Profitability of Contrarian vs Momentum Strategies: Evidence from the Istanbul Stock Exchange

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Abstract

Financial academics and practitioners have recognized that average stock returns are related to past performance and cross-section of stock returns is that predictable based on past returns. Number of researchers report that past losers (negative or lowest return-stocks) outperform past winners (positive or highest return-stocks) or vice versa over the subsequent three to five years not only in US markets but also in other stock markets. This study examines the momentum and contrarian effects on stock returns in one of the leading emerging markets, Istanbul Stock Exchange (ISE) between years 1991 and 2000 by using the same empirical methodology in Jegadeesh and Titman (1993). It also investigates the weak-form efficiency of the stock market by examining the profitability of a number of contrarian strategies based on past prices, size, price, book-to-market, earnings-to-price ratios of stocks.

Prior loser-stocks are found to outperform prior winner-stocks consistent with the predictions of the overreaction hypothesis. Compounded annual return difference between the top-winners and top-losers is around 15% in favor of loser-stocks since the average return difference during the 10-year period is 1.14% per month. Empirical findings for the longer-term average returns up to 36 month holding periods reveal a reversal of returns from 15 months to 36 months. On the other hand, we find that average abnormal returns and the average abnormal return difference per month between losers and winners increase as the holding period extends. Results also indicate that there is a downward trend in average returns for the winner stocks based upon the length of past returns that is used for portfolio formation but upward trend for the losers. Profitability of the strategies is robust to changes in the size of the portfolios. We also find that contrarian profits in January are significantly higher than those in non-January months, particularly for the short-term holding periods such as one and three months, however, losers outperform the winners in most of the months of the year. The overreaction is significantly stronger for smaller firms than for larger firms. Losers portfolio are typically smaller, lower priced, high-B/M and high-E/P stocks (as distressed stocks) than stocks in the winners portfolio.

Our evidence indicates that there is significant price, size, B/M and E/P effects in stock returns in ISE, consistent to previous empirical work. After we analyzed 80 different strategies based on five different factors such as past-return, size, price, B/M and E/P, in various length of formation and holding periods, we find that stocks that have lower price, smaller size, lower past-return, higher-B/M and E/P are significantly provide higher returns than others. Price, size and E/P-based portfolios earn a larger return than loser-winner portfolios suggested by the overreaction hypothesis. Large profits of winners&losers portfolios might be subsumed or caused by the other factors such as size, E/P and B/M effects. It might most probably be size-based phenomenon with the contribution of other factors. On the other hand, findings show that losers are riskier than the winners because they are more sensitive to all three Fama-French factors, however, significant contrarian profits are partially related with risk factors and not captured by the three-factor model of Fama and French. Large abnormal returns of winner and loser portfolios and overreaction effects might be explained only in part by the risk factors.

Finally, our results show that contrarian effects or more specifically "winners and losers effect" are existing on stock returns in ISE and the contrarian trading strategies that is buying past losers and selling past winners realize significant abnormal profits to the investors consistent to DeBondt and Thaler (1985). However the evidence is also consistent with the overreaction and partially with the behavioral hypothesis and risk, reasons behind the profitability of the contrarian strategies needs to be scrutinized by using new explanatory risk factors and hypothesis.

Keywords: Contrarian strategies, momentum effects, winners-losers effect, overreaction, emerging markets
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I. Introduction

Financial academics and practitioners have recognized that average stock returns are related to past performance and cross-section of stock returns is that predictable based on past returns. For example, DeBondt and Thaler (1985, 1987) report that long-term past losers (negative or lowest return-stocks) outperform long-term past winners (positive or highest return-stocks) over the subsequent three to five years. Stocks with poor three-to-five year past performance earn higher average returns than stocks that performed well in the past. They show that arbitrage (zero investment) portfolio of losers and winners earn an average return of 25% over a three-year period. Contrarian strategies that buying past losers and selling past winners is also called as Winners&Losers Effect. Contrary to the findings of DeBondt and Thaler who show stock "return reversals" over longer horizons, Jegadeesh and Titman (1993) add a new insight by documenting "return continuation" that over an intermediate horizon from three to 12 months, past winners on average continue to outperform past losers, so that there is "Momentum" in stock prices. Investment strategies that exploit such momentum or contrarian strategies, predate the scientific evidence and implemented by many professional investors. In particular in the past decade, momentum strategies have become more popular among institutional investors and is one of the most popular investment styles in US and other equity markets.

Return reversals and continuation are only two of many patterns in anomalies in stock markets that empirical researchers have uncovered. Recent literature has identified two families of pervasive regularities or anomalies; "underreaction" and "overreaction". Psychologists, economics and analysts have shown that individuals tend to overreact to information. DeBondt and Thaler (1985) used the extension of this view and suggested that stock prices also overreact to information through the behavior of overreacting individuals. Over long horizons, stock prices overreact to consistent patterns of information indicating in same direction. That is, stocks which have long record of good news tend to become overpriced and have low average returns afterwards. On the other hand, the underreaction shows that over horizons of perhaps 1-12 months, stock prices underreact to information. Information is incorporated gradually into prices, which tend to exhibit positive autocorrelations over these horizons. Good and positive information contributes in predicting positive returns in the future.

The evidence on return predictability is, as Fama (1991) notes, among the most controversial aspects of the debate on market efficiency. There has been growing literature on whether these return patterns reflect an improper response by market participants to information, or whether they can be explained by market microstructure biases or risk. According to efficient markets theory, investors can not earn extra returns without bearing extra risk and using the information based on past stock prices. Therefore, momentum and contrarian strategies presents a challenge to the efficient markets theory in this perspective, by providing abnormal returns by taking advantage of underreaction or overreaction without bearing extra risk.

Determining whether these anomalies are rooted in behavior that can be exploited by more rational investors at low risk has profound implications for market efficiency and optimal investment policy. Momentum and contrarian abnormal returns remain one of the most puzzling of these anomalies, both because of the magnitude and horizon patterns.

II. Literature Review

An increasingly popular interpretation of return predictability emphasized by a number of researchers is that the stock market consistently overreacts to new information. Stock market overreaction hypothesis asserts that stock prices take temporary swings away from their fundamental values due to waves of optimism and pessimism.

After DeBondt and Thaler (1985) first provided the evidence in favor of long-term overreaction, Chopra, Lakonishok and Ritter (1992) attribute long-term price reversals to investor overreaction. Jegadeesh (1990) and Lehmann (1990) provide evidence of short-term return reversals at shorter horizons such as monthly and weekly intervals. Profitability of these short-term contrarian strategies may also present short-term price pressure or a lack of liquidity in the market rather than overreaction. Jegadeesh and Titman (1991) provide evidence on the relationship between short-term return reversals and bid-ask spreads that supports this interpretation. In addition, Lo and MacKinlay (1990) argue that a large part of the abnormal return documented by Jegadeesh and Titman is attributable to a delayed stock price reaction to common factor rather than to overreaction.

On the other hand, momentum strategies leaded by Jegadeesh and Titman (1993), using a U.S. sample of NYSE-AMEX stocks over the period from 1965-1989, find that a strategy buys past six-month winners and sells past losers earns approximately one percent per month over the subsequent six months. Brock, Lakonishok, and LeBaron (1992) used 90 years of daily data on DJIA to show that moving average strategies produce superior returns. Conservative contrarian investment strategy used by the institutional investment management division of Xerox Financial Services, generated higher returns in 1980s by 18-31% than the standard measures in equities, government and corporate bonds, and municipal bonds.[1]

A. International Evidence

Profits generated by momentum and contrarian strategies are seen not only in US markets, but also in stock markets across continents. For example, Rouwenhorst (1998) obtains very similar numbers by focusing on medium-term international return continuation within markets and across markets at the individual stock level using a sample of 2190 stocks from 12 European countries in the period 1978 to 1995. The main finding of Rouwenhorst is that an internationally diversified relative strength portfolio that invests in medium-term winners and sells past medium-term losers earns approximately one percent per month. Momentum effects exist in all 12 markets. It holds across size deciles, although return continuation is stronger for small than large firms. The outperformance last for about one year, and cannot be attributed to conventional measures of risk. Rouwenhorst (1997) also finds that momentum strategies earn significant profits on average also in a sample of 20 emerging markets.

Asness, Liew, and Stevens (1996) and Richards (1996) have studied return patterns across stock markets at the country index level. Chui, Titman, and Wei (2000) document that with notable exception of Japan and Korea, momentum profits also obtain in Asian markets.

Sean and Inglis (1998) show evidence for Canadian stocks that abnormal profits could have been generated by using momentum strategies but this profitability represents appropriate compensation for risk and risk premiums that vary through time. They also find that strategy may not be exploitable by the average retail investors facing higher levels of transaction costs. Foerster, Prihar, and Schmitz (1994, 1995) followed a similar strategy to Jegadeesh and

[1] Abbott (1990)

Titman (1993) using Canadian data from 1978 to 1993 and documented stronger evidence of momentum in stock returns. Subsequent Canadian studies by Korkie and Plas (1995), and Kan and Kirikos (1996) supported the profitability of momentum strategies.

On the other hand, few studies are in favor of contrarian strategies internationally. For example, Chang, McLeavey, and Rhee (1995) have examined and shown the short-term abnormal returns of the contrarian investment strategy in the Japanese stock market.

A study tests for long-term reversals by Campbell and Limmack (1997) for the UK market for the period 1979-1990 show that in the 12 months following portfolio formation, losers persisted in generating positive abnormal returns, thus appearing to support the winner-loser effect. It was also found that the very smallest loser companies did experience a reversal in their abnormal returns over the following 12 months, but that no such reversal existed for the smallest winner companies.

Baytas and Cakici (1999), in their study on seven industrialized countries, have found that returns to long-term contrarian strategies are significant except the US market long-term overreaction to the arbitrage portfolios based on past performance. Moreover, they have shown that arbitrage portfolios based on price are higher than those based on size and outperform the winner-loser arbitrage portfolios. Zamri and Simon (2001) investigate long-run overreaction and seasonal effects for the stocks in Kuala Lumpur Stock Exchange for the period 1986-1996. Stock that exhibits extreme returns relative to the market over a 3-year period experiences a reversal of fortunes during the following 3 years. There is also evidence that employing a contrarian trading strategy may yield excess returns.

There are also few studies that demonstrates the momentum or contrarian effects in other markets: White and Okunev (2001) find that profitability of momentum strategies to hold for currencies as well and to have continued throughout the 1980s and the 1990s, however, Chen (1998) find little evidence to support the overreaction hypothesis in futures markets. Saitta (1997) tests the contrarian strategy for T-bond futures and find that results are unimpressive and the average profit per trade is negative.

B. Explanatory Factors of Momentum Strategies

Given the persistence of the momentum or contrarian anomaly, it is important to understand its cause. While the existence of momentum in stock returns does not seem to be too controversial, it is much less clear what might be driving it. A number of authors, for example, Barberis, Shleifer, and Vishny (1998), Daniel, Hirshleifer, and Subrahmanyam (1998), and Hong and Stein (1999) present behavioral models that are based on the idea that momentum profits arise because of inherent biases in the way that investors interpret information. Others, however argued that profitability of momentum strategies may simply be compensation for risk. Most notably, Conrad and Kaul (1998) argue that profitability of momentum strategies could be entirely due to cross-sectional variation in expected returns rather than to any predictable time-series variation in stock returns.

The behavioral models and Conrad and Kaul's arguments make opposed predictions about the returns of past winner and losers over the period following the initial holding period. The behavioral models imply that the holding period abnormal returns arise because of a delayed overreaction to information that pushes the prices of winners (losers) above (below) their long-term values. These models predict that in subsequent time periods, when the stock prices of winners and losers revert to their fundamental values, the returns of losers should exceed the returns of winners. In contrast, Conrad and Kaul (1998) suggest that the higher returns of winners in the holding period represent their expected rates of return and thus predict that the returns of the momentum portfolio will be positive on average in any postranking period.

Jegadeesh and Titman (2001) test the conflicting implications of these theories. Jegadeesh and Titman evaluated the various explanations for the profitability of momentum strategies documented in their study in 1993. Their evidence indicates that momentum profits have continued in 1990s and original results were not a product of data snooping bias. They also support for the behavioral models with caution. They find that, momentum portfolio yields significant positive returns in the first 12 months following the formation period. Their momentum portfolio returns in the 13 to 60 months following the portfolio formation month are negative. Although this evidence clearly rejects the Conrad and Kaul (1998) hypothesis, and is consistent with the behavioral models, but for a variety of reasons should be tempered with caution. They suggest that behavioral models provide a partial explanation for the momentum anomaly.

A number of hypothesis have been proposed in the literature to explain the profitability of momentum strategies.

a) **Market Underreaction:** Momentum profits arise because investors underreact to ranking period information, which is gradually incorporated into stock prices during the holding period. In Barberis, Shleifer, and Vishny (1998), there is a representative investor who suffers from a conservatism bias, and who does not update his beliefs sufficiently when he observes new public information. The conservatism bias, suggests that individuals underweight new information in updating their priors. If investors act in this way, prices will tend to slowly adjust to information, but once the information is fully incorporated in prices, there is no further predictability in stock returns. This interpretation suggests that the postholding period returns will be zero.

b) **Behavioral Models:** In order to explain the evidence of long-term overreaction (negative returns in momentum portfolios in postholding period) has been provided by Jegadeesh and Titman (1993) and DeBondt and Thaler (1985), Barberis et. al. (1998) present a model that combines the conservatism bias with what Tversky and Kahneman (1974) refer to as a "representative heuristic" which is the tendency of individuals to identify "an uncertain event by the degree to which it is similar to the parent population". Barberis et. al. argue that the representative heuristic may lead investors to mistakenly conclude that firms realizing extraordinary earnings growths will continue to experience similar extraordinary growth in the future. This behavioral tendency in conjunction with the representative heuristic can lead to long horizon negative returns for stocks with consistently high returns in the past.

Daniel et. al. (1998) and Hong and Stein (1999) propose alternative trading models that are also consistent with short-term momentum and long-term reversals. Daniel et. al. argue that informed traders suffer from a "self-attribution" bias. In their model, investors observe positive signals about a set of stocks, some of which perform well after the signal is received. Because of their cognitive biases, the informed traders attribute the performance of ex-post winners to their stock selection skills and that of the ex-post losers to bad luck. As a result, these investors become overconfident about their ability to pick winners and thereby overestimate the precision of their signals for these stocks. Based on their increased

confidence in their signals, they push up the prices of the winners above their fundamental values. The delayed overreaction in this model leads to momentum profits that are eventually reversed as prices revert to their fundamentals.

In Hong and Stein (1999) the emphasis is on heterogeneities across investors, who observe different pieces of private information at different points in time. Hong and Stein make two key assumptions: i) firm-specific information diffuses gradually across the investing public, ii) investors cannot perform the rational-expectations trick of extracting information from prices. Taken together, these two assumptions generate underreaction and positive return autocorrelations. Hong and Stein consider two groups of investors who trade based on different sets of information. The informed investors or the news watchers in their model obtain signals about future cash flows but ignore information in the past history of prices. The other investors in their model trade based on a limited history of prices and do not observe fundamental information. The information obtained by the informed investors is transmitted with a delay and hence is only partially incorporated in the prices when first revealed to the market. This part of the model contributes to underreaction, resulting in momentum profits. The technical traders extrapolate based on past prices and tend to push prices of past winners above their fundamental values. Return reversals obtain when prices eventually revert to their fundamentals.

As it can be seen, there are a number of theories in "behavioral" (not risk-based) explanations, that can give rise to positive medium-term return autocorrelations. In some of these, prices initially overreact to news about fundamentals, then continue to overreact further for a period of time. The positive-feedback-trader model of DeLong et.al. (1990) fits to this, as does the overconfidence model of Daniel, Hirshleifer, and Subrahmanyam (1998). In other models, momentum is a symptom of underreaction-prices adjust to slowly to news.

Furthermore, Hong, Lim, and Stein (2000) tested the Hong-Stein version of the underreaction hypothesis to find the evidence that momentum reflects the gradual diffusion of firm-specific information. They find three key results: First, once one moves past the very smallest stocks, the profitability of momentum strategies declines sharply with firm size. Second, holding size fixed, momentum strategies work better among stocks with low analyst coverage. Finally, the effect of analyst coverage is greater for stocks that are past losers than for past winners. Their

findings are consistent with the hypothesis that firm-specific information, especially negative information, diffuses only gradually across the investing public.

c) **The Conrad and Kaul Hypothesis:** Conrad and Kaul (1998) start with the hypothesis that stock prices follow random walks with drifts, and the unconditional drifts vary across stocks. The Conrad and Kaul hypothesis suggests that the differences in unconditional drifts across stocks explain momentum profits. This predicts that the stocks on the long side of the momentum portfolio should continue to outperform stocks on the short side by the same magnitude in any postranking period. They have suggested a risk-based interpratation of momentum although there is little evidence in favor of risk.

Fama and French (1996) note that momentum effects are not subsumed by their three-factor model. Brennan, Chordia and Subrahmanyam (1998) examined the relation between stock returns and measures of risk and non-risk security characteristics. They find that momentum and trading volume effects persists by using the three-factor model of Fama and French. There is strong evidence of return momentum both before and after risk-adjustment.

Ahn, Conrad and Dittmar (2001) asses the profitability of momentum trading strategies using a stochastic discount factor approach. They show that the risk of a momentum strategy should be increasing with respect to the market risk premium. Empirically, while the risk measures of the strategies, estimated relative to the stochastic discount factor, behave as predicted, market betas do not. This suggests that the use of CAPM benchmarks to assess the risk-adjusted performance of momentum strategies may lead to incorrect inferences.

Jegadeesh and Titman (1993) find a seasonality in momentum profits. They document that the winners outperform losers in all months except January, but the losers significantly outperform the winners in January. Jegadeesh and Titman (2001) also find that the momentum profits in January are also negative in all subperiods. This indicates that most of the previously reported negative returns in January are due to small and low-priced stocks.

For the Contrarian Evidence: DeBondt and Thaler (1987) show empirical evidence that is relevant to the winner-loser, size and January effects which are used to reevaluate the overreaction hypothesis. The results are: a) excess returns for losers are negatively related to formation period performance, while January excess returns for winners are negatively related

to the excess returns for the prior December. b) The winner-loser effect can not be attributed to changes in risk and size effect. c) The small firm effect is partly a losing firm effect. d) The earnings of winning and losing firms exhibit reversal patterns that are consistent with overreaction.

Zarowin (1989) examined to determine whether size and seasonality can account for short-run price reversals as well. The results indicate that losers significantly outperform winners over all months, regardless of which group is smaller. Thus, short-run overreaction effect is a separate anomaly. Using different control, an overreaction effect that is distinct from the size effect is also found by Albert and Glenston (1995).

Another economically significant overreaction effect is found by Chopra, Lakonishok, and Ritter (1992). In portfolios formed on the basis of prior 5-year returns, extreme prior losers outperform extreme prior winners by 5-10% per year during the subsequent 5 years. Although January seasonal effect is present, the evidence suggests that the overreaction effect is distinct from tax-loss selling effects. In addition, the overreaction is significantly stronger for smaller firms than for larger firms. Returns consistent with the overreaction hypothesis are also observed for short windows around quarterly earnings announcements. Chan, Jegadeesh, and Lakonishok (1996) also examine the relation between earnings momentum and return momentum.

A study by Chang, McLeavey, and Rhee (1995) examines short-term abnormal returns of the contrarian investment strategy in the Japanese stock market. Empirical evidence is provided that: 1) the short-run contrarian strategy remains profitable after systematic risk and firm size are taken into account, 2) the seasonality effect does not explain the contrarian profits, 3) abnormal profits are reported regardless of whether losers are smaller or greater than winners and the magnitude of the profits does not differ after an adjustment for firm size, and 4) contrary to empirical evidence documented for the US market, a strong asymmetry exists between the performance of the two extreme portfolios.

Jegadeesh and Titman (2001) also find strong evidence of return reversals for small firms, but the evidence is somewhat weak for large firms, particularly when they evaluate portfolio performance relative to Fama and French (1993) benchmark. In addition, return reversals is substantially weaker in the sub-period, 1982-1998. This is important since there is no

difference between either the magnitude or the significance of the momentum profits in the two subperiods.

Relative performance of bid-ask errors and market overreaction in determining the time series of properties of short-horizon security returns have been investigated by Kaul and Nimalendran (1990). The analysis of them documents two important findings: First, it shows that the main source of price reversals for Nasdaq firms in the short run is the bid-ask spread. There is little evidence of market overreaction. This analysis suggests that the positive profits earned by contrarian strategies could largely be due to a combination of the asymmetric lead-lag relations in returns and price reversals due to the bid-ask effect. Bid-ask and closing price bias in estimated contrarian portfolio returns is severe. When returns are calculated from successive bid prices of Nasdaq stocks, short-term contrarian profits largely disappear.

Volume Effects: First, Datar, Naik and Radcliffe (1998) show that low (high) volume firms earn higher (lower) future returns. Then, Lee and Swaminathan (2000) examine the relations between momentum, volume, and long horizon returns to test the predictions of behavioral models. They show that past trading volume provides an important link between "momentum" and "value" strategies. Past trading volume also predicts both the magnitude and persistence of price momentum and related to various value strategies. Lee and Swaminathan show that this volume effect exists in long term and is most pronounced among the extreme winner and loser portfolios. High (low) volume stocks earn higher (lower) average returns in each of the five years prior to portfolio formation. They show that the improvement gained by conditioning on past volume appears economically significant in price momentum strategies and timing of price reversals is predictable based on past trading volume. Specifically, price momentum effects reverse over the next five years, and high (low) volume winners (losers) experience faster reversals. No significant price reversals through the third year following portfolio formation like Jegadeesh and Titman found. However, over years three to five, Lee and Swaminathan find that initial winner portfolios significantly underperform initial loser portfolios. This finding is important since it refutes the common presumption that price momentum is simply a market underreaction. Instead, the evidence suggests that at least a portion of the initial momentum gain is better characterized as an overreaction. Their findings show that past volume helps to reconcile intermediate-horizon "underreaction" and long-horizon "overreaction" effects.

Industry Effects: In another study, Moskowitz and Grinblatt (1999) and Grundy and Martin (2000) examine the industry and factor components of momentum profits. After the finding that industry-specific aspect of momentum gives rise to profitable trading strategies that use industry-sector mutual funds, O'Neal (2000) shows that strategies of buying previous intermediate-term top-performing sector funds outstripped the S&P Index over the 10-year period from 1989 to 1999 on a total-return basis.

Moskowitz and Grinblatt (1999) documented that momentum strategies are significantly less profitable once the industry momentum is controlled. Industry momentum investment strategies, which buy stocks from past winning industries and sell stocks from past losing industries, appear highly profitable, even after controlling for size, book-to-market equity, individual stock momentum, the cross-sectional dispersion in mean returns, and potential microstructure influences. Unlike individual stock momentum, industry momentum is strongest in the short-term (at the one-month horizon) and then, like individual stock momentum, tends to dissipate after 12 months, eventually reversing at long horizons. Thus, the existence of industries as a key source of momentum profits may support the viability of behavioral models that have been offered for the individual stock momentum anomaly. They also pointed out the extremely strong industry influence on the information in past prices and so that important role of industries in asset pricing.

Lastly, the evidence presents also a challenge to the efficient markets theory because it suggests that in a variety of markets, sophisticated investors can earn superior returns by taking advantage of underreaction and overreaction without bearing extra risk. The most notable recent attempt to explain the evidence form the efficient markets viewpoint is Fama and French (1996). Their three-factor model can account for the overreaction evidence, but not for the continuation of short-term returns (underreaction). This evidence also presents a challenge to behavioral finance theory because early models do not successfully explain the facts. This challenge is to explain how investors might form beliefs that lead to both underreaction and overreaction.

In sum, relatively higher returns generated by these strategies have been attributed mostly to size, book-to-market and January effects, risk, volume and industry effects, market

inefficiency, bid-ask spreads, data snooping bias, and the last but not the least, to psychological factors and behavioral patterns of investors.

While previous studies focus on these hypotheses, they use mostly the US data to find evidence for this phenomena. Therefore, there is no enough evidence found in other international markets, in particular in emerging markets, which can contribute to develop an explanation to the previous findings in US markets. Differences in development level of markets and market structures provide unique opportunity to examine the validity of phenomena and hypothesis internationally. For example, if short-term return continuation is found internationally, this would confirm the validity of the profitability of the momentum strategies in short-term up to 12 months seen in U.S markets. It also investigates the weak-form efficiency of the stock market by examining the profitability of a number of contrarian strategies based on past prices, size, price, book-to-market, earnings-to-price ratios of stocks. Lastly, to our knowledge, this is the first study that investigates the profitability of momentum and contrarian investment strategies on stock returns in Istanbul Stock Exchange.

The remainder of the paper is organized as follows: Section II reviews the previous findings in literature whereas Section III describes a brief description of institutional specifications of ISE, our data and empirical methodology used in this study. Next section, Section IV presents the descriptive statistics and characteristics of portfolios based on past-returns, empirical tests and results and also identifies the potential reasons driving the abnormal profits based on contrarian strategies, between the years 1991 and 2000 in ISE. Price, size, B/M and E/P effects are also analyzed in this section. The last section, Section V, contains the summarized results and concluding remarks of the study.

III. EMPIRICAL RESEARCH

A. Institutional Specifications of the ISE

Although the Istanbul Stock Exchange (ISE) was established just a decade ago in 1986, it has achieved rapid development. As a leading emerging market, ISE's progressive infrastructure and dynamism are attracting increasing international interest. In average, foreign and international institutional investors own 50% of the free float of the shares at the ISE. Total market capitalization is approximately US$ 80 Billion whereas it is a highly active market

with an average daily trading value of US$ 753 Million and 315 listed stocks at yearend of 2000.

The ISE is an order-driven, multiple-price, continuos auction market with no market makers or specialists. The trading is realized through the computerized trading system. There is no opening session or pre-open procedure at the ISE. The market is open Monday through Friday, (morning session) from 09:30 a.m. until 12:00 and after two hours lunch break, (afternoon session) from 2:00 p.m. to 4:30 p.m. The "National-100 Index" (ISE-100) which is the main market indicator of the Istanbul Stock Exchange is a market capitalization-weighted index and represents at least 75% of the total market capitalization, traded value, number of shares traded and number of trades realized in the market.

B. Data

Our sample is constructed from the stocks traded in National Market of the Istanbul Stock Exchange. Shares of investment trusts, REITs, other stocks delisted or halted by the Exchange by the time and also the stocks which has less than 12 month-data are excluded from the sample, due to the lessen the negative effects leaded by small, illiquid, low-priced stocks, bid-ask bounce, extraordinary stock-specific cases and sanctions imposed by Exchange and lack of data. Thus, the data set used in this study consists monthly return series of 210 stocks which are obtained from the ISE for the period from January 1991 to December 2000. Our sample represents approximately 80 % of the market in terms of market capitalization and trading activity. All prices are adjusted for dividends, rights issues and stock splits. We have also cut the sample to two equal sub-periods, 1991-1995 and 1996-2000 in order to see time-variation and to strengthen the results.

C. Methodology

The strategies implemented in this study select stocks based on their returns over the past 1, 3, 6 and 12 months and hold the selected stocks from 1 month to 12 months. This gives a total of 16 strategies. We used one-month period both for prior and holding periods which is different than previous studies, due to the myopic investment characteristics of investors in Turkish stock market as a result of inflation. We also examine the returns of the winner and loser stocks in the 24 and 36 months following the formation period. In order to increase the power of statistical tests, the strategies examined include portfolios with overlapping holding

periods. Therefore, in any given month t, the strategies hold a series of portfolios that are selected in the current month as well as in the previous K-1 months, where K is the holding period. Specifically, a strategy that selects stocks on the basis of returns over the past J months and holds them for K months is constructed as follows: at the beginning of each month t, the stocks are ranked in descending order on the basis of their returns in the past J months. We used totally the same methodology that of Jegadeesh and Titman (1993).

Based on these rankings, five quintile portfolios are formed that equally weight the stocks contained in the top quintile (i.e. 20% of the stocks in sample) , the second quintile, and so on. The top quintile portfolio is called the "winners" quintile and the bottom quintile is called the "losers" quintile. Portfolio P1 represents the stocks with the highest ranking period returns and Portfolio P5 represents the stocks with the lowest ranking period returns. In each month t, the strategy buys the winner portfolio and holds this position for K months. Hence, under this strategy, the weights on 1/K of the stocks in the entire portfolio in any given month are revised and carried over the rest from the previous month. The profits of the above strategies were calculated for a series of portfolios that were rebalanced monthly to maintain equal weights.

At the end of each month, we rank the stocks in our sample based on their past J month-returns, for example, month –5 to month 0, if J is defined as six, and then group the stocks into five equally weighted portfolios based on these ranks. Each portfolio is held for K months following the ranking month, for example, month 1 to month 3, if K is defined as three (K3). Overlapping portfolios that is a momentum quintile portfolio in any particular month holds stocks ranked in that quintile in any of the previous six ranking months, if J = 6 (J6). For example, a December winner portfolio comprises 20% of the stocks with the highest returns over the previous June to November period, the previous May to October, and so on up to the previous January to June period. Each month has equal weight in this portfolio. For example, at the end of month t the J = 6, K = 3 portfolio of Winners consists of three parts: a position carried over from an investment of 1 TL at the end of month t-3 in the 20% of firms with highest prior six-month performance as of t-3, and two similar positions resulting from a TL invested in the top-performing firms at the end of months t-2 and t-1. At the end of month t, the first of these holdings will be liquidated and replaced with a unit investment in the stocks with highest six-month performance as of time t.

Then, the monthly average portfolio returns generated by the each use of the momentum strategies that are implemented are averaged across the time, which gives the Average Return (AR_i). Average Abnormal Return on a momentum portfolios, from P1 to P5, portfolio i (AAR_i) is calculated as formula 1;

$$AAR_i = AR_i - R_m \qquad (1)$$

AR_i = Average monthly return on portfolio i measured by the application of momentum strategies.

R_m = Average monthly return on market portfolio (value-weighted ISE-100 index) on month t measured by the percentage change in ISE-100 index relative to previous month, and then averaged.

On the other hand, studies of long-term returns are also sensitive to the way the tests are done. Average monthly abnormal returns (AARs or CARs) can produce different inferences than buy-and-hold abnormal returns (BHARs). Equal-weight returns produce different results than value-weight returns. There are several studies that have shown the advantages and disadvantages of using the AARs and BHARs in long-term return measurement.[2] We used average returns in return calculation since that AARs are a common approach to examining long-term returns and also pose fewer statistical problems than long-term BHARs as suggested by Fama (1998).

IV. EMPIRICAL FINDINGS

A. Holding Period Returns

Table 1 displays average monthly returns and the standard deviations of returns for the five momentum portfolios. The average difference between the P1 (top-winners) and P5 (top-losers) portfolio returns during the 10-year period is 1.14 % per month in favor of losers, which is statistically different from zero.[3] Past losers (P5) outperformed past winners (P1) approximately by one percent per month. It also presents that the winners (P1) outperform the

[2] Blume and Stambaugh (1983), Conrad and Kaul (1993), Ball, Kothari, and Shanken (1995), Mitchell and Stafford (1997), Barber and Lyon (1997), Fama (1998).

[3] t-test results whether mean is equal to zero or not are not reported here since all of the return on winner&loser portfolios are found statistically significant at 0.01 level.

value-weighted index of ISE-100 by only 0.65 % per month, whereas the losers (P5 and P4) outperform the market by 1.79 % and 1.85 % per month, respectively. However, variability of the losers is higher than winners (8.79% vs 7.12%), losers still provide slightly higher "mean return per unit of risk". By using the equal-weighted index which contains the whole sample of stocks used in this study weighted equally in the market portfolio, in measuring the abnormal average return of momentum strategies, abnormal average returns (AARs) for losers are 1.07 % and 1.13 % per month, for P5 and P4, respectively, this figure is negative (-0.07%) for winners at the same period. The evidence here supports the validity of contrarian strategies and consistent with the overreaction hypothesis (Figure 1).

The best strategies which provides the highest return among the strategies that have been implemented are K12 and J12 for top-loser portfolio (9.44 %) and K12 and J1 for top-winner portfolio (8.22 %) that is reported in Table 2. In portfolios formed on the basis of prior year-return, extreme prior losers outperform extreme prior winners by 1.94% per month (7.48 vs. 9.44) during the subsequent 12 months. Losers still contribute additional 1.22 % per month in subsequent 12 months than that of winners. In general, shorter-term investment strategies such as a month-holding periods have always lower returns than longer ones both for winners and losers. Thus, evidence shows that the longer the holding period, the higher the monthly abnormal return for whole portfolios, particularly for loser stocks.

We find that the highest returns are always hold for loser portfolios, P5 and P4, whereas the lowest returns are generated by the winner portfolios, P1 and P2, for the all holding periods. However the differences in monthly average returns which are around 1 % between winner and losers that might be seen low relative to nominal values, compounded annual return difference is around 15 % in favor of loser-stocks which is quite high. Thus, losers outperform the winners both for long and short-term investment horizons.

We have also observed that few number of extreme loser stocks which are close to bankruptcy show higher volatility and keep being losers because of difficulty in financial situations. These stocks may have an impact on return statistics as an outliers.

The average monthly return generated from all of the past performance-based investments strategies is 7.69 %, which is 0.69 % and 1.40 % per month higher from the equal-weighted and value-weighted indices, respectively. This finding is another evidence that confirms the

existence of profitability of past performance-based strategies, in particular contrarian strategies, relative to the simple buy-and-hold type of investment style.

Table 4 displays that almost all of the AARs in excess of value-weighted index are positive except for the strategies based on 1-month holding period (K1) for winners (P1). This confirms the existence of overreaction that stocks performed well than others in past are not able to continue the same performance in short-run, particularly in 1-month holding period. All the strategies using 1-month holding period for winner-stocks underperformed the market portfolio. In contrast, AARs are greater for losers and the highest AAR is generated by the strategies based on long investment terms, like 12 months. The most loser stocks (P5) in past provide the highest average abnormal returns per month, like the strategy K12 and J12, which generates 3.15% per month.

Using equal-weighted index instead of value-weighted index to calculate the abnormal returns make a bit change in results. Nine of the 16 different strategies for the top-winner portfolios underperform the equal-weighted index that is shown in Table 5. There are four portfolios of which return is under the market for P2. On the other hand, there is only one portfolio underperforms the market both for the top two quintiles of loser stocks. The top loser-stocks generate 8.1 % per month in average, where the average returns on value-weighted index and equal-weighted index are 6.3 % and 7 % per month, respectively. Monthly abnormal returns in excess of both equal-weighted and value-weighted indices, for winner portfolios P1 and P2 are negative or very close to zero, particularly in short-term holding periods such as in one and three months. Loser stocks provide low but positive abnormal monthly average returns even in the one and three-month holding periods.

Table 3 displays that there is a clear increasing trend in returns from winners to losers that confirms the validity of overreaction hypothesis . For example, the monthly average returns in one-month holding period regardless of the length of the prior returns that strategy based on are 6.14 %, 6.78 %, 7.28 %, 7.59 % and 7.45 %, respectively, from portfolios P1 to P5, winners to losers. On the other hand, we find that abnormal returns increase as the holding period extends. Those numbers increase to 7.81 % and 8.98 % for the top-winners and top-losers, respectively, in twelve-month holding period. Therefore, investors should prefer longer holding periods while investing either of winner or loser portfolios.

As we indicated that, in general, top-loser portfolio (P5) provides 1.14 % (8.08% vs. 6.94 %) higher return than top-winner portfolio (P1), this return difference spread out almost equally among the different holding periods (Table 3). Table 3-A presents that the difference among the average returns on different holding periods varies between 0.36 % to 1.46 %. This difference between the one-month and twelve-month holding periods (K12 – K1) is 1.46 % per month. Finally, these findings demonstrate that past loser stocks always generate higher average returns than the past winner stocks. Relatively higher returns are obtained in longer investment horizons and using trading strategies based on winners and losers effects may help investors boost the total return of their portfolios even after the trading costs are considered.[4]

In addition to the result that the longer the holding period the more the average return both for winners and losers, in contrast, there is a downward trend in average returns based upon the length of past returns that is used in the strategy for the winner stocks. In other words, the more one goes back for past returns in choosing the strategy, the lower the return for winners, but interestingly, the higher the return for losers. For example, as it can be seen in Table 2, in one-month holding period, the monthly average return for top-winner stocks is 6.28 % and 5.87 %, if the stocks in portfolio are chosen by looking the past one-month and past twelve-month returns, respectively. In contrast, the average return increase as the *J* gets bigger for loser stocks.

Moreover, the evidence shown on Table 2 and Table 2-B pointed out that the return difference between the top-losers and top-winners begins to enlarge as the past returns used for portfolio formation becomes older or in other words, the length of past returns extends back to the longer period. For example, this difference goes up to 2.22 % per month in one-month holding period while the past twelve-month returns are taken into account in choosing the stocks to the winner and loser portfolios (K1, J12), whereas it is only 0.31 % per month while only past one-month returns are considered at the same holding period (K1, J1). It is clear that the return difference between losers and winners depends on the length of past returns (J). The gap between losers and winners increases as the *J* increases in favor of losers and the effect of *J* on holding period return seems to be more important than that of the length of holding period (K). By considering the whole *Js* and *Ks*, the average return difference between top-losers and top-winners soars, if past twelve-month returns are taken into account instead of

[4] Minimum trading fee charged by the brokerage houses is 0.2% over the trade value in ISE

past one-month returns. Evidence presents that prices of short-term winner stocks continue to increase in long term and so that there is only 0.42 % difference in average returns per month between top losers and winners such as for the strategy K12-J1, while this difference goes up to 1.96 % per month for the same holding period by forming the portfolio with longer-term past returns such as J12. On the other hand, the abnormal returns of winners drop whereas increase for losers as the length of past returns considered extends. Therefore, the longer one goes back the higher return he or she earns in each of the holding periods. It might be rational behavior for the investors that choosing always the past loser-stocks relative to past winner-stocks, particularly, lowest-return stocks in last 12 months since that year-low stocks earn more in subsequent holding periods than a month-low stocks at the same holding period.

Furthermore, although the explanatory hypothesis do not have significant comments regarding the length of holding periods to observe corrections or reversals in stock prices, we extend the postholding period to three years here since the evidence of underperformance of IPOs and seasoned equity offerings in long term up to five years after the public offerings that have been shown previously.[5] Therefore, we also measure the average returns for the strategies based on from 15 to 36 months holding periods (Table 2-A). Results reveal a reversal of returns in the one through three years (Figure 2). However the average returns are still positive, they are lower than the returns on the period up to fifteen months. There is downward trend in returns as the postholding period extends beyond 15 months for the loser stocks. Interestingly, top-winner portfolio continues its increasing performance by the maturity up to 36 months and does not show a significant reversal on returns between second and third years following the initial portfolio formation. Return reversal for top-loser stocks begins 15 months after implementing the contrarian portfolios. Evidence consistent with the overreaction hypothesis here partially supports the behavioral hypotheses.

We also have investigated the robustness of the results according to size of the portfolios by reshaping the winner and loser portfolios for two different criteria. First, ten decile portfolios are formed that equally weight the stocks contained in the top decile (i.e. 10% of the stocks in sample), the second decile, and so on. The top decile portfolio P1 is called the “winners” decile and represents the stocks with the highest ranking period returns whereas the bottom decile P10 is called the “losers” decile and represents the stocks with the lowest ranking

[5] Loughran and Ritter (1995)

period returns. Lastly, we formed three equally weighted portfolios which divides the sample of stocks into three equal pieces. Thus, there are three porfolios existed in this formation, P1 represents the most winners and P3 represents the most losers. Then same metholodogy defined above have been applied to these portfolios.

Findings are summarized in Table 7 and Table 8. Results consistently support our previous findings both for two different portfolio sizes: losers significantly outperform the winners and this outperformance increases as the holding period and past returns used extends. Best strategies among the 16 strategies which maximizes the difference between the most losers and the most winners are K1-J12, K3-J12, K12-J12 for decile portfolios, respectively. The average return difference is around 3% per month in favor of losers (for example 7% vs. 10% for K12-J12). The other formation method also provides similar results. Mean return of loser portfolios are always higher than the mean return of winner portfolios except K1-J1 strategy out of 16 different strategies used here. We also observe that profitability of the strategies is robust to the changes in the size of the portfolios. Profitability of the contrarian strategies increases as the size of the portfolios becomes smaller.

B. Seasonality in Contrarian Profits

Contrarian effects are also analyzed to find whether the Size and January effects exist or not in profits generated based on the contrarian investing strategies. The size decile ranks here are computed with the size rank of one being the largest and the size rank of five being the smallest. Jegadeesh and Titman (1993) documented that the winners outperform the losers in all months of the year except January, but the losers significantly outperform the winners in January. Jegadeesh and Titman (2001) reports that momentum profits in January are negative due to small and low-priced stocks.

Table 6 presents the returns that are generated by the implementation of the strategy based on winners and losers effects in calendar months of the year. Mean return differences between the most losers (P5) and the most winners (P1) are positive in all 16 strategies implemented also in most of the months of the year which confirms that losers outperform winners. In 83% of the months mean return of the losers outperforms the mean return of winners, however, this figure varies from 50% to 100% depending on the strategy chosen. Interestingly, the number of months in a year in which the average return difference between losers and winners is

positive, increases as the *J* and *K* extend. For example, losers outperform winners in all months of the year for the strategies K12-J12, K12-J6, K6-J12, K6-J3.

However our findings indicate apparently that returns based on contrarian strategy that buys the past losers and sells the past winners are profitable across the most of the months of the year, they are not the same across the calendar months. Contrarian profits in January are significantly higher than those in non-January months, particularly for the strategies which are based on relatively short-term holding periods such as one and three months. Only in one strategy out of 16 that losers underperformed by the winners in January. Persistently, losers earn exceptionally large January returns in which are significantly higher than those of winners. Positive and high return differences in favour of losers in January disappear and the profitability of the contrarian strategies spread out to other months of the year as the holding period extends. Thus, we find that well-known January effect in contrarian profits exits mostly in short-term strategies. This finding is consistent to previous findings of DeBondt and Thaler (1985, 1987) and Jegadeesh and Titman (1993, 2001).

On the other hand, we observe that the highest mean return differences of loser and winners occur in May, December and January, respectively. The difference between P5 and P1 in these months decreases as the holding period extends but increases as the portfolio formation period extends. Profitability of losers over winners downs to minimum in July across the months which is interesting since the mean return of July is the negative and the lowest across the months of the year.

C. Portfolio Characteristics of Winners&Losers Portfolios: Risk and the Contrarian Returns

The role of non-risk characteristics such as size (market capitalization), dividend yield, book value-to-market value (B/M) and earnings-to-price (E/P) can be accounted for by frictions within the rational pricing paradigm or for by their ability as proxies for expected returns. Researchers show that a firm's average stock return is related to its size, B/M, E/P, cash flow-to-price (C/P) and few more factors.[6] B/M, E/P and C/P are related positively with average returns whereas size is related negatively. Size and B/M become more elusive after Fama and French (1993, 1995, 1996) have shown that these non-risk characteristics can capture much of

[6] Banz (1981), Basu (1983), Lakonishok, Shleifer and Vishny (1994)

the cross-sectional variation in expected returns. These variables have been shown to predict average returns, and Fama and French (1996) have shown that momentum effect is correlated with size and B/M. Fama and French and Lakonishok, Shleifer and Vishny (1994) show both for US and major international and emerging stock markets, there is a strong value premium in average returns since high B/M, E/P and C/P stocks have higher average returns than low high B/M, E/P and C/P stocks. They also found that the value premium is associated with relative distress. High B/M, E/P and C/P stocks tend to have persistently low earnings; low B/M, E/P and C/P stocks tend to be strong (growth) firms with persistently high earnings. Lakonishok, Shleifer and Vishny (1994) argue that the value premium in average returns arises because the market undervalues distressed stocks and overvalues growth stocks. When these pricing errors are corrected, distressed value stocks have high returns and growth stocks have low earnings returns. Fama and French, on the other hand, argue that the value premium is compensation for risk missed by the Capital Asset Pricing Model (CAPM) of Sharpe (1964) and Lintner (1965).

Fama and French (1995) show that book-to-market equity and slopes on high minus low book-to-market equity (HML) proxy for relative distress. Weak firms with persistenly low earnings tend to have high B/M and positive slopes on HML, strong firms with persistently high earnings have low B/M and negative slopes on HML. Using HML to explain returns is that there is covariation in returns related to relative distress that is not captured by the market return and is compensated in average returns. Similarly, using size and slopes on small minus big size (SMB) to explain returns, covariation in the returns on small stocks that is not captured by the market return is compensated by the average return. SMB and HML mimic combinations of two underlying risk factors or variables. They show that firm size and B/M capture the cross-sectional relation between average returns and earnings yield and leverage. Three-factor model of Fama and French (FF) seems to capture much of the cross-sectional variation in average stock returns. FF (1993) also show that the model is a good description of returns on portfolios formed on size and B/M. Three-factor model also captures the reversal of long-term past returns documented by DeBondt and Thaler (1985). Stocks with low long-term past returns (losers) tend to have positive SMB and HML slopes (they are smaller and relatively distressed) and higher future returns. Conversely, long-term winners tend to be strong stocks that have negative slopes on HML and low future returns. This model can not explain the momentum effect or the continuation of short-term returns documented by Jegadeesh and Titman (1993). Moreover, low price effect documented by Miller and Scholes

(1982) reflects the fact that firms with low prices are often in financial distress and financial institutions may be reluctant to invest in them and show an aversion from them.

Contrarian Effects are Other Anomalies ?

Relying on previous literature to forecast mean returns, we use the price, size, B/M and E/P ratios of a firm to accomplish the relationship of these factors with the return of the winners&losers' portfolios. In order to gain further insight into the relationship among holding period returns of winners&losers portfolios, price, size, E/P and B/M ratios of the stocks, the performance of the stocks based on these factors are evaluated by using exactly the same procedure that we used for winners&losers portfolios previously in this study. This section also examines the characteristics of the winners&losers portfolios and the risk-adjusted contrarian portfolio returns. The remainder of this paper is devoted primarily to these issues.

First we detected the size, price, E/P and B/M characteristics of the winners&losers portfolios for the strategy K6-J12 (six-month holding period based on the last twelve months' past performance). It is clearly demonstrated in Table 9 that loser stocks are the small-cap. and low-price stocks, whereas winners are the largest-cap. and high-price stocks. For example, median market capitalization is 16.8 billion TL for the winners and 5.2 billion TL for the losers. Similar to market capitalization, median price for the winners and losers are 23.816 TL and 10.506 TL, respectively. We find that winner firms have higher average prices and market values than those of losers in ISE similar to seven developed markets shown by Baytas and Cakici (1999). Average size and price of the portfolios decreases from winners to losers. On the other hand, consistent to findings of Fama-French and Lakonishok, Shleifer and Vishny, Table 9 also shows that the winners are the low-B/M and low-E/P stocks, whereas the losers are high-B/M and high E/P stocks, so that distressed stocks. We also analysed the characteristics of the portfolios that have been constructed based on price, size, B/M and E/P. There is positive relationship between price and size, B/M and E/P, and negative relationship between price, size and B/M, E/P (Table 17). These findings point out that winners&losers effect might be caused primarily by the other factors such as size, price, B/M and E/P, since the stocks in the losers portfolio are typically smaller, lower priced, high-B/M and high-E/P stocks than stocks in the winners portfolio at the portfolio formation date.

Size Effect

After we find that losers are smaller stocks than winners, we also have divided the each portfolio of winners&losers from P5 to P1 into three equal pieces, big, medium and small, and ranked the stocks descending based on market capitalization of stocks in each portfolio (Table 9-A). We have found that there is a negative relationship between size and the mean returns of winners&losers. Average return of portfolio increases as the size of stocks becomes smaller. The mean return difference between the largest size of the stocks in winner portfolio (7.20%) and the smallest size of the stocks in loser portfolio (9.91%) reached to 2.71% which is higher than the return difference between winners and losers. Therefore, investors are able to generate higher returns from the winners&losers strategy by selecting the smallest size stocks among the losers. The results here indicate that the winners&losers effect continues for large stocks and more strongly for small stocks. Return reversal is stronger for small stocks than large stocks.

Then, the same methodology that has been applied for past returns has been used to construct the size-based portfolios and to test their performance as applied by Baytas and Cakici (1999). Firms are ranked based upon the market capitalizations at the portfolio formation date as of end of each month similar to the past returns. Table 10 demonstrates that there is a negative relationship between size and the average returns in ISE. Average returns increase from P1 to P5, as the size of the firms decrease. Return of the size-portfolios is positively related to the length of holding period. The longer the holding period the higher the monthly average return of the size portfolios. K12-J1 strategy provides the highest monthly return among the 16 size-based strategies used. The smallest stocks generate 10.13% per month and this is 1.73% is higher than return of the largest stocks. Mean return difference between the smallest and the largest cap. stocks is 1.66% per month by considering all strategies. Maximum return difference per month occurs for the strategy K6-J1 which is 2.08%.

Moreover, monthly mean returns and the mean return difference between large and small portfolio returns for size-sorted portfolios are slightly higher than those of between winner and loser portfolio returns. In 12 out of 16 strategies, the smallest size portfolios earn much more than the loser stocks. Only for the strategies K1-J12 and K12-J12, mean return difference between P5 and P1 in past-return based portfolios is higher than those of the size-based portfolios.

The winners-losers effect is not merely a reflection of firm size, however, past losers outperform past winners in every size category and the effect is stronger for smaller firms. Implementation of the winners-losers strategy may be difficult since it requires positions in small stocks in which the transaction costs can be relatively higher than that of large stocks. Average returns are negatively related to firm size and outperformed the loser stocks in short-term strategies suggests that size as a risk factor might explain the contrarian profits at least partially.

Price Effect

In order to find the existence of price effect in stock returns in ISE, price-based portfolios are constructed similar to the methodology we used for size portfolios. Consistent to the previous findings both in other studies and here, we found negative relationship between the average returns and price level of the stocks which is also used as a size indicator. Table 11 summarizes the average returns that are generated from several price-based portfolio strategies and shows that low-price (high-price) portfolios outperform (underperform) the market in the evaluation period. Over a-year period, low-priced stocks outperforms the market by 2.85 % per month, while the high-priced stocks earn average abnormal return of 0.80 % per month. Low-price stocks generate more return than high-price stocks, in average 2.05 % per month. Average return for the price-based arbitrage portfolio (P5-P1) soar to its maximum level for the strategies K1-J3, K3-J3 and K6-J3 which is around 2.3% per month. Findings are very close to what we hold for size-based portfolios however price-based arbitrage portfolios slightly outperform the size-based arbitrage portfolios. Average returns generated by price-based portfolios are in average 1% higher than returns on past return-based portfolios.

Whatever the length of the formation period is, the mean return of the lowest-price portfolio increases as the holding period extends and it reaches to the peak level which is around 10 % per month, in 12-month holding periods. Strategies K12-J1 and K12-J6 generate the maximum mean return among the 16 strategies. On the other hand, the return differences of low and high-price stocks, for the strategies K1-J12, K3-J12 and K12-J1, are lower than those of generated by the winners&losers portfolios. When we compare to Price and Size; except the P1, all other portfolios by using price, provide higher returns than those by size.

Furthermore, there are no much differences among the average returns of the price, size and contrarian portfolios for the strategy K12-J12.

In sum, our findings show that he highest mean returns are hold in long periods such as 12-months for the lowest price, size and past-return portfolios. There is significant price and size effects in stock returns in ISE. Therefore, we first test the overreaction hypothesis to determine whether price or size is significant in explaining holding period returns of winner and loser portfolios as have been shown by Baytas and Cakici (1999). We observe that low-price and small size portfolios consistently outperform the market by more than approximately 2% per month, while high-price and large-cap. portfolios earn a return still a bit above the market performance. These findings are similar to those obtained by Conrad and Kaul (1993) and Baytas and Cakici (1999). Price and size-based portfolios earn a larger return than loser-winner portfolios suggested by the overreaction hypothesis. Overreaction seems to be a price or size-based phenomenon. Both winner and loser portfolios are negatively correlated to size and price. Price and size are effective on winners&losers profits. Investment strategies based on price and especially size produce returns higher than those based on past performance, and since losers (winners) tend to be low (high) price and low (high) market value firms, price and size effects might explain some of the long-term return reversals observed in winner and loser stocks.

These results suggest that overreaction effects might be explained in part by price and size effects. Moreover, two points must be considered in interpreting our findings: first, they should also be viewed in light of Loughran and Ritter's (1996) conclusion that when portfolios are formed on a single variable such as performance, price or size, "the combined effects of correlated variables are related to returns are present, overstating the impact of the single variable". Secondly, the returns to some portfolios such as losers might be accounted, at least in part, by higher risk.

B/M Effect

Other factor that can be used in predicting stock returns is B/M ratio as shown in previous studies mentioned above. Therefore, we have analysed the performance of the B/M-sorted portfolios (Table 12). Consistent to the previous studies, the average return of B/M based portfolios have an linear positive trend which shows that average return increases as the B/M

ratios up. The return difference between P5 and P1 is always negative and in average 1.2% per month in favour of high B/M stocks, unlikely to previous findings for price, size and past return based portfolios. The length of portfolio formation period have no significant impact on mean returns of B/M portfolios. In contrast, holding period does matter and mean return increase as the holding period extends. The highest return among the portfolios based on B/M is generated by the strategies K12-J1 and K12-J3, which are 8.90% and 8.73%, respectively. Additionally, the mean return difference between P1 and P5 for an arbitrage (zero-cost) portfolio is % 1.51 per month in favour of the highest B/M stocks for the strategy K12-J1. In general, average return of B/M based portfolios (7.23%) are less than those of price (7.81%), size (7.71%), past-return (7.69%) and E/P (7.98%) based portfolios and this difference might be higher depending on the length of the holding and formation periods. Furthermore, the average return of all B/M based portfolios and especially the portfolio P1 which contains the stocks that have the highest B/M ratios outperformed the market[7] is by around 1.7% per month for the 12-month holding strategies.

E/P Effect

Lastly, we analysed the performance of E/P-sorted portfolios due to the previous findings in empirical studies and its accountability on international investment managers. Monthly average returns of E/P portfolios are demonstrated in Table 13. Once again, similar to the size and price based portfolios, stocks that have the lowest E/P provide higher average returns than the stocks that have higher E/P ratios. This is contrary to the findings in previous studies which states that value stocks (high-E/P or high-B/M) stocks outperform the growth (low-E/P or low-B/M) stocks, although, the average return of E/P portfolios increases as the E/P ratio drops after a specific level of E/P. First, the average return decreases as the E/P drops as consistent to the expectations until the mean E/P ratio comes to specific level such as average E/P of Portfolio 3, then starts to increase as the E/P drops. This can be explained by two factors; first, the small size of the Portfolio 5 which dominates the portfolio returns may cause this trend with the contribution of the distance of E/P ratios from the market-wide average E/P. For example, investors do not consider the E/P ratios among the blue-chip largest-cap. index stocks, especially for the stocks in financial sector. Secondly, E/P based portfolios does not cover the firms in loss. So that, those can be effective on the results. In fact, the highest E/P portfolio, P1 outperforms the other portfolios except only P5, most probably because of

[7] Value-weighted market return is 7.04% in this period.

the size effect. For example, mean return of P1 is 0.73% higher than the mean return of P4. Both the lowest and the highest E/P portfolios significantly outperformed the market.

The difference between the mean returns of the lowest and the highest E/P portfolios is around 1% per month and this difference goes to the maximum by strategies K6-J1 and K6-J3. Average return based on E/P-sorted portfolios soars as the holding period extends, while there is no significant change in average return as the formation period extends. Similar to the mean return of price-based portfolios, portfolios contain the lowest E/P stocks for the 12-month holding periods earn the highest return which is approximately 10% per month. K12-J3, K12-J1 and K12-J6 are the strategies that provide the highest return among the 16 strategies used in the analysis for the E/P-sorted portfolios. However, average return of E/P based portfolios are very close to those of price and size based portfolios, they are higher than the average return of price, size, B/M and past-return based strategies.

In conclusion, after we analyzed 80 different strategies based on five different factors such as past-return, size, price, B/M and E/P, in various length of formation and holding periods, we found that the most profitable strategies are those of based on E/P, price and size in ISE. Findings show that stocks that have lower price, smaller size and past-return are significantly provide higher returns than stocks that have higher price, size and past-return. The lowest and the highest E/P stocks generate higher returns than other stocks. Mean return of Portfolio 5, which contains the lowest of the chosen factor always outperforms the other portfolios for all strategies except the strategy based on B/M. High B/M stocks provide higher returns than low B/M stocks. The length of holding period has a positive impact on returns and the mean return increases as the holding period extends for all strategies.

Strategies based on 12-month holding period which promises approximately 10% return per month that can be used to provide the highest abnormal returns. This is almost 3.8% over the value-weighted market performance per month in the same period. Except the contrarian strategy, increase in the length of formation period causes a minor decrease in mean returns. Interestingly, all the factors that are used to construct the portfolios outperformed the market and achieved significantly high abnormal returns, however, the abnormal returns vary by the chosen factor and the length of the formation and holding periods of portfolios.

If we scrutinize the ranking based on the average arbitrage portfolio returns (difference in mean return of P5 and P1), the ranking can be shown as; Price > Size > B/M > Past-Return > E/P. The highest arbitrage portfolio profits (around 2% per month) are generated mostly by the price-sorted portfolios, in 13 of the 16 strategies, while the rest is by winners&losers portfolios in 12-month formation periods (Table 14). In general, E/P sorted portfolios provide the highest return among the strategies used in this study. The average returns of portfolios based on different factors are very close to each other, in particular for those of E/P, size and price-sorted portfolios. On the other hand, in 11 of the 16 strategies, the smallest-size stock portfolios have provided the higher returns than those of by other factors, whereas the lowest E/P stocks generate higher returns in four of the 16 strategies, mostly in long-term 12-month holding periods, and the lowest-price stocks outperformed the others in only one strategy of 16. Therefore, it can be concluded that large profits of winners&losers portfolios might be subsumed or dominated by the other factors such as size and E/P effects.

Fama-French Three Factor Model

After we present the significant evidence regarding the existence of size, price, E/P and B/M effects on stock returns in ISE and their impact on the contrarian profits, we have tested the sensitivities of the winners&losers portfolios for the K6-J12 strategy to the three Fama-French (FF) factors[8]. The results in Table 15 indicate that the market factor loadings for winners and losers are virtually equal. However, the losers are somewhat more sensitive to the size factor than are the winners (the loadings). These results indicate that the losers are riskier than the winners because they are more sensitive to all three FF factors: Market, SMB and HML.

The alphas of the winners&losers portfolios estimated by regressing the monthly returns of the winners&losers portfolios on the monthly returns of both the value-weighted ISE index and the three FF factors are demonstrated in Table 15. If the three-factor model describes expected returns, the regression intercepts should be close to zero. The model for ISE does not capture the whole variation in the average returns on the winners and losers portfolios since the average absolute intercepts are still so high, especially for losers (4.64% per month). Consistent to Fama and French (1996), the FF-alpha is always strong, positive and statistically significant in large number of regressions applied. The FF alpha for the losers

[8] The data used in FF three-factor regressions comprise the period of January 1995 – June 2000 due to lack of B/M and E/P series before this date.

minus the winners is close to the return difference of these portfolios, since the average beta of the portfolios are about the same.[9] Raw return difference between losers and winners for the strategy K6-J12 is much more than the FF alpha of this arbitrage portfolio (1.64% vs. 1.25%) since losers are more sensitive to FF factors than winners.

Factor loadings of HML and SMB are increasing from winners to losers. All coefficients are statistically significant except the SMB for losers, and their signs are consistent to the expectations. Positive slopes on HML increase towards to losers and negative slopes on SMB for winners tend to turn to positive towards to losers are parallel to earlier evidence in empirical studies. FF three-factor model is not able to explain the return differences perfectly between losers and winners in ISE. However, FF three-factor model explains approximately 75% of the abnormal returns of winners and losers, risk factors can not explain the winners&losers effect perfectly since regression intercepts or alphas are not close to zero and they are statistically significant. It states that and there is still a significant portion that needs to be explained by other factors. Therefore, winners&losers effect exists in ISE significantly and this effect can not be explained by risk.

CAPM and Other Explanatory Models

We also have run various single and multi-factor time-series regressions including CAPM in order to measure the sensitivity of winner and loser portfolios to the risk factors. In addition to the factors; market, SMB and HML, we also have used HMLEP (High minus Low E/P ratio stocks) as an additional factor to three-factor FF model. Our findings from these regressions are summarized in Table 15-B and C.

In CAPM, we see that losers are somewhat more sensitive to the market performance than winners. Although market model seems to make the intercept almost zero for the return difference of losers and winners, R^2 is very low at 11.6%. On the other hand, 63 % of the variation in returns on losers is explained by the market model, however, the intercepts of the loser and winner returns are still high, positive and statistically significant. Thus, market factor is not enough to explain the abnormal return of losers and winners.

[9] Table 9

Other findings indicate that these variables including HMLEP are significantly related to expected returns of winners and losers portfolios. The best models that make intercepts close to zero and insignificant are; market and SMB, four-factor model (market, SMB, HML and HMLEP) and the two-factor model includes HML and HMLEP or the model includes SMB, HML and HMLEP. In these models, signs of the coefficients are all positive as expected and statistically significant. HML seems to be stronger than the other factors while significance of the market factor weakened in three and four-factor models relative to the market model, probably due to the high correlation with other variables. HMLEP have also positive and significant factor loadings on returns of winners and losers portfolios. Furthermore, we also tested the sensitivity of the winner and loser portfolios to the same factors by following different approach that constructs the each portfolio for SMB, HML and HMLEP in itself and reached to similar results unreported here.

Using the data of 1995-2000 period in regressions enables us observing the persistence of winners&losers effect in a sub-period. Losers outperformed the winners by 1.79% per month (7.92% vs 6.13) for the strategy K6-J12. Although the return variability or the standard deviation of losers are almost 2% higher than winners (8.63% vs 6.73), mean return per unit risk of losers portfolio is still a bit higher than winners. If the mean return per unit of risk is taken as a appropriate measure, both winners and losers significantly outperformed the market even after risk is considered (0.349 vs 0.995 for winners and 1.001 losers). Return difference between losers and winners is much more than premiums of SMB and HML while it is less than premium of HMLEP. HMLEP premium is extremely large as 22.8% per month in this period, similar to variance of HMLEP which is about 50% higher than those of losers. Correlation coefficients between the variables and the return on winners and losers in Table 16 confirmed our previous findings that average abnormal return of losers is related to HML, HMLEP, market and SMB. Losers are riskier than winners since they are more sensitive to risk factors than winners.

Finally, however, three-factor model seems to capture much of the cross-sectional variation in average stock returns of winner and loser portfolios and significant portion of the reversal of return, there are significant positive return remained unexplained by risk factors. Other models including CAPM could not explain the large contrarian profits well, since either the intercept is not zero or explanatory power is low in models. Stocks with low past returns tend to have positive HML, HMLEP and SMB, slopes since they are smaller and relatively

distressed and higher future average returns. Our evidence indicates that large abnormal returns of winner and loser portfolios and overreaction effects might be explained in part by market, size, price, B/M and E/P. It might most probably be size-based phenomenon. Moreover, significant contrarian profits are partially related with risk and captured by the factors defined by Fama and French such as HML, market and SMB. It can be concluded that winners&losers profits still exits even after the risk is considered and these large arbitrage profits can only be partially explained by the risk factors.

In order to get more accurate results in explaining the abnormal average returns of loser portfolios, a richer model including an addition risk factors should be developed if the asset pricing is rational. Otherwise, if the asset pricing is considered as irrational, we have to focus on behavioral finance-type explanations. It assumes that investors underreact to short-term past information, which produces return continuation, but they overreact to long-term past information, which produces return reversal. Thus, similar to the characteristics of the winners and losers effect, behavioral finance model predicts overreaction and return reversal. Our evidence suggests that the performance of the contrarian profits in 15 to 36 months following the portfolio formation month are negative, as suggested by Barberis et al. (1998), Daniel et al. (1998) who present behavioral models that states that the post holding period returns of the momentum portfolio should be negative. But, behavioral models might partially explain the overreaction and winner&loser effects.

V. SUMMARY and CONCLUSION

Financial academics and practitioners have recognized that average stock returns are related to past performance and cross-section of stock returns is that predictable based on past returns. Number of researchers report that past losers (negative or lowest return-stocks) outperform past winners (positive or highest return-stocks) or vice versa over the subsequent three to five years not only in US markets but also in other stock markets. Momentum and contrarian strategies have become one of the most popular investment styles in last decade, however there is no enough evidence found in other international markets, in particular in emerging markets, which can contribute to developing an explanation to the previous findings in US markets.

This study examines the momentum and contrarian effects on stock returns in one of the leading emerging markets, Istanbul Stock Exchange between years 1991 and 2000. It also investigates the weak-form efficiency of the stock market by examining the profitability of a number of contrarian strategies based on past prices of stocks. Lastly, to our knowledge, this is the first study that investigates the profitability of momentum and contrarian investment strategies on stock returns in Istanbul Stock Exchange. The data set used in this study consists monthly return series of 210 stocks representing the large part of the market for the period from January 1991 to December 2000.

In this study, portfolios of prior loser-stocks are found to outperform prior winner-stocks consistent with the predictions of the overreaction hypothesis. The average difference between the top-winners and top-losers portfolio returns during the 10-year period is 1.14 % per month in favor of losers, which is statistically different from zero and there is a clear increasing trend in returns from winners to losers. Compounded annual return difference is approximately 15 % in favor of loser-stocks which is quite high. Empirical analyses also present that the winners outperform the value-weighted index of ISE-100 by only 0.65 % per month, whereas the losers outperform the market by 1.79 % per month, respectively. By using the equal-weighted index, average abnormal returns for losers and winners are 1.07 % and -0.07 % per month at the same period. Monthly abnormal returns in excess of both equal-weighted and value-weighted indices for winner portfolios are negative or very close to zero, particularly in short-term holding periods such as in one and three months. Thus, this paper documents that trading strategies that buy past losers and sell past winners realize significant abnormal returns over the 1991-2000 period. The evidence here supports the validity of contrarian strategies and consistent with the overreaction hypothesis.

The best strategies which provides the highest return among the 16 strategies that have been implemented in this study are K12 and J12 for top-loser stocks (9.44 %) and K12 and J1 for top-winner stocks (8.22 %). In portfolios formed on the basis of prior year-return, prior top-losers outperform prior top-winners by 1.96 % per month (9.44 vs. 7.48) during the subsequent 12 months. On the other hand, we find that abnormal returns increase as the holding period extends. In average, strategies based on 12-month holding period outperformed one-month holding period 1.53 % per month (8.98% vs. 7.45% for K12 – K1). Therefore, investors should prefer past loser stocks for longer holding periods. We also observe that profitability of the strategies is robust to the changes in the size of the portfolios.

On the other hand, findings indicate apparently that returns based on contrarian strategy that buys the past losers and sells the past winners are not the same across the calendar months. We find that losers significantly outperform winners over most of the months in a year, but more strongly in January. Contrarian profits in January are significantly higher than those in non-January months, particularly for the strategies which are based on relatively shorter holding periods such as one and three months. This indicates that most of the positive returns in January are due to small and low-priced stocks. The small firm effect is partly a losing firm effect or vice versa.

We show that there is a downward trend in average returns based upon the length of past returns that is used in the strategy for the winner stocks but upward trend for the losers. It is clear that the return difference between losers and winners depends on the length of past returns (J). The gap between losers and winners increases in favor of losers as the J increases and the effect of J on holding period return seems to be more important than that of the length of holding period (K).

We also measure the average returns for the strategies based on from 15 to 36 months holding periods. Results reveal a reversal of returns in the one through three years. However the average returns are still positive, they are lower than the returns on the period up to fifteen months. There is downward trend in returns as the postholding period extends beyond 15 months for the loser stocks. Interestingly, top-winner portfolio continues its increasing performance by the maturity up to 36 months and does not show a significant reversal on returns between second and third years following the initial portfolio formation. Evidence consistent with the overreaction hypothesis here partially supports the behavioral hypotheses.

Relying on previous literature to forecast mean returns, we use the price, size, B/M and E/P ratios of a firm to accomplish the relationship of these factors with the return of the winners&losers' portfolios. We find that winner firms have higher average prices and market values than those of losers in ISE similar to seven developed markets shown by Baytas and Cakici (1999). We have found that there is a negative relationship between size and the mean returns of winners&losers. Average return of portfolio increases as the size of stocks becomes smaller. The mean return difference between the largest size of the stocks in winner portfolio (7.20%) and the smallest size of the stocks in loser portfolio (9.91%) reached to 2.71% which

is higher than the return difference between winners and losers. Therefore, investors are able to generate higher returns from the winners&losers strategy by selecting the smallest size stocks among the losers. The results here indicate that the winners&losers effect continues for large stocks and more strongly for small stocks. The overreaction is significantly stronger for smaller firms than for larger firms.

On the other hand, consistent to findings of Fama-French and Lakonishok, Shleifer and Vishny, the winners are the low-B/M and low-E/P stocks, whereas the losers are high-B/M and high E/P stocks, so that distressed stocks. We also analysed the characteristics of the portfolios that have been constructed based on price, size, B/M and E/P. There is positive relationship between price and size, B/M and E/P, and negative relationship between price, size and B/M, E/P. These findings point out that winners&losers effect might be caused primarily by the other factors such as size, price, B/M and E/P, since the stocks in the losers portfolio are typically smaller, lower priced, high-B/M and high-E/P stocks than stocks in the winners portfolio at the portfolio formation date.

In order to gain further insight into the relationship among holding period returns of winners&losers portfolios, price, size, E/P and B/M ratios of the stocks, the performance of the stocks based on these factors are evaluated by using exactly the same procedure that we used for winners&losers portfolios previously in this study.

Mean return difference between the smallest and the largest cap. stocks is 1.66% per month and is higher than those of losers by considering all strategies. There is a negative relationship between size and the average returns in ISE. Average returns are negatively related to firm size and small firms outperformed the loser stocks in short-term strategies suggests that size as a risk factor might explain the contrarian profits at least partially. Consistent to the previous findings both in other studies and here, we found negative relationship between the average returns and price level of the stocks. Over a-year period, low-priced stocks outperforms the market by 2.85 % and 2.05 % high-price per month. Average returns generated by price-based portfolios are in average 1% higher than returns on past return-based portfolios.

In sum, our findings show that he highest mean returns are hold in long periods such as 12-months for the lowest price, size and past-return portfolios. There is significant price and size

effects in stock returns in ISE. These findings are similar to those obtained by Conrad and Kaul (1993) and Baytas and Cakici (1999). Price and size-based portfolios earn a larger return than loser-winner portfolios suggested by the overreaction hypothesis. Both winner and loser portfolios are negatively correlated to size and price. Investment strategies based on price and especially size produce returns higher than those based on past performance, and since losers (winners) tend to be low (high) price and low (high) market value firms, price and size effects might explain some of the long-term return reversals observed in winner and loser stocks. Overreaction seems to be a price or size-based phenomenon.

Consistent to the previous studies, the average return of B/M based portfolios have an linear positive trend which shows that average return increases as the B/M ratios up. The return difference between P5 and P1 is always negative and in average 1.2% per month in favour of high B/M stocks. Lastly, stocks that have the lowest E/P provide higher average returns than the stocks that have higher E/P ratios, however, both the lowest and the highest E/P portfolios significantly outperformed the market. This is contrary to the findings in previous studies which states that value stocks (high-E/P or high-B/M) stocks outperform the growth (low-E/P or low-B/M) stocks, although, the average return of E/P portfolios increases as the E/P ratio drops after a specific level of E/P. The difference between the mean returns of the lowest and the highest E/P portfolios is around 1% per month. However, average return of E/P based portfolios are very close to those of price and size based portfolios, they are higher than the average return of price, size, B/M and past-return based strategies.

In conclusion, after we analyzed 80 different strategies based on five different factors such as past-return, size, price, B/M and E/P, in various length of formation and holding periods, we found that the most profitable strategies are those of based on E/P, price and size in ISE. Findings show that stocks that have lower price, smaller size and past-return are significantly provide higher returns than stocks that have higher price, size and past-return. The lowest and the highest E/P stocks generate higher returns than other stocks. High B/M stocks provide higher returns than low B/M stocks. The length of holding period has a positive impact on returns and the mean return increases as the holding period extends for all strategies. Interestingly, all the factors that are used to construct the portfolios outperformed the market and achieved significantly high abnormal returns.

If we scrutinize the ranking based on the average arbitrage portfolio returns (difference in mean return of P5 and P1), the ranking can be shown as; Price > Size > B/M > Past-Return > E/P. The highest arbitrage portfolio profits (around 2% per month) are generated mostly by the price-sorted portfolios, in 13 of the 16 strategies, while the rest is by past-return based portfolios. In general, E/P sorted portfolios provide the highest return among the strategies used in this study. The average returns of portfolios based on different factors are very close to each other, in particular for those of E/P, size and price-sorted portfolios. On the other hand, in 11 of the 16 strategies, the smallest-size stock portfolios have provided the higher returns than those of by other factors, whereas the lowest E/P stocks generate higher returns in four of the 16 strategies, mostly in long-term 12-month holding periods, and the lowest-price stocks outperformed the others in only one strategy of 16. Therefore, it can be concluded that large profits of winners&losers portfolios might be subsumed or caused by the other factors such as size, E/P and B/M effects.

On the other hand, two points must be considered in interpreting our findings: first, they should also be viewed in light of Loughran and Ritter's (1996) conclusion that when portfolios are formed on a single variable such as performance, price or size, "the combined effects of correlated variables are related to returns are present, overstating the impact of the single variable". Secondly, the returns to some portfolios such as losers might be accounted, at least in part, by higher risk.

After we present the significant evidence regarding the existence of size, price, E/P and B/M effects on stock returns in ISE and their impact on the contrarian profits, we have tested the sensitivities of the winners&losers portfolios for the K6-J12 strategy to the three Fama-French (FF) factors[10]. These results indicate that the losers are riskier than the winners because they are more sensitive (the loadings) to all three FF factors: Market, SMB and HML. Factor loadings of HML and SMB are increasing from winners to losers. All coefficients are statistically significant except the SMB for losers, and their signs are consistent to the expectations.

The model for ISE does not capture the whole variation in the average returns on the winners and losers portfolios since the FF-alpha is always strong, positive and statistically significant

[10] The data used in FF three-factor regressions comprise the period of January 1995 – June 2000 due to lack of B/M and E/P series before this date.

in large number of regressions applied especially for losers (0.0464), although, FF three-factor model explains approximately 75% of the abnormal returns of winners and losers, Therefore, however, three-factor model seems to capture much of the cross-sectional variation in average stock returns of winner and loser portfolios and significant portion of the reversal of return, there are significant positive return remained unexplained by risk factors. We also have run various single and multi-factor time-series regressions including CAPM in order to measure the sensitivity of winner and loser portfolios to the risk factors. Evidence indicate that these variables including HMLEP (High minus Low E/P ratio stocks) are significantly related to expected returns of winners and losers portfolios. Stocks with low past returns tend to have positive HML, HMLEP and SMB, slopes since they are smaller and relatively distressed and higher future average returns. The best models that make intercepts close to zero and insignificant are; market and SMB, four-factor model (market, SMB, HML and HMLEP) and the two-factor model includes HML and HMLEP or the model includes SMB, HML and HMLEP. For example, contrarian arbitrage strategy remains unprofitable after systematic risk and firm size are taken into account. In these models, signs of the coefficients are all positive as expected and statistically significant, however only half of the variation in return differences of winners&losers can be explained by these factors. It states that and there is still a significant portion that needs to be explained by other factors.

Finally, our results show that contrarian effects or more specifically “winners and losers effect” are existing on stock returns in Istanbul Stock Exchange and the contrarian trading strategies that is buying past losers and selling past winners realize significant abnormal profits to the investors. Our evidence indicates that large abnormal returns of winner and loser portfolios and overreaction effects might be explained in part by the factors; market, size, price, B/M and E/P. It might most probably be size-based phenomenon with the contribution of other factors. Moreover, significant contrarian profits are partially related with risk and captured by the factors defined by Fama and French such as HML, market and SMB. It can be concluded that winners&losers profits still exits even after the risk is considered and large arbitrage profits can only partially be explained by the risk factors. However the evidence is also consistent with the overreaction and partially with the behavioral hypothesis, reasons behind the profitability of the contrarian strategies needs to be scrutinized by using new explanatory risk factors and hypothesis.

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Table and Figures

Table 1 Contrarian Portfolio Returns

Portfolios	1991-2000 Monthly Average Return (%)	Monthly Average Standard Deviation (%)
P1 (Past Top-Winners)	6.94	7.12
P2	7.45	8.03
P3	7.86	8.16
P4	8.13	8.87
P5 (Past Top-Losers)	8.08	8.79
P5-P1	1.14	3.75

Equal-Weighted Index	7.00
Value-Weighted Index	6.29

Table 2 Monthly Average Returns on Contrarian Portfolios (%)

Holding	Past	P1	P2	P3	P4	P5	Mean	P5 - P1
K1	J1	6.28	7.22	7.42	7.66	6.59	7.04	0.31
K1	J3	6.23	6.54	7.49	7.50	7.37	7.03	1.14
K1	J6	6.16	6.60	6.82	7.86	7.75	7.04	1.59
K1	J12	5.87	6.76	7.38	7.31	8.09	7.08	2.22
K3	J1	6.96	7.44	7.72	7.64	7.18	7.39	0.22
K3	J3	6.70	6.94	7.75	7.86	7.47	7.34	0.78
K3	J6	6.63	7.39	7.22	8.06	7.88	7.44	1.25
K3	J12	6.34	7.05	7.63	8.00	8.18	7.44	1.84
K6	J1	7.39	7.81	8.09	7.84	7.95	7.82	0.56
K6	J3	7.18	7.43	7.93	8.15	8.05	7.75	0.87
K6	J6	7.11	7.51	7.85	8.36	8.25	7.81	1.14
K6	J12	6.89	7.37	7.97	8.44	8.54	7.84	1.64
K12	J1	8.22	8.37	8.64	8.57	8.65	8.49	0.42
K12	J3	7.89	8.21	8.57	8.75	8.80	8.44	0.91
K12	J6	7.66	8.24	8.65	9.06	9.04	8.53	1.38
K12	J12	7.48	8.28	8.57	9.09	9.44	8.57	1.96
	Mean	6.94	7.45	7.86	8.13	8.08	7.69	1.14

Table 2-A Long-Term Monthly Average Returns (%)

Holding	Past	P1	P2	P3	P4	P5	Mean	P5 - P1
K15	J12	7,69	8,35	8,55	9,10	9,78	8,69	2,09
K18	J12	7,79	8,21	8,44	8,88	9,43	8,55	1,65
K21	J12	7,88	8,07	8,32	8,81	9,11	8,44	1,23
K24	J12	7,78	8,02	8,20	8,28	8,65	8,19	0,87
K27	J12	7,58	7,89	8,03	8,47	8,49	8,09	0,91
K30	J12	7,53	7,77	7,94	8,01	8,41	7,93	0,88
K33	J12	7,83	7,95	8,09	8,43	8,44	8,15	0,61
K36	J12	7,72	7,98	8,07	8,00	8,20	7,99	0,48

Table 3 Monthly Average Returns on Contrarian Portfolios (%)

	P1	P2	P3	P4	P5	P5 - P1
K1	6.14	6.78	7.28	7.59	7.45	1.32
K3	6.66	7.20	7.58	7.89	7.68	1.02
K6	7.14	7.53	7.96	8.20	8.20	1.05
K12	7.81	8.27	8.61	8.87	8.98	1.17

Table 3-A Average Return Differences among Different Holding Period Returns (%)

	P1	P2	P3	P4	P5	Mean
K3 - K1	0,52	0,42	0,30	0,30	0,23	0,36
K6 - K3	0,48	0,33	0,38	0,31	0,52	0,40
K12 - K6	0,67	0,74	0,65	0,67	0,79	0,70
K12 - K1	1,68	1,49	1,33	1,28	1,53	1,46

Table 4 Monthly Average Abnormal Returns on Contrarian Portfolios
(% in Excess of Value-Weighted Index)

Holding	Past	P1	P2	P3	P4	P5
K1	J1	-0.01	0.93	1.13	1.37	0.30
K1	J3	-0.06	0.25	1.20	1.21	1.08
K1	J6	-0.13	0.31	0.53	1.57	1.46
K1	J12	-0.42	0.47	1.09	1.02	1.80
K3	J1	0.67	1.15	1.43	1.35	0.89
K3	J3	0.41	0.65	1.46	1.57	1.18
K3	J6	0.34	1.10	0.93	1.77	1.59
K3	J12	0.05	0.76	1.34	1.71	1.89
K6	J1	1.10	1.52	1.80	1.55	1.66
K6	J3	0.89	1.14	1.64	1.86	1.76
K6	J6	0.82	1.22	1.56	2.07	1.96
K6	J12	0.60	1.08	1.68	2.15	2.25
K12	J1	1.93	2.08	2.35	2.28	2.36
K12	J3	1.60	1.92	2.28	2.46	2.51
K12	J6	1.37	1.95	2.36	2.77	2.75
K12	J12	1.19	1.99	2.28	2.80	3.15
	Mean	0.65	1.16	1.57	1.85	1.79

Table 4-A Monthly Average Abnormal Returns (% in Excess of Value-Weighted Index)

Holding	Past	P1	P2	P3	P4	P5
K15	J12	1,40	2,06	2,26	2,81	3,49
K18	J12	1,50	1,92	2,15	2,59	3,14
K21	J12	1,59	1,78	2,03	2,52	2,82
K24	J12	1,49	1,73	1,91	2,00	2,36
K27	J12	1,29	1,60	1,74	2,18	2,20
K30	J12	1,24	1,48	1,65	1,72	2,12
K33	J12	1,54	1,66	1,80	2,14	2,15
K36	J12	1,43	1,69	1,78	1,72	1,91

Table 5 Monthly Average Abnormal Returns (% in Excess of Equal-Weighted Index)

Holding	Past	P1	P2	P3	P4	P5
K1	J1	-0.72	0.22	0.41	0.66	-0.41
K1	J3	-0.77	-0.46	0.49	0.50	0.37
K1	J6	-0.84	-0.40	-0.18	0.86	0.74
K1	J12	-1.13	-0.24	0.38	0.31	1.09
K3	J1	-0.04	0.44	0.72	0.64	0.18
K3	J3	-0.31	-0.06	0.74	0.86	0.47
K3	J6	-0.37	0.38	0.22	1.05	0.88
K3	J12	-0.66	0.05	0.63	0.99	1.18
K6	J1	0.39	0.81	1.09	0.84	0.95
K6	J3	0.18	0.43	0.93	1.15	1.04
K6	J6	0.10	0.50	0.85	1.36	1.25
K6	J12	-0.11	0.37	0.97	1.44	1.53
K12	J1	1.22	1.37	1.64	1.57	1.64
K12	J3	0.88	1.21	1.57	1.75	1.79
K12	J6	0.66	1.24	1.64	2.05	2.04
K12	J12	0.47	1.27	1.56	2.08	2.44
	Mean	-0.07	0.44	0.85	1.13	1.07

Table 5-A Monthly Average Abnormal Returns (% in Excess of Equal-Weighted Index)

Holding	Past	P1	P2	P3	P4	P5
K15	J12	0,68	1,34	1,55	2,09	2,78
K18	J12	0,78	1,21	1,43	1,87	2,43
K21	J12	0,87	1,06	1,32	1,81	2,11
K24	J12	0,78	1,02	1,20	1,28	1,64
K27	J12	0,58	0,89	1,02	1,47	1,49
K30	J12	0,52	0,77	0,94	1,00	1,40
K33	J12	0,83	0,94	1,09	1,43	1,44
K36	J12	0,72	0,97	1,06	1,00	1,20

Table 6 Winners & Losers Portfolio Returns in Calendar Months

Holding	Past	January	February	March	April	May	June	July	August	September	October	November	December	Mean	Los>Win	January	Feb-Dec
K1	J1	3.67	-1.27	-1.68	1.31	5.77	-0.26	-1.59	-0.51	2.64	1.40	-0.19	4.91	1.18	50%	3.67	0.96
K1	J3	4.70	3.05	0.77	0.69	6.23	2.16	-5.38	2.88	1.30	0.21	0.81	3.19	1.72	92%	4.70	1.45
K1	J6	4.96	-0.57	1.94	-1.48	9.07	1.11	0.88	1.63	-0.80	-0.73	3.22	4.48	1.98	67%	4.96	1.71
K1	J12	5.80	2.69	3.13	-0.09	1.01	2.01	0.50	3.07	-0.82	-1.45	7.18	4.08	2.26	75%	5.80	1.94
K3	J1	2.15	-0.73	-0.62	0.75	2.28	-0.70	-1.01	-2.25	2.43	0.17	1.56	3.67	0.64	58%	2.15	0.50
K3	J3	2.86	0.73	0.02	1.43	4.03	1.44	-1.40	-0.20	1.64	-0.30	1.48	3.05	1.23	75%	2.86	1.08
K3	J6	2.62	0.36	-0.03	-0.09	3.81	1.61	1.46	1.53	1.96	1.47	2.83	3.00	1.71	83%	2.62	1.63
K3	J12	4.80	2.54	0.56	-1.21	1.89	2.60	0.90	0.07	0.67	1.74	4.94	4.81	2.02	92%	4.80	1.77
K6	J1	0.83	1.16	-0.26	1.23	1.43	-0.65	0.63	-1.19	1.21	0.65	1.28	2.58	0.74	75%	0.83	0.73
K6	J3	0.46	0.94	1.15	1.59	2.99	1.14	0.08	0.59	1.28	0.09	1.13	1.28	1.06	100%	0.46	1.12
K6	J6	0.70	-0.12	0.83	0.92	2.49	1.43	2.40	2.60	1.27	2.03	2.09	1.38	1.50	92%	0.70	1.58
K6	J12	1.70	0.64	1.28	0.49	1.91	1.84	2.53	1.92	1.52	2.78	3.11	2.91	1.89	100%	1.70	1.90
K12	J1	0.44	1.33	1.14	1.82	1.81	0.06	0.75	-0.69	0.27	-0.06	-0.03	1.05	0.66	75%	0.44	0.68
K12	J3	-0.09	0.81	1.66	2.61	2.79	1.30	0.96	0.78	1.33	0.61	0.36	0.45	1.13	92%	-0.09	1.24
K12	J6	1.42	0.64	0.95	1.51	2.69	2.24	2.69	2.01	1.28	1.67	1.61	1.44	1.68	100%	1.42	1.70
K12	J12	1.61	0.76	0.79	1.73	2.90	2.91	2.12	2.59	2.34	2.17	2.14	1.83	1.99	100%	1.61	2.02
	mean	2.41	0.81	0.73	0.83	3.32	1.27	0.41	0.93	1.22	0.78	2.10	2.76	1.46	0.83	2.41	1.38
	median	1.93	0.74	0.81	1.08	2.74	1.44	0.82	1.16	1.29	0.63	1.59	2.96	1.59	0.88	2.34	1.40

Table 7 Monthly Average Returns on Contrarian Portfolios (%)

Holding	Past	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	Mean	P10 - P1
K1	J1	6.25	6.26	7.40	7.40	6.85	7.80	6.85	7.15	7.39	5.77	6.91	-0.48
K1	J3	5.97	7.04	6.26	6.74	6.43	8.01	8.39	6.94	7.60	7.22	7.06	1.25
K1	J6	5.26	6.74	6.30	6.31	6.64	7.21	7.65	7.61	8.32	7.85	6.99	2.59
K1	J12	5.09	6.44	6.44	6.91	6.40	7.90	7.45	6.77	7.15	8.60	6.91	3.52
K3	J1	5.70	7.02	6.64	7.30	7.33	7.55	8.03	8.04	7.58	8.84	7.40	3.14
K3	J3	6.96	6.96	6.80	7.09	7.38	8.13	8.28	7.65	7.70	7.63	7.46	0.66
K3	J6	5.87	7.12	7.10	7.56	6.95	7.71	7.66	7.89	8.42	8.30	7.46	2.43
K3	J12	5.70	7.02	6.64	7.30	7.33	7.55	8.03	8.04	7.58	8.84	7.40	3.14
K6	J1	7.04	7.59	7.64	8.04	8.03	8.32	7.58	7.76	8.13	8.17	7.83	1.14
K6	J3	7.13	7.31	7.43	7.58	7.90	8.22	8.34	8.07	8.34	8.08	7.84	0.96
K6	J6	6.67	7.37	7.64	7.50	7.75	8.34	8.36	8.19	8.32	8.82	7.90	2.15
K6	J12	6.36	7.31	7.16	7.65	7.66	8.06	8.17	8.86	8.51	8.99	7.87	2.63
K12	J1	8.15	8.40	8.33	8.34	8.80	8.76	8.59	8.56	8.83	8.93	8.57	0.78
K12	J3	7.69	8.15	8.37	8.22	8.62	8.80	9.03	8.69	9.12	8.95	8.56	1.26
K12	J6	7.07	8.09	8.26	8.26	8.56	8.93	9.25	9.06	9.19	9.52	8.62	2.44
K12	J12	7.02	7.85	8.18	8.44	8.36	8.68	8.93	9.30	9.46	10.02	8.62	3.00
Mean		6.49	7.29	7.29	7.54	7.56	8.12	8.16	8.04	8.23	8.41	7.71	1.91

Table 8 Monthly Average Returns on Contrarian Portfolios (%)

Holding	Past	P1	P2	P3	Mean	P3 - P1
K1	J1	6.84	7.44	6.67	6.98	-0.17
K1	J3	6.43	7.48	7.24	7.05	0.81
K1	J6	6.36	7.15	7.84	7.12	1.48
K1	J12	6.17	7.44	7.90	7.17	1.74
K3	J1	7.16	7.63	7.50	7.43	0.34
K3	J3	6.79	7.77	7.76	7.44	0.97
K3	J6	6.96	7.52	8.19	7.56	1.23
K3	J12	6.59	7.54	8.36	7.50	1.78
K6	J1	7.54	8.01	8.06	7.87	0.52
K6	J3	7.38	8.05	8.32	7.92	0.94
K6	J6	7.28	7.99	8.50	7.92	1.22
K6	J12	7.08	7.85	8.70	7.88	1.62
K12	J1	8.32	8.66	8.73	8.57	0.41
K12	J3	8.17	8.71	8.96	8.62	0.79
K12	J6	7.95	8.64	9.18	8.59	1.23
K12	J12	7.86	8.56	9.44	8.62	1.57
Mean		7.18	7.90	8.21	7.76	1.03

Tablo 9: Characteristics of Contrarian Portfolio (K6-J12)

Average Market Value (TL)		Median Market Value (TL)	
P1	69.237.670.378	P1	16.755.518.097
P2	61.954.704.129	P2	11.596.951.081
P3	44.529.002.847	P3	9.338.267.131
P4	31.211.869.393	P4	6.394.779.709
P5	32.979.919.309	P5	5.177.723.754

Average Price (TL)		Median Price (TL)	
P1	23.816	P1	12.378
P2	21.022	P2	9.297
P3	18.436	P3	7.565
P4	13.865	P4	6.237
P5	10.506	P5	5.668

Average B/M		Median B/M	
P1	0,26	P1	0,21
P2	0,36	P2	0,29
P3	0,44	P3	0,35
P4	0,50	P4	0,40
P5	0,64	P5	0,53

Average E/P		Median E/P	
P1	0,06	P1	0,05
P2	0,08	P2	0,08
P3	0,09	P3	0,09
P4	0,09	P4	0,09
P5	0,04	P5	0,07

Average Beta	
P1	0,8906
P2	0,8904
P3	0,8676
P4	0,8539
P5	0,8482

Tablo 9-A: Monthly Average Returns of Size-Sorted Contrarian Portfolio (K6-J12) %

Portfolios	Big	Medium	Small
P1	7,20	6,60	7,34
P2	7,17	6,93	8,13
P3	7,62	7,11	8,80
P4	7,86	8,02	9,27
P5	7,71	8,79	9,91

Table 10: Monthly Average Returns on Size-Based Portfolios (%)

Holding	Past	P1	P2	P3	P4	P5	Mean	P5 - P1
K1	J1	7,01	5,62	7,09	6,99	8,26	6,99	1,25
K1	J3	6,87	6,07	6,58	7,08	8,36	6,99	1,49
K1	J6	6,83	5,86	6,84	6,84	8,49	6,97	1,66
K1	J12	6,97	5,84	6,61	6,80	8,43	6,93	1,46
K3	J1	7,34	6,17	7,30	7,29	9,17	7,45	1,83
K3	J3	7,31	6,36	7,15	7,38	9,14	7,47	1,83
K3	J6	7,33	6,30	7,28	7,54	9,03	7,49	1,70
K3	J12	7,27	6,30	7,05	7,53	8,80	7,39	1,53
K6	J1	7,64	6,76	7,58	7,79	9,72	7,90	2,08
K6	J3	7,60	6,92	7,49	7,89	9,62	7,90	2,02
K6	J6	7,59	6,94	7,60	7,93	9,48	7,91	1,89
K6	J12	7,51	6,85	7,52	7,77	9,31	7,79	1,80
K12	J1	8,40	7,57	8,44	8,50	10,13	8,61	1,73
K12	J3	8,34	7,72	8,30	8,52	9,98	8,57	1,65
K12	J6	8,34	7,74	8,28	8,54	9,82	8,55	1,48
K12	J12	8,41	7,81	8,07	8,44	9,66	8,48	1,25
	Mean	7,55	6,68	7,45	7,68	9,21	7,71	1,66

Table 11: Monthly Average Returns on Price-Based Portfolios (%)

Holding	Past	P1	P2	P3	P4	P5	Mean	P5 - P1
K1	J1	6,53	5,94	6,79	8,12	8,15	7,11	1,62
K1	J3	6,00	6,11	7,00	8,01	8,33	7,09	2,34
K1	J6	6,40	6,03	6,60	7,74	8,63	7,08	2,23
K1	J12	6,43	6,69	6,67	8,04	8,29	7,22	1,86
K3	J1	6,85	6,68	6,98	8,03	8,88	7,48	2,04
K3	J3	6,59	6,72	7,29	8,08	8,92	7,52	2,33
K3	J6	6,86	6,40	7,17	8,15	8,95	7,51	2,09
K3	J12	6,95	6,75	7,27	8,29	8,67	7,59	1,71
K6	J1	7,19	6,99	7,55	8,45	9,41	7,92	2,21
K6	J3	7,09	6,98	7,73	8,49	9,36	7,93	2,27
K6	J6	7,23	6,93	7,71	8,52	9,29	7,94	2,06
K6	J12	7,36	7,07	7,70	8,69	9,19	8,00	1,82
K12	J1	8,00	7,81	8,33	9,13	10,05	8,66	2,05
K12	J3	7,93	7,76	8,47	9,03	10,04	8,64	2,11
K12	J6	8,00	7,72	8,51	8,91	10,05	8,64	2,05
K12	J12	8,00	7,97	8,27	9,04	9,95	8,65	1,95
	Mean	7,09	6,91	7,50	8,42	9,14	7,81	2,05

Table 12: Monthly Average Returns on B/M -Based Portfolios (%)

Holding	Past	P1	P2	P3	P4	P5	Mean	P5 - P1
K1	J1	7,26	7,40	6,67	6,00	6,03	6,67	-1,23
K1	J3	7,28	7,32	6,75	6,21	5,74	6,66	-1,54
K1	J6	7,10	7,76	6,89	6,75	5,45	6,79	-1,66
K1	J12	6,85	7,71	6,86	6,01	6,31	6,74	-0,54
K3	J1	7,49	7,37	6,80	6,23	6,23	6,83	-1,27
K3	J3	7,22	7,39	6,99	6,60	6,00	6,84	-1,22
K3	J6	7,10	7,98	7,01	6,59	5,86	6,91	-1,24
K3	J12	7,35	7,89	6,71	6,34	6,38	6,94	-0,96
K6	J1	7,91	7,65	7,21	6,74	6,68	7,24	-1,23
K6	J3	7,61	7,83	7,12	6,92	6,45	7,19	-1,16
K6	J6	7,50	8,25	7,17	6,84	6,51	7,25	-0,99
K6	J12	7,69	8,31	6,77	6,72	6,78	7,25	-0,91
K12	J1	8,90	8,59	8,13	7,68	7,39	8,14	-1,51
K12	J3	8,73	8,83	7,92	7,63	7,41	8,11	-1,33
K12	J6	8,63	8,86	7,68	7,76	7,40	8,07	-1,23
K12	J12	8,66	8,87	7,58	7,76	7,71	8,12	-0,94
	Mean	7,71	8,00	7,14	6,80	6,52	7,23	-1,19

Table 13: Monthly Average Returns on E/P-Based Portfolios (%)

Holding	Past	P1	P2	P3	P4	P5	Mean	P5 - P1
K1	J1	7,74	7,50	5,83	6,27	8,27	7,12	0,53
K1	J3	7,63	7,44	6,47	7,05	8,12	7,34	0,49
K1	J6	7,38	7,36	6,33	6,86	8,23	7,23	0,85
K1	J12	7,55	7,10	6,75	6,69	8,11	7,24	0,57
K3	J1	8,07	7,88	6,43	6,95	9,00	7,67	0,94
K3	J3	7,92	7,66	6,81	7,30	8,94	7,73	1,02
K3	J6	7,77	7,65	6,69	7,28	8,82	7,64	1,06
K3	J12	7,98	7,43	7,30	7,20	8,66	7,72	0,69
K6	J1	8,39	7,99	7,04	7,52	9,62	8,11	1,23
K6	J3	8,35	7,76	7,19	7,70	9,56	8,11	1,21
K6	J6	8,33	7,71	7,16	7,70	9,46	8,07	1,13
K6	J12	8,47	7,56	7,47	7,76	9,28	8,11	0,81
K12	J1	9,24	8,50	7,95	8,48	10,13	8,86	0,89
K12	J3	9,17	8,51	8,03	8,63	10,14	8,90	0,98
K12	J6	9,12	8,50	8,03	8,65	10,11	8,88	0,99
K12	J12	9,10	8,43	8,44	8,49	10,06	8,90	0,97
	Mean	8,26	7,81	7,12	7,53	9,16	7,98	0,90

Table 14: Summarized Results of Different Strategies

Holding	Past	The Highest Return	Provided by the Criteria	The Highest P5 - P1 Return Difference	Provided by the Criteria
K1	J1	8,27	The Lowest E/P Stocks	1,62	Price
K1	J3	8,36	The Smallest Size Stocks	2,34	Price
K1	J6	8,63	The Lowest Price Stocks	2,23	Price
K1	J12	8,43	The Smallest Size Stocks	2,22	Past-Returns
K3	J1	9,17	The Smallest Size Stocks	2,04	Price
K3	J3	9,14	The Smallest Size Stocks	2,33	Price
K3	J6	9,03	The Smallest Size Stocks	2,09	Price
K3	J12	8,80	The Smallest Size Stocks	1,84	Past-Returns
K6	J1	9,72	The Smallest Size Stocks	2,21	Price
K6	J3	9,62	The Smallest Size Stocks	2,27	Price
K6	J6	9,48	The Smallest Size Stocks	2,06	Price
K6	J12	9,31	The Smallest Size Stocks	1,82	Price
K12	J1	10,13	The Smallest Size Stocks	2,05	Price
K12	J3	10,14	The Lowest E/P Stocks	2,11	Price
K12	J6	10,11	The Lowest E/P Stocks	2,05	Price
K12	J12	10,06	The Lowest E/P Stocks	1,96	Past-Returns

Table 15: Risk Characteristics of Portfolios

Panel A	FF Factor Sensitivities						
Portfolio	Intercept	Market	SMB	HML	Adj.R^2	F	Sig.F.
P1	0,0339	0,4063	-0,5572	1,0469	0,748	65,4	0,00
p-value	0,00	0,00	0,00	0,00			
P2	0,0361	0,4813	-0,7243	1,1794	0,757	68,7	0,00
p-value	0,00	0,00	0,00	0,00			
P3	0,0413	0,4746	-0,6186	1,3832	0,791	83,1	0,00
p-value	0,00	0,00	0,00	0,00			
P4	0,0414	0,4930	-0,3709	1,6094	0,810	93,3	0,00
p-value	0,00	0,00	0,09	0,00			
P5	0,0464	0,4181	-0,1489	1,7142	0,773	74,9	0,00
p-value	0,00	0,00	0,52	0,00			
P5 - P1	0,0125	0,0118	0,4083	0,6673	0,459	19,4	0,00
p-value	0,02	0,84	0,01	0,00			

Panel B	CAPM				
Portfolio	Intercept	Market	Adj.R^2	F	Sig.F.
P1	0,0133	0,6824	0,666	130,7	0,00
p-value	0,04	0,00			
P5	0,0194	0,8486	0,626	109,9	0,00
p-value	0,03	0,00			
P5 - P1	0,0062	0,1662	0,140	11,6	0,00
p-value	0,24	0,00			

Panel C	Other Explanatory Models							
Portfolio	Intercept	Market	SMB	HML	HMLEP	Adj.R^2	F	Sig.F.
P5 - P1	0,0138		0,5799			0,154	12,8	0,00
p-value	0,00		0,00					
P5 - P1	0,0159			0,7675		0,400	44,3	0,00
p-value	0,00			0,00				
P5 - P1	0,0133		0,3979	0,6927		0,468	29,5	0,00
p-value	0,00		0,00	0,00				
P5 - P1	0,0191	-0,0486		0,8640		0,416	22,4	0,00
p-value	0,00	0,40		0,00				
P5 - P1	0,0004	0,1843	0,6381			0,333	17,2	0,00
p-value	0,93	0,00	0,00					
P5 - P1	-0,0034	0,0026	0,4691	0,4550	0,0747	0,503	17,5	0,00
p-value	0,67	0,96	0,00	0,01	0,01			
P5 - P1	-0,0121				0,1345	0,265	24,5	0,00
p-value	0,09				0,00			
P5 - P1	0,0045			0,6122	0,0530	0,417	24,3	0,00
p-value	0,55			0,00	0,09			
P5 - P1	-0,0122	0,0699			0,1129	0,274	13,3	0,00
p-value	0,09	0,19			0,00			
P5 - P1	0,0076	-0,0627		0,7230	0,0576	0,419	16,6	0,00
p-value	0,34	0,28		0,00	0,07			
P5 - P1	-0,0032		0,4669	0,4604	0,0748	0,511	23,7	0,00
p-value	0,65		0,00	0,00	0,01			
P5 - P1	-0,0167		0,5944		0,1366	0,435	26,0	0,00
p-value	0,01		0,00		0,00			
P5 - P1	-0,0170	0,0913	0,6202		0,1085	0,461	19,5	0,00
p-value	0,01	0,05	0,00		0,00			

Table 16: Correlation Coefficients

	P1	*P2*	*P3*	*P4*	*P5*	*RM*	*SMB*	*HML*	*HMLEP*
P1	1								
P2	0,97	1,00							
P3	0,95	0,97	1,00						
P4	0,96	0,97	0,97	1,00					
P5	0,93	0,94	0,95	0,98	1,00				
RM	0,82	0,82	0,84	0,84	0,79	1,00			
SMB	-0,15	-0,18	-0,12	-0,03	0,05	-0,09	1,00		
HML	0,74	0,73	0,78	0,82	0,83	0,70	0,22	1,00	
HMLEP	0,53	0,59	0,63	0,62	0,62	0,51	-0,02	0,62	1,00

	P5-P1	*RM*	*SMB*	*HML*	*HMLEP*
P5-P1	1,00				
RM	0,39	1,00			
SMB	0,41	-0,09	1,00		
HML	0,64	0,70	0,22	1,00	
HMLEP	0,53	0,51	-0,02	0,62	1,00

Table 17 : Characteristics of Portfolios

A: Price-Sorted Portfolios

Price	Mean	Median	B/M	Mean	Median	E/P	Mean	Median
P1	25,407	13,184	P1	0.250	0.216	P1	0.075	0.068
P2	23,804	9,769	P2	0.377	0.310	P2	0.095	0.081
P3	20,368	7,288	P3	0.472	0.390	P3	0.098	0.088
P4	13,188	6,894	P4	0.504	0.417	P4	0.076	0.080
P5	8,896	5,527	P5	0.596	0.447	P5	0.028	0.063

B: Size-Sorted Portfolios

Size	Mean	Median	B/M	Mean	Median	E/P	Mean	Median
P1	151,413,129,513	41,009,609,448	P1	0.216	0.174	P1	0.066	0.058
P2	126,508,277,178	18,388,203,124	P2	0.318	0.278	P2	0.081	0.080
P3	70,757,105,525	10,745,854,128	P3	0.357	0.331	P3	0.072	0.077
P4	35,360,768,772	9,409,068,782	P4	0.471	0.417	P4	0.063	0.072
P5	14461674839	7025107082	P5	0.79861	0.74184	P5	0.1	0.0876

C: B/M-Sorted Portfolios

Size	Mean	Median	Price	Mean	Median	E/P	Mean	Median
P1	30,142,547,936	7,169,743,443	P1	5,301	2,877	P1	0.104	0.089
P2	25,355,213,402	7,819,776,613	P2	10,637	6,221	P2	0.084	0.084
P3	41,309,987,567	12,469,781,903	P3	12,590	8,591	P3	0.080	0.084
P4	100,912,590,583	24,466,925,957	P4	23,510	11,713	P4	0.074	0.080
P5	1.96655E+11	49237974252	P5	50206.7	21779.9	P5	0.05	0.0489

D: E/P-Sorted Portfolios

Size	Mean	Median	Price	Mean	Median	B/M	Mean	Median
P1	45,120,820,043	8,049,695,694	P1	17,638	4,741	P1	0.639	0.553
P2	48,908,283,018	11,305,328,347	P2	19,361	8,629	P2	0.398	0.345
P3	67,473,296,716	13,344,736,727	P3	16,806	10,277	P3	0.382	0.316
P4	67,273,694,766	11,921,319,816	P4	18,809	9,185	P4	0.370	0.295
P5	41346338843	7127408244	P5	18483.1	8149.65	P5	0.42	0.2697

Figure 1 - Winners vs Losers (J=12)

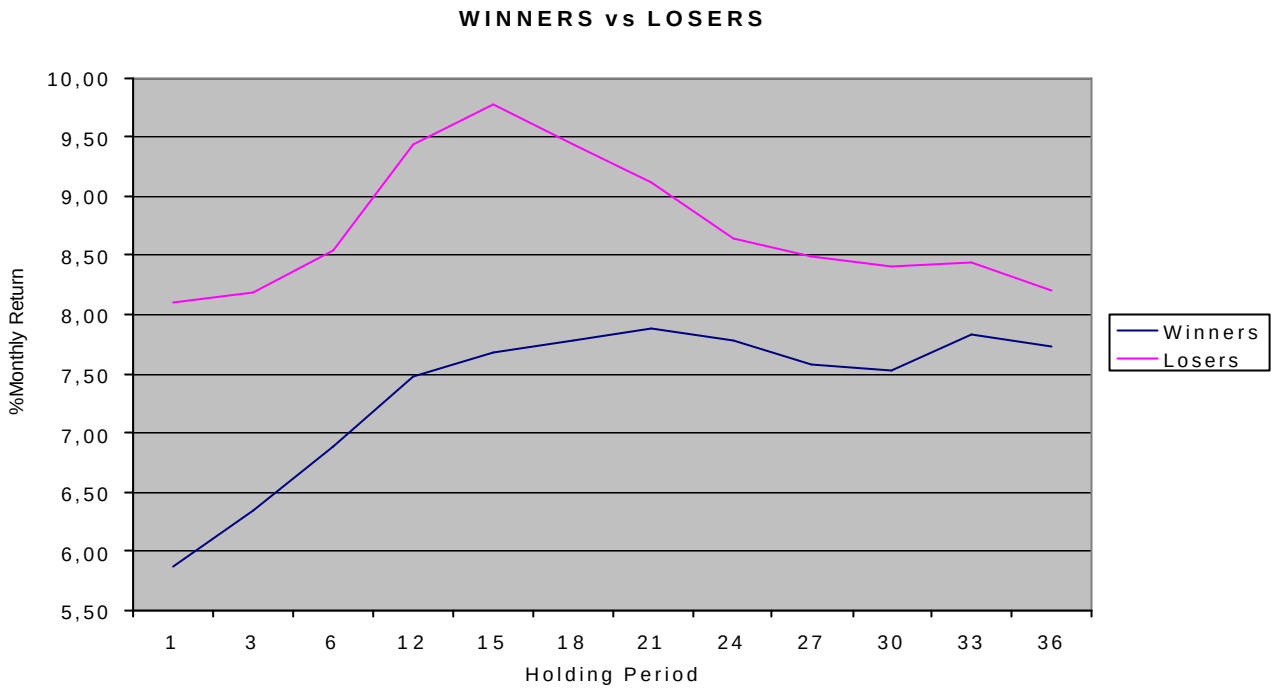

Figure 2 - Return Difference Between Losers and Winners (P5 – P1) - (J=12)