

The identification and weighting of behavioral biases of investors in stock market of Isfahan

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Abstract: The control of behavioral biases causes that investors evaluate their decision making process carefully and can react well in case of encounter with the mentioned biases and avoid deviation from decisions. The present study is fundamental and applied in terms of purpose and survey study in terms of implementation method. Also, math methods are used in estimations. The calculated inconsistency rate in questionnaire is less than 0.1 and is supported. This study prioritizes the behavioral biases. To weight effective behavioral on decision making of investors in stock market of Isfahan, 36 biases are classified in five groups. After the design of questionnaire and completion by financial and stock market of Isfahan experts (lecturers and authorities of brokerage), they biases are prioritized by hierarchy analytic process as one of the multi-criteria decision making methods. In five group ranking, cognitive, emotional, unusual phenomena, heuristic behaviors and preference group achieved one to five priorities, respectively. Also, the subgroups are ranked in each group.

Key words: Behavioral biases; Stock exchange market. Behavioral finance; Hierarchy analytic process

1. Introduction

The behavior of investors in stock exchange market affects the decision making, monetary resources allocation, pricing and evaluation of the firms return. The ambiguous conditions and cognitive mistakes rooted in human psychology cause that investors have some errors in formation of their expectations and they can express special behaviors during investment in financial markets. Investors' behavior is affected by many factors and one of the main reasons of these behavioral ambiguities is the uncertainty and information asymmetry. This causes that when new information is issued, the participants in market react to them and cause some changes and volatility of securities price and trading volume. If the confidential and heterogeneous information is issued, different reactions are observed in financial markets and this is with misleading and false analyses (Sinayi and Davoodi., 2009).

Special cultural structures in Iran and their effect on individual and group behaviors namely in capital market, make the necessity of recognizing the theories and analytical, cognitive behavioral financial models as unavoidable for the market activists and authorities. It is observed sometimes, instead of mutual demand and having buyers and sellers at the same time, we are encountered with one-way demand and purchase or selling queue and it is one of the examples of specific behavioral models in market. Behavioral finance helps to

identity our capital market well by formulization of behavioral models and eliminates some of the problems of behavioral models well. Thus, it is necessary to conduct a study regarding the impact of identification and weighting of behavioral biases of investors in stock market of Isfahan by AHP approach.

2. Review of literature

2.1. The definition of behavioral finance

The relationship between financial science and other social sciences fields as called financial psychology evaluates the decision making process of investors and their reaction to various financial markets conditions and it mostly emphasizes on the impact of personality, culture and judgments of investors on decision making of investment. Financial psychology is raised against logical behaviors paradigm of investors and is presented based on all financial models. Taller believes that sometimes it is necessary to accept the probability that some factors don't act reasonable in economy to find a response for empirical financial puzzles and this is the subject of behavioral finance.

2.2. The emergence of behavioral and psychological dimensions in financial and investment issues

Normally, the factors and structures (emergence of behavioral sciences in financial decisions) are investigated in various literatures forming the

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behavior of investors. The importance of this issue shows that investment decisions are not only affected by economic indices and reasoning and some factors including investment horizon, risk toleration, self-confidence and assurance of the investors on that choice and investment process in market and etc. have important role in behavior of investors and their decisions type and form their investment style. The emergence of behavioral sciences in financial issues is a new approach to financial markets studies. This approach deals with the issue that despite standard financial theories and issues, behavioral and cognitive inclinations can be effective on prices of financial assets. Despite the theories and approaches of Sharp and Marqits, financial behavior and investment are regarding the people and methods collecting and using information. This aspect of financial decisions and investment try to predict and understand the impact of psychological decisions in regular financial market.

2.3. Review of literature

Rai et al., (2010) in a study raised behavioral finance as different approach in financial field and stated that : behavioral finance is a paradigm by which financial markets are studied by some models and two main restricting hypotheses of traditional paradigm ignore expected suitability maximization and full reasoning. Behavioral finance is based on two main bases, one limitation in arbitrage, by which reasoning investment based on accepting some risks can not use arbitrage opportunities easily. The second behavioral finance base is psychology by which behavior and judgment of investors and their errors during judgment are investigated.

Falah et al ., (2011) in a study investigated the effective factors on investment intention of real investors in TSE. They designed 28-item questionnaires and distributed them among 450 people with the aim of the identification of effective factors on investment intention of real investors. The findings of their study showed that financial information of firms and issued public information in market are effective directly and via affecting the expectations of investors on their purchase decisions. Also, personal needs were effective directly on stock purchase intention.

Christy and Huang (2006) conducted an empirical study with econometric approach to identify the collective behavior of investors in capital market. They presented a regression model with dummy variables and measured collective behavior of investors by cross section deviation of return in various market conditions. They stated that under the conditions of high fluctuations of market, people can ignore their personal beliefs and follow the total market performance.

Hisio (2006) in a study "the effect of transparency of financial information on behavior of shareholders in Taiwan stock exchange market" evaluated the role of transparency dimensions of financial information

to increase investment in stock market. The results showed that there was a positive and significant association between perception of investors of stock market regarding the transparency dimensions of financial information and their behavior. Among transparency dimensions, ownership structure transparency had the highest impact. Also, perception of investors of transparency dimensions is different based on their demographic variables and the relationship between investment experience in stock market and their behavior was positive and significant.

3. Study population and sample size

The study population in the study is including experts in stock market. The experts of study population are including:

- a. Academic experts as lecturers of University.
- b. Professional experts as authorities of brokerage

To determine the sample, the following experts are selected:

- a. The work experience above 5 years
- b. Inclination to participate in the study

The sample size is 30 experts of stock exchange market. The questionnaires are distributed among them. The study period is 2013 and the data are collected by questionnaire and data collection form.

4. Study variables

In the studies regarding the evaluation of behavioral biases effective on investors' decision making in TSE, there are some similarities and 5 effective factors are used among them.

1-The role of heuristic behaviors bias in decision making of investors in TSE: Heuristic behaviors bias is divided into three types as expectancy bias, gambler's fallacy and money illusion bias

2- The role of unusual phenomena bias (economic behavior) in decision making of investors in TSE:

The unusual phenomena bias (economic behavior) is divided into six types as disposition effect, attachment bias, preferences with time limitation error, momentum investment, herd instinct and sunk costs fallacy

3-The role of cognitive biases in decision making of investors in TSE: Cognitive biases are divided into 14 types including Overconfidence, Availability, conservatism, Mental Accounting, Hindsight, cognitive dissonance, confirmation, self-attribution, ambiguity Aversion, pro-innovative, Framing, Representativeness, Anchoring and Illusion of Control.

4-The role of emotional biases in decision making of investors in TSE: Emotional biases are divided into 7 groups including:

Self-Control, Optimism-pessimism, regret aversion, loss aversion, endowment, Status Quo and overreaction to random sequence of events.

5-The role of preference biases in decision making of investors in TSE

Preference biases are divided into 6 types including non-linear probabilities weighting, ambiguity in value changes, using purchase price as reference point, and inclination to short-term view instead of long-term view, inclination to risk repetition and close framing.

Table 1: The pairwise comparison of main factors

	Heuristic behaviors	Unusual phenomena	Cognitive	Emotional	Preference
Heuristic behaviors	1	1.2	4	1.5	5
Unusual phenomena	2	1	5	1.2	3
Cognitive	3	5	1	1.3	7
Emotional	5	2	3	1	9
Preference	1.5	1.3	1.7	1.9	1

Based on AHP algorithm, the following relative weights are obtained for biases.

Table 2: Relative weight of main biases

Relative weight (relative value)	Bias
0.14	Heuristic behaviors
0.13	Unusual phenomena
0.29	Cognitive
0.33	Emotional
0.11	Preference

5.2. The table of pairwise comparison of sub-biases of heuristic behaviors

Here, the table of pairwise comparison of heuristic behaviors biases is shown.

Table 3: The pairwise comparison of heuristic behavior biases

	Expectancy bias	Gambler fallacy bias	Money illusion bias
Expectancy bias	1	3	5
Gambler fallacy bias	1.3	1	3
Money illusion bias	1.5	1.3	1

Based on AHP algorithm, the following relative weights are obtained for biases.

Table 3: The weights of final importance of behavioral biases of heuristic behaviors

Final importance weights	The weight of heuristic behaviors group	Initial importance weights	Bias of heuristic behavior group
0.0574	0.14	0.41	Expectancy bias
.042	0.14	0.30	Gambler fallacy bias
0.0406	0.14	0.29	Money illusion bias

5.3. The table of pairwise comparisons of unusual phenomena biases (economic behavior)

5. The results of study

5.1. The table of pairwise comparison of main biases

The table of pairwise comparison of 5 main biases is shown.

Here, the pairwise comparison table of sub biases of unusual phenomena is shown. The followings are used for simplicity.

Table 4: pairwise comparison table of sub biases of unusual phenomena

Sign	Unusual phenomena group biases
K1	Disposition effect
K2	Attachment
K3	Preferences with limited time error
K4	Momentum investment
K5	Herd instinct
K6	Sunk costs fallacy

Table 5: The pairwise comparison of sub biases of unusual phenomena biases (economic behavior)

	K1	K2	K3	K4	K5	K6
K1	1	4	8	5	1/3	2
K2	1.4	1	2	4	1.6	1.3
K3	1.8	1.2	1	2	1.9	1.5
K4	1.5	1.4	1.2	1	1.7	1.3
K5	3	6	9	7	1	4
K6	1.2	3	5	3	1.4	1

Based on AHP algorithm, the following relative weights are obtained for biases.

Table 6: Final importance weights of unusual phenomena biases (economic behavior)

Final importance weights	Weight of unusual phenomena group	Initial importance weights	unusual phenomena biases
0.023	0.13	0.175	Disposition effect
0.021	0.13	.161	Attachment
0.019	.13	0.144	Preferences with limited time error
0.020	0.13	0.155	Momentum investment
0.025	0.13	0.195	Herd instinct
0.022	0.13	0.170	Sunk costs fallacy

5.4. The table of pairwise comparison of cognitive sub biases

Here, the pairwise comparison table of 14 sub biases is shown. At first the following signs are used in the table.

Table 7: pairwise comparison table of 14 sub biases

Sign	Cognitive bias
F1	Overconfidence
F2	Availability
F3	Conservatism
F4	Mental accounting
F5	Hindsight

F6	Cognitive dissonance
F7	Confirmation
F8	Self-attribution
F9	Ambiguity aversion
F10	Pro-innovative
F11	Framing
F12	Representativeness
F13	Anchoring
F14	Control illusion

Table 8: The pairwise comparison of sub biases of cognitive bias

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14
F1	1	2	3	1.3	1.2	4	5	1.3	1.2	1.2	5	1.3	8	4
F2	1.2	1	2	1.2	1.3	3	3	1.5	1.3	1.6	5	1.5	7	5
F3	1.3	1.2	1	1.3	1.4	4	5	1.5	1.3	1.6	6	1.5	4	3
F4	3	2	3	1	1.2	3	6	1.3	1.2	1.3	5	1.3	8	4
F5	2	3	4	2	1	4	5	1.3	1.6	1.4	6	1.3	7	5
F6	1.4	1.3	1.4	1.3	1.4	1	1.4	1.6	1.4	1.5	3	1.6	1.5	1.6
F7	1.5	1.3	1.5	1.6	1.5	4	1	1.6	1.5	1.5	3	1.6	1.4	1.3
F8	3	5	5	3	3	6	6	1	3	2	8	1.2	9	6
F9	2	3	3	2	6	4	5	1.3	1	1.2	8	1.3	8	6
F10	2	6	6	3	4	5	5	1.2	2	1	7	1.2	8	5
F11	1.5	1.5	1.6	1.5	1.6	4	1.3	1.8	1.8	1.7	1	1.8	4	6
F12	3	5	5	3	3	6	6	2	3	2	8	1	9	6
F13	1.8	1.7	1.4	1.8	1.7	5	6	1.9	1.8	1.8	1.4	1.9	1	5
F14	1.4	1.5	1.3	1.4	1.5	4	3	1.6	1.6	1.5	1.6	1.6	1.5	1

Based on AHP algorithm, the following relative weights for biases are obtained.

Table 9: The final importance weights of behavioral biases of cognitive biases group

Final importance weights	Cognitive group weight	Initial importance weights	Cognitive biases
0.026	0.29	0.091	Overconfidence
0.017	0.29	0.06	Availability
0.017	0.29	0.06	Conservatism
0.026	0.29	0.09	Mental accounting
0.026	0.29	0.089	Hindsight
.014	0.29	0.049	Cognitive dissonance
0.015	0.29	0.051	Confirmation
.030	0.29	0.101	Self-attribution
0.026	0.29	0.09	Ambiguity aversion
0.029	0.29	0.10	Pro-innovative
0.012	0.29	.04	Framing
0.028	0.29	.099	Representativeness
0.009	0.29	0.03	Anchoring
0.015	0.29	.05	Control illusion

5.5. The table of pairwise comparison of emotional bias sub biases

Here, the table of pairwise comparison of 5 main biases is shown. At first, we can use the following signs in table.

Table 10: table of pairwise comparison of 5 main biases

Sign	Emotional biases
S1	Self-control
S2	Optimism and pessimism
S3	Regret aversion
S4	Loss aversion
S5	Endowment
S6	Status Quo
S7	Overreaction to random sequence of events.

Table 11: Pairwise comparison of emotional sub biases

	S1	S2	S3	S4	S5	S6	S7
S1	1	1.2	1.2	3	7	5	6
S2	2	1	2	4	8	7	4
S3	2	1.2	1	2	7	1.4	1.3
S4	1.3	1.4	1.2	1	5	1.5	6
S5	1.7	1.8	1.7	1.5	1	7	1.8
S6	1.5	1.7	4	5	1.7	1	6
S7	1.6	1.4	3	1.6	8	1.6	1

Based on AHP algorithm, the following relative weights are obtained for biases.

5.6. The table of pairwise comparison of preference biases (preference or priority)

Here, the preference pairwise comparison table is shown. The following signs are used for simplicity.

Table 12: Final importance weights of behavioral biases of emotional biases group

Final importance weights	Emotional group weight	Initial importance weights	Emotional biases
0.046	.33	0.140	Self-control
.031	0.33	0.094	Optimism and pessimism
0.052	0.33	0.159	Regret aversion
.087	0.33	0.265	Loss aversion
.029	.33	.087	Endowment
.045	.33	.135	Status Quo
0.040	.33	0.120	Overreaction to random sequence of events.

Table 13: preference pairwise comparison table

Sign	Preference biases (preference, priority)
T1	non-linear probabilities weighting
T2	ambiguity in value changes
T3	using purchase price as reference point
T4	inclination to short-term view instead of long-term view
T5	inclination to risk repetition
T6	close framing

Table 14: The pairwise comparison of preference biases (preference or priority)

	T1	T2	T3	T4	T5	T6
T1	1	1.2	1.2	3	7	7
T2	2	1	2	4	8	8
T3	2	1.2	1	2	7	7
T4	1.3	1.4	1.2	1	5	5
T5	1.7	1.8	1.7	1.5	1	4
T6	1.7	1.8	1.7	1.5	.41	1

Based on AHP algorithm, the following relative weights are achieved for biases.

Table 15: The final importance weights for preference biases group

Final importance weights	Preference group weight	Initial importance weights	Preference biases (preference, priority)
0.003	0.11	0.024	non-linear probabilities weighting
0.036	0.11	0.330	ambiguity in value changes
0.030	0.11	.272	using purchase price as reference point
.029	0.11	0.263	inclination to short-term view instead of long-term view
.008	0.11	.070	inclination to risk repetition
.005	0.11	0.041	close framing

Table 16: Prioritization of 36 biases

Final weights	Group	Bias	Priority
0.087	Emotional	Los aversion	1
0.0574	Heuristic behaviors	Expectancy	2
0.052	Emotional	Regret aversion	3
0.0406	Heuristic behaviors	Money illusion	4
0.045	Emotional	Status Quo	5
0.046	Emotional	Self control	6
0.042	Heuristic behaviors	Gambler fallacy	7
0.040	Emotional	Overreaction to random sequence of events	8
.036	Preference	Ambiguity in value changes	9
.031	Emotional	Optimism and pessimism	10
0.030	Preference	Using purchase price as reference point	11
0.030	Cognitive	Self-attributing	12
.029	Preference	Inclination to short term view than long term view	13
0.029	Cognitive	Pro-innovative	14
.029	Emotional	Endowment	15
.028	Cognitive	Representatives	16
.026	Cognitive	Hindsight	17
.026	Cognitive	Overconfidence	18
.026	Cognitive	Ambiguity averse	19
.026	Cognitive	Mental accounting	20
0.025	Unusual phenomena	Herd instinct (collective behavior)	21
.023	Unusual phenomena	Disposition effect	22
.022	Unusual phenomena	Sunk cost fallacy	23
.021	Unusual phenomena	Attachment	24

Table 17 shows the priorities of 36 biases (sub-criteria). Also, Chart of Table 8 shows the prioritization of 36 biases (sub-criteria).

Various factors are effective on specific behavioral bias in investors and these factors can be involved in creating other biases. Sometimes we can consider one or some factors as the most important factors to create specific bias.

6. Conclusion and Recommendations

Table 17: priorities of 36 biases (sub-criteria)

Final weights	Group	Bias	Priority
0.020	Unusual phenomena	Momentum investment	25
0.019	Unusual phenomena	Preferences with limited time error	26
.017	Cognitive	Availability	27
.017	Cognitive	Conservatism	28
.015	Cognitive	Control illusion	29
0.015	Cognitive	Confirmation	30
.014	Cognitive	Cognitive dissonance	31
.012	Cognitive	Framing	32
0.009	Cognitive	Anchoring	33
.008	Preference	Inclination to risk repetition	34
.005	Preference	Close framing	35
.003	Preference	Non-linear probability weighting	36

This issue "identification and periodization of the reasons of creating behavioral biases of investors of TSE" can be another topic of study.

- Based on the high priority of cognitive and emotional group inflations, it can be said, in TSE, there are strong mutual relations between personality and behavioral biases of investors. They mostly rely on emotion than logical decisions and scientific calculations. This is due to low financial knowledge of investors or the extreme interferences of government. These interferences have caused that the market has no natural process and can not fulfill the needs of shareholders by financial and logical techniques and they mostly rely on emotions for their decisions.
- "Loss aversion" bias is mostly observed in instable economies. Thus, if we put this bias on priority, it shows the unstable condition of TSE and itself is based on macroeconomic environment of our country. It is proposed to the investors involved in this type of bias to keep the stock at loss as they are sure the price of this stock is increased in future and sell these stocks rapidly in case of the counselor view. Also, it is proposed to them to thinking about selling their stock to sell it at appropriate time. Also, achieving first, third and fifth positions for "loss aversion", "expectancy" and "regret aversion" can show the formation of price bubbles and mis-valuation of stock in TSE.
- As behavioral biases as "gambler fallacy", Status Quo" and "self-control" are in second, sixth and ninth priorities, it shows the lack of timely access of shareholders to correct information regarding firms listed on TSE and this leads to false decision makings. Because the lack of correct information leads to false decisions and intuitional decisions are highly weighted and people consider these decisions more. The people with gambler fallacy in case of the lack of adequate information think that all the past events are effective on the future events. It is recommended that when they are doubtful regarding the relationship between two outcomes, these outcomes are not considered as dependent and even when they are sure two events are dependent, they can investigate their reasoning process. It is recommended to the

shareholders with "Status Quo" overcome this inflation in long-term via increasing knowledge, information and specialization in investment. The statistics show that this bias is high among the emotional people. Thus, it is recommended to them to emphasize the role of logics in their decisions. This bias is also strong among the people fearing risk. Thus, it is recommended to increase their knowledge in high risk to manage it better. The shareholders with self-control bias prefer to spend more at present time and less save for future and it is recommended to them to determine high limit for their short term investment and lower limit for their long term investment. Also, it is recommended to them to have exact planning for their financial activities in stock market and stock trading. In addition, they establish logical balance in purchasing different stocks and don't think only about purchasing early return stock and dedicate logical value to late-return stock in their portfolio. This behavior is arising from over fluctuations and logical instability in economy of a country and it causes that investors or shareholders can not trust in far future and has long-term planning. Most of financial counselors believe that these people don't have financial order in their behavior and it is due to the lack of adequate rules in stock exchange market.

- "Inclination to short-term view instead of long-term view" is in 14th rank and it indicates that shareholders of TSE have not long-term decisions. In other words, shareholders mostly consider short-term conditions. This issue is due to the hard conditions of our economy, instability of economic conditions and the lack of bright economic future. Also, high cases of un-real trading in stock market by real entities for instant changes in indices cause that people only consider present condition for their decisions.
- "Herd instinct (collective behavior) is in tenth rank and it shows that investors and shareholders mostly follow the group than their individual capabilities in TSE. This indicates their uncertainty to their individual capabilities. Others try to rely on their individual capabilities and due to

overconfidence bias (rank 21), they decide incorrectly.

Due to these behaviors in relying on others decisions and assuring their capabilities, the shareholder decisions are biased. Holding specialized courses of investment training and stock indices familiarity increases the capability and knowledge of shareholders and biases as "herd instinct (collective behavior) are avoided. The researchers recommend the people without any independence not to accept any idea without reason. For example, to avoid this bias, it is recommended to the investors to ask for reasons in case of proposal for purchasing stock or selling it and consult with the expert counselors.

"Self-attribution" and "overconfidence" biases are in 17th and 21th ranks. Daniel et al., in the study showed that the investors with high awareness are mostly exposed to overconfidence and self-attribution biases. Overconfidence causes that they exaggerate in the validity of their personal information and self-attribution causes that they less consider public issued information namely when the information is in contradiction with their personal information

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