ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF SCIENCE ENGINEERING AND TECHNOLOGY

PROFITABILITY OF MOMENTUM AND CONTRARIAN TRADING STRATEGIES IN THE U.S. STOCK MARKET

M.Sc. THESIS

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Department of Management Engineering

Management Engineering Programme

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ISTANBUL TEKNİK ÜNİVERSİTESİ ★ FEN BİLİMLERİ ENSTİTÜSÜ

AMERİKAN HİSSE SENEDİ PİYASASINDA MOMENTUM VE ZITLIK YATIRIM STRATEJİLERİNİN KARLILIĞI

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Yağızhan YILMAZ, a M.Sc. student of ITU Graduate School of Science Engineering and Technology student ID 507161037, successfully defended the thesis entitled "**PROFITABILITY OF THE MOMENTUM AND CONTRARIAN TRADING STRATEGIES IN THE U.S. STOCK MARKET**", which he prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

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To a place where we know we are loved,

FOREWORD

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Yağızhan YILMAZ
(Civil Engineer)

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ABBREVIATIONS

ISE : Istanbul Stock Exchange
Nasdaq : National Association of Securities Dealers Automated Quotation
NYSE : New York Stock Exchange
S&P 500 : Standard & Poor's 500 Index
TV : Stock Turnover Velocity

SYMBOLS

J	**:** Portfolio Formation Period
K	**:** Portfolio Holding Period
$\mathbf{R_{pt}}$, $\mathbf{R_{it}}$	**:** Return of Portfolio
$\mathbf{P_{it}}$	**:** Adjusted Close Price
t	**:** Time
n	**:** Number of a Stocks in Portfolio

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PROFITABILITY OF MOMENTUM AND CONTRARIAN TRADING STRATEGIES IN THE U.S. STOCK MARKET

SUMMARY

Over the past decades, investor rationality is underlined by most of the theories developed in the finance literature. In the context of the absolute rationality of the market participants, the efficient market hypothesis which has been one of the dominant sources for price prediction claims that asset prices incorporated fundamental information used by rational investors. Therefore every asset is at its equilibrium price. In such a case, any unforeseeable inconsistency in security prices is considered as an anomaly in the financial markets. These anomalies and their main drivers have attracted the interest of many financial researchers who have often agreed that not all market participants are rational. Consequently, their researchers provided a basis for a behavioral finance which is an approach that involves the models which are influenced by irrational factors more than those are considered rational.

Considering the purpose of the study, it is mainly aimed to shed light on the return patterns as anomalies which are causatively connected with investment decisions of market participants and their reactions to the information. The thesis investigates the momentum and contrarian approaches comparatively on equity returns in the U.S. Stock Market. In this regard, the study analyzed whether strategies on average outperformed the benchmark of the market return, building on the filtered and corrected monthly historical data of the stocks traded in the S&P500 Index between December 1994 and January 2018. Momentum strategies focus on the portfolios that involve stocks with higher profits in the past and contrarian strategies vice versa. Correspondingly, the results show the significant profitability of momentum strategies based on various trading frequencies, even after possible transaction costs. However, it is not possible to say for contrarian strategies. For instance, the average monthly excess returns are maximized for the momentum strategy that select first 25 stocks and has 3-month observation period and 12-month holding period with a value of 4,33% at 1% significance level. In addition, the relationship between the monthly average excess returns of momentum and contrarian strategies and the turnover velocity of the market is examined. A significantly negative relationship is observed with monthly momentum profits and market turnover.

AMERİKAN HİSSE SENEDİ PİYASASINDA MOMENTUM VE ZITLIK YATIRIM STRATEJİLERİ UYGULAMALARI

ÖZET

Günümüzde bilgi teknolojilerindeki gelişmeler ile bilgi akışı etkin hale gelmekte ve işlem gerçekleştirme hızı artmaktadır. Bu durum etkin piyasalar hipotezinin varlık fiyatlamaları için daha açıklayıcı olması beklentisine yol açmaktadır. Ancak yine de hipotez, varlığı çok net bir şekilde gözlemlenen piyasa anomalilerini açıklamakta hala güçlük çekmektedir. Bunun bir sonucu olarak, söz konusu anomaliler ve anomalilerin olası nedenleri finans alanındaki birçok araştırmacının dikkatini çekmiştir. Yapılan araştırmalar sonunda elde edilen bulgular anomalilerin nedenlerini açıklayıcı niteliktedir. Bu bulguların en başında insan doğasında bulunan sınırlı rasyonellik, psikolojik önyargılar, belirsizlik etkisi gibi davranışsal ve bilişsel temelli olgular yer almaktadır.

Davranışsal finans teorisine göre yatırımcılar, sahip oldukları bilişsel kusurlar nedeni ile yatırım kararlarını verirken rasyonellikten sapmaktadır. Bu durum insan doğasında var olan psikolojik eğilimlerden ileri gelmektedir. İnsan, bilgi toplama, bilgi işleme ve karar alma aşamasında psikolojik eğilimlerin yarattığı ön yargıların etkisi altındadır. Bahsedilen ön yargılar çoğunlukla zaman kısıtı altında, gereğinden fazla bilgi varlığında veya aksine yeterli bilgi olmaması durumunda ortaya çıkmaktadır. Yapılan çalışmalarda söz konusu ön yargılar kullanılarak bazı yatırımcı modelleri geliştirilmiştir. Bu modellere konu olan yatırımcıların aldığı kararların piyasada gözlemlenen anomalilerin başlıca nedenlerinden olduğu öne sürülmüştür. Bahsedilen modellere göre yatırımcılar sahip oldukları ön yargılar nedeni ile piyasadaki varlıkları konu alan haberlere veya olaylara aşırı tepki ya da normalden az tepki vermeye yatkındırlar. Bu durum varlık fiyatlamalarında dengeden sapmalara yol açmaktadır. İlgili literatürden örnekler bu sapmalardan yararlanarak ek bir riske maruz kalmadan karlı bir yatırım fırsatı sunan stratejiler ortaya koymuştur. Bu stratejilerin başında momentum yatırım stratejileri ve zıtlık yatırım stratejileri gelmektedir. Momentum stratejileri piyasadaki düşük tepkiden ileri gelirken zıtlık stratejileri piyasadaki aşırı tepkiden yararlanır. Gösterilen düşük tepki varlık fiyatının gerçek değerinin altında gerçekleşmesine neden olur böylelikle takip eden dönemde varlık fiyatının gerçek değerine ulaşacağı kabulu ile bir kar aralığı oluşacağı söylenebilir. Bu durum aşırı tepki durumu için de geçerlidir.

Bu tez kapsamında yatırımcıların yatırım kararlarını verirken gösterdikleri ön yargı temelli davranışlar literatürden örnekler ile anlatılmış ve bu davranışların piyasalarda yarattığı etkiden yararlanan yatırım stratejilerinin karlılığı gelişmiş piyasa örneği olan Amerikan hisse senedi piyasasında araştırılmıştır. Stratejilerin karlı sayılabilmesi için ortalama aylık getirilerin örnek dönemde piyasanın üzerinde getiri getirmesi beklenmektedir. Amerikan hisse senedi piyasasını temsil etmesi için çalışmada S&P 500 toplam getiri indeksinden yararlanılmıştır.

Çalışmanın örneklemini Aralık 1994 ile Ocak 2018 tarihleri arasında S&P 500 indeksine dahil olan hisse senetleri oluşturmaktadır. Momentum ve zıtlık stratejilerinin karlılığı farklı gözlem periyodu ve farklı elde tutma periyotları için oluşturulan portföyler ile incelenmiştir.

Yapılan çalışmada momentum yaklaşımı ile oluşturulan portföylerin ortalama aylık getirilerinin pozitif olduğu bulunmuştur. Bu getirilerin 3 aylık gözlem periyodu ve 12 aylık elde tutma periyodu için aylık %4,33 değerinde %1 önem derecesi ile maksimize edildiği gözlenmiştir. Bu değeri 6 aylık gözlem periyodu ve 12 aylık elde tutma periyodu için elde edilen aylık %3,88 getiri değeri izlemektedir. Elde edilen değerler işlem maliyetlerinin hesaba katılması ile S&P 500 toplam getiri indeksinin söz konusu dönemdeki getirisinin üzerinde kalan değerdir. Momentum karlılığının aksine zıtlık yaklaşımı ile oluşturulan portföylerin getirileri pozitif olsa da istatistiksel olarak anlamlı olmadığı sonucuna ulaşılmıştır.

Stratejilerin düşüş ve yükseliş dönemlerindeki karlılığının incelenmesi için 170 aylık yükseliş ve 50 aylık düşüş dönemleri oluşturulmuştur. Momentum stratejilerinin aylık getirileri piyasanın yükseliş dönemlerinde artış göstermektedir. Düşüş dönemlerinde ise ortalama karlılığı devam etmekte ancak anlamlılığı kaybolmaktadır. Düşüş dönemlerinde 12 aylık elde tutma periyoduna sahip zıtlık stratejilerinin genellikle pozitif getiriye sahip olduğu gözlemlenmiştir. Buna ek olarak aylık hisse senedi devir hızı ile söz konusu yatırım stratejilerinin karlılığının ilişkisi incelenmiştir. Momentum stratejileri için bu ilişkinin tüm yatırım dönemlerinde anlamlı bir şekilde negatif olduğu gözlenmiştir. Ancak zıtlık stratejisi için böyle bir anlamlılık söz konusu değildir. Bu durum piyasadaki işlem hacminin ve market aktifliğinin artması ile aynı dönem için momentum getirilerinin azalması anlamına gelmektedir.

İlerleyen çalışmalarda portföy oluşturma momentum ve zıtlık stratejileri için daha koşullu hale getirilebilir. Piyasanın üzerinde getiriye sahip portföyler belirlenirken Fama – French üç faktörlü model gibi modeller kullanılabilir. Böylelikle portföylerin bu çalışmada yapılanın aksine risk düzeltilmiş getirileri hesaplanabilir. Risk düzeltilmiş hisse senetleri ile momentum veya zıtlık yaklaşımı kullanılarak oluşturulan portföylerin ileri dönemdeki getiri sonuçlarının farklı olacağı öngörülmektedir.

1. INTRODUCTION

Over the past decades, investor rationality is underlined by most of the theories developed in finance literature. Within the context of the absolute rationality of market participants, efficient market hypothesis claims that asset prices completely incorporated fundamental information used by rational investors. In the case of market efficiency which has been one of the dominant sources for price prediction, it is assumed that every asset is on its equilibrium price. Thus, in financial markets, the presence of any unforeseeable inconsistency in asset prices is considered as an anomaly. These anomalies and their main drivers have attracted the interest of many financial researchers who mostly disagreed that all market participants are rational. The studies of these researchers usually assert that the hypothesis can be questioned to explain the anomalies mentioned as fluctuations, deviations and price reversals in asset prices. With respect to studies implemented in contrast with market efficiency, it can be said that the literature in finance has partially evolved away from the time that rationality perspective of the efficient market hypothesis was considered as a dominant.

A lot of researchers have shifted their focus from the theories rooted in investor rationality, for instance, technical analyses of time series, toward behavioral theories taken their source from investor psychology. Their researches provided a basis for a topic of behavioral finance. “Behavioral finance” is considered an approach that involves the models which are more influenced by irrational factors than those are considered rational. For instance, in the paper of Shiller (2003), it is indicated that behavioral finance is one of the most vital research topics, and it stands in sharp contradiction to much of efficient market hypothesis.

The studies generally accepted that the main purpose of behavioral finance is not to prove that the classical financial approaches are wrong, but to explain that investors have not only decided with rational techniques and that their investment decisions can be optimized with psychological competence. In addition, behavioral

finance aims to be able to explain the connection of the developed human brain with its primitive structure in terms of investment decisions, to present the reasons of misguidances and, to raise awareness about the individual's cognitive biases.

If any predictable pattern of returns does exist in asset prices, a profitable interval occurs due to price predictability. A profitable interval, as a result of the market anomalies, can only be exploited by rational market participants until predictability of prices is lost. However, it is observed that well-known anomalies continued to exist and to create an opportunity to generate excess profits in contradiction with the assumption of investor rationality. Therefore, several investor models were developed on the basis of psychological/cognitive bias by behavioral finance researchers to investigate the reasons for continuous market returns as known as market anomalies. These models will be introduced in Chapter 2 "Behavioral Models". Most of the studies implemented in behavioral finance indicated that the anomalies generally were seen in the market are associated with the individual reactions of market participants to the information. Their reactions to the information can be exploited to earn excess profits with using trading strategies called "Momentum strategies" and "Contrarian strategies" in the relevant literature. Considering the purpose of the thesis, it is mainly aimed to shed light on the continuation of returns which are causatively connected with underreaction and overreaction to the available information of market participants.

The study differs from its own precedents by the reason that it examines the momentum and contrarian approaches comparatively. Addition to that, it might be considered as a recent example of testing the continuity of the profitability of behavior-based investment strategies in the U.S. stock market, as an example of a developed market. Besides, it is a quite example of raising awareness of the research topic. The relationship between the profitability of behavior-based investment strategies and the transaction volume of the market is also examined.

As mentioned above, behavioral finance literature presents a challenge to the efficient markets theory because it suggests that investors can earn excess returns by taking advantage of market anomalies due to investor underreaction and overreaction without bearing extra risk. In this regard, the study basically searches for an answer to the following research questions:

1. Can momentum investment strategy outperform the market with generating significant positive returns over horizons of 1-12 months?

2. Can contrarian investment strategy outperform the market with generating significant positive returns over horizons of 1-12 months?

3. Can momentum-based strategy be considered more profitable than contrarian-based strategy?

4. Are momentum and contrarian performance affected by the extent of the number of selected stocks in winner or loser portfolios?

5. Do momentum and contrarian strategies perform better in uptrend and downtrend market?

6. Is turnover velocity correlated to excess returns from momentum and contrarian strategies?

The remainder of thesis is organized as follows. “Chapter 2” clarifies the cognitive biases that individuals show while they were making investment decisions and, by doing so, it explains the investor models created by combining these biases. “Chapter 3” consists of a literature review regarding investment strategies that originated from behavioral anomalies in the market. “Chapter 4” shows the data and it details methodology employed in this thesis. “Chapter 5” presents empirical results of the research questions and discusses them. “Chapter 6” summarizes and concludes the study.

2. BEHAVIORAL MODELS

The human brain can be a misleading instrument in contrast with rational decision making for investments. Considering the rational manner of the human brain, classical economics assumes that human brain exploits stable preferences to obtain maximum benefit from investments in a rational manner. However, it is clearly seen that the assumptions of classical economics do not correspond with the findings of behavioral economics. Behavioral economics, with a different perspective, argues that people have irrational behavior rooted from the cognitive biases. These biases involve perceptions in the decision-making process and mistakes during collection of information or processing of information. This section provides an answer to the question that why momentum and contrarian profits do have a relationship with behavioral concepts with explanations from relevant literature. Probably, the answer can be latent in the studies implemented in late of the last century. These studies commonly attributed the market anomalies regarding market participants' decision making processes which are enormously correlated with their cognitive biases. The results of studies pointed investor models based on irrationality. The following behavioral models were attempted by various researchers to explain the biases through searching investment decisions of market participants.

2.1 Representative Investor Model

Barberis, Shleifer, and Vishny (1998) proposed a model of investor sentiment, in other words, a model of how investors make their judgement. The proposed model involves experiments related with both inadequacies of individual decisions under uncertain circumstances and the investor' trading patterns in various situations. They used two main behavioral heuristics "representativeness and conservatism" as basis while developing their model. The representative heuristic is first described in the study of Tversky and Kahneman (1974). In their article, about individual heuristics that are employed by decision makers to access probabilities and forecast values, they

explained the “representative heuristic” is the tendency of individuals to identify a sample by the degree to which it is similar to the parent population. More specifically, for example, investors might have an opinion that some securities are growth potential based on a history of continuously earnings growth with neglecting the possibility that there are just a few securities that keep growing in earnings.

On the other hand, the conservatism heuristic was first defined in psychology by Edwards (1968) as a notion that states that individuals behave laggardly to change their opinion while confronting a new information. Investors exposed to conservatism might have less attention to information such as earnings announcement due to their belief about information is temporary, and still related partially to their previous earnings estimations. As a result, they subject to incommensurate valuation of shares in response to new information.

Barberis et al. (1998) combined these two heuristics to construct an investor model. According to their purpose, as a subject, investor should be viewed as one whose beliefs follow commonly accepted forecasts even when other investors had different estimations. These inaccurate beliefs of relevant investor affect prices and possible future returns. Their empirical research has identified two different outcomes: investor underreaction, and overreaction. The underreaction outcome indicates that from 1 to 12 months of horizons, investors underreact to new information, thus, the information is incorporated directly into security prices with an assumption of current good news has influence on predictions of positive possible future returns. Also, overreaction shows that in longer horizons, for example, the security prices are led to same direction by investor’s reactions to news from 3 to 5 years. That is, securities tend to become overpriced and have low average returns in the future.

Daniel, Hirshleifer, and Subramanyam (1998) constructed an investor model correlated with overreaction and underreaction using similar psychological conceps just as Barberis et al. (1998). With a few difference, they mostly linked overconfidence and self-attribution to these reactions as a main driver. This model will be explained in the following title.

2.2 Biased Self Attribution Model

As stated in De Bondt and Thaler (1995), probably the most signified outcome of the psychology of decision making is that people are broadly overconfident. In that context, Daniel et al. (1998) asserted a model that primarily presumes investors are under the assumption of their abilities to evaluate securities are superior than they actually are. A frame of mind actually leads the situation that investors or individuals had an underestimation of their error variances while forecasting. This seems coherent with general psychological evidences which state individuals give more credit to their capabilities, and feel themselves more capable than they are perceived by the others.

On the basis of overconfidence bias Daniel et al (1998) broaden their theory with referring to the significance of biased self-attribution. Biased self-attribution is identified in their study as a pattern in which individuals attribute events that confirm the validity of their actions to their own ability and attribute events that disprove their actions to bad luck. In fact, more specifically, it is observed that the self-esteem of individual rose when generally accepted opinion by others is conformable for his own opinion, however, not correspondingly, does not show falling tendency when accepted opinion in contrast with what his thought. That is to say, the psychological evidence indicates that people prone to give credit themselves for success, and see external factors as responsible for the failure. In their relevant study, Langer and Roth (1975) summarize this individual prospensity in brief, by saying, “Heads I win, tails it’s chance.”

As mentioned at the beginning of this model in conjunction with biased self-attribution also is consistent with individuals investment decisions. The investors featured a self-attribution bias connect the good performance of securities with positive returns in the past with their ability of selection skills, and the bad performance of securities with negative returns with bad luck. Consequently, these investors become more certain for their expertise about to selection. Thereby, they push up the price of securities above their actual values. Fundamentally, the overreaction in this model cause reversed momentum profits as prices revert to their actual value hereafter.

2.3 Unified Model

Barberis et al. (1998) and Daniel et al. (1998) assert that security prices are affected by a single investor model who subjected several cognitive biases. In that context, they questioned the extent to which these biases are effective for short horizon and long horizon profit continuations. Addition to their studies, Hong and Stein (1999) questioned profit continuation with an explanation of the unified model. They do not directly pointed any behavioral biases like conservatism or represantativeness, however, they consider two type of investor is only able to screen some part of avaliable information and process it, thus, they can be accepted as restricly rational. Their model consisted of "newswatchers" and "momentum traders" as types of investors neither of them are completely rational.

According to the model, newswatchers use possible future information about the market but ignoring historical or current information. In contrast, momentum traders make their decisions using historical information without observation of fundamental information. Using future information, newswatchers effect prices partially when information totally incorporated into the market, therefore they create a contribution to underreaction effect. On the other hand, momentum traders use past information of prospering securities and tend to push their prices above their fair price, consequently, they create an overreaction effect because return reversals are possible when prices are adjusted to their fundamental value. So, in case of presence of only newswatcher in the market, there should be underreaction and if there is only momentum trader, overreaction exists.

With two different bounded rationality assumptions, the unified model tries to unify underreaction and overreaction in the following order. In the beginning, one group of traders to underreact to information, then, second of traders tend to behave as arbitrageur to exploit this underreaction created by the first group. By doing it, the second group causes a deviation in prices resulting with overreaction. As a result, overreaction is fed by underreaction by making overreaction profitable for momentum traders.

As a conclusion, these behavioral models as an alternative to classical models can be constructed on restrict rationality and limited computational capacity of investors. All these studies mentioned above implemented with a perspective of investors have an intention to overweight information, consequently, stock prices overreact or underreact and swing from their fundamental values.

Following major studies for momentum and contrarian research reached remarkable results connecting underreaction and overreaction with possible future momentum and contrarian profits. However, these studies do not forge a link between any cognitive biases and reaction evidences. According to De Bondt and Thaler (1987), over longer horizons, for instance from 3 to 5 years, security prices tend to overreact to consistent patterns of news pointing in the same direction. In other words, securities that have had a long record of good news turn to be overpriced and have low average returns afterward. Addition to that, Jegadeesh and Titman (1993), states that the underreaction evidence shows that over horizons of perhaps from 1 to 12 months, security prices underreact to the news. Chapter 3 examines the studies with overreaction and underreaction perspective in detail.

3. LITERATURE REVIEW

Market efficiency can be explained by a market in which available value-added information totally and continuously reflects current prices. The efficient market hypothesis first documented by Eugene Fama assert that financial instruments incorporate relevant market information arriving at their fair prices which makes impossible that investors either buy an undervalued instrument or sell the instrument which is overvalued by the market. For that reason, the investors can not earn any excess returns more than expected without increasing the their risk due to the reason that prices rapidly adjust to new information. In this environment, three main forms of efficiency were considered related to adjustments of security prices regarding new information subsets. According to Fama (1970), these forms are indicated below,

Weak form efficiency: This is the first form that suggested all information is not incorporated in the current security price. Security prices reflect only information set by historical prices.

Semi-strong form efficiency: In addition to the historical price data available in the weak form, current information is widely available among investors and all information in the current and past period is incorporated into the security price.

Strong form efficiency: The strong form efficiency includes all value-added information including both public and private or even insider information reflecting the security prices. For that, investors cannot improve their predictions leading abnormal profits even they had an insider information.

Even if the accessibility level of information is changed, the main idea behind these type of efficiencies related information subsets remain same, "the profits opportunities can only exist as long as the market is inefficient". However, Grossman (1976) pointed that in case of an increase in common belief of market efficiency among investors, the market begins to act passively then the less efficient market becomes. This situation was identified efficiency paradox.

Although the forms of market efficiency and the investor rationality as the main source of market efficiency have been the main subject of many researches, the recent empirical evidences in the research field of behavioral finance seem incompatible with the efficient market hypothesis for the valuation of equity prices. According to behavioral finance approach, the investors do not act completely rational regarding psychological reasons. In this context, an undervaluation or overvaluation for security prices can be observed in the financial markets due to the irrationality of decision makers. The irrationality of investors involves displaying underreaction to available information which leads momentum effect in the market and overreaction to released information which creates price reversals in the long run, even if the market is at the strong form efficiency conditions.

De Bondt and Thaler (1985) asserted that "If the stock prices systematically overshoot, then their reversal is predictably from their past return data". Their tests tried to clarify the extent to which systematic excess return in the portfolio holding period is associated with systematic excess returns in the portfolio formation months. They named "winner" (W) stocks that have experienced either extreme capital gains and named "loser" which have extreme losses over formation periods up to five years. They suggest that "winner" (W) and "loser" portfolios (L) are formed conditional upon past excess returns, rather than some information such as quarterly earnings generated by firms. In sum, their findings claim that stocks with negative returns in the past outperform the stocks with positive returns over the subsequent three to five years. They attributed these results to that the market displays overreaction.

In a further research, De Bondt and Thaler (1987) had an effort to re-evaluate the overreaction hypothesis with new empirical findings that are relevant to the seasonality which includes January effect. They first noticed that in January stock returns were generally higher than in other months, which could not be explained by market efficiency information only.

Similar to De Bondt and Thaler, a few years later, Lo and MacKinlay (1990) posed an empirically decidable question in their research: "Are return reversals responsible for the predictability of stock returns?" While seeking to find the right answer to this question, they used short-term horizons based on weekly returns. By using this weekly data, they had a conclusion that the cross-sectional relations of stock dynamics are also important for security returns. They added the stock market overreaction is not the one and only explanation of the profitability of the portfolios constructed based on overreaction perspective. In 1992, Chopra, Lakonishok, and Ritter studied stock reversals in the long-term about to three to five years as De Bondt and Thaler did in 1985. Their studies had similar outcomes that approve there are price reversals of overvalued securities in such short-time horizons.

Despite the popularity of contrarian strategies in the literature, the researchers focused on momentum strategies that buy winners and sells losers more recently. Adding a new insight, a pioneer of the field of momentum research, Jegadeesh and Titman (1993) published in their leading article, "Returns to buying winners selling losers," the conclusions they drew were extraordinarily influential, and still from the bedrock of good motivational practice of momentum researches nearly 30 years. They stated that "If stock prices either overreact or underreact to information, then profitable trading strategies that select stocks based on their past returns will exist." Unlikely overreaction researchers cited above, they found an evidence that investors in the U.S. stock market tend to underreact to some speculative news regardless of whether the news is positive or negative. Their study included best-performed stocks in the past that continue to outperform worst-performing stocks related to momentum effect. In that context, the portfolio buying best-performed stocks and selling worst-performed stocks earns abnormal returns of about 1% per month between 1965 to 1989 sample period via using six-month trading frequency. They used stock's past compound return

as ranking variables in their price momentum strategy extending back six months prior to portfolio formation.

Studies shared similarity with Jegadeesh and Titman mostly argue that this underreaction creates an opportunity to earn profit from the stocks. For instance, with a similar manner, Chan, Jegadeesh, and Lakonishok (1996) questioned underreaction to the news as a source of profits beyond that they examine whether the predictability of future returns from past returns is due to the market's underreaction to information, in particular to past earnings news with using a sample period of 1977-1993. They differentiate the momentum effect earnings momentum and price momentum which is mentioned in the study of Jegadeesh and Titman (1993). According to their perspective, earnings momentum correlates with earnings announcements and the momentum in stock prices related to the evidence on the market underreaction to earnings-related information. More specifically, an earnings momentum may benefit from underreaction to information related to short-term earnings, while a price momentum strategy may benefit from the market's slow response to a broader set of information, including longer-term profitability. To measure the presence of earnings momentum they used standardized unexpected earnings (SUE) variable. They concluded that the effect of market risk, size, and book to market factors could not be the only reason for profitability. The results come up with market responds only gradually to new information. The effect of the market reaction to new earnings information on profits is also remarkable as they reported.

In the light of the prior studies mentioned above, the behavioral research has been extended by researchers in the U.S. Market. For example, Moskowitz and Grinblatt (1999) documented initial conjecture about the possibility of momentum effect driven by industry-based portfolios having abnormal returns in the past. They focused on the positive persistence in stock returns over intermediate horizons about 6 to 12 months. Their research constructed the portfolios, after controlling size, book-to-market ratios and potential microstructure influences. Correspondingly, their results industry momentum returns are more profitable than individual stock momentum returns and for the most of the part they are statistically significant.

At the same year, Hong and Stein (1999) studied behavioral theories derived from investors cognitive biases involving strict rationality and unlimited computational capacity, and they draw an attention to the momentum phenomenon correlated with the behaviors of individual investors As mentioned in Chapter 2, their model features two type of investors both bounded rational, “newswatchers” and “momentum traders”. A newswatcher is identified as an investor who has a current and past information and makes forecasts based on observation about future fundamentals, in contrast, a momentum trader seeks for past fundamentals. They identified the notion of momentum cycle which means a time span in which the prices showed a momentum. In particular, the newswatchers cause an increase in price at time t when potential news arrived, but not far enough, so that there is still profitable price lag in the long-run. Consequently, at time t+1, momentum buyers get in due to increasing in prices as a result of newswatchers’ transactions. These cycles create a further increase in prices which sets more momentum buying, and so on. Later buyers in the momentum cycle for those buying at t+2 etc. lose their profit margin because they made a deal at a price above the long-run equilibrium.

Lee and Swaminathan (2000) provided an important link between past trading volume and momentum investing strategy. Their findings show that past trading volume helps to reconcile intermediate-horizon "underreaction" and long-horizon (over the next five years) "overreaction" effects.

Cooper, Gutierrez, and Hameed (2004) have reached the result that clarifies the profitability of momentum strategy highly correlated with the state of the market. They defined two of market states, “up and down”. Up state occurs when the lagged three-year market return is non-negative and “down” occurs in the case of it is negative. When market conditions signed that up state momentum strategy generates a significant mean monthly profit of 0.93%, contrarily, when the state is down the profit goes -0.37%.

In addition to the studies investigating momentum characteristics, some researches were implemented to compared momentum with other trading strategies being used. For example, George and Hwang (2004), practiced head-to-head comparison of a strategy based on the 52-week high with not conditional momentum strategies.

After a whole range of empirical studies, the popularity of this phenomenon has grown in the U.S. Stock Market and other equity markets as well. For example, Rouwenhorst (1998) reported that the momentum strategies examined by Jegadeesh and Titman for the U.S. market could also be profitable in 12 European markets. According to his work, the returns of European markets are quite similar to the returns of the U.S. Market in the period 1978 to 1995. In fact, Rouwenhorst obtained a larger t-statistics for the European sample. With a different point of view, Grinblatt and Keloharju (2000) investigated how the type of investor sophistication effects investment decisions specifically in Finland. They asserted that foreign investors tend to use momentum strategies while domestic investors particularly households tend to be contrarians. The results come up with momentum returns bigger than contrarian ones.

Chui, Titman, and Wei (2001) analyzed the momentum profits in eight Asian markets which include all listed companies during a time period of consisting Asian financial crisis as well as periods that many of these markets first opened to the foreign investors. With a similar motivation of Grinblatt and Keloharju, they examined the effect of foreign ownership on momentum effect and reached a weak evidence that foreign participation actually improves momentum profits. Furthermore, Nijman, Swinkels, and Verbeek (2002) examined the presence of momentum effect with categorizing into country, industry and individual effects in European markets over the period of 1990 to 2000. Griffin, Ji and Martin (2003) investigated the relation between momentum returns and macroeconomic risk among the 40 countries in an attempt to whether momentum returns are consistent with risk-based explanations or behavioral models. They had findings support the notion that country-specific macroeconomic risk has a significant role in driving momentum.

On the other hand, as researchers of an emerging market, Bildik and Gulay (2007) reported a significant abnormal return (approximately 15% annually) obtained from the strategies are rooted in contrarian perspective in Istanbul Stock Exchange (ISE). They claimed that their study can be "independent" evidence for an emerging market since the returns of the main market index of ISE-100 has a relatively lower correlation with developed markets' indexes such as S&P-500.

More recently, in a study of Mao and Wei (2014) where momentum phenomenon is analyzed into two major sub-groups (price and earnings), the profitability of momentum strategies is associated to the contributions of different three components. These components are described as the expected return, the cash flow return, and the discount rate return. They linked these components with the momentum returns and conclude that momentum returns are basically driven by cash flow information which shows slowly integration into the market. With more behavioral attention, Lee and Cho (2014) found out an asymmetric reaction of investors to public information and they reported momentum signs are weak in Korean Stock Market as a developing market compared to the U.S. between 2001 and 2010. Zhu and Yung (2016) gave attention to formation and holding periods and achieved an interrelation between momentum profits and short-term performance of stocks (1 month), besides, short-term reversal as known as contrarian profits are related to medium-term (1-6 months) performance. Their sample includes domestic common shares listed in NYSE during the post-2000 period. They had a 3.16% an average monthly raw return by buying short-term losers and medium-term winners and selling short-term winners and medium-term losers.

4. DATA AND METHODOLOGY

4.1 Data

The study aims to provide an insight into the presence of momentum profits in the U.S. equity market. For this purpose, the data used in this research comprised the stocks listed in the S&P 500 throughout the time period from December 1994 to January 2018. The most substantial reason for choosing stocks traded in S&P 500 is that it is considered an eligible representative of the U.S. equity market by containing the common stocks dealt in both NYSE and NASDAQ. The index is composed of 500 constituent companies and measures the performance of the large-cap segment of the market. The constituent companies must satisfy criteria related to their liquidity, financial viability, length of time publicly traded etc. According to guidelines of U.S. indices methodology of Standard & Poor's 2017, to speak in terms of liquidity-based requirements, a constituent company should have a market capitalization greater than $6.1 billion USD, a ratio of annual value traded in dollars and float-adjusted market capitalization is greater than 1.0. Furthermore, a company should be traded a minimum of 250,000 shares in each of the six months leading up to the evaluation date in order to be added S&P500 Index. Assuredly, to be included in data sample used, stocks have to satisfy all requirements mentioned above. By using S&P500 components, a possibility of lack of data or the negative effects led by small, illiquid or low-priced stocks were diminished.

The component data contains totally 1128 unique constituents added to an index at least once during the period of 1994-2018. For some reasons, the stocks can be merged, delisted, name-changed or expired. Relevant stocks in that position were taken into consideration while constructing data set of the study. Consequently, all available company stocks are used without excluding any of the companies which were listed after December 1994.

Jegadeesh and Titman used a sample of 24 years in their research in 1993. Rouwenhorst (1998) used 17 years to analyze momentum effect in European countries. The sample period of the study spans between 1994 and 2018, approximately 23 years by having a quite similar length with the literature of the field of research. In fact, the span of the study starts from 1994 due to lack of constituents data of S&P500 Index prior to the end of 1993. This extensive span provides 275 number of monthly observation which is suitable for the empirical statistical tests. On the other hand, investigated period includes several financial crises or recessions which allows investigating the momentum effect and profitability of the strategies in different macroeconomic conditions.

To calculate monthly returns of index constituents, adjusted monthly close price series were used. The selection of adjusted closing price is implicated to avoid impacts due to a stock split or dividend sharing etc. Monthly closing price series of stocks and index constituents during sample period which represents the main sources of the study are obtained from "Thomson Reuters DataStream".

Finally, the study examines Momentum and Contrarian profits in relation with U.S. stock market turnover rate. For that reason, value of share trading and market capitalization data (USD in millions) are required to calculate stock turnover rate. This dataset is obtained by using the World Federation of Exhanges database for the period January 2003 to December 2017.

4.2 Methodology

As researchers of momentum effect in the market, Jegadeesh and Titman (1993) predict while overreaction and underreaction exist among the investors then trading strategies that select stocks based on their past performance will be profitable. To analyze the performance of trading strategies related to behavioral bias, they used a strategy designed as follows, select stocks based on their returns over the past 1, 2, 3 or 4 quarters and held them for periods that vary from 1 to 4 quarters, which makes 16 strategies in total. Explicitly, at the beginning of each month, all stocks in their sample are ranked in ascending order on the basis of past J month's cumulative returns where "J" represents the portfolio formation period. Moreover, strategies select best-performed stocks during J months and hold them for K months where "K" represents the portfolio holding period. They called this method as a J-month / K-month strategy.

Accordingly, in this study, the portfolios are constructed with using 1, 3, 6 and 12 months instead of taking quarters in the method used by Jegadeesh and Titman (1993) to observe the short-term effect. The short-term effect is mentioned in the article of Zhu and Yung (2016) as 1 month. According to their study, portfolios constructed with the stocks sorted into quintiles with respect to their past 6 or 12 month returns were held to calculate short-term reversals.

Stocks' performance is gauged with J month's raw returns calculated with using their adjusted trade close data at the each month's end. The calculation of the raw returns for all individual formation periods, Rit, obtained from the formula demonstrated below where Pit represents adjusted close of stock i at time t, and Pit-j represents adjusted close of stock i at time t-J.

$$\boldsymbol{Rpt} = \frac{\boldsymbol{Pit}}{\boldsymbol{Pit - j}} - \mathbf{1} \qquad 4.1$$

At that time, the five hundred constituents of the index are revised and ranked independently related to their performance over the previous months (1, 3, 6, and 12 months respectively).

Rankings are implemented depending on their raw returns without any other condition. Therefore, this sorting methodology is called "independent sort" which is mentioned in the study of Lee and Swaminathan (2000). Based on observation periods' rankings, the stocks are selected and the portfolios are formed equally weighted with best-performed stocks. If a stock is expired or delisted for some reason during the observation period, then that stock could not be selected for portfolio formation time.

Griffin, (2003) told that any momentum strategy consists of a observation or ranking period, over which winner portfolios and loser portfolios are determined, and an investment period, over which winners are held and losers sold short. In addition, beyond that, it is broadly known that discussions concerning the return performance of the momentum portfolios focus on the assumptions related to transaction costs involved in investment periods. Jegadeesh and Titman (1993, 2001) find abnormal returns for the momentum trading strategy by taking into account 0.5% transaction costs for U.S. stock market. In this study, relevant transaction costs for portfolio formation will be taken into account 0.5% by the reason of using the same sample market. They are reflected to performances of portfolios by subtracting from the average monthly percentage of portfolio returns. To answer first and second research questions about performance of momentum and contrarian strategies, following null and alternative hypothesis were tested with Paired Two Sample for Means, t-test at 5% significance level. Hypothesis 1:

H_0: Excess Returns of Momentum / Contrarian Strategies, $\mu = 0$

H_1: Excess Returns of Momentum / Contrarian Strategies, $\mu \neq 0$

The return in any given month Rpt is measured with the following formula, where Rit is the return of stock i at month t while n represents a number of stocks in the constructed portfolio.

$$Rpt = \sum_{i=1}^{n} Rit / n \qquad 4.2$$

The study uses the samples containing best-performed 25, 50, 100 stocks to construct the portfolios despite the fact that the researchers of this field generally use of a method that divides the total sample into quintiles or deciles. By doing that, it is aimed to evaluate the extent to which extreme stock selection is correlated with excess return performances of the portfolios. Extreme stock number selection is tested with Paired Two Sample for Means, t-test, following null and alternative hypothesis at 5% significance level. Hypothesis 2,

H_0: Difference Between P1 and P3 Excess Returns, $\mu = 0$

H_1: Difference Between P1 and P3 Excess Returns, $\mu \neq 0$

While the monthly returns of the portfolios were calculated, profitability of S&P500 total return index was taken into consideration as a benchmark during the same period. In this regard, the relative returns of the portfolio are calculated by subtracting the market turnover and possible transaction costs from the portfolio returns. Correspondingly, S&P500 total return index monthly data is used during calculation of the market returns. To be considered successful, the portfolios constructed in a compliance with the return of formation periods and held for various holding periods are expected to yield more than the market itself considered as S&P500 total return index.

The excess returns of the portfolios obtained from strategies were calculated by rolling order methodology. The methodology can be explained as follows. The portfolios are constructed with best performed stocks in line with the number of months in the portfolio formation period. The returns of these portfolios are calculated at the end of each holding period. In this way, each month's return data can be obtained during sample period. For example, for the strategy using J,K = 3,3, a portfolio being observed from time "t-3" is invested at time "t" and a return of this portfolio is calculated at the end of holding period at time "t+3". Consecutively, a portfolio being observed from time "t-2" starts being held at time "t+1" and return value is obtained for that portfolio at time "t+4". Using this method, the number of mothly return observations during the sample period is increased to 275 for both momentum and contrarian strategies.

In accordance to answer third research question about difference of the momentum and contrarian returns, following null and alternative hypothesis were tested Paired Two Sample for Means, t-test at 5% significance level. Hypothesis 3:

H_0: Difference Between Momentum and Contrarian Excess Returns, $\mu = 0$

H_1: Difference Between Momentum and Contrarian Excess Returns, $\mu \neq 0$

To measure performance of the momentum and contrarian performance in uptrend and downtrend market, between 1994 and 2018, five "up" and two "down" following subperiods are identified.

Uptrend Subperiods		Downtrend Subperiods	
Oct.31 1997	Apr.30 2000	Apr.30 2000	Mar.31 2003
Mar.31 2003	Dec.31 2007	Dec.31 2007	Feb.28 2009
Feb.28 2009	Apr.30 2011		
May.31 2012	May.31 2015		
Feb.28 2016	Jan.31 2018		
Total 170 Months		Total 50 Months	

Figure 4.1 Upward and downward subperiods for S&P500 Index

Finally, the relationship between share turnover velocity and the monthly excess returns of momentum and contrarian portfolios is investigated. Turnover velocity basically implies the volume of shares that change hands in the sample period. In other words, it can be said that it is an indicator for a number of transaction executed among the total market. If the market substantially active, then the higher turnover velocity will exist. In order to calculate this indicator, a dollar value of shares traded in a given period divided by average market capitalization in the same period. A turnover velocity is calculated for every month in the sample period.

$$Turnover\ Velocity\ = \frac{\text{Value of share trading (USD in millions)}}{\text{Market capitalization (USD in millions)}}$$

With an assumption that market value does not change a considerable amount on a monthly basis, thus, the value of turnover velocity is expected to converge to trading volume in dollars. While calculating the turnover velocity value, the market capitalization and traded share value for a current month is used for stocks listed in NYSE and NASDAQ. NYSE has a bigger size than NASDAQ for both traded value and market capitalization. However, a weighting was not taken into consideration while calculating the traded share value and market capitalization since the study aims to examine total of U.S. stock market.

After calculation of market turnover velocity values on a monthly basis, to explore whether monthly excess returns of momentum and contrarian portfolios have a correlation with the market turnover or not, the following regression formula is constructed on the monthly data between January 2003 and December 2017.

$$r_t^e\ =\ \alpha +\ \beta\ TV_t + \varepsilon_t \qquad 4.3$$

Where r_t^e represents excess returns of the portfolio invested at time t and, TV_t represents share turnover velocity calculated with value of time t and t-1.

5. EMPIRICAL RESULTS

In this chapter, the results of the study are represented into four different sections. Section 5.1 presents a monthly excess returns of the momentum and contrarian portfolios and indicates them comparatively. Section 5.2 presents a discussion about the effect of the stock number used during portfolio formation to the performance of strategies. Section 5.3 displays a changing for portfolio returns with respect to different market conditions. Section 5.4 clarifies the correlation between market turnover and monthly excess returns of the portfolios.

5.1 Excess Returns of the Momentum and Contarian Portfolios

Table 5.1 demonstrates the average monthly excess returns for portfolios consisted first 25, 50, and 100 stocks with the highest returns in the formation period for both momentum and contrarian trading strategies. To obtain relative performance of the portfolios as excess returns on a monthly basis, market returns were calculated and subtracted from portfolio returns. Paired Two Sample for Means, the t-test was applied to the portfolio returns to determine whether the excess returns are significantly different from zero. The return values that have 1% and 5% significance level of the t-test with respect to P-values are shown in bold characters in Table 5.1.

The average monthly excess returns are maximized for the momentum strategy that select first 25 stocks and has 3-month observation period and 12-month holding period (J,K = 3,12) with a value of 4,33% at 1% significance level. This strategy is followed by the strategies selecting 25 stocks and having J,K = 6,12; J,K = 12,12 and J,K = 1,12 with an average excess returns 3,88%, 3,71%, and 3,34% respectively. Starting from this, it can be said that a profitability of momentum-based trading strategies is more apparent for longer holding periods (K). However, it is possible to assert that there are other profitable strategies, not only having 12-month holding period but also having 6-month holding period. For instance, J,K = 3,6 and J,K = 6,6

have a same average excess returns as 2,75% during the sample period also at 1% significance level.

For only one out of the sixteen momentum trading strategies (J,K = 1,1), a monthly average excess return is negative. This implies the strategy cannot achieve returns above the market. The other fifteen momentum strategies have remarkable returns above the returns of S&P total return index after monthly transaction costs at level 0,05%.

On the other hand, about contrarian approach, the positive average excess returns are obtained on a monthly basis for all strategies. Nevertheless, it is not obtained that any sufficient significance level for any strategy at all.

To answer first and second research questions, hypothesis 1 for zero excess returns, H_0: Excess Returns of Strategies, $\mu = 0$, is tested at 5% significance level. According to the empirical results, for the eight momentum strategies, the null hypothesis can be rejected. However, for all of the sixteen contrarian strategies, the null hypothesis cannot be rejected, for the reason that t-statistics are not led to rejection of the null hypothesis, at a 95% confidence interval.

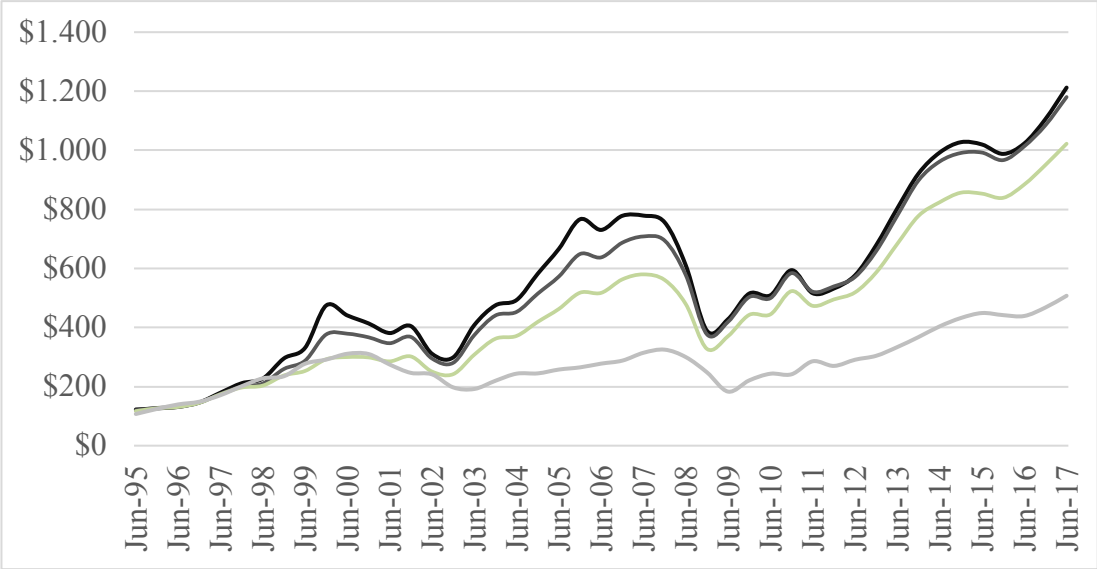

Figure 5.1 Value per $100 dollar long for J,K = 6,6; P1, P2, P3, .SPX

Figure 1 demonstrated a value in dollars for portfolio consisted of 25(P25), 50(P50), and 100(P100) best-performed stocks during formation periods using 6-month formation period and 6-month holding period (J,K = 6,6). Apparently, each portfolio has positive returns more than S&P500 total return index. Value per 100$ dollar long has reached a value above 1.200$ at the end of the sample period while index returns have approximately 500$.

Table 5.1 Average monthly excess returns

	Momentum			Contrarian		
Strategy J,K	*P25*	*P50*	*P100*	*P25*	*P50*	*P100*
(1,1)	-0,0011	-0,0008	-0,0006	0,0003	0,0017	0,0022
	0,61	0,58	0,56	0,48	0,36	0,30
(1,3)	0,0074	0,0048	0,0035	0,0061	0,0048	0,0070
	0,18	0,25	0,30	0,29	0,31	0,21
(1,6)	0,0167	0,0140	0,0103	0,0119	0,0097	0,0109
	0,10	0,11	0,16	0,24	0,26	0,20
(1,12)	**0,0340**	**0,0304**	0,0228	0,0278	0,0173	0,0168
	0,04	0,04	0,08	0,14	0,22	0,20
(3,1)	0,0049	0,0021	0,0010	0,0022	0,0021	0,0023
	0,12	0,28	0,39	0,37	0,35	0,31
(3,3)	**0,0142**	0,0079	0,0042	0,0027	0,0052	0,0063
	0,03	0,12	0,25	0,41	0,30	0,24
(3,6)	**0,0274**	**0,0198**	0,0126	0,0081	0,0087	0,0107
	0,01	0,03	0,10	0,33	0,29	0,22
(3,12)	**0,0433**	**0,0352**	**0,0254**	0,0235	0,0188	0,0158
	0,01	0,02	0,05	0,20	0,22	0,23
(6,1)	0,0037	0,0027	0,0019	0,0014	0,0015	0,0015
	0,19	0,24	0,29	0,41	0,40	0,40
(6,3)	**0,0148**	**0,0115**	0,0080	0,0038	0,0034	0,0049
	0,02	0,05	0,10	0,38	0,38	0,30
(6,6)	**0,0275**	**0,0242**	**0,0180**	0,0087	0,0077	0,0083
	0,01	0,01	0,03	0,34	0,33	0,29
(6,12)	**0,0388**	**0,0329**	**0,0248**	0,0264	0,0172	0,0162
	0,01	0,02	0,04	0,21	0,26	0,24
(12,1)	0,0049	0,0032	0,0024	0,0018	0,0011	0,0010
	0,13	0,21	0,25	0,40	0,42	0,42
(12,3)	0,0118	0,0096	0,0081	0,0040	0,0031	0,0039
	0,07	0,08	0,09	0,38	0,39	0,35
(12,6)	**0,0214**	0,0170	0,0140	0,0116	0,0081	0,0080
	0,05	0,06	0,07	0,29	0,33	0,30
(12,12)	**0,0371**	**0,0266**	0,0210	0,0325	0,0242	0,0184
	0,02	0,04	0,06	0,15	0,19	0,22

The average excess portfolio returns on a monthly basis for the 16 momentum and contrarian strategies, with the observation periods as J = 1, 3, 6 or 12 and holding periods as K = 1, 3, 6 or 12 are shown. The average returns of the portfolios are calculated for the sample period which spans from December 1994 to January 2018. In each month, stocks are ranked on their performance during the formation period. P25, P50, and P100 represent the portfolio consisted first 25, 50, and 100 stocks with the highest returns in the formation period respectively. Paired Two Sample for Means, t-test shows whether the portfolio returns significantly different from zero at 1% and 5% significance level, where mean values indicated bold characters. For each strategy, the second row demonstrates P-value of the significance test.

Table 5.2 shows the difference between excess returns of the momentum portfolios and the excess returns of the contrarian portfolios. It is observed that the monthly average mean returns of momentum P25 and P50 portfolios are more than contrarian portfolios in every strategy with an exception of J,K = 1,1 strategy. Although on average, excess returns momentum portfolios seems superior more than contrarian ones and differences are positive throughout the strategies, no statistical evidence has reached the 5% significance level. The most significant difference is obtained by strategy with first 25 best-performed stocks using J,K = 3,6 periods which has 0,019% mean return with only 10% significance level. In short, for all strategies having P25 and P50 portfolios except one, the difference between the monthly momentum returns and the contrarian returns on average is positive but not significant.

In accordance to answer third research question, hypothesis 3, H_0: Difference Between Momentum and Contrarian Excess Returns, $\mu = 0$ were employed at 5% significance level. According to the empirical results obtained, for the all of sixteen both momentum and contrarian strategies, the null hypothesis cannot be rejected for the reason that t-statistics are not led to rejection of the null hypothesis, at a 95% confidence interval.

Table 5.2 Difference between monthly excess returns of momentum and contrarian portfolios

Strategy J,K	*P25*	*P50*	*P100*
(1,1)	-0,0014	-0,0025	-0,0028
	0,37	0,23	0,14
(1,3)	0,0013	0,0000	-0,0035
	0,43	0,50	0,22
(1,6)	0,0048	0,0043	-0,0006
	0,33	0,31	0,46
(1,12)	0,0061	0,0131	0,0061
	0,36	0,16	0,27
(3,1)	0,0027	0,0001	-0,0014
	0,30	0,49	0,33
(3,3)	0,0115	0,0027	-0,0022
	0,09	0,34	0,33
(3,6)	0,0193	0,0111	0,0018
	0,08	0,14	0,40
(3,12)	0,0197	0,0164	0,0096
	0,16	0,14	0,20
(6,1)	0,0022	0,0012	0,0004
	0,36	0,40	0,47
(6,3)	0,0110	0,0081	0,0032
	0,15	0,17	0,30
(6,6)	0,0188	0,0165	0,0097
	0,13	0,10	0,14
(6,12)	0,0124	0,0157	0,0086
	0,31	0,21	0,27
(12,1)	0,0032	0,0020	0,0013
	0,32	0,35	0,37
(12,3)	0,0078	0,0065	0,0043
	0,26	0,25	0,28
(12,6)	0,0098	0,0090	0,0060
	0,30	0,27	0,29
(12,12)	0,0046	0,0024	0,0026
	0,43	0,45	0,43

Difference between monthly excess returns of momentum and contrarian portfolios on a monthly basis for the 16 strategies, with observation periods as J = 1, 3, 6 or 12 and holding periods as K = 1, 3, 6 or 12 are shown. The difference of momentum and contrarian portfolios are calculated for all sample period which spans from December 1994 to January 2018. In each month, stocks are ranked on their performance during the formation period. P25, P50 and P100 represents the portfolio consisted first 25, 50, and 100 stocks with the highest returns in the formation period respectively. Paired Two Sample for Means, t-test shows whether the portfolio returns significantly different from zero at 1% and 5% significance level, where mean values indicated bold characters. For each strategy, second row demontrates P-value of the significance test.

5.2 Effect of the Number of Stocks in the Portfolios

Table 5.3 contains the results of the tests implicated to observe the effect of the number of stocks in the portfolio on the monthly excess returns of the portfolios. These results demonstrate that the difference between monthly excess returns of portfolios with 25 (P25) and 100 (P100) stocks. For the momentum approach, there is a negative difference between the performances of the two different portfolios contained 25 and 100 stocks in one out of the sixteen strategies, that is J,K = 1,1. Beyond that, each fifteen strategy performed significantly better with portfolios that select best-performed 25 stocks. It was observed that portfolios returns are respectably increasing in extent to which decreasing number of stock selection. For a J,K = 3,12 strategy difference reached a peak with a difference in 1,79% average monthly return at 1% significance level. However, it is difficult to make similar interpretations for the contrarian approach. There was no significant difference between the performances of the distinct contrarian portfolios formed by 25 and 100 stocks.

To answer fourth research question, hypothesis 2, H_0: Difference Between P25 and P100 Excess Returns, $\mu = 0$ were tested at 5% significance level. For nine out of sixteen momentum strategies null hypothesis can be rejected at 5% significance level. Even more, all strategies that has 3-month formation period have a significance level of 1%.

Table 5.3 Difference between monthly excess returns of portfolios with 25 and 100 stocks

	Momentum	Contrarian
Strategy J,K	*P25-P100*	*P25-P100*
(1,1)	-0,0006	-0,0020
	0,35	0,17
(1,3)	0,0039	-0,0009
	0,08	0,40
(1,6)	0,0064	0,0010
	0,07	0,43
(1,12)	**0,0111**	0,0111
	0,04	0,09
(3,1)	**0,0039**	-0,0002
	0,01	0,47
(3,3)	**0,0101**	-0,0036
	0,00	0,17
(3,6)	**0,0148**	-0,0026
	0,00	0,33
(3,12)	**0,0179**	0,0078
	0,00	0,19
(6,1)	0,0018	0,0000
	0,13	0,49
(6,3)	**0,0068**	-0,0011
	0,01	0,40
(6,6)	**0,0095**	0,0005
	0,01	0,48
(6,12)	**0,0140**	0,0102
	0,02	0,18
(12,1)	0,0025	0,0007
	0,09	0,39
(12,3)	0,0036	0,0001
	0,15	0,49
(12,6)	0,0074	0,0036
	0,12	0,29
(12,12)	**0,0161**	0,0141
	0,03	0,08

Difference between monthly excess returns of portfolios with 25 and 100 stocks of momentum and contrarian portfolios on a monthly basis for the 16 strategies, with observation periods as J = 1, 3, 6 or 12 and holding periods as K = 1, 3, 6 or 12 are shown. P25 and P100 represents the portfolio consisted first 25 and 100 stocks with the highest returns in the formation period respectively. Paired Two Sample for Means, t-test shows whether the portfolio returns significantly different from zero at 1% and 5% level, where mean values indicated bold characters. For each strategy, second row demontrates P-value of the significance test.

5.3 Performance of Portfolios in Different Market Conditions

Table 5.4 shows the results for the performance of the portfolios created with the momentum and contrarian approach in different market conditions. The mentioned market conditions are expressed on the basis of long-run (at least two years) up and down trends in the S&P 500 Index. In that context, five "up" and consequtively two "down" subperiods were clearly identified between the period of 1994 and 2018. These subperiods can be observed throughout the sample period of the study as shown in the graphical demonstration of S&P 500 Index in Figure 5.2. According to specific dates, approximately 170 months of observation are available for each strategy during "up" periods. Contrarily, this number is just 50-month observation for "down" periods. With a similar manner Lee (2012) reviewed the down market momentum effect for up to 133 months for the period from 1963 to 2010 for 431 months 6 months holding period. According the his study, the results came up with positive 1,1% with a 1% confidence interval in the up market, while these results are negative in the down market. Cooper et. al (2004) have reached the similar results that clarifies the profitability of the strategy in the up state of the market. Therefore, the results are quite similar to the literature.

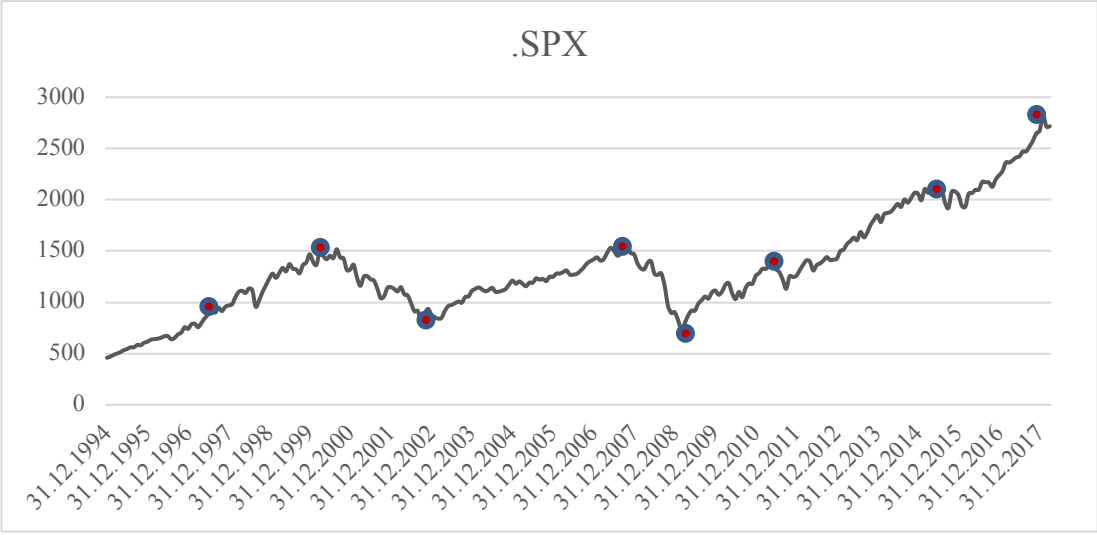

Figure 5.2 S&P500 Index during a sample period

According to the contrarian strategies, all strategies with 6-month and 12-month formation periods have achieved significant average returns in the conditions of the downtrend market. However, since the number of observations in the downtrend subperiods is low and considerable insufficient for statistical tests beyond that, for worst-performed stocks, recovery is possible in the medium-term after downtrend is disappeared, thus, there is no certain comment for the downtrend market.

Table 5.4 Average monthly excess returns in different market conditions

	Momentum			Contrarian		
Strategy J,K	All	Uptrend	Downtrend	All	Uptrend	Downtrend
(1,1)	-0,0011	0,0051	-0,0054	0,0003	0,0045	0,0072
	0,61	0,16	0,63	0,48	0,21	0,38
(1,3)	0,0074	**0,0155**	0,0153	0,0061	0,0131	0,0497
	0,18	0,04	0,29	0,29	0,14	0,13
(1,6)	0,0167	**0,0228**	0,0431	0,0119	0,0064	**0,0140**
	0,10	0,05	0,14	0,23	0,36	0,04
(1,12)	**0,0340**	0,0244	**0,1351**	0,0278	-0,0062	**0,0262**
	0,04	0,14	0,01	0,12	0,59	0,00
(3,1)	0,0049	**0,0090**	0,0054	0,0022	0,0086	0,0047
	0,12	0,04	0,34	0,37	0,10	0,43
(3,3)	**0,0142**	**0,0225**	0,0178	0,0027	0,0117	0,0265
	0,03	0,01	0,24	0,40	0,17	0,27
(3,6)	**0,0274**	**0,0389**	0,0323	0,0081	-0,0154	0,1049
	0,01	0,00	0,19	0,32	0,36	0,06
(3,12)	**0,0433**	**0,0387**	**0,1204**	0,0235	-0,0368	**0,0235**
	0,01	0,04	0,01	0,17	0,57	0,00
(6,1)	0,0037	0,0074	0,0039	0,0014	0,0083	0,0046
	0,19	0,08	0,38	0,12	1,20	0,43
(6,3)	**0,0148**	**0,0244**	0,0149	0,0038	0,0135	0,0383
	0,02	0,00	0,26	0,38	0,18	0,22
(6,6)	**0,0275**	0,0398	0,0217	0,0087	0,0011	**0,0123**
	0,01	0,00	0,26	0,33	0,48	0,04
(6,12)	**0,0388**	**0,0374**	**0,0817**	0,0264	-0,0185	**0,0308**
	0,01	0,04	0,05	0,18	0,71	0,00
(12,1)	0,0049	0,0072	0,0018	0,0018	0,0099	0,0053
	0,13	0,09	0,45	0,40	0,09	0,42
(12,3)	0,0118	**0,0201**	0,0014	0,0040	0,0113	0,0442
	0,07	0,02	0,48	0,38	0,22	0,19
(12,6)	**0,0214**	**0,0387**	-0,0197	0,0116	0,0030	**0,0139**
	0,05	0,01	0,72	0,27	0,45	0,04
(12,12)	**0,0371**	**0,0479**	0,0173	0,0325	-0,0155	**0,0310**
	0,02	0,02	0,36	0,13	0,68	0,00

Average monthly excess returns in different market conditions for the 16 momentum and contrarian strategies, with the observation periods as J = 1, 3, 6 or 12 and holding periods as K = 1, 3, 6 or 12 are shown. The average returns of the portfolios are calculated for the sample period which spans from December 1994 to January 2018. In each month, stocks are ranked on their performance during the formation period. P25, P50, and P100 represent the portfolio consisted first 25, 50, and 100 stocks with the highest returns in the formation period respectively. Two-Sample Assuming Unequal Variances, t-test shows whether the portfolio returns significantly different from zero at 1% and 5% significance level, where mean values indicated bold characters. For each strategy, the second row exhibits P-value of the significance test. Results are demonstrated only for P25.

5.4 Relation Between Share Turnover and Excess Returns of Portfolios

Table 5.6 and Table 6 illustrates the relationship between turnover velocity of the market and average monthly excess returns of momentum and contrarian portfolios. The turnover velocity was calculated for the entire U.S. stock market with a difference of calculation for stock-specific turnover rate. A turnover velocity values are obtained for the U.S. stock market, taking into consideration the monthly transactions on the both NASDAQ and NYSE. Assuming that market capitalization does not change necessarily on a monthly basis, this relationship is expected to approximate the transaction volume and return relationship.

For a momentum trading strategies, the beta coefficients are significantly negative. For that reason, the excess returns cannot be considered as positively correlated with a transaction volume of the market. In other words, market activity cannot explain positive excess returns of momentum portfolios.

Table 5.5 Regression values between monthly excess momentum returns and market turnover

	Momentum				
Strategy J,K	*Alfa*	*P-Value*	*Beta*	*P-Value*	*Adjusted R^2*
(1,1)	0,0250	0,03	-0,1097	0,17	0,0051
(1,3)	0,0800	0,00	-0,3565	0,02	0,0258
(1,6)	0,1287	0,00	-0,4867	0,04	0,0178
(1,12)	0,1916	0,00	-0,5427	0,11	0,0089
(3,1)	0,0322	0,00	-0,1470	0,04	0,0188
(3,3)	0,1062	0,00	-0,5297	0,00	0,0771
(3,6)	0,1062	0,00	-0,5296	0,00	0,0755
(3,12)	0,2752	0,00	-1,1496	0,00	0,0779
(6,1)	0,0401	0,00	-0,2115	0,00	0,0479
(6,3)	0,1202	0,00	-0,6367	0,00	0,1213
(6,6)	0,1972	0,00	-0,9748	0,00	0,1240
(6,12)	0,3045	0,00	-1,4222	0,00	0,1239
(12,1)	0,0415	0,00	-0,2382	0,00	0,0554
(12,3)	0,1107	0,00	-0,6363	0,00	0,1309
(12,6)	0,1850	0,00	-1,0068	0,00	0,1471
(12,12)	0,3094	0,00	-1,4962	0,00	0,1529

Correlation between monthly excess portfolio returns on a monthly basis for the 16 momentum strategies with the observation periods as J = 1, 3, 6 or 12 and holding periods as K = 1, 3, 6 or 12 and market turnover are shown. The average returns of the portfolios and market turnover are calculated on a monthly basis for the sample period which spans from January 2003 and December 2017. Regression statistics consist alfa-beta coefficients and adjusted R^2. For each strategy, the second and fourth column exhibits P-value of the coefficients. Results are demonstrated only for P25.

Table 5.6 Regression values between monthly excess of contrarian returns and market turnover

	Contrarian				
Strategy J,K	*Alfa*	*P-Value*	*Beta*	*P-Value*	*Adjusted R^2*
(1,1)	0,0348	0,02	-0,2030	0,04	0,0171
(1,3)	0,0633	0,05	-0,2340	0,28	0,0010
(1,6)	0,0309	0,54	0,2422	0,47	-0,0027
(1,12)	0,0292	0,69	0,6711	0,16	0,0058
(3,1)	0,0270	0,11	-0,1190	0,30	0,0005
(3,3)	0,0615	0,06	-0,2245	0,30	0,0005
(3,6)	0,0117	0,83	0,4043	0,27	0,0012
(3,12)	-0,0104	0,89	0,9561	0,06	0,0145
(6,1)	0,0194	0,29	-0,0750	0,54	-0,0035
(6,3)	0,0373	0,32	-0,0250	0,92	-0,0056
(6,6)	-0,0560	0,38	0,8848	0,04	0,0184
(6,12)	-0,1329	0,14	1,7813	0,00	0,0453
(12,1)	0,0252	0,19	-0,1112	0,39	-0,0015
(12,3)	0,0350	0,37	-0,0298	0,91	-0,0056
(12,6)	-0,0397	0,53	0,7222	0,09	0,0108
(12,12)	-0,0759	0,39	1,3227	0,02	0,0245

Correlation between monthly excess portfolio returns on a monthly basis for the 16 contrarian strategies with the observation periods as J = 1, 3, 6 or 12 and holding periods as K = 1, 3, 6 or 12 and market turnover are shown. The average returns of the portfolios and market turnover are calculated on a monthly basis for the sample period which spans from January 2003 and December 2017. Regression statistics consist alfa-beta coefficients and adjusted R^2. For each strategy, the second and fourth column exhibits P-value of the coefficients. Results are demonstrated only for P25.

6. CONCLUSION

Presenting a challenge with efficient markets concept, it is commonly observed that by numerous studies that market anomalies as known as predictable return patterns in financial markets continued to exist and those patterns might be exploited by attracted investors to earn excess profits. Easy to say that, among these anomalies, one of the most renowned return patterns can be considered as momentum effect. As stated in many studies pointed market inefficiency, momentum effect survives in the short and medium term as from one to twelve months and it takes its main source from psychological or behavioral patterns of market participants. Although according to the scope of this study, momentum profitability is made with an effort to demonstrate in the context of behavioral models, yet the behavioral models were not tried to show evidence with empirical tests.

With using the methodology of Jegadeesh and Titman employed in 1993, 16 distinct trading strategies are interpreted to observe future returns of momentum effect in total. As addressed in chapter 5, main results of momentum strategies are generally positive in the short term except for that one-month formation and holding "J1K1" strategy even after subtraction of possible transaction cost. It can be easily observed that fifteen out of the sixteen trading strategies yield positive excess returns beyond the market. These results have a correspondence with most of the results indicated in the relevant field of research asserted in 90's and 00's especially for developed markets having large market capitalization and liquidity.

The study shows that in the case of momentum portfolios, the narrower selection of the past winners for investment, the higher excess returns realized. For instance, as seen in empirical results, the strategies with 3 month formation period that select first 25 past winners approximately yield 1% more than same strategies that select first 100 past winners on average. Moreover, these returns are much more significant in all other strategies except for the one-month formation period.

Concurrently, about contrarian profitability derived from the overreaction of market participants, no significant excess returns have been achieved. The reason could lie in the fact that the study examines short-medium term, however, the return reversals as contrarian returns can be explained by long term horizons, since, the relevant literature has indicated return reversals with the long run. Although average returns of momentum-based portfolios are better in comparison with average returns of contrarian-based portfolios during the sample period for all strategies, when the statistical significance test was applied to the momentum and contrarian monthly returns, a significance was not reached. For that reason, even though the results can draw clues indicating momentum strategies more successful than contrarian strategies, statistically this statement can not be obtained from this study.

Through the observation of the state of the market, it can be apparently examined that monthly momentum excess returns get strengthen about 1% for all strategies while market conditions seems an uptrend. Controversially, when the market is in a downtrend the return of the strategies lost their significance level. On the other hand, contrarian profits do not show any significant difference when the market is in an uptrend or downtrend with an exception of strategies that have 12-month holding periods.

The market activity is defined with explanations for share turnover velocity in this study. According to empirical evidence, there is a negative correlation between market activies and monthly profits of momentum strategies.

To conclude the study, the main research questions can be answered with the achieved empirical results with a statistical significance. Momentum investment strategy can outperform the market with generating significant positive returns over horizons of 1-12 months but contrarian investment strategy has not the same performance over short and medium horizons. In addition, the extent of the number of selected stocks has a convincing positive effect on momentum portfolios.

It is possible to verify that there are more questions to answer and more concern to address about conditional portfolio construction or risk adjustments of returns by the CAPM or the Fama French Three Factor Model beyond that not only related with nature of the strategies, but also regarding behavioral approaches. Further research can be positioned to shed more light behavioral based market return continuations.

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