studies indicate that Fama-French-Carhart four factor model outperform other asset pricing models in Canadian markets through 1960-2001 (L'Her, Masmoudi & Suret, 2004); in Tunisian market through 2000-2005 (Naceur & Chaibi, 2007); in Hong Kong markets through 1981-2001 (Lam, Li & So, 2010). Together with this, Liew and Vassalou (2000) test the four factor model in main developed stock markets through 1978-1996 and conclude that although WML factor have a role in explaining return, its explanatory power is not as strong as SML and HML factors.

On the other hand, some studies report that multifactor asset pricing models are not successful in explaining returns. Ferson and Harvey (1999) report that both models cannot explain returns on U.S common stocks between 1963 and 1994. Daniel, Titman and Wei (2001) document that while three factors model does not predict returns on Japanese stock market between 1971 and 1997, characteristic-based pricing model can explain returns Japanese stock through the same period. Cao, Leggio and Schniederjans (2005) work on the firms traded in Shanghai stock exchange and compare explanatory power of CAPM, three factor model and artificial neural networks. They report that artificial neural networks is better in capturing return patterns than linear models especially in emerging markets. Vasilov and Bergström (2010) support CAPM rather than three or four factors model since they do not observe any size, value or momentum effect in Sweden market though 1997-2010. Furthermore, Griffin (2002) tests the three factors model in the Japanese, Canadian, and British markets through 1981- 1995. He finds that the model functions in country specific and is poor in explaining international returns. Moerman (2005) and Mirza and Afzal (2011) find consistent results with Griffin (2002).

2.6.3.2 Studies in Turkey on Multifactor Asset Pricing Models

As for Turkish markets, the existing studies indicate that Fama-French three factors model is a good estimator in predicting return for Turkish stocks through 1990-2002 (Yıldırım, 2006), through 1993-1997 (Aksu & Önder, 2000), through 1995-2005 (Doğanay, 2006), through 1992-2005 (Erişmiş, 2007), through 1992-2005 (Canbaş, Kandır and Erişmiş, 2008), through 2001-2006 (Gökgöz, 2008), through

1991-2000 (Bildik & Gülay, 2007), and through 1993-2007 (Atakan & Gokbulut, 2010). However, there are studies which argues that multifactor models do not function well in Turkish markets. Results of some studies show that three factor asset pricing model fails to explain return on Turkish stock market through 1993-1998 (Gönenç & Karan, 2003), through 1996-2002 (Şamiloğlu, 2006). Together with this, Arıoğlu (2007), Canbas and Arioglu (2008) and Eraslan (2013) find that three factor model can explain the stock returns on Borsa Istanbul; yet, significant alpha values imply that some additional factors are required. Yalçın (2012) find that Fama-French three factor model slightly outperforms CAPM through 2003-2010.

Studies which test the Fama-French-Carhart four factor asset pricing model for Turkish market are not vast in number. Ünlü (2012), tests four factors model in Borsa Istanbul and reports the model explains the return on Turkish stocks through 1992-2008. Subsequently, Ünlü (2013) test CAPM, three factors model, four factors model and five factors model (liquidity as the fifth factor), and concludes that all models are valid for Borsa Istanbul in years between 1992-2011. Kandır and Arıoğlu (2014) test Fama-French-Carhart four factors asset pricing model for Borsa Istanbul through the years 2005 and 2013. The authors find that although the role of momentum factor is weaker than other factors in explaining stock returns, all factors is statically significant. However, Kandır and Arıoğlu (2014) also report that inconsistently with international evidence, the momentum effect observed in the Turkish market has negative coefficient.

On the other hand, some studies report that CAPM is better estimator of abnormal return than multifactor asset pricing models. For example, Gökgöz (2009) concludes that since Turkish markets highly sensitive to risk-free rate changes, inputs estimated by the CAPM products lower portfolio variances than the three and four factors asset pricing models. Additionally, Karatepe, Karaaslan and Gökgöz (2002) shows that returns estimated by the conditional CAPM are quite close to actual returns.

CHAPTER 3

DATA AND METHODOLOGY

Chapter 3 covers data and the methodology that we follow to test the neglected stock effect. Section 3.1 introduces our data scope and presents the descriptive statistics of our variables. Section 3.2 explains methodology that we follow to test the neglected stock effect in detail. In order to test the neglected stock effect in Borsa Istanbul, we follow two steps. In the first step, we check whether means of neglected and popular stocks' returns are significantly different from each other via t-test. Next, we apply CAPM, Fama-French three factors asset pricing model, and Fama-French-Carhart four factor asset pricing models. Then, we form a five factor asset pricing model by adding a neglect factor to Fama-French-Carhart four factor model to show the role of the neglected stock effect in explaining return.

3.1 Data scope

In this study we test the existence of the neglected stock effect in Borsa Istanbul, thorough the periods between July, 2005 and June, 2013. In our analysis, we use monthly data and we provide all data from Bloomberg terminals except risk free rate[3]. We employ the number of analyst following the stock (analyst coverage) as the measure of neglect. Hence, we include all stocks traded in Borsa Istanbul after eliminating the firms which do not provide any analyst coverage information. In other words, we do not cover the stocks which we do not have any information about how many analysts follow them since lack of analyst coverage data prevents us from

[3] For risk-free rate, we benefit from http://www.investing.com/rates-bonds/turkey-1-year-bond-yield-historical-data

classifying them as neglected or popular. In order to show the portion of stocks that we cover for each year, Table 1 compares the number of stocks with and without analyst coverage information. While first column shows the monthly average number of stocks which have analyst coverage information, second column shows the actual number of the stocks traded in Borsa Istanbul as of the first day of that year. Finally, third column provides the percentage of stocks which have analyst coverage information to the all stocks traded in Borsa Istanbul. As third column indicates, for each period we cover approximately the half of the all stocks.

Table 1. Number of Stocks with and without Analyst Coverage Information

The Monthly Average Number of Stocks with Analyst Coverage Information		Actual Number of the Stocks Traded in Borsa Istanbul as of the First Day of January		Percentage of Stocks Included in the Analysis
July 2005-June 2006	143	January 2006	322	44%
July 2006-June 2007	156	January 2007	327	48%
July 2007-June 2008	171	January 2008	326	52%
July 2008-June 2009	179	January 2009	325	55%
July 2009-June 2010	182	January 2010	350	52%
July 2010-June 2011	194	January 2011	375	52%
July 2011-June 2012	206	January 2012	422	49%
July 2012-June 2013	210	January 2013	438	48%

In our analysis, we take natural logarithms of monthly closing stock prices in order to calculate monthly stock returns as follows:

$$R_{k,i} = \ln\left(\frac{P_{k,i}}{P_{k,i-1}}\right) \tag{1}$$

where

$R_{k,i} = Return\ of\ stock\ k\ at\ month\ i$

$P_{k,i} = Closing\ price\ of\ stock\ k\ at\ month\ i$

$P_{k,i-1} = Closing\ price\ of\ stock\ k\ at\ month\ i - 1$

Table 2 and Table 3 presents information about the stocks in the data set. While Table 2 includes monthly average stock number, stock return and market capitalization for each year, Table 3 provides details about monthly analyst coverage.

Table 2. Monthly Average Stock Number, Return and Market Capitalization

Year	The Monthly Average Number of Stocks with Analyst Coverage Information	Monthly Arithmetic Average Return	Monthly Average Market Capitalization (in TL)
July 2005-June 2006	143	2.37%	1,300,585,371
July 2006-June 2007	156	1.98%	1,428,539,119
July 2007-June 2008	171	-3.10%	1,593,903,246
July 2008-June 2009	179	0.11%	1,147,655,013
July 2009-June 2010	182	3.32%	1,790,472,135
July 2010-June 2011	194	2.21%	2,219,776,373
July 2011-June 2012	206	-0.96%	1,965,919,742
July 2012-June 2013	210	0.63%	2,477,928,878

As we see in Table 2, the average monthly return on the included stocks stays approximately 2% until 2007. However, return drops dramatically in the second half of the 2007. Through 2008 and 2009, the return continues to be relatively low probably due to global financial crisis. Between second half of the 2009 and the first half of 2010, return jumps to 3.32% but then it continues to follow a decreasing pattern again. When it comes to market capitalization, it shows a steady increase except slight decreases in the period between July 2008-June 2009 and July 2011-June 2012.

Table 3. The Summary Statistics for Analyst Coverage

Year	Monthly Average Analyst Coverage	Lowest Analyst Coverage per month	Highest Analyst Coverage per month	Stock with Highest Analyst Coverage
July 2005-June 2006	3	0	20	AKBNK Equity
July 2006-June 2007	4	0	21	AKBNK Equity
July 2007-June 2008	5	0	30	GARAN Equity
July 2008-June 2009	5	0	30	GARAN Equity
July 2009-June 2010	6	0	31	TUPRS Equity
July 2010-June 2011	6	0	30	GARAN Equity & YKBNK Equity
July 2011-June 2012	7	0	35	YKBNK Equity
July 2012-June 2013	7	0	33	TUPRS Equity & HALKB Equity & YKBNK Equity

Table 3 shows the average analyst coverage per month stocks with the highest analyst coverage. As we see in Table 3, when the lowest analyst coverage is zero for all years, the highest analyst coverage changes between 20 and 33. Except the period between July 2009 and June 2010, at least one bank's stock is labelled as the stock with highest analyst coverage. The banks in Table 3 are Turkiye Garanti Bankasi A.S. (GARAN Equity), Akbank T.A.S. (AKBNK Equity), Yapi ve Kredi Bankasi A.S. (YKBNK Equity), Turkiye Halk Bankasi A.S. (HALKB Equity). The only non-bank company with the highest analyst coverage is Turkiye Petrol Rafinerileri A.S. (TUPRS Equity).The highest analyst number in the list is 35 and belongs to Yapi ve Kredi Bankasi A.S in year July 2011-June 2012. Average monthly analyst coverage gradually increases and becomes 7 at the period of July 2012-June 2013 while it is 3 at the period of July 2005-June 2006.

In this section, we introduce data scope and provide simple statistic of main variables in dataset. Section 3.2 follows with the methodology and will give the details of analysis.

3.2 Methodology

In this thesis, we examine the existence of the neglected stock effect in Borsa Istanbul in two steps. First, we apply t-test to decide whether the portfolio return on neglected stocks bring a statistically higher return than portfolio return on popular stocks. In the second step, stock returns are explained by CAPM, Fama-French three factors model, and Fama-French-Carhart four factors model. Finally, we add neglected stock premium as a fifth factor and to test for the neglected stock effect.

3.2.1 Returns to be explained

As section 2.5 discusses, previous studies on the neglected stock effect take into account that small firms are more likely to be neglected and thus there may be an interaction between size effect and the neglected stock effect. Table 4 shows that there is a high correlation between firm size (market capitalization) and firm popularity (analyst coverage) in our data set as well. The correlation is 0.688, which can be considered to be high.

Table 4. Correlation Table for Market Capitalization and Analyst Coverage

	Analyst Coverage	Market Capitalization
Analyst Coverage	1	
Market Capitalization	0.688	1

In order to prevent size bias, Arbel and Strebel (1982) divide stocks into cross groups based on their size and popularity rather than constructing portfolios based on only popularity of stocks. Method offered by Arbel and Strebel (1982) is followed by many other studies (Arbel & Strebel, 1983; Arbel, et al., 1983; Beard & Sias, 1997; Carvel & Strebel, 1987; Dowen & Bauman, 1986; Elfakhani & Zaher, 1998). Consequently, cross portfolio construction based upon size and popularity becomes an indispensable part of methodology on the neglected stock effect.

In our analysis we also follow methodology of Arbel and Strebel (1982) in order to ensure any premium that we find stems from not size effect but completely the neglected stock effect. While labelling stocks as neglected or popular based on their analyst coverage, we may end up with identifying small sized stocks as neglected stocks and big sized stocks as popular stocks because of the high correlation between size and coverage. This causes size bias since any significant premium may stem from not the neglected stock effect but small firm effect. Therefore, in order to prevent size bias, we follow the sequence illustrated in Figure 2.

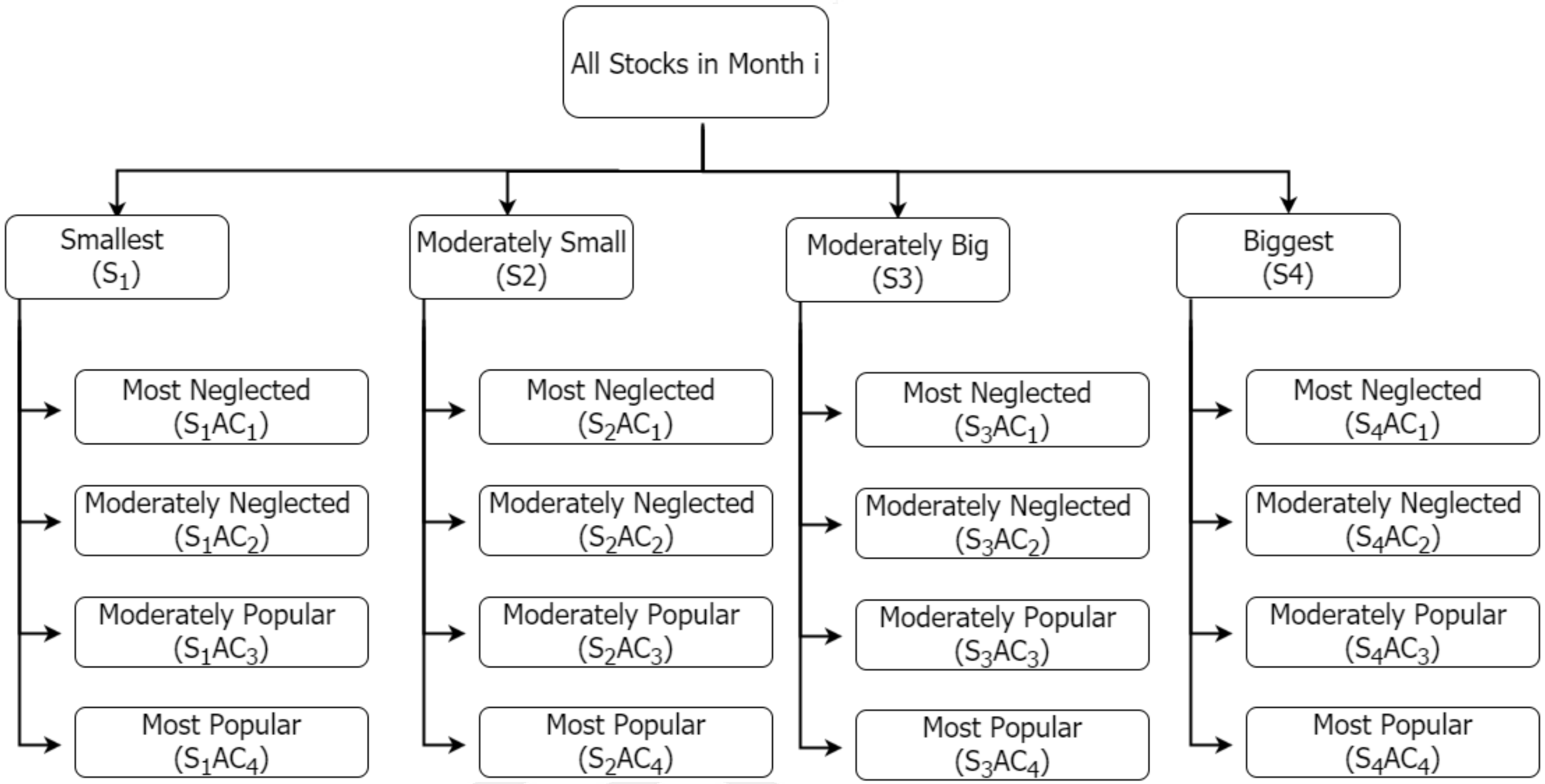

Figure 2. Cross portfolio construction based on size and popularity

As Figure 2 indicates, each month we firstly split all stocks into four size levels as smallest (S_1), moderately small (S_2), moderately big (S_3), and biggest (S_4) based on their market capitalization. Then, we divide each size group into four sub-groups as most neglected (AC_1), moderately neglected (AC_2), moderately popular (AC_3), and most popular (AC_4) based on their analyst coverage. [4] By grouping firstly size and then analyst coverage, we confirm that we identify neglected and popular stocks in each and every size group and eliminate size bias. We prefer to group stocks into four in order to create portfolios with reasonable stock numbers. Dividing four size and four neglect group generates sixteen portfolios for each month. Returns of these sixteen portfolios are value weighted and calculated as follows:

$$E(R_{j,i}) = \sum_{k=1}^{I} (R_{k,i}) \left(\frac{MCap_{k,i}}{\sum_{k=1}^{N} MCap_{k,i}} \right) \qquad (2)$$

Where

$E(R_{j,i}) =$ expected return of portfolio j at month i

$R_{k,i} =$ return of stock k at month i

$MCap_{k,i} =$ the market capitalization of stock k at month i

$N =$ the total stock number in the portfolio

In the first and second part of our analysis, we refer to value weighted returns of these sixteen portfolios as our dependent variables.

[4]The S correspond to Size and AC corresponds to Analyst Coverage.

3.2.2 First step: t-test

In the first part of the analysis, we use t-test to observe whether portfolios consisted of most neglected stocks bring higher return than portfolios consisted of most popular stocks. We take S_1AC_1, S_2AC_1, S_3AC_1, S_4AC_1 for most neglected sample; and S_1AC_4, S_2AC_4, S_3AC_4, S_4AC_4 for most popular sample, which makes eight portfolios in total. Table 5 lists ten stocks that are frequently identified as most neglected and the most popular for each size group and orders them according to their frequency across time. This may give an idea about which stocks are frequently placed in most neglected portfolio (S_1AC_1, S_2AC_1, S_3AC_1, S_4AC_1) and which one of them in most popular portfolio (S_1AC_4, S_2AC_4, S_3AC_4, S_4AC_4).

Table 5. Top Ten Stocks Frequently Identified As the Most Neglected and the Most Popular For Each Size Group

Size	Frequency Order	Most Neglected (AC_1)	Most Popular (AC_4)
Smallest (S_1)	1	SERVE Equity	YKGYO Equity
	2	PIMAS Equity	INDES Equity
	3	USAK Equity	ARENA Equity
	4	KNFRT Equity	DOBUR Equity
	5	BAKAB Equity	DGGYO Equity
	6	LINK Equity	RYSAS Equity
	7	MERKO Equity	ALGYO Equity
	8	HEKTS Equity	MRGYO Equity
	9	LOGO Equity	VAKFN Equity
	10	TUKAS Equity	RYGYO Equity
Moderately Small (S_2)	1	SARKY Equity	BOYNR Equity
	2	MRSHL Equity	BOLUC Equity
	3	OLMIP Equity	TATGD Equity
	4	COMDO Equity	ALGYO Equity
	5	TBORG Equity	CLEBI Equity
	6	BOSSA Equity	DGZTE Equity
	7	GOODY Equity	PETUN Equity
	8	PRKAB Equity	BAGFS Equity
	9	ECYAP Equity	ALCTL Equity
	10	BRYAT Equity	RYSAS Equity
Moderately Big (S_3)	1	CMENT Equity	ADANA Equity
	2	AVIVA Equity	CIMSA Equity
	3	KORDS Equity	ANACM Equity
	4	IHLAS Equity	ISGYO Equity
	5	AKMGY Equity	DOAS Equity
	6	KIPA Equity	AKENR Equity
	7	KARTN Equity	ANSGR Equity
	8	IZOCM Equity	SNGYO Equity
	9	GOODY Equity	NETAS Equity
	10	BRISA Equity	ALARK Equity
Biggest (S_4)	1	FINBN Equity	GARAN Equity
	2	YAZIC Equity	AKBNK Equity
	3	NUHCM Equity	ISCTR Equity
	4	PETKM Equity	TUPRS Equity
	5	DENIZ Equity	TCELL Equity
	6	AYGAZ Equity	YKBNK Equity
	7	ULKER Equity	VAKBN Equity
	8	THYAO Equity	HALKB Equity
	9	PTOFS Equity	ARCLK Equity
	10	DOHOL Equity	BIMAS Equity

The process in Figure 2 is repeated for each month from July-2005 to June 2013, making 96 months in total. Since each month we take four portfolios for the most neglected sample and four portfolios for the most popular sample, there will be consequently 384 portfolio returns for each sample. The most neglected and the most popular samples that we create are non-overlapping and independent from each other since there is no way for a stock to be included in the both popular and neglected portfolio in a specific month. Therefore, the t-test type that we apply to this data set should be independent sample t-test.

Since we have eliminate the size effect, we can say that our independent variable is neglect level, which is measured by analyst coverage. And the portfolio returns that we have calculated is the dependent variable for t-test. Besides, it is important to emphasize our dependent variable (portfolio return) is a continuous variable, which is the one of the main assumptions of a vast range of statistical tests that compare means including t-test.

We apply Levene's t-test in order to explore whether or not the variances of two samples can be assumed equal. If the variances of most neglect and most popular samples are assumed to be equal, then we should use Student's t-test. Otherwise, we should apply Welch's unequal variances t-test. The null hypothesis of Levene's t-test is that the population variances are normal. Hence, at 95% confidence level, we can assume that the population variances are equal if p-value is greater than 0.05. Otherwise, we reject null hypothesis and assume unequal variances. Table 6 indicates the result of Levene's test.

Table 6. The Result of Levene's Test

	Observation	Std. Dev.	Sig. (p-value)
Portfolio returns on most neglected stocks	384	.087	.004
Portfolio returns on most popular stocks	384	.101	

As we can see in Table 6, p-value of Levene's t-test is lower than 0.05. This means that we reject the null hypothesis and assume unequal variances. Therefore, in order to compare the means of most neglected and most popular stocks' portfolio returns, we should apply Welch's t-test which is also called unpaired, unequal variances t-test.

3.2.3 Second step: asset pricing model analysis

In the second part of the analysis, we apply various asset pricing models. We explain the excess return of sixteen portfolio, which sub-section 3.2.1 explains and Figure 2 shows, with CAPM, Fama-French three factor model and Fama-French-Carhart four factor model. Finally we investigate the performance of a five factor model asset pricing model which we create by adding neglected stock premium as fifth factor.

3.2.3.1 Capm

To explain the excess returns on the sixteen portfolios that we create on the basis of market capitalization and analyst coverage, we firstly use CAPM. Sharpe-Linter version of CAPM, which is contributed by Jensen's alpha, exhibits the relation between risk and expected return as follows:

$$R_{j,t} - R_{f,t} = \alpha_{j,t} + \beta_j(R_{m,t} - R_{f,t}) + \varepsilon_{j,t} \quad (3)$$

Where,

$R_{j,t} - R_{f,t}$ = excess return on portfolio j over risk free rate of return for time t

$\alpha_{j,t}$= the abnormal return on portfolio j over the theoretical expected return (Jensen's alpha)

β_j = systematic risk of portfolio j or algebraically $\frac{Cov\,(R_j, R_m)}{Var(R_m)}$

$R_{m,t} - R_{f,t}$= the excess return on the market portfolio over risk free rate of return for time t,

$\varepsilon_{j,t}$=error term for the asset j for the time t

In our analysis, we use Turkey 1-Year Bond Yield as risk free rate (R_f). For market return (R_m) we use the return on all stocks traded in Borsa Istanbul.

3.2.3.2 Fama-french three factor asset pricing model

After CAPM, we explain excess returns on sixteen cross portfolios based on size and analyst coverage by means of Fama-French three factor asset pricing model. By adding size factor (SMB) and value factor (HML) to CAPM's market beta, Fama-French three factor asset pricing model explain excess returns as follows:

$$R_{j,t} - R_{f,t} = \alpha_{j,t} + \beta_1(R_{m,t} - R_{f,t}) + \beta_2(SMB)_t + \beta_3(HML)_t + \varepsilon_{j,t} \quad (4)$$

Where,

$R_{j,t} - R_{f,t}$ = excess return on portfolio j over risk free rate of return for time t

$\alpha_{j,t}$= the abnormal return on portfolio j over the theoretical expected return

$R_{m,t} - R_{f,t}$= the excess return on the market portfolio over risk free rate of return for time t,

$(SMB)_t$ = the difference between the simple average of the returns on the small size stock portfolios and the big size stock portfolios for time t,

$(HML)_t$ = the difference between the simple average of the returns on the high B/M portfolios and low B/M portfolios for time t,

$\varepsilon_{j,t}$=error term for the asset j for the time t

Risk premium (Rm-Rf) is the same as CAPM equation. For creating additional two factors, SMB and HML factors, we follow methodology of Fama and French (1993), 1996). Subsequent steps summarizes how we calculate SMB and HML factors:

1.) Since the previous studies (Fama & French 1992a, 1992b) indicate that B/M ratio is more influential in explaining average return than size, stocks are divided into three groups based on B/M ratio in December of year y-1, and into two groups based on size in June of year y.

2.) We omit the firms with negative B/M ratio. Therefore, a firm should have an available market capitalization in June of year y, positive B/M ratio in December of year y-1, and available stock price series for that year in order to enter the sample of that year.

3.) When stocks are divided into two groups according to their size, the cutoff point is median value of market capitalization in June of year y. (Small=50%, Big=50%)

4.) When stocks are divided into three groups according to their B/M ratio, the cutoff points are the 30^{th} and 70^{th} decile of the B/M ratio in December of year y-1. (Low=30%, Medium=40%, and High=30%)

5.) Six portfolios are created from the intersections of two size and three B/M portfolios (SL, SM, SH, BL, BM, and BH). Definition of each portfolios are as follows:

SL: portfolio consisting of stocks with small size and low B/M ratio

SM: portfolio consisting of stocks with small size and medium B/M ratio

SH: portfolio consisting of stocks with small size and high B/M ratio

BL: portfolio consisting of stocks with big size and low B/M ratio

BM: portfolio consisting of stocks with big size and medium B/M ratio

BH: portfolio consisting of stocks with big size and high B/M ratio

6.) Six portfolios' monthly value-weighted returns are calculated from July of year y to June of y + 1. The reason for calculating return in July of year y is because annual year end reports are made public with lags nearly 5 or 6 months. Therefore, construction portfolios based B/M ratio in December of year y-1 and calculating portfolio returns in June of year y ensure that book equity of year y-1 is known by the investors.

7.) For each month, SMB (Small Minus Big) factor is calculated as the differences between the simple average of the returns on the three small-size stock portfolios

(S/L, S/M, and S/H) and the simple average of the returns on the three big-size stock portfolios (B/L. B/M, and B/H) as follows:

$$SMB_t = \frac{(SL_t + SM_t + SH_t) - (BL_t + BM_t + BH_t)}{3} \quad (5)$$

8.) For each month, HML (High Minus Low) factor is calculated as the differences between the simple average of the returns on the two high B/M stock portfolios (S/H and B/H) and the simple average of the returns on the two low B/M stock portfolios (S/L and B/L) as follows:

$$HML_t = \frac{(SH_t + BH_t) - (SL_t + BL_t)}{2} \quad (6)$$

While SMB factor serves for mimicking the risk factor in return associated with the size, HML factor serves for mimicking the risk factor in return associated with the B/M ratio. Therefore, Fama-French three factor model catches not only market risk but the return patterns related with size and value effects as well.

3.2.3.3 Fama-French-Carhart Four Factor Asset Pricing Model

Carhart (1997) adds momentum factor (WML) to Fama-French three factor asset pricing model as a fourth factor to capture short term continuation of stock returns. Following equation presents the four factors asset pricing model offered by Carhart (1997), which is also known as Fama-French-Carhart four factors asset pricing model:

$$R_{j,t} - R_{f,t} = \alpha_{j,t} + \beta_1(R_{m,t} - R_{f,t}) + \beta_2(SMB)_t + \beta_3(HML)_t + \beta_4(WML)_t + \varepsilon_{j,t} \quad (7)$$

Where,

$R_{j,t} - R_{f,t}$ = excess return on portfolio j over risk free rate of return for time t

$\alpha_{j,t}$= the abnormal return on portfolio j over the theoretical expected return

$R_{m,t} - R_{f,t}$= the excess return on the market portfolio over risk free rate of return for time t,

$(SMB)_t$ = the difference between the simple average of the returns on the small size stock portfolios and the big size stock portfolios for time t,

$(HML)_t$ = the difference between the simple average of the returns on the high B/M portfolios and low B/M portfolios for time t,

WML[5] = the difference between the simple average of the returns on the winner portfolio and loser portfolio for time t

$\varepsilon_{j,t}$=error term for the asset j for the time t

Carhart (1997) obtains the SMB and HML factors from Fama and French and (1996) and leave them unchanged. Then Carhart (1997) calculates the WML (Winner Minus Loser) factor as "the equal-weight average of firms with the highest 30 percent eleven-month returns lagged one month minus the equal-weight average of firms with the lowest 30 percent eleven-month returns lagged one month" (p. 61). Although Carhart (1997) firstly introduces momentum factor, the author does not give further details about how WML factor is calculated. Thus, we follow L'Her et al

[5] WML factor is also called as UMD (Upper Minus Lower) in some studies. Moreover, Carhart (1997) names momentum factor as PR1YR.

(2004) for calculating momentum. Similarly to the authors' methodology, we create size neutral momentum portfolios to calculate WML. The following steps explain how we compute WML factor.

1.) A firm should have an available market capitalization in June of year y, positive B/M ratio in December of year y-1, and available stock price series for that year in order to enter the sample of that year. We omit the stocks that do not satisfy these conditions.

2.) Consistent with Fama and French (2012), for each month t, we divide the stocks into two groups according to their size. The cutoff point is median value of market capitalization in month t. (Small=50%, Big=50%).

3.) For each month t, we calculate 6-month performance of the stocks between t − 8 and t− 2. We calculate momentum based a 6-month performance rather than a 10-month performance as suggested by L'Her et al (2004) and French (n.d) or 12-month performance as suggested by Liew and Vassalou (2000) and Carhart (1997). The reason why we take 6-month performance is that one year or 10-month performance may not be representative for short-term performance of stocks in an emerging markets like the Turkish market. Considering momentum stands for catching the short term continuation of returns, calculating momentum in a shorter horizon than developed markets is more appropriate for Borsa Istanbul. Thus, following Inci, Narayanan and Seyhun (2014), we calculate momentum based on 6-month performance of stocks. Besides, we take the previous six months performance starting from month t − 2 not month t – 1 since the bid-ask bounce may attenuate the continuation effect (Jegadeesh & Titman, 2001; Rouwenhorst, 1998).

4.) For each month t, we divide stocks into two groups according to their pervious 6-month performance. The cutoff points are the 30th and 70th decile of the previous 6-month performance at month t-2. (Winner=30%, Medium=40%, and Loser=30%)

5.) Six portfolios are created from the intersections of two size and three momentum portfolios (SLs, SMd, SW, BLs, BMd, and BW). Definition of each portfolios are as follows:

SLs: portfolio consisting of stocks which are small according to size and loser according to 6-month momentum

SMd: portfolio consisting of stocks which are which are small according to size and medium according to 6-month momentum

SW: portfolio consisting of stocks which are small according to size and winner according to 6-month momentum

BLs: portfolio consisting of stocks which are big according to size and loser according to 6-month momentum

BMd: portfolio consisting of stocks which are big according to size and medium according to 6-month momentum

BW: portfolio consisting of stocks which are big according to size and winner according to 6-month momentum

6.) For each month, WML (Winner Minus Loser) factor is calculated as the difference between the simple average of the returns on the two winner stock portfolios (SW, BW) and the simple average of the returns on the two loser stock portfolios (SLs, BLs) as follows:

$$WML_t = \frac{(SW_t + BW_t) - (SLs_t + BLs_t)}{2} \tag{8}$$

WML factor serves for mimicking the continuation of return in the short run. Thus, Fama-French- Carhart four factor model catches momentum premium which Fama-French three factor falls short of catching.

3.2.3.4 Five Factor Asset Pricing Model: The neglected stock effect as Fifth Factor

After applying CAPM, Fama-French three factor model and, Fama-French-Carhart four factor model, we investigate the performance of a five factor asset pricing model which includes neglected stock premium (NMP: Neglected Minus Popular) as the fifth factor. Fama-French-Carhart four factor model includes market risk factor plus three widely-observed anomalies which are size, value, and momentum. We add NMP as the fifth factor to Fama-French-Carhart four factor model so that we can observe the additional explanatory power of neglected stock premium over the four factor model. With the NMP factor, the five factor asset pricing model will be as in the following equation:

$$R_{j,t} - R_{f,t} = \alpha_{j,t} + \beta_1\left(R_{m,t} - R_{f,t}\right) + \beta_2(SMB)_t + \beta_3(HML)_t + \beta_4(WML)_t + \beta_5(NMP)_t + \varepsilon_{j,t} \tag{9}$$

Where,

$R_{j,t} - R_{f,t}$ = excess return on portfolio j over risk free rate of return for time t

$\alpha_{j,t}$= the abnormal return on portfolio j over the theoretical expected return

$R_{m,t} - R_{f,t}$= the excess return on the market portfolio over risk free rate of return for time t,

$(SMB)_t$ = the difference between the simple average of the returns on the small size stock portfolios and the big size stock portfolios for time t,

$(HML)_t$ = the difference between the simple average of the returns on the high B/M portfolios and low B/M portfolios for time t,

WML = the difference between the simple average of the returns on the winner portfolio and loser portfolio for time t

NMP= the difference between the simple average of the returns on the neglected portfolio and popular portfolio for time t

$\varepsilon_{j,t}$=error term for the asset j for the time t

Following steps summarize how we calculate NMP factor:

1.) Since our analysis does not cover the stocks which do not provide analyst coverage information, all stocks already have available analyst coverage for each month t (see section 3.1). Therefore, a firm should have an available market capitalization in June of year y, positive B/M ratio in December of year y-1, and available stock price series for that year in order to enter the sample of that year. We omit the stocks that do not satisfy these conditions.

2.) For each month t, we divide the stocks into two groups according to their size. The cutoff point is median value of market capitalization in month t. (Small=50%, Big=50%).

3.) For each month t, we divide stocks into three groups according to their analyst coverage as Neglected, Medium, and Popular. We label the stocks with zero analyst coverage as neglected stocks. Since the portion of stocks with zero analyst coverage corresponds to 35% of all stocks covered in a month on average, we take the highest 35% as popular stocks. In other words we take 65th decile as the cutoff point for popular stocks. The remaining stocks, which are not labelled as neither neglected nor popular, is labelled as medium.

4.) Six portfolios are created from the intersections of two size and three analyst coverage portfolios (SN, SMdm, SP, BN, BMdm, and BP). Definition of each portfolios are as follows:

SN: portfolio consisting of stocks which are small according to size and neglected according to analyst coverage

SMdm: portfolio consisting of stocks which are small according to size and medium according to analyst coverage

SP: portfolio consisting of stocks which are small according to size and popular according to analyst coverage

BN: portfolio consisting of stocks which are big according to size and neglected according to analyst coverage

BMdm: portfolio consisting of stocks which are big according to size and medium according to analyst coverage

BP: portfolio consisting of stocks which are big according to size and popular according to analyst coverage

5.) For each month, NMP (Neglected Minus Popular) factor is calculated as the difference between the simple average of the returns on the two neglected stock portfolios (SN, BN) and the simple average of the returns on the two popular stock portfolios (SP, BP) as follows:

$$NMP_t = \frac{(SN_t + BN_t) - (SP_t + BP_t)}{2} \tag{10}$$

Similarly to WML factor, NMP factor is computed based on size neutral monthly portfolios. In this way, we calculate two additional factors (WML and NMP) in a consistent way. Besides, we ensure that NMP portfolios are not size biased. In other words, if NMP factor is not based on size neutral portfolios, then we would end up with labelling big size stock as popular and small size stocks as neglected due to high correlation between size and analyst coverage. This would lead to a considerable size bias and NMP factor may be nothing but another version of SMB factor. However, cross portfolios based on size and analyst coverage prevents NMP factor from a probable size effect.

NMP factor serves for mimicking the premium stemming from the neglected stock effect. Thus, five factor asset pricing model with a NMP factor catches the neglected stock effect premium and indicates how NMP factor performs in explaining stock return.

CHAPTER 4

RESULTS

Chapter 4 present the results of the analysis. Consistently with the heading sequence of chapter 3, Chapter 4 starts with section 4.1 which gives the results of t-test. Subsequently, section 4.2 includes the regression results of CAPM, Fama-French three factors asset pricing model, Fama-French-Carhart four factors asset pricing models, and five factors asset pricing model that we create by adding a neglect factor to Fama-French-Carhart four factor model.

4.1 Result of t-test

As mentioned in the section 3.1 under Chapter 3, we apply t-test in order to compare the means of the most neglected and most popular stocks' portfolio returns (see Figure 2). According to Levene's test, we find that the variances of the most neglected and the most popular portfolios' returns cannot be assumed equal; thus, we apply Welch's t-test. The hypothesis of the Welch's t-test is as follows:

H_0: The means of two populations are not statistically significant.

$$\mu_{(\text{most neglected})} = \mu_{(\text{most popular})}$$

H_1: The means of two populations are statistically significant.

$$\mu_{(\text{most neglected})} \neq \mu_{(\text{most popular})}$$

Table 7 shows the results of the t-test. We can see that the portfolio mean of the most neglected stocks is 1.35% and is relatively higher than the portfolio mean of the most popular stocks, which is -0.28%. However, to decide whether the excess return observed in the mean of the most neglected portfolio is statistically significant, we consider the p-value of Welch's t-test. Since p-value is below 0.05, we can reject null hypothesis and claim that at 95% confidence level, portfolio mean of most neglected stocks is statistically different than the portfolio mean of the most popular stocks.

Table 7. Result of Welch's T-Test (Unpaired, Unequal Variances T-Test)

	Observation	Mean	Std. Dev.	Mean Diff.	Sig. (p-Value)
Portfolio returns on most neglected stocks	384	.0135	.087	0.0158	0.022
Portfolio returns on most popular stocks	384	-.0028	.101		

Results of the Welch's t-test show that on average the portfolios which consists of the most neglected stocks bring higher return in comparison to portfolios which consists of the most popular stocks, therefore suggest a neglected stock effect in Borsa Istanbul.

4.2 Results of asset pricing model

4.2.1 Summary statistics

Table 8, Table 9 and Table 10 show the summary statistics for sixteen portfolios that we construct in the sub-section 3.2.1 (see Figure 2). While Table 8 and Table 9 gives information about stock number included in each portfolios, Table 10 gives the descriptive statistics of the returns on these portfolios.

Table 8. Monthly Average Stock Numbers of Sixteen Cross Portfolios

		July 2005-June 2006	July 2006-June 2007	July 2007-June 2008	July 2008-June 2009	July 2009-June 2010	July 2010-June 2011	July 2011-June 2012	July 2012-June 2013
S_1	S_1AC_1	22	22	26	28	29	28	32	34
	S_1AC_2	5	6	4	4	4	4	4	5
	S_1AC_3	5	5	8	5	7	7	7	4
	S_1AC_4	4	6	4	8	6	8	8	9
Total		35	39	42	45	46	47	52	52
S_2	S_2AC_1	17	19	14	18	20	20	20	19
	S_2AC_2	8	6	11	11	10	8	12	13
	S_2AC_3	5	7	9	8	7	11	8	9
	S_2AC_4	6	7	8	7	9	10	12	13
Total		36	39	43	45	45	49	52	52
S_3	S_3AC_1	14	12	14	15	16	15	15	18
	S_3AC_2	10	11	10	9	8	11	12	9
	S_3AC_3	6	8	12	11	12	13	13	14
	S_3AC_4	7	8	8	10	11	10	11	12
Total		36	39	43	45	46	49	52	53
S_4	S_4AC_1	10	11	12	12	12	13	14	14
	S_4AC_2	9	9	10	11	12	12	13	13
	S_4AC_3	9	11	12	11	11	13	13	13
	S_4AC_4	7	8	8	10	10	11	12	12
Total		36	39	43	44	45	49	51	52
Overall Total		143	156	171	179	182	194	206	210

As Figure 2 indicates, we create cross portfolios on monthly basis. Since we cover twelve years from 2005 July and 2013 June, there are 96 months in total. However, a table that shows stocks numbers in each portfolios for each 96 months would be tough to follow up; and thus, would not be efficient to present summary statistics about stock numbers. Thus, Table 8 rather presents the monthly average stock number in each portfolios for each year. As we see, the overall total monthly average stock number in each year matches exactly with the stocks number in Table 1. Each year, the overall number of stocks are almost distributed equally to each size groups (S_1, S_2, S_3, S_4), which means each size groups include nearly one quarter of the total stock numbers for the corresponding year. However, the distribution among analyst coverage levels in each size group does not seem equal. In the smallest size group (S_1), moderately small group (S_2), and moderately big group (S_3), the stock number of most neglected portfolio (AC_1) is strikingly higher than the stock number of the remaining portfolios (AC_2, AC_3, AC_4). Although the stock number in S_2 and S_3 follow a more homogenous distribution in the recent years, in S_1 group stock number of most neglected portfolio (S_1AC_1) is dramatically higher than S_1AC_2, S_1AC_3, and S_1AC_4 in all years. Together with this, in the biggest group (S_4), the stock number of four analyst coverage level (AC_1, AC_2, AC_3, AC_4) is nearly equal for all years.

One of the reasons why AC_1 portfolio include the higher number of stocks than the remaining analyst coverage level (AC_2, AC_3, AC_4) in S_1, S_2 and S_3 group is the number of stocks which have zero coverage. Stocks with zero coverage have to be included in the most neglected portfolios (AC_1) because they are highly neglected by analysts. Thus, if the number of zero coverage stocks is high in a size group, it will increase the stock number in AC_1 sub-group. Considering the high correlation between market capital and analyst coverage, the zero coverage stocks have a high possibility to be placed in the smallest size group (S_1) and have a medium possibility to be placed in moderately small and moderately big groups (S_2, and S_3). But they have a very low possibility to be placed in biggest size group (S_4). Table 9 shows the monthly average of number of stocks with zero coverage for each size groups:

Table 9. Monthly Average Numbers of Zero Coverage Stocks

	July 2005-June 2006	July 2006-June 2007	July 2007-June 2008	July 2008-June 2009	July 2009-June 2010	July 2010-June 2011	July 2011-June 2012	July 2012-June 2013
S_1	22	22	26	28	29	28	32	34
S_2	17	19	14	18	20	20	20	19
S_3	14	11	8	8	6	7	9	7
S_4	1	2	1	1	2	4	4	3

As Table 9 presents, the stock number with zero coverage decreases as the size level increases. The maximum monthly average stock number with zero analyst coverage in S_4 is 4. However, the stocks with zero analyst coverage is considerably high in S_1 and relatively high in S_3 and S_2. Considering the numbers Table 8 and Table 9, S_1AC_1 consists of almost only zero coverage stocks. While zero analyst stocks contributes to S_2AC_1 and S_3AC_1 substantially, S_4AC_1 includes very low number of stocks with zero analyst coverage. Therefore, stocks with zero coverage are less likely to distract the stock distribution in S_4 group, which results in a more homogenous stock distribution.

Table 10 presents the mean, standard deviation, minimum and maximum of returns on sixteen portfolios over 96 months.

Table 10. Summary Statistics of Returns to Be Explained (%)

Portfolios		Mean	Std. Dev.	Min	Max	Obs
S_1	S_1AC_1	0.32	9.39	-30.25	17.95	96
	S_1AC_2	2.45	10.29	-32.28	21.46	96
	S_1AC_3	2.92	11.59	-37.36	24.51	96
	S_1AC_4	-1.39	10.38	-38.56	22.74	96
S_2	S_2AC_1	1.07	8.31	-28.29	18.69	96
	S_2AC_2	2.10	8.46	-25.72	20.50	96
	S_2AC_3	1.98	9.77	-32.23	21.51	96
	S_2AC_4	-0.32	10.62	-47.82	20.69	96
S_3	S_3AC_1	1.89	9.24	-26.65	30.70	96
	S_3AC_2	1.21	8.48	-39.15	24.90	96
	S_3AC_3	0.74	10.49	-49.33	23.05	96
	S_3AC_4	-0.12	9.94	-37.56	22.94	96
S_4	S_4AC_1	1.92	7.94	-24.64	26.18	96
	S_4AC_2	0.78	9.25	-30.33	23.31	96
	S_4AC_3	1.09	8.60	-30.90	20.76	96
	,S_4AC_4	0.92	9.52	-28.41	23.18	96

In Table 10, we can see that in all size groups (S_1, S_2, S_3, S_4) the return on the most neglected portfolios (AC_1) is higher than the return on the most popular portfolios (AC_4). Table 11 presents the summary statistics for independent variables, which are the returns on the factors that we compute for asset pricing models, and compares them with the return on the global factors provided by Fama and French (2012). One of most striking point is that standard deviations of all factors except WML factor are higher than standard deviations of the global factors. High standard deviations may be tied to emerging and risky characteristics of Turkish markets. In other words, volatility in Turkey is higher than developed markets. When we compare the means, we can see that market factor (R_m-R_f) is close to global averages. However, premium of SMB, HML, and WML factors have some different properties from international markets. Starting with SMB and HML factors, we can observe that average premium of our SMB factor is almost six times of the global SMB premium while our HML factor generate a considerably lower average premium than global HML. Besides, global premium of HML is higher than global premium of SMB while our SMB premium is strikingly higher than our HML premium. However, when we compare our results with other studies from Turkey, we observe that higher SMB premium, lower HML premium and higher standard deviations of the factors are common characteristics of Turkish markets (Bereket, 2014; Canbas et al., 2008; Kandır & Arioglu, 2014; Ünlü, 2012).

As for WML, we again see its average premium is 0.08%, which is considerably lower than the global premium of 0.62%. Actually, since the studies which test the performance of Fama-French-Carhart four factor asset pricing model for Turkish market are not vast in number (see sub-section 2.6.3.2), evidence for WML factor in Turkish market are inconclusive. Ünlü (2012) report that the average premium of WML is 3.43% in years between 1992 and 2008. On the other hand, Kandir and Arioglu (2014) cover the years between 2005 and 2013 and find average premium of WML is 0.14%. The main reason for the contradicting results between Ünlü (2012) and Kandir and Arioglu (2014) seem the differences in the time periods they cover. The time period that we cover in our study is very similar to the time in the study of Kandir and Arioglu (2014). Hence, our average WML premium is more close to premium that Kandir and Arioglu (2014) report. Still, the premium they report (0.14%) is almost twice of our premium (0.08%). This may be due to the stock that we have to omit due to lack of analyst coverage data.

Table 11. Summary Statistics of Factor Returns (%)

	Turkey					Global (Fama & French, 2012)	
Factors	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.
Rm-Rf	0.41	8.84	-24.53	20.31	96	0.44	4.37
SMB	0.61	5.08	-10.27	30.29	96	0.10	2.19
HML	0.31	5.29	-35.83	11.99	96	0.45	2.46
WML	0.08	4.18	-14.10	10.91	96	0.62	4.20
NMP	1.17	4.80	-8.35	22.33	96	-	-

Together with this, average premium of NMP factor exceeds the other factor as seen in Table 11. There may be two explanation for this high average premium. First, we construct three portfolios when we calculate NMP factor (Neglected: if analyst coverage is zero, Popular: 35% and Medium: remaining stocks) and we do not use the Medium portfolio. Therefore we take differences of two extreme portfolios based on analyst coverage in order to calculate NMP factor. Second reason can be sample characteristics. Since we narrow down our data and we only include the stocks which provide analyst coverage information, this high NMP premium may be valid for only this sample.

Table 12 presents the correlation among factors. Any of correlation coefficients do not even reach to 40 per cent. The highest correlation is the negative correlation between SMB and HML factors, which is -0.371. Although Fama and French (1993, 1996) report a negative but weak correlation between SMB and HML factors, other studies on Turkish markets report a strong and inverse relationship between SMB and HML factors consistent with our results (Bereket, 2014; Canbas & Arioglu, 2008; Kandır & Arioglu, 2014; Ünlü, 2012).

Table 12. Correlations among Factors

	Rm-Rf	SMB	HML	WML	NMP
Rm-Rf	1				
SMB	-0.212	1			
HML	-0.163	-0.371	1		
WML	-0.232	-0.076	0.226	1	
NMP	-0.320	0.357	0.035	0.056	1

4.2.2 Results of the regression analysis

This section presents the regression results of the asset pricing models for each of the sixteen portfolio that we create based on market capitalization and analyst coverage (see Figure 2). Table 13, Table 14, Table 15, and Table 16 indicates the regression results of smallest stock group (S_1AC_1, S_1AC_2, S_1AC_3, S_1AC_4), moderately small stock group (S_2AC_1, S_2AC_2, S_2AC_3, S_2AC_4), moderately big stock group (S_3AC_1, S_3AC_2, S_3AC_3, S_3AC_4), and biggest stock group (S_4AC_1, S_4AC_2, S_4AC_3, S_4AC_4) respectively. We explain each of the portfolios initially with CAPM. Secondly, we add SMB and HML factors and apply Fama-French three factor model. Then, we include momentum factor WML and explain the excess return of the portfolios with Fama-French-Carhat four factor model. Finally, we add NMP factor in order to investigate the performance of a five factor asset pricing model which includes a neglected stock effect premium.

Table 13. Regression Results of Asset Pricing Models For Smallest Stock Group: (S_1AC_1, S_1AC_2, S_1AC_3, S_1AC_4)

	Alfa	Premium	SMB	HML	WML	NMP	Adjusted R Square
S_1AC_1							
CAPM	-0.011 (0.028)*	0.968 (0.000)*	-	-	-	-	0.486
Fama-French Three Factor Model	-0.017 (0.000)*	1.103 (0.000)*	0.817 (0.000)*	0.289 (0.000)*	-	-	0.560
Fama-French-Carhart Four Factor Model	-0.017 (0.000)*	1.075 (0.000)*	0.804 (0.000)*	0.324 (0.000)*	-0.258 (0.002)*	-	0.560
Five Factor Model	-0.018 (0.000)*	1.091 (0.000)*	0.744 (0.000)*	0.302 (0.000)*	-0.259 (0.002)*	0.145 (0.066)**	0.566
S_1AC_2							
CAPM	0.006 (0.431)	0.872 (0.000)*	-	-	-	-	0.495
Fama-French Three Factor Model	0.001 (0.909)	0.993 (0.000)*	0.660 (0.000)*	0.341 (0.025)*	-	-	0.599
Fama-French-Carhart Four Factor Model	0.001 (0.918)	0.999 (0.000)*	0.663 (0.000)*	0.333 (0.031)*	0.061 (0.732)*	-	0.604
Five Factor Model	0.002 (0.808)*	0.986 (0.000)*	0.710 (0.000)*	0.350 (0.026)*	0.062 (0.729)	-0.114 (0.510)	0.601
S_1AC_3							
CAPM	0.015 (0.090)**	0.985 (0.000)*	-	-	-	-	0.726
Fama-French Three Factor Model	0.008 (0.286)	1.122 (0.000)*	0.857 (0.000)*	0.251 (0.120)	-	-	0.805
Fama-French-Carhart Four Factor Model	0.009 (0.262)	1.090 (0.000)*	0.843 (0.000)*	0.290 (0.075)**	-0.290 (0.129)	-	0.812
Five Factor Model	0.009 (0.236)	1.081 (0.000)*	0.877 (0.000)*	0.302 (0.068)**	-0.289 (0.131)	-0.082 (0.655)	0.817
S_1AC_4							
CAPM	-0.029 (0.000)*	1.017 (0.000)*	-	-	-	-	0.653
Fama-French Three Factor Model	-0.036 (0.000)*	1.183 (0.000)*	0.830 (0.000)*	0.373 (0.000)*	-	-	0.791
Fama-French-Carhart Four Factor Model	-0.035 (0.000)*	1.154 (0.000)*	0.817 (0.000)*	0.309 (0.000)*	-0.268 (0.030)*	-	0.799
Five Factor Model	-0.036 (0.000)*	1.164 (0.000)*	0.780 (0.000)*	0.396 (0.000)*	-0.268 (0.030)*	-0.088 (0.041)*	0.807

p values are showed in parenthesis
* significant at 95% confidence level
** significant at 90% confidence level

Starting with smallest stock group, Table 13 shows that market factor of CAPM is significant at 95% confidence level and has a high coefficient in all of the four analyst coverage levels (S_1AC_1, S_1AC_2, S_1AC_3, S_1AC_4). However, CAPM products relatively low adjusted R squares for neglected and moderately neglected group (S_1AC_1 and S_1AC_2), which means CAPM is able to catch return patterns of moderately popular and most popular portoflios (S_1AC_3 and S_1AC_4) more efficiently.

When we add SMB and HML factor and apply Fama-French three factor model, adjusted R square increases in all of the four portfolios. SMB factor is significant in each portfolios. Besides, since Table 13 presents the results of the smallest stock groups, in all four portfolios we observe that coefficients of SMB factor is positive and between 0.66 and 0.85 which is quite high. As for HML factor of Fama-French three factor, we see that it is also significant in all portfolios except portfolio of S_1AC_3. The coefficients of HML is positive yet it is considerably lower than the coefficient of SMB factor. The highest HML coefficient reaches to 0.373, which is almost the half of the smallest SMB coefficient.

The results of Fama-French-Carhart model shows that coefficient of WML factor is negative except S_1AC_2. WML factor is significant for S_1AC_1 and for S_1AC_4 and insignificant for S_1AC_2 and for S_1AC_3. However, a statistically significant WML factor does not necessarily cause a considerable increase in R square. R square of S_1AC_1 remain the same before and after we add WML factor, which means WML factor does not provide an observable increase for S_1AC_1. For S_1AC_3 WML increases R square by 0.008 and bring it from 0.791 to 0.799.

Table 13 finally shows the results of a five factor model including NMP for the portfolios of S_1AC_1, S_1AC_2, S_1AC_3, and S_1AC_4. The NMP factor is significant for the most neglected portfolio (S_1AC_1) at 90% confidence level and for the most popular portfolio (S_1AC_3) at 95% confidence level. The coefficient of NMP is 0.145 for S_1AC_1 and -0.088 for S_1AC_4. A positive NMP coefficient for S_1AC_1 and a negative NMP coefficient for S_1AC_3 is expected since S_1AC_1 represents the most neglected portfolio while S_1AC_4 represents the most popular portfolio in the smallest (S_1) size level. Considering that NMP factor is calculated in order to catch the premium that neglected stocks generates over popular ones, the excess return of S_1AC_1 has a positive relation with NMP factor and the excess return of S_1AC_4 has a negative relation with NMP factor. Together with this, similarly to WML factor, NMP factor does not contribute to R square even in the cases that it provides significant results.

Table 14. Regression Results of Asset Pricing Models For Moderately Small Stock Group: (S_2AC_1, S_2AC_2, S_2AC_3, S_2AC_4)

	S_2AC_1						
	Alfa	Premium	SMB	HML	WML	NMP	Adjusted R Square
CAPM	-0.003 (0.461)	0.855 (0.000)*	-	-	-	-	0.540
Fama-French Three Factor Model	-0.008 (0.016)*	0.966 (0.000)*	0.679 (0.000)*	0.227 (0.002)*	-	-	0.710
Fama-French-Carhart Four Factor Model	-0.008 (0.017)*	0.959 (0.000)*	0.676 (0.000)*	0.235 (0.002)*	-0.064 (0.455)	-	0.721
Five Factor Model	-0.010 (0.005)*	0.979 (0.000)*	0.601 (0.000)*	0.209 (0.005)*	-0.066 (0.436)	0.180 (0.027)*	0.740
	S_2AC_2						
	Alfa	Premium	SMB	HML	WML	NMP	Adjusted R Square
CAPM	0.003 (0.585)	0.751 (0.000)*	-	-	-	-	0.716
Fama-French Three Factor Model	-0.003 (0.546)	0.889 (0.000)*	0.790 (0.000)*	0.352 (0.001)*	-	-	0.846
Fama-French-Carhart Four Factor Model	-0.003 (0.584)	0.862 (0.000)*	0.778 (0.000)*	0.385 (0.000)*	-0.245 (0.038)*	-	0.848
Five Factor Model	-0.003 (0.481)	0.872 (0.000)*	0.741 (0.000)*	0.372 (0.000)*	-0.245 (0.038)*	0.088 (0.430)	0.852
	S_2AC_3						
	Alfa	Premium	SMB	HML	WML	NMP	Adjusted R Square
CAPM	-0.004 (0.459)	0.955 (0.000)*	-	-	-	-	0.651
Fama-French Three Factor Model	-0.011 (0.019)*	1.112 (0.000)*	0.807 (0.000)*	0.322 (0.000)*	-	-	0.795
Fama-French-Carhart Four Factor Model	-0.011 (0.021)*	1.099 (0.000)*	0.802 (0.000)*	0.338 (0.000)*	-0.120 (0.300)	-	0.795
Five Factor Model	-0.012 (0.018)*	1.107 (0.000)*	0.775 (0.000)*	0.328 (0.000)*	-0.121 (0.300)*	0.300 (0.563)*	0.793
	S_2AC_4						
	Alfa	Premium	SMB	HML	WML	NMP	Adjusted R Square
CAPM	-0.018 (0.002)*	1.096 (0.000)*	-	-	-	-	0.727
Fama-French Three Factor Model	-0.024 (0.000)*	1.224 (0.000)*	0.737 (0.000)*	0.318 (0.002)*	-	-	0.820
Fama-French-Carhart Four Factor Model	-0.024 (0.000)*	1.216 (0.000)*	0.733 (0.000)*	0.327 (0.002)*	-0.072 (0.543)	-	0.818
Five Factor Model	-0.021 (0.000)*	1.181 (0.000)*	0.861 (0.000)*	0.373 (0.000)*	-0.070 (0.541)	-0.307 (0.006)*	0.831

p values are showed in parenthesis
* significant at 95% confidence level
** significant at 90% confidence level

Table 14 indicates the result of the asset pricing models for moderately small groups. As we see, market factor of CAPM model has high coefficients and is significant at 95% confidence level for all of the four portfolios (S_2AC_1, S_2AC_2, S_2AC_3, S_2AC_4). When it comes to SMB and HML factors of Fama-French three factor model, the both factors are statistically significant and contributes considerably to R squares for all of the four portfolios. Despite being a little bit lower than the SMB coefficients of smallest size group (see Table 13), SMB coefficients in Table 14 can be considered to be high. The HML coefficients are again around 0.30 similarly with the smallest size group (see Table 14). As for WML factor, it is statistically significant for only S_2AC_2 with a negative coefficient of -0.245. Besides, again we can observe that Fama-French-Carhart four factor model does not increase R square considerably.

As for NMP factor, it is statistically significant for S_2AC_1 and S_2AC_4 at 95% confidence level. As we observe in the case of smallest group (S_1) (see Table 13) The coefficient of NMP factor is positive (0.18) for S_2AC_1, which is the portfolio of the most neglected stocks in moderately small group, and negative (-0.307) for S_2AC_4, which is the portfolio of the most popular stocks in moderately small group. In S_2 group, NMP contributes to R squares generally at 0.015-0.02 level, which is a higher contribution than what is observed in S_1 group.

Table 15. Regression Results of Asset Pricing Models For Moderately Big Stock Group: (S_3AC_1, S_3AC_2, S_3AC_3, S_3AC_4)

S_3AC_1	Alfa	Premium	SMB	HML	WML	NMP	Adjusted R Square
CAPM	0.005 (0.445)	0.832 (0.000)*	-	-	-	-	0.552
Fama-French Three Factor Model	-0.002 (0.578)	0.991 (0.000)*	0.745 (0.000)*	0.286 (0.003)*	-	-	0.790
Fama-French-Carhart Four Factor Model	-0.002 0.595	0.982 (0.000)*	0.745 (0.000)*	0.296 (0.002)*	-0.080 (0.470)	-	0.788
Five Factor Model	-0.005 (0.304)	1.010 (0.000)*	0.707 (0.000)*	0.261 (0.006)*	-0.082 (0.450)	0.240 (0.023)*	0.801

S_3AC_2	Alfa	Premium	SMB	HML	WML	NMP	Adjusted R Square
CAPM	0.005 (0.314)	0.805 (0.000)*	-	-	-	-	0.616
Fama-French Three Factor Model	0.000 (0.937)	0.933 (0.000)*	0.606 (0.000)*	0.289 (0.001)*	-	-	0.777
Fama-French-Carhart Four Factor Model	0.000 (0.916)	0.943 (0.000)*	0.605 (0.000)*	0.277 (0.002)*	0.085 (0.416)	-	0.776
Five Factor Model	-0.001 (0.824)	0.949 (0.000)*	0.572 (0.000)*	0.269 (0.004)*	0.085 (0.420)	0.056 (0.576)	0.774

S_3AC_3	Alfa	Premium	SMB	HML	WML	NMP	Adjusted R Square
CAPM	-0.008 (0.157)	1.098 (0.000)*	-	-	-	-	0.752
Fama-French Three Factor Model	-0.012 (0.012)*	1.203 (0.000)*	0.574 (0.000)*	0.301 (0.003)*	-	-	0.810
Fama-French-Carhart Four Factor Model	-0.012 (0.013)*	1.205 (0.000)*	0.574 (0.000)*	0.299 (0.004)*	0.017 (0.889)	-	0.808
Five Factor Model	-0.011 (0.027)*	1.190 (0.000)*	0.626 (0.000)*	0.318 (0.003)*	0.018 (0.883)	-0.125 (0.277)	0.808

S_3AC_4	Alfa	Premium	SMB	HML	WML	NMP	Adjusted R Square
CAPM	-0.016 (0.000)*	1.120 (0.000)*	-	-	-	-	0.867
Fama-French Three Factor Model	-0.019 (0.000)*	1.186 (0.000)*	0.391 (0.000)*	0.159 (0.027)*	-	-	0.895
Fama-French-Carhart Four Factor Model	-0.019 (0.000)*	1.180 (0.000)*	0.388 (0.000)*	0.167 (0.022)*	-0.062 (0.465)	-	0.895
Five Factor Model	-0.019 (0.000)*	1.178 (0.000)*	0.392 (0.000)*	0.169 (0.023)*	-0.062 (0.468)	-0.010 (0.898)	0.894

p values are showed in parenthesis
* significant at 95% confidence level
** significant at 90% confidence level

Table 15 represents the results of asset pricing models for moderately big stock group (S_3AC_1, S_3AC_2, S_3AC_3, S_3AC_4). Similarly to Table 13 and Table 14, CAPM is able to explain excess returns of the each of the four portfolios in Table 15 in an efficient way. Market factor of CAPM is significant and has high and positive coefficients. The R squares of CAPM model is around 0.70 except S_3AC_1. Similarly to previous size groups (S_1 and S_2) the CAPM generates the lowest R square (0.540) for the most neglected portfolio (S_3AC_1) in moderately big size group as well.

Fama-French three factor model increases R squares for all portfolios but especially increase in R squares for S_3AC_1 is striking. SMB and HML factor of Fama-French three factor model is statistically significant at 95% confidence level for all portfolios. Although Table 15 presents the regression results of the moderately big stock group, SMB factor of Fama-French three factor model has positive coefficients. However, the coefficient of SMB factor is decreasing as level of analyst coverage increases (through AC_1 to AC_4). This may imply that the correlation between size and analyst coverage is still apparent for moderately big stock group. As for HML factor, its coefficients does not deviate with respect to analyst coverage level. The range of HML coefficient is between 0.16 and 0.28, which is relatively lower than the previous two size groups (S_1 and S_2).

For moderately big group, Fama-French-Carhart model does not perform very efficiently. WML factor is not significant for any of the four analyst coverage levels. Finally, NMP factor is significant for only the most neglected portfolio (S_3AC_1). NMP factor for S_3AC_1 is 0.19, which is positive similarly with the NMP factors for most neglected portfolios in other size groups (S_1AC_1 and S_2AC_1). Besides, NMP increases R square for S_3AC_1 by 0.013.

Table 16. Regression Results of Asset Pricing Models for Biggest Stock Group: (S_4AC_1, S_4AC_2, S_4AC_3, S_4AC_4)

	S_4AC_1						
	Alfa	Premium	SMB	HML	WML	NMP	Adjusted R Square
CAPM	0.005 (0.283)	0.755 (0.000)*	-	-	-	-	0.616
Fama-French Three Factor Model	0.002 (0.660)	0.823 (0.000)*	0.563 (0.000)*	-0.047 (0.597)	-	-	0.742
Fama-French-Carhart Four Factor Model	0.002 (0.681)	0.833 (0.000)*	0.567 (0.000)*	-0.059 (0.509)	0.094 (0.374)	-	0.742
Five Factor Model	0.000 (0.967)	0.857 (0.000)*	0.482 (0.000)*	-0.090 (0.315)	0.092 (0.373)	0.207 (0.039)*	0.761
	S_4AC_2						
	Alfa	Premium	SMB	HML	WML	NMP	Adjusted R Square
CAPM	0.001 (0.866)	1.040 (0.000)*	-	-	-	-	0.860
Fama-French Three Factor Model	-0.002 (0.595)	1.097 (0.000)*	0.295 (0.000)*	0.183 (0.011)*	-	-	0.879
Fama-French-Carhart Four Factor Model	-0.002 (0.633)	1.079 (0.000)*	0.287 (0.000)*	0.205 (0.004)*	-0.163 (0.052)**	-	0.883
Five Factor Model	-0.001 (0.740)	1.074 (0.000)*	0.307 (0.000)*	0.212 (0.004)*	-0.162 (0.053)**	-0.049 (0.539)	0.882
	S_4AC_3						
	Alfa	Premium	SMB	HML	WML	NMP	Adjusted R Square
CAPM	-0.001 (0.621)	0.993 (0.000)*	-	-	-	-	0.909
Fama-French Three Factor Model	-0.002 (0.553)	1.000 (0.000)*	-0.036 (0.550)	0.025 (0.659)	-	-	0.907
Fama-French-Carhart Four Factor Model	-0.002 (0.560)	0.998 (0.000)*	-0.036 (0.561)	0.027 (0.640)*	-0.015 (0.826)	-	0.907
Five Factor Model	-0.002 (0.581)	0.998 (0.000)*	-0.037 (0.580)	0.028 (0.639)	-0.015 (0.828)	-0.004 (0.950)	0.905
	S_4AC_4						
	Alfa	Premium	SMB	HML	WML	NMP	Adjusted R Square
CAPM	-0.006 (0.007)*	1.123 (0.000)*	-	-	-	-	0.953
Fama-French Three Factor Model	-0.005 (0.021)*	1.100 (0.000)*	-0.127 (0.007)*	-0.057 (0.200)	-	-	0.955
Fama-French-Carhart Four Factor Model	-0.005 (0.023)*	1.094 (0.000)*	-0.130 (0.006)*	-0.049 (0.277)	-0.062 (0.243)	-	0.955
Five Factor Model	-0.005 (0.038)*	1.090 (0.000)*	-0.115 (0.026)*	-0.043 (0.340)	-0.061 (0.246)	-0.035 (0.485)	0.955

p values are showed in parenthesis
* significant at 95% confidence level
** significant at 90% confidence level

Table 16, it represents the results of asset pricing models for biggest stock group (S_4AC_1, S_4AC_2, S_4AC_3, S_4AC_4). Similarly to Table 13, Table 14, and Table 15, market factor of CAPM is significant in all of the four portfolios and generates high R squares. Especially, R squares of CAPM for S_4AC_3, S_4AC_4 is higher than 0.90, which are strikingly high as expected. Considering that S_4AC_3 and S_4AC_4 are two biggest and most popular portfolios among the sixteen cross portfolios constructed based on size and analyst coverage, S_4AC_3 and S_4AC_4 are expected to have the highest comovement with market return.

HML factor of Fama-French three factor model is significant for S_4AC_2. Moreover, unlike the other size groups, HML factor in the biggest size group has either negative coefficient or considerable lower positive coefficients. Considering HML represents financial distress (Fama & French, 1995), it seems that stocks in the biggest size group are less likely to suffer from financial distress. Thus, they have an insignificant HML factor with lower coefficients. As for SMB factor, it is significant for all of the portfolios in Table 16 except S_4AC_3. The coefficient of SMB is positive for S_4AC_1 and S_4AC_2, but turns to negative for S_4AC_3 and S_4AC_4. Similarly to Table 16, this may imply that the correlation between size and analyst coverage is still apparent for biggest stock group as well. In other words, positive coefficients in lowest analyst coverage levels (S_4AC_1 and S_4AC_2) signal that these portfolios have a positive relationship with SMB factor, which means there is a size premium. On the other hand, negative coefficients in highest analyst coverage levels (S_4AC_3 and S_4AC_4) means that these portfolios have a negative relationship with SMB factor. Besides, the overall contribution of SMB and HML factor to R square is remarkable only for S_4AC_1. This may also be due to the correlation between size and analyst coverage in the biggest size group. Since there seems a remarkable size premium for the lowest level of the analyst coverage in the biggest stock (S_4AC_1) in comparison with the higher levels of the analyst coverage in the same size group (S_4AC_2, S_4AC_3, S_4AC_4), SMB contributes most to explanatory power of the regression in the case of S_4AC_1.

Similarly to previous size groups, Fama-French-Carhart factor does not perform very efficiently for the biggest stock group as well. WML factor is only significant for S_4AC_2 at 90% confidence level. It has negative coefficient, which is -0.163. However, WML factor does not lead an observable increase in the R square for any of the four portfolios.

Finally, NMP factor is significant for only the most neglected portfolio in the biggest stock groups (S_4AC_1). Similarly to the previous size groups, the coefficient of NMP for most neglected portfolio is positive (0.207), which means there is a statistically significant neglected stock premium for these portfolios. Moreover, NMP factor contributes to R square of S_4AC_1 by 0.019.

Overall, the Table 13, Table 14, Table 15, Table 16 imply that CAPM is a good estimator of stock returns in Turkish markets. Furthermore, SMB and HML are generally statistically significant. Besides, SMB and HML usually make an observable increases in R squares, which indicates that Fama-French three factor model performs efficiently. However, marginal contribution of Fama-French three factor model to R square diminishes as analyst coverage level increase (through AC_1-AC_4) and as size level increases (through S_1-S_4). On the other hand, Fama-French-Carhart four factor model generally does not increase R square. Additionally WML factor is significant for only four out of sixteen portfolios.

As for five factor model, NMP factor is significant all of the four most neglected portfolios (S_1AC_1, S_2AC_1, S_3AC_1, S_4AC_1) and two of the most popular portfolios (S_1AC_4, S_2AC_4). While NMP generates positive coefficients for the most neglected stock groups, its coefficients turn to negative for the most popular portfolio groups. Together with this, NMP factor is not statistically significant for moderately neglected (S_1AC_2, S_2AC_2, S_3AC_2, S_4AC_2) and moderately popular portfolios (S_1AC_3, S_2AC_3, S_3AC_3, S_4AC_3). The reason for this may the following: The highest and lowest analyst coverage that we encounter in Borsa Istanbul is 35 and 0 respectively (see Table 3). The difference between them is not dramatically large compared to American market. When we divide stocks into four based on their analyst coverage, the difference in analyst coverage of subsequent portfolios becomes even smaller. Thus, we can observe the neglected stock effect premium only for the most neglected and the most popular portfolios.

As for adjusted R squares, although five factor model does not lead a very large increase in R square, still its contribution to R square seems more considerable than Fama-French-Carhart four factor model.

CHAPTER 5

CONCLUSION

According to EMH, which is one of the most celebrated models that aim to reveal economic performance of the markets, investors cannot generate abnormal returns and beat the market. However, empirical tests conducted especially during 1980s indicate that there are some cases that contradict with EMH. The empirical results which are not consistent with EMH are called anomalies. Among these anomalies, the neglected stock effect is defined as the empirical observation that the stocks neglected in the market bring higher return than the popular ones. This study aims to test the neglected stock effect in Borsa Istanbul during the years between 2005 and 2013.

The few studies testing the neglected stock effect in Borsa Istanbul have contradicting results. While Gerçek (1999) and Karan (2000) document that there is a neglected stock effect in Borsa Istanbul, Hepsen and Demirci (2007) and Akkoç et al. (2009) conclude that there is no sign of the neglected stock effect in Borsa Istanbul.

In this study, we test the neglected stock effect in Borsa Istanbul during the years between 2005 and 2013. We measure the neglect level with the number of analyst following the stock. In order to eliminate size bias, we create cross portfolios based on size and analyst coverage.

First, we find that Fama-French three factor model perform efficiently for Borsa Istanbul consistent with the results of Yıldırım, (2006), Aksu and Önder (2000), Doğanay (2006), Erişmiş (2007), Canbaş et al. (2008), Gökgöz (2008), Bildik and Gülay (2007), and Atakan and Gokbulut (2010). Second, our results show that momentum factor does not contribute to explanatory power of three factor model; thus Fama-French-Carhart does not have a superior performance over Fama-French three factor model for Borsa Istanbul. Moreover, WML factor is statistically insignificant for thirteen portfolios out of sixteen portfolios and generally has negative coefficients, which means only past losers seem to impact stock returns. Our results are in line with the study of Kandir and Arıoğlu (2014). In their study, Kandir and Arıoğlu (2014) covers the period between 2005 and 2013, similarly to our study, and the authors find that WML factor is statistically insignificant and has negative coefficients. Finally, we find that NMP factor, which serves for mimicking neglected premium, is statistically significant for all of the four most neglected stock portfolios and for two of the four most popular portfolios. The coefficient of NMP factor is positive for the most neglected portfolios and negative for the most popular stocks, which means that there is neglected stock premium for most neglected portfolios. Besides, despite being lower in comparison with the contribution of size and value factors, the contribution of neglect factor to R square is higher than momentum factor.

The results of our t-test and regression analyses indicate that when analyst coverage is employed as the neglect proxy there is a neglected stock effect in the Borsa Istanbul independently from the size effect. Our findings are consistent with the international studies that use analyst coverage as the neglect measure (Arbel & Strebel, 1982, 1983; Carvel & Strebel, 1987; Elfakhani & Zaher, 1998; Peterson et al., 1986). As for the studies on Turkey, our results are in line with Gerçek (1999) and Karan (2000). Gerçek (1999) and Karan (2000) cover earlier periods. More recent studies, Hepşen and Demirci (2007) and Akkoç et al. (2009), find no sign of the neglected stock effect in Borsa Istanbul. One reason for this contradiction may be the differences in the neglect proxies. All of the studies on Turkey use trade volume or number of trade contract to measure neglect. Thus, findings show that premium measured by trade volume diminish over time. However, when we measure neglect level with the analyst coverage, like most of the international studies, we find that there is a neglected stock effect premium in Borsa Istanbul in recent years.

In our study, we do not have analyst coverage information for every stock traded in Borsa Istanbul. Further research that has a better estimate for neglect or involve more stocks in terms of the analyst coverage measure would add to the findings in the literature. Second, we cannot group stocks according to industry in order not to reduce our number of stocks covered even further. For example, it would be interesting to see whether banks and non-bank firms differ in terms of the neglected stock effect.

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