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An evaluation of investors' overreaction to past financial function criteria: Iranian evidence

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One of the assumptions of the efficient market hypothesis is that logical reaction of investors to known and available data cause the cost of invested wealth to approach its main cost. However, the experience shows that the behavior of investors in capital market has not always been correct and market cooperators show overreaction to new data. The aim of this study is to determine whether or not the investors have assigned a higher level for the stock of companies that have acquired rather high criteria in the past from the real values, and whether or not the prices of these stocks will return to their original costs and experience the return of previous returns. Similarly, the companies that have had rather weak return in the past have been valued in lower price by experts and will acquire more return as compared to their partners in the next periods. Among the financial functional criteria, average of sales growth rate, average growth of operational profit, average annual return and average cumulative abnormal return (ACAR) have been selected and four hypotheses have been tested in Tehran Stock Exchange during 2001 to 2009. The evidences of the present research show that the investors in Tehran Stock Exchange have shown overreaction to financial function criteria.

Key words: Overreaction, output return, winner portfolios, lose portfolio.

INTRODUCTION

According to efficient market hypothesis (EMH), there are two predictions about market prices behavior and return. First, the prices observed in the market are equal to their innate values and secondly, the market output cannot be predicted by the public available data. It means that all stocks are valued correctly and the stock prices are equal to the present values of all future expected based available data on the evaluation date. Experimental evidences in the last two decades show that the investors behavioral bias in data processing cause the stock prices to be diverted from their real values, which will end in abnormal return based on the old data which implicitly refer to inefficiency, even in a low level in the market.

Behavioral finance theory

Behavioral economy is one of the most active areas in economic research in extent and amount. This theory rejects the behavioral insight of the economic representatives based on maximization of the expected idea. Concentration of behavioral finance theory on one approved definition of human behavior is under risk and uncertainty as compared to a normal description. One of the goals of behavioral finance is the comprehension of psychological traits of economic representatives (Shleifer, 2000). Most financial and economic theories are defined as the individuals act intellectually, and take all available data into consideration; however, researchers have found great evidences about this issue (Shleifer, 2000). This theory opines that sometimes, it is necessary to accept the probability that some factors in economy do not act quite intellectually in order to find an answer to finance

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experimental dilemmas (Thaler, 1999). The basic elements of behavioral finance theory are cognitive psychology (how individuals think and decide), as well as limitation in the arbitrage that will be described further.

Cognitive psychology and decision making processes

Heuristic decision refers to roles in which individuals take complex decisions in uncertain situations. There are completely justified reasons for using heuristic decisions, especially when the time of decision is limited. Heuristic processes can lead to non-optimal decisions (Tversky and Kahneman, 1974; Ritter, 2003). However, similar behavioral bias approved in psychology related to cognitive psychology, are described in brief.

Representativeness bias guide individuals not to overestimate the incidence of one occurrence based on similarity between the specifications of that occurrence and the specifications of the original community of that occurrence (Tversky and Kahneman, 1974; Barberis and Thaler, 2001). When evaluating whether something belongs to a group or not, people overuse that group's representativeness and rarely use base rate (like the similarities of one member of that group). For instance, if somebody looks like a convict, people evaluate the probability that he is a convict more than the reality that he is not, because they overuse the similarities, but rarely use the fact that convicts form a very low percent of the society. In behavioral models, representativeness leads to over reaction, so it predicts return of the next output (over reaction).

Overconfidence

Overconfidence between partners is a very clear problem. Overconfidence bias in financial science refers to the fact that investors think of their ability in the valuation of negotiable documents more than it really is, so the variance error of their predictions is less estimated.

Self-attribution bias

The investor's self-confidence grows when the general information parallels his personal information, but if they contradict each other, this self-confidence does not grow equally. Psychological studies show that people tend to be proud of their past success and attribute their failures to external factors and bad luck (Daniel et al., 1997).

Conservatism bias

Edwards became popular by discovering conservatism bias in 1968. This bias causes people to slowly update their opinions about what is used in Brav's rationality

standard. It means that people overuse one base scale and rarely use the available data; that is why Brav and Heaton (2002) classified conservatism bias as intuitive, contrary to the representative bias in some concepts. The implied concept of conservatism valuation in behavioral finance theory is that this bias leads to lesser reaction. Therefore, conservatism bias predicts speed in return. Conservatism can be seen as over self-confidence about individuals' previous information (Chan et al., 2004). It should be noted that data processing bias is the infrastructure of a number of behavioral finance models in the companies' sequential function which foresees systematic errors in evaluation due to over or lesser reaction. While each author uses presuppositions and trends with little difference in developing their model, they all suppose that investors fail to have a correct interpretation of the companies' previous function. Barberis and Shleifer (1998) emphasized both representative and conservatism bias as stimulators of these systematic errors.

Limitation in arbitrage

The concept of arbitrage means that wrong valuation of a property creates profit without risk. According to arbitrage theory, the investors are in two groups: intelligent traders who are able to compensate other investors' mistakes, and common traders, who have bias in decision making most of the time (Shiller, 2003).

LITERATURE REVIEW

The study of Debondt and Thaler (1985) is among the pioneer works which used psychological evidences for explaining the investors' behavior. In their study, the share monthly abnormal return was calculated for a 16-year period. They found that the share purchase with a lower return in the last five years was about 19.6% higher than that of the market in the subsequent 3 to 5 years, whereas the investor's strategy in the purchase share with higher return gains was about 5% lower than the market in the next 3 to 5 years.

Debondt and Thaler (1985) findings can be explained by factors such as the company's size, secondary effects and temporary variations in risk factors. Debondt and Thaler (1985) showed that their previous evidences do not attribute to special characteristics of the company about risk, size and secondary effects factors. Zarowin (1989) studied overreaction in a similar time return on the research of Debondt and Thaler in 1985 to 1987. Also, he studied the share return in 17 periods, and then compared successful and unsuccessful portfolios return function, having controlled the size of the company. The results showed that the portfolios return difference was eliminated for the size factor, after the size was controlled, and in the companies, no significant difference was observed in the portfolios' rerun (Zarowin, 1989).

Lakonisho and Shleifer (1994) presented evidences that value strategies make more returns since they use less optimal behaviors of the investor, so these strategies are not innately risky. Laporta (1996) studied the differential return between growth share and value share regarding future profit growth rate predicted by financial analysts from 1982 to 1990. His findings showed that the companies with low expected profit overcome the companies with high expected profit, about 20% within the first year after the formation of portfolios. The difference of return between share growth and share value will continue up to the fifth year after the formation of portfolios. Performing extra tests, he concluded that his findings are not affected by factors of size, effects of B/M and other potential risks. However, the research results showed strong evidences of the overreaction hypothesis (Alwathainani, 2006).

Gunaratne and Yonesawa (1997) made a research about the return reverse in Tokyo stock market. The results showed the strong return reverse in Tokyo stock market. In addition, the tests on the portfolios' return were compared considering risk time difference in ranking and in the test period. It showed that the risk difference in the two periods was very low, but the return difference was high.

Barberis (1998) found evidences that markets showed overreaction to markets, as the average share return in the next period to a series of good data was lower than the average return after a series of bad news. Ahmad and Hossain (2001) studied overreaction and the effect of a New Year in the stock market of Malaysia. Some evidences, found in the results of the three periods, showed that markets had overreaction about information, as the average return of the shares in its next periods to a series of good information was lower than the average return to a series of bad news. Chan and Frankel (2004) studied two valuation effects related to two psychological biases (representative and conservative biases), and it was observed that this research did not find any evidence of the return reverse in companies which functioned during the past few years. Also, this research offered evidences confirming less reaction derived from conservative bias.

Alwathainain (2006) tested the hypothesis that investors show overreaction to growth and evenness of patterns in the last financial years from 1983 to 1999 in NYSE, NASDAQ and AMEX stock markets. The results displayed that past growth rates in each of the research variation led to moving the price to higher and lower levels. Then, in long-term, the prices would return to their innate levels causing higher and lower returns respectively. Mirada, in 2005, showed an overreaction in Tehran stock market from 1992 to 2003. The results showed significant ACAR information and testing periods for winner and loser portfolios, which is the indicator of overreaction of common shareholders in Tehran stock market.

Bowman et al. (1998) tested the stock price features in New Zealand after a weekly great change in prices. The results showed the existence of short term overreaction in New Zealand stock market. Issues like time stability, prices of sale purchase that can be indicators of overreaction hypothesis, have also been studied in this research. The results of extra tests found evidence confirming the foregoing supposition.

Ma et al. (2005) studied the effect of overreaction of markets on stock which has the highest or lowest percentage of daily change in prices reported in wall street journal and New York stock in a two year period of 1996 and 1997. The results showed strong evidences of overreaction of the stock market on NASDAQ stock.

In the companies' shares having the most capital, market value in England show efficient reaction to the data of market doubt. Nonetheless, the investors in the companies' share, having average and small capital market value, showed different behaviors with weak reaction to the market doubts. More analyses confirmed that this group of investors showed less reaction to the data including excessive events. However, this has mostly been shown in positive doubts.

RESEARCH METHODOLOGY

The population of the current study comprised all listed companies in Tehran Stock Exchange. All companies having the following specification would be elected as a member of the statistical community:

1. The company should not be one of the investors or financial intermediate's companies.
2. All needed data for calculating growth rates in financial function criteria (sale, profit) and return should be available.
3. The shares of the company should be transacted more than once during one year.
4. The company's financial year should end at March 20th in each year.

Formation and test periods of the studied companies and operational definitions of variations

The formation and test periods for each tested functional criteria and also the number of studied companies is presented in Tables 1 and 2.

Varieties calculations and research sample of abnormal return

The meaning of each share abnormal return is the difference between the real and expected return of that share. In this research, it has been supposed that the expected return for all negotiable instruments is the same and the return of each negotiable instrument is like market return. The market return is calculated as follows:

$$R_m = \frac{I_1 - I_0}{I_0}$$

where I_0 is the total price and year index of all normal share

Table 1. Period of the study.

Period	Formation period	Test period
First	2001-2003	2005-2007
Second	2003-2006	2007-2008
Third	2004-2006	2008-2009

Table 2. Needed variables of the study.

Period	Studied variations for main hypothesis				Added variations in extra tests			
	Sale growth average		Operational benefit growth average		Annual return average		Cumulative abnormal return	
	Studied companies	Winner and looser companies	Studied companies	Winner and looser companies	Studied companies	Winner and looser companies	Studied companies	Winner and looser companies
First	150	30	140	28	150	30	150	30
Second	150	30	150	30	150	30	150	30
Third	145	29	145	29	150	30	150	30

announced by Tehran Stock Exchange in the beginning of the year, and I_t is the value of this index for the end of the year.

In this research, the share real return is calculated as:

$$R_{i,t} = \frac{P_1(1+\alpha) + DPS - [P_0 + \alpha(1000)] + SD + SR}{P_0 + 1000(\alpha)}$$

where $R_{i,t}$ stands for the real return of i company in t period; P_1 stands for share price in the end of the period; P_0 stands for share price in the beginning of the period; DPS stands for divided profit of each share; α stands for capital growth percentage; SD^1 stands for stock dividends; and SR^2 stands for stock right.

Fundamentally, the nominal price of each stock companies share is 1000 Rials (Iranian currency). Finally, the annual abnormal return is calculated as:

$$AR_{it} = R_{i,t} - R_m$$

Geometric average of sale growth

Sale growth was calculated by the year to year change for each share. Then, the geometric average was calculated

for this variation within three years as:

$$SG_{jt} = \left[\prod_{T=-3}^{-1} (1 + \Delta SPS)_{jT} \right]^{\frac{1}{T}} - 1$$

where $SG_{j,t}$ stands for annual geometric average of sale growth rate of each share of j company within the last three years to the date of portfolios' formation in t time; and ΔSPS_{jT} stands for year to year variations in sale for the share of j company in T years.

Geometric average of operational profit growth

Operational profit growth was calculated by the year to year variations in operational profit for each share which was scaled by the properties in the beginning of the period. The geometric average, which was calculated for this variety with the last three years measurement, is:

$$EG_{jt} = \left[\prod_{T=-3}^{-1} (1 + \Delta EPS)_{jT} \right]^{\frac{1}{T}} - 1$$

where $EG_{j,t}$ stands for annual geometric average of operational profit growth for each share of j company within the last three years measuring to date of portfolios formation in t time; and ΔSPS_{jT} stands for year to year variation in operation profit for each share of j company in T year, which has been scaled by the properties in the beginning of the period.

Research test

The test method used in this research for confirmation or rejection of the hypotheses was divided into two parts: main portfolios test and extra portfolios test. Companies were ranked in five groups for each studied period and criterion. Then, the loser and winner portfolios were formed based on each financial operation criterion. These portfolios were kept for three years since formation, and the ranking period return (formation period) and maintenance period (test period) were calculated for each year (from one to three years).

Testing of hypotheses

It should be noted that these stages are just for

Table 3. Results for successful portfolio (ranking based on average sales growth).

Period	Formation period			Test period			p-value	Results
	Average cumulative actual return	Average of accumulated market gain	ACAR	Average cumulative actual return	Average of accumulated market gain	ACAR		
First	264.68	159.10	105.58	111.69	202.12	-90.43	≤0.01	Rejected H ₀
Second	194.79	154.03	40.75	73.41	138.35	-64.94	≤0.01	Rejected H ₀
Third	199.70	232.74	-33.04	38.92	14.73	24.19	0.06	H ₀ confirmed

geometric average growth sale criterion in three years before formation (for the geometric average growth criterion of operation profit growth, three years before formation in the same way is repeated).

1. First, the data related to sale and return growth calculation in the ranking period are collected for all statistical society shares.
2. The qualified shares were ranked in the formation period based on the geometric average of annual sale growth rate. Then, 20% of shares with the most geometric average of annual sale growth rate were determined for each studied period as winner portfolios, and 20% of shares with the least geometric average of annual sale growth rate were determined for each studied period as loser portfolios.
3. In this stage, at first, abnormal return for each share was calculated annually, after which the cumulative abnormal return (CAR) for each share within the three years period was calculated as:

$$CAR_{i,t} = \sum_{t=1}^t AR_{i,t}$$

4. Average cumulative abnormal return (ACAR) for each portfolio for the formation and test period is calculated as:

$$ACAR = \frac{1}{N} \sum_{t=1}^t CAR_{i,t}$$

5. In the final stage, ACAR of each portfolio for formation and test periods were compared and used in deciding the

confirmation or rejection of the main hypotheses.

RESULTS AND DISCUSSION

Research hypotheses

The first research hypothesis states that in companies, where proportional sale growth is higher, the ACAR in the portfolios formation period is more than that in the test period. This hypothesis can be expressed in the null hypothesis as:

$$H_0 : ACAR_{fpw} \leq ACAR_{tpw}$$

As seen in Table 3, in the first period, the ACAR of winner portfolios in the test period is much less than that in the formation period. This average has reduced from 105.58% in the formation period to -90.43% in the test period (that is, 196.01% has been reduced).

This reduction occurred in the second period as well; in other words, ACAR reduced from 40.75 to -64.94% (that is, 121.73% has decreased). Thus, in the first and second period, the hypothesis (H₀) was rejected and the result was that the average cumulative abnormal return of companies that have higher relative growth, formed during the test period portfolios, was more. Studying the third period, the average non-cumulative output during

the test period was established and it indicated the confirmation of more hypotheses.

The second research hypothesis states that in companies where proportional operational profit growth is higher, portfolios formation period is more than the test period. This hypothesis can be expressed in the null hypothesis as follows:

$$H_0 : ACAR_{fpL} \geq ACAR_{tpL}$$

The result test (Table 4) in each three periods of the study confirmed the null hypothesis (H₀). In the first period, ACAR in the formation period was 42.54% and it reduced to -79.2% in the test period (that is, a reduction of 121.74%). The rate of reduction in the said average in the second period was -26.52% from the formation period to the test period. In the third period, the value of this average increased to -23.82% (that is it had an increase of 1%), but the increase rate was not meaningful; as such, the second hypothesis of the third period was not approved also. Therefore, the loser portfolio (having been formed based on the sale growth average in the last three years) resulted to be the optimum in the formation period than in the test period.

The third research hypothesis states that in companies, where proportional operational profit growth is higher, ACAR in the portfolios formation period is more than that in the test period.

Table 4. Results for unsuccessful portfolio (ranking based on average sales growth).

Period	Formation period			Test period			p-value	Results
	Average cumulative actual return	Average of accumulated market gain	ACAR	Average cumulative actual return	Average of accumulated market gain	ACAR		
First	201.64	159.10	42.54	122.92	202.12	-79.20	≤0.001	H ₀ Confirmed
Second	101.03	154.03	-53.00	58.83	138.35	-79.52	0.20	H ₀ Confirmed
Third	208.92	232.74	-23.82	15.73	14.73	1.00	0.32	H ₀ Confirmed

Table 5. Results for successful portfolio (ranking based on average operating profit growth).

Period	Formation period			Test period			p-value	Results
	Average cumulative actual return	Average of accumulated market gain	ACAR	Average cumulative actual return	Average of accumulated market gain	ACAR		
First	325.61	159.10	166.51	148.54	202.12	-53.58	≤.001	H ₀ Rejected
Second	284.04	154.03	130.00	87.93	138.35	-50.42	≤.001	H ₀ Rejected
Third	277.27	232.74	44.54	41.27	14.73	26.54	0.35	H ₀ Confirmed

This hypothesis can be expressed in the null hypothesis as follows:

$$H_0 : ACAR_{fpw} \leq ACAR_{tpw}$$

As seen in Table 5, ACAR in the test period reduced to 220.09 as compared to the formation period.

In the second period, this average reduced from 130% in the formation period to -50.42% in the test period (that is, an equivalent 180.2% decrease was observed), but in the third period, the fall in this average, from the formation period to the test period was not meaningful statistically. So, the H₀ hypothesis is rejected in the first and second periods, and the results show that in companies, where the relative growth of the functional profit is higher, the average of abnormal accumulated gain of these companies in the

formation period is more than in the test period.

The fourth research hypothesis states that in companies where proportional operational profit growth is low, ACAR in the portfolios formation period is lower than that in the test period. This hypothesis can be expressed in the null hypothesis as follows:

$$H_0 : ACAR_{fpL} \geq ACAR_{tpL}$$

As it is noted in Table 6, the fourth hypothesis tests results show that ACAR in the first period of the formation period is 42.12%, and it reduced to -103.12%. In the test period, the fourth hypothesis was rejected in the first period, in that it has a 4% increase (-69.961%). As shown by the p-value, the increase was not meaningful; therefore, the null hypothesis (H₀) was approved in this

period as well. In the third period, ACAR increased from -98.41 to 17.03% in the test period for loser portfolios (meaning that it increased by 115.44). So, in the third period, H₀ was rejected.

In companies, where the relative functional profit growth is lower, the average accumulated abnormal gain in the formation period is higher than in the test period.

Conclusion

This paper presents evidence consistent with the hypothesis that individual investors overreact to information in stale public news stories. News-event returns partially reversed only in stocks with an abundance of old information, based on several alternative measures. The information released during these news events is likely to contain substantial overlap with past information, and

Table 6. Results for unsuccessful portfolio (Ranking based on average operating profit growth).

Period	Formation period			Test period			p-value	Results
	Average cumulative actual return	Average of accumulated market gain	ACAR	Average cumulative actual return	Average of accumulated market gain	ACAR		
First	116.98	159.10	-42.12	99.00	202.12	-103.12	0.01	H ₀ Confirmed
second	79.97	154.03	-74.07	68.39	138.35	-69.96	0.45	H ₀ Confirmed
third	134.33	232.74	-98.41	31.76	14.73	17.03	≤.001	H ₀ Rejected

hence could likely be stale. In contrast, news events that are likely to convey more new information elicit much smaller return reversals, or even return continuations.

In classic economic theories, it is assumed that people are completely rational and have limited processing capacity. Standard models of the output, like the model of pricing the capitalistic properties, the hypothesis efficient market and the arbitrage pricing theory are based upon these two assumptions. However, experimental evidences in the decision making process and judging show that divergence is more prevalent than is be considered as an exception among investors because of limitation in information processing capacity time and other source of cognitive constraints. The main question of this paper was: “does investing overreact to financial function criteria?”

These predictions indicate that investors, who are pessimistic for optimistic ideas about past financial experience, cause the share price to be higher or lower, thus giving it its real value. The evidences provided in this research showed that the companies, in which the period of time had less average sale growth and annual average outcome, were more superior to those companies which were in higher status. In these regards, the companies are more efficient.

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