THE INVESTIGATION OF INVESTORS' OVERREACTION TO PATTERNS OF PAST FINANCIAL PERFORMANCE MEASURES: EVIDENCE FROM TEHRAN STOCK EXCHANGE

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A B S T R A C T

The researchers who have studied overreaction of stockholders have concluded that investors overreact to the past financial performance of firms. Firm that achieved high past financial performance tend to be overvalued; eventually, stock prices of these firms return to their fundamentals, resulting in low returns over longer horizons. On the other hand, firms that experienced poor past financial performance become under-priced and subsequently their shares earn higher return. This article examines the overreaction of stockholders of Tehran Stock Exchange. This study was performed without controlling the effect of *B/M* ratio and 'market capitalizations (size)' in the first stage and by controlling the *B/M* ratio and size as risk criteria in the second stage. Time period of research was eight years since 1999 to 2006. Our sample is constructed from all stocks traded on the Tehran Stock Exchange (TSE) and the research method was Portfolio Test. Two sample independent t-test was used for data analysis. The results indicate that stockholders in Tehran Stock Exchange overreact to earnings before extraordinary items and discontinued operations, sale and return of Stock but do not overreact to cash flow variable.

Keywords: Formation period of portfolio, Test period of portfolio, Winner portfolio, Loser portfolio, Overreaction.

INTRODUCTION

According to Fama, efficient market is the one in which stock prices reflect perfectly all of the available information and market apply the influence of new information on stock price in timely manner and far from psychological bias. (Fama, 1991) Theory of efficient market and logicality of investors' decisions is the main idea of modern finance that its foundation is financial economy. But, since 1980 new financial sciences were replaced by modern financial sciences. In modern finance, the hypothesis of logicality of investors is criticized. The belief of efficiency of Stock markets is challenged seriously in these sciences. (Hagen, 2009).

Studies that investigate the hypothesis of overreaction of market show that investors evaluate the stocks with desirable past performance higher than their intrinsic value. Finally, during longer periods of time, when investors identify their last evaluation is invalid, these shares receive a return that is lower than expectation.

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On the other hand, the stock price having weak past financial operation is determined under its intrinsic value .When the future operation of these shares is surplus of investors' expectations, they can receive a return higher than their expectation in long period of time. (De Bondt and Thaler,1985,1986).

The present research is seeking to answer the question that whether there is overreaction in Tehran Stock Exchange or not, that whether it can observe the needs of investors in applying optimal method in dealing and can be a good guidance for investors in the stock market.

RESEARCH BACKGROUND

The research done by De Boudt and Thaler in 1985 is one of the early activities and research about overreaction of investors. They are regarded as the main designers of overreaction hypothesis. (De Bondt and Thaler,1985,1986) Barberis and Shleifer and Vishney (1998) recognized this market as the one in which the mean of stock return of firms after a set of desirable information is lower than its mean after undesirable information and news (Barberis, Shleifer

and Vishney,1998) There are two behavioral models in interpretation of overreaction. The first model is known as BSV which is represented by Barberis, Shleifer and Vishney and the second model is known as DHS which is related to Daniel, Hirshleifer and Subrahmanyam. (Fama, 1991) The first model (BSV) recognizes the reason for overreaction of investors in their use of heuristic technique of representation during making investing decisions. A person, because of using heuristic method of representation, ensures that firms will continue this process with fixed growth of profit or fixed decrease of profit and this is because of extreme consideration of investors to the last financial operation during the prediction of future profit of firms. (Barberis, Shleifer and Vishney, 1998) In the interpretation of overreaction, the second model (DHS), suggests two psychological bias of investors during making investment decisions. One of them is Overconfidence and another is Biased Self - Attribution. Overconfidence means that peoples like to trust to their own skills, own abilities and own knowledge. Overconfidence is more powerful in the case of shares whose value determination is difficult. In the result of psychological bias of Biased Self - Attribution, investors attribute desirable results to their skills and attribute undesirable and unexpected results to their bad chance and trust to their skills in selecting the shares completely. (Daniel, Hirshleifer and Subrahmanyam, 1998).

Lakonishok and Shleifer and vishney (1994) investigated the overreaction after controlling the (B/M) ratio and 'market capitalizations (size). They divided company to ten portfolios from the perspective of ratio B/M and ten portfolios in terms of size. Then, they investigated the winner and loser stock performance in its equal class (in relation to B/M, and size) which was classified according to sale, the earnings before extraordinary items and discontinued operations and cash flow. In testing period, loser portfolios received virtually 3.5 % more than market returns but winner portfolios received virtually 4% lower than market returns. (Lakonishok, Shleifer, and vishney, 1997).

Carol Park (2008) stated that after terroristic attacks to universal commercial center, investors overreact to stock prices of insurance companies in the America stock exchange. He found some evidence in his research that showed reverse movements of stock returns of insurance companies after September 11th which

proved overreaction in short period of time and he found similar evidence even after controlling market Beta as a risk criteria. According to him, the overreaction of investors, the creation of a large ambiguity about future outlook of these companies' shares in the stock market was after this event. (Carol park, 2008).

Nikbakht and Moradi (2005) have assessed the overreaction of shareholders in Tehran Stock Exchange in their research. They have analyzed sixty accepted companies in Tehran Stock Exchange during 1992 to 2003 and by accounting cumulative abnormal returns via price and weekly indicators during two six-year periods (three years of portfolios formation period and three years of portfolios test period) have investigated overreaction phenomena. The results of their research have confirmed overreaction in Tehran stock market in long period of time. (Nikbakht and Moradi, 2007).

Mehrani and Nonahal Nahr (2007) have analyzed the possibility of raising investments   return and receiving abnormal returns by the use of reversed dealing method in Tehran Stock Exchange. The sample used in their research included five main industries that were investigated during 2000-2005. The results of their research confirmed overreaction of investors in Tehran Stock Exchange. Furthermore, according to their words, overreaction of Iranian investors to bad news is much more than their overreaction to good news (Mehrani and Nonahal Nahr, 2007).

Overreaction or Risk premium: A group of researchers such as Chan (1988) and ball and Kothari (1989), etc. believe that reversed movements of prices (outperforming losers from winners) can be attributed to risk factors according to them, De Bondt and Thaler have weakened in control of risk factors and when risk is controlled, the reversed movements of price cannot be observed. (Hagen, 2009) Paul Zarowin (1989) believes that more return of losers compared to winners is only because of obtained risk of loser companies in smaller size. He mentioned that in De Bondt and Thaler's research, the winner were obviously larger than loser (582 million dollars against 304 million dollars).When both groups were supposed similar and parallel in terms of size, these difference in returns were vanished. This means that the difference in returns is due to the size of the company. (Zarowin, 1990).

Fama and French also claimed that losers have higher '(B/M) ratio'. According to them, since 'B/M ratio

indicates companies' risk, difference in stock return of winner and loser is due to the differences in their risk and not due to excessive reaction of investors to the company's past performance. Multivariate test results indicate that when '(B/M) ratio 'increases, similarly shares' returns increases from 0.64 to 1.63 and even in the same size class, returns increases by increasing the 'B/M ratio. (Fama and French, 1992) According to Dechev, based on many researches, the company size and the (B/M) ratio can be the indicator of the consequent risk of bad financial position of firms. (Dichev, 1998).

Peterkort and Nielsen (2005) answered to this question that whether B/M ratio operates as risk representative or no. Doing their research, they concluded that the difference in risk is an important factor in interpretation of' B/M' ratio. (Peterkort and Nielsen, 2005).

Chang and Luo (2009), in their research, have investigated the investors 'mistakes in stock pricing and the effects of these mistakes on future stock returns. According to them, investors' mistakes in stock pricing compared to some factors such as company size and the (B/M) ratio has more interpretative ability in relation to future returns of stocks. Their evidence is compatible with overreaction of investors (Chan and Kothari, 2004).

RESEARCH HYPOTHESIS

Research hypothesis were designed in two stages. In first stage, winner and loser portfolios is formed without any attention to company size and (B/M) ratio, but in second stage for controlling the risk factors winner and loser portfolios are alike in terms of company size and (B/M) ratio.

The first stage hypothesis: *H1:* The stock of firms that their sell had higher (lower) growth in the past, has been overpriced /underpriced and took low (high) return in long time.

H2: The stock of firms that their profit had higher (lower) growth in the past, has been overpriced /underpriced and took low (high) return in long time.

H3: The stock of firms that their cash flow has had higher (lower) growth in the past, has been overpriced /underpriced and took low (high) return in long time.

H4: The stock of firms that their return has had higher (lower) growth in the past, has been overpriced /underpriced and took low (high) return in long time.

The second stage hypothesis: *H5 :* By controlling (B/M) ratio and firm size, the stock of firms that their sell has had higher (lower) growth in the past, has been

overpriced /underpriced and took low (high) return in long time.

H6: By controlling (B/M)ratio and firm size, the stock of firms that their profit has had higher (lower) growth in the past, has been overpriced /underpriced and took low (high) return in long time.

H7: By controlling (B/M)ratio and firm size, the stock of firms that their cash flow has had higher (lower) growth in the past, has been overpriced /underpriced and took low (high) return in long time.

H8:: By controlling (B/M)ratio and firm size, the stock of firms that their return has had higher (lower) growth in the past, has been overpriced /underpriced and took low (high) return in long time.

A Hypothetical test is formed for testing the above hypotheses:
$$\begin{cases} H_0 : \Delta P_1 - \Delta P_3 \leq 0 \\ H_1 : \Delta P_1 - \Delta P_3 > 0 \end{cases}$$

ΔP_1: The mean of company's rates of return changes which has had the lowest growth rate in terms of each variable in the past (losers).

ΔP_3: The mean of company's rates of return changes which has had the highest growth rate in terms of each variable in the past (winners).

We should notice that the rejection of H_0 hypothesis means the overreaction confirmation.

Sample: In this research, like most research done on overreaction, in a period of time (formation period) firms' stocks are divided to loser and winner portfolios based on the past operation. Formation period is time interval from 1999 to 2002 that is four years in present research and in next period (test period), the return of loser and winner portfolios is investigated to identify whether return reversing or in other words outperforming the losers from winners has taken place or not. In present research portfolios test period is four years namely from 2003 to 2006.

Variables: In the present research, past financial performance of company is calculated by changes in following variables and overreaction to them is investigated including Sale, earning, Cash flow and stock return.

In present research, earning means earnings before extraordinary items and discontinued operations.

Cash flow which is proposed in accounting literature is calculated by following method:

Cash flow= operating earning-(change in current assets - change in cash) – (change in short term liabilities- change

in current portion of long term debit - change in income taxes payable) +depreciation and amortization expenses. Also, stock return rate in the past is supposed as another past operative variable of firms.

So that:

$$R_{i,t} = \frac{P_{1(1+\alpha)} + D - [P_0 + \alpha(1000)]}{P_0 + \alpha(1000)}$$

R_i: stock return in t_1 year

P: stock price in the end of t year

P_0: stock price at the beginning of t year

α: The percentage of increasing the capital

The ratio of book-to-market equity (B/M): the ratio of the book value of a common stock to its market value: (Lakonishok, Shleifer and vishney, 1994).

$$\frac{Total\ equity\ capital\ on\ the\ balance\ test}{Stock\ market\ value\ \times\ Number\ of\ shares\ outstanding}$$

Market value of Equity capital also follow the Fama and French method. (Mehrani and Nonahal Nahr, 2007) that is calculated as the number of shares outstanding multiplied by the stock prices at portfolio formation is used as a criterion for the size of firms (size).

Source of data: Statistical population of this research includes all accepted companies in Tehran Stock Exchange. Two features were taken into account in the selection of required sample:

1. Between the years 1999-2006, their stocks are being traded at least once per year.
2. 2- The company is not part of the investment firms and financial intermediation.

Due to these two features, 158 companies were chosen among accepted companies inTehran Stock Exchange in time interval of1999to 2006.

By regarding two above features 158 firms were selected among accepted firms in the Tehran Stock Exchange in time interval of 2006 to 2009.

The CDs of stock market organization, Tadbir Pardaz software and Pars Portfolio software were used for collecting the required data. Financial statements available in the library of Tehran Stock Exchange were used when the aforementioned softwares did not include the required data.

Research methodology: Portfolio test method is used in the present research. This method is done in two stages.

Portfolio test method-first stage: In the first stage of portfolio test, without considering the effects of B/M ratio and company size, companies were divided into loser and winner in the formation period (1999 to 2002).At first, for this purpose, geometric mean of growth rate proposed for every variable in each hypothesis was calculated. An example of how to calculate the geometric mean of growth rate in sale variable (first hypothesis) is shown below.

$$SGit = \left[\Pi(1+i)\right]^{\frac{1}{t}} - 1$$

$SGit$ = geometric mean of growth rate

i=growing rate in sale

Then, firms in terms of geometric mean of growing rate in supposed variable were classified to three portfolios in this manner. 30% of the companies with the highest growing rate were placed in winner portfolio (P_3) and 30% of the companies with the lowest growing rate were placed in loser portfolio (P_1) and 40% were placed in middle of portfolio. After that ΔP_1- ΔP_3 was calculated.

Δp_1: is the mean of changes of return rate of loser portfolio from the beginning of formation period to the end of testing period, that is calculated like this:

AR_{F1}-AR_{T1}=ΔP_1

AR_{F1}: is the arithmetical mean of return rate of loser portfolio in formation period

AR_{T1}: is the arithmetical mean of return rate of loser portfolio in testing period.

$\Delta P3$: is the mean changes of return rate of winner portfolio from the beginning of formation period to the end of testing period, that is calculated like this:

AR_{F3}-AR_{T3}=ΔP_3

AR_{F3}: is the arithmetical mean of return rate of winner portfolio in formation period.

AR_{T3}: is the arithmetical mean of return rate of winner portfolio in testing period.

If the result of (ΔP_1-ΔP_3) is meaningfully greater than zero, the overreaction is confirmed in the first stage.

Portfolio test method -second stage: In this stage, for controlling the risk effect, winner and loser portfolio were resembled to each other in terms of (B/M) ratio and size to indicate that whether losers outperforming of winners is really due to the overreaction or the (B/M) effect and size. Also, each of the first four hypotheses that the overreaction of first stage was not confirmed was again investigated in this manner to identify whether overreaction is confirmed for them or not by controlling risk effect. At first, some portfolios were

created based on the company size and (B/M) ratio for this goal. Thus, companies were divided based on size mean into two portfolios of small companies (S) and big companies (B) since 1999 to 2002 and then they were divided into two high and low portfolio based on the mean of (B/M) ratio in three portfolio of firms with high(H) (B/M) ratio, firms with low(L) (B/M) ratio and firms with mean (M) (B/M) ratio since 1999 to 2002.Thus, six portfolios were formed. Then, each of these six portfolios was divided into three portfolios in terms of geometric mean of growing rate in each of four mentioned variables. Eighteen portfolios were formed through cooperation of three factors of size of company, (B/M) ratio and past operation as follows.

Table 1. Growth and value portfolio based on company size and (B/M) ratio and past financial performance.

Firms ranked by growth	(B/M) ratio			Size
Rates in their past financial performance variables	L	M	H	
1	S/L_1	S/M_1	S/H_1	
2	S/L_2	S/M_2	S/H_2	S
3	S/L_3	S/M_3	S/H_3	
1	B/L_1	B/M_1	B/H_1	
2	B/L_1	B/M_2	B/H_2	B
3	B/L_1	B/M_3	$B/3_1$	

$$\begin{cases} (PS/H_1 + PS/M_1 + PS/L_1 + PB/H_1 + PB/M_1 + PB/L_1) = P1 \\ (PS/H_3 + PS/M_3 + PS/L_3 + PB/H_3 + PB/M_3 + PB/L_3) = P_3 \end{cases}$$

As an Example, in the above table, B/H_1 Portfolio is the one that includes stocks with the largest size and highest B/M and lowest growth rate and S/H_3 Portfolio is the one that includes stocks with the smallest size and highest B/M and highest growth rate.

After portfolio formation, Δp_1 - Δp_3 was calculated as described above.

Hypotheses were analyzed through t-test by considering n-1 freedom degree. Data analysis was done by using Minitab software and at the confidence level of %95. The level of significance was done in two ways. At first, by the use of test statistics that if the amount is more than the amount in t-test table in the %95 level, the null hypothesis (H_0) is rejected in a significance level (α =/05) and this means the confirmation of overreaction. Second, p-value amount is calculated by applying SPSS and Minitab software. If p-value is larger than the level of significance, it is not meaningful and null hypothesis (H_0) cannot be rejected. Similarly, if the p-value is smaller than the level of significance, it is meaningful and H_0 hypothesis is rejected.

RESEARCH FINDINGS

By calculating the Δp_1 - Δp_3, hypotheses testing from one to four was done by the use of t- test as follows:

Table 2. Result for growth and value portfolio in the first stage of portfolio test.

Variable name	Number of Winner and loser	mean $(\Delta P_1 - \Delta P_3)$	Standard deviation $(\Delta P_1 - \Delta P_3)$	test statistics	amount in t-test table in the %95	P-value	Confirmation or rejection of overreaction
Sale H1	47	49.6	88.7	3.84	1.645	0	Confirmation
earningH2	47	66.2	86.4	5.25	1.645	0	Confirmation
Cash flow H3	47	17.9	49.9	1.25	1.645	.104	rejection
Return H3	47	105.7	50.91	14.09	1.645	0	Confirmation

According to the results of above table, overreaction in first stage was confirmed for three variables including sale, earning before extraordinary items and discontinued operations and stock return (hypothesis one, two and four). First, because the value of test statistics observed is more than value of t-test table that is 1.645 for these three variables. Therefore, null hypothesis is rejected for the hypothesis one, two and

four at the significance level of α =0/05. Second, by the use of probability value (p-value), null hypothesis is rejected for these three hypothesis because its value is less than α =/05 However, the overreaction is not

confirmed for cash flow variable in the first stage. By calculating $\Delta P_1 - \Delta P_3$, testing hypothesis five to eight was done by using t-test as follows:

Table 3. Result for growth and value portfolio in the second stage of portfolio test.

Illustration/ Variable name	Number of Winner and loser	mean $(\Delta P_1 - \Delta P_3)$	Standard deviation $(\Delta P_1 - \Delta P_3)$	test statistics	amount in t-test table in the %95	P-value	Confirmation or rejection of overreaction
Sale H_1	47	23.4	75.9	2.09	1.645	0.021	Confirmation
Earninh H_2	47	50	86.4	3.93	1.645	0	Confirmation
Cash Flow H_3	47	6.8	83.4	0.55	1.645	0.291	Confirmation
Return H_3	47	86.6	73	8.05	1.645	0	Confirmation

According to the results of above table, overreaction is confirmed in second stage for three variables including sale, earning before extraordinary items and discontinued operations and stock return (hypothesis one, two and four) because the value of test statistics observed is more than value of t-test table that is 1.645 for these three variables. Therefore, the null hypothesis H_0 is rejected for hypothesis one, two and four at a significance level α =0.05. Also, through applying the probability value (p-value) H_0 hypothesis is rejected for these three hypotheses because its value is less than α =0.05. However, overreaction was not confirmed for cash flow variable at the second stage.

Test results of hypotheses in second stage shows that more return resulting from investing in loser stock is not due to the risk as a result of investing in the shares of smaller firms or investing in the shares of firms with the high (B/M) ratio but it is due to overreaction of investors towards three variables of sale, earning before extraordinary items and discontinued operations and stock return because when loser and winner portfolios are resembled in terms of size and (B/M) ratio, mean changes of return rate of loser Portfolio minus mean changes of return rate of winner Portfolio became meaningfully more than zero.

CONCLUSION

Evidence obtained in present research indicated that shareholders in Tehran Stock Exchange overreact to three variables of sale, earning before extraordinary items and discontinued operations and stock return but they did not overreact to cash flow of firms. Investors drive stock with high historical financial measures in

terms of sale, earning before extraordinary items and discontinued operations and stock return above there fundamental values. These stocks under –performed the market over longer periods when investors realized that their previous expectations have not materialized. On the other hand prices of stocks with poor past financial performance in terms of sale, earning before extraordinary items and discontinued operations and stock return are pushed below their fundamental value. These stocks earned higher returns over the long horizon when future performance exceeds investors expectations. It means firm shares having smaller success in terms of sale rate, earning before extraordinary items and discontinued operations and stock return have lower price than intrinsic value. Although, in this manner, the firm is not a successful firm but its stocks is supposed to have a good opportunity for investing. Obtained results are similar to the results of some other research done abroad such as Lakonishok et al (1994) and Laporta tt al (1997).

RECOMMENDATIONS

The following suggestions are represented for research in the domain of overreaction:

- Study of overreaction in a shorter period of time
- The investigation of this subject that whether two phenomena of overreaction and underreaction are independent from each other or underreaction is a result of overreaction
- The study of the effect of industry on the overreaction
- The replication of present research by using other variables.

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