

Modeling the prediction of the Financial Behavior in Iranian Stock Market Investors with an Interpretive Structural Approach

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Abstract

Nowadays, predicting the financial behavior of investors plays a crucial role in decision-making and the financial policy-making process. This study is aimed at providing a paradigm to predict the financial behavior of investors in Iran's stock market. 24 experts were interviewed to identify the variables, and 24 variables were identified. The interpretive structural paradigm was carried out using a self-interaction matrix based on the experts' opinions. The MICMAC analysis has been used to identify the types of the variables. As findings of the study, a five-level paradigm was determined, in which environmental factors and the background of financial behavior on the fifth level were the most influential variables and also arbitrage, bias, and the perceptual mistake were the most impressive variables of the paradigm on the first level. MICMAC analysis of this study suggested that the variable of environmental factors had low dependence and high efficacy. Furthermore, psychological projection, perceptual mistake, arbitrage, and bias are dependent

variables with high dependence and low efficacy. Other variables are mediator variables with high dependence and effectiveness.

Keywords: Prediction, Financial Behavior, Investors, Iran's Stock Market, Decision-Making.

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Introduction

As a key element of economic decision-making, prediction is one of the boundless inclinations of human beings that estimate future events in order to decrease risk. Currently, those seeking to achieve transcendental goals in a competitive world, maximize capital, maximize returns, and implement win-win strategies in businesses, focus on factors such as scientific predictions, speed, flexibility, and simulation.

Therefore, a suitable prediction paradigm that increases performance in the capital market is critical. Recently many studies have been conducted in the field of volatility in financial markets and related instruments. In the recent years, academics, rather than scientific researchers, have done well in predicting future fluctuations in financial markets and the rate of return on business advantage, and have also vastly contributed to the development of financial instruments, financial interest rates and, many strategic financial tools that can transform predictions into profit (Malekouti, 2014, 37). Foresight is a necessity in everyday life and many sciences. Prediction is also one of the most significant factors in financial and economic issues (Pour Zamani, 2014, 118). On the other hand, behavioral finance advocates the belief that an awareness of the psychological tendencies in the field of investment is absolutely necessary and requires serious development of studies in the domain and it is difficult for those who consider the role of psychology in financial knowledge as an effective factor on securities markets and investors decisions.

Behavioral finance began in the early 1970s. This combination of financial sciences, which in fact uses psychology and sometimes sociology to better analyze the issues of financial markets, often studies the decision-making process of investors and their reaction to different conditions of financial markets, and its more emphasis is on the influence of personality, culture, and judgment of investors on investment decisions. Specific cultural structures in Iran and their effects on individuals and group behaviors, especially in the capital market, necessitate the understanding of various

theories and, the analytical and behavioral finance paradigms for market operators and operations. Behavioral finance helps in formulating the behavioral paradigms, better recognizing the capital market and acting better in meeting some bottlenecks that arise from better behavior paradigms (Fadaeinejad et al., 2015, 8). A behavioral financial paradigm reveals how investors behave and how their behavior may effect financial markets and help investors learn how to behave rationally.

The financial foundation of behavioral finance constitutes compliance between sentiment and investor decision-making. The findings suggest that investors are not always acting logically and unbiased as they represent prevailing paradigms. According to psychological theories, humans tend to care for certain events in their minds, and these subjective visions in some cases have greater effects on individuals' behaviors. Several studies have shown how individuals perform their non-rational performance in investment and monetary discussions. Behavioral finance helps to better understand the capital market by formulating the behavioral paradigms and also help to better deal with some bottlenecks caused by behavioral patterns. Behavioral finance helps investors in decision-making and is often defined as the application of psychology in finance. The vast literature of psychology shows that emotion has a significant effect on decision-making and increases the ability of individuals to differentiate between rational and irrational decisions (Hosseini Chegini et al. 2014).

Therefore, in addition to fundamental factors, we also should consider the effect of investors' behavioral and emotional factors on the stock prices (Zarei and Darabi, 2018, 132). Since the accumulation of capital is one of the most important sources of continuous economic growth in a country, it can be accelerated by forming capital through the financial markets. Financial markets are considered as the main element in the collection of resources through small and large savings in the national economy, investment optimization, and guiding consumption and investment needs in economic sectors. The positive impacts of the stock exchange on economic development is so high that some economists argue that the difference between developing and developed economies is not necessarily based on the available technology, but the presence of integrated and global financial markets. Therefore, improving the conditions of investors in the stock exchange leads to an improvement in the country's economy (Hassanzadeh and Ahmadian, 2015, 33).

The necessity of investing in economic growth and development is undeniable. Resources are required to increase a country's funds and people's

savings are considered as the best source to do so. True leadership will follow up the right and correct course in order to direct wandering funds towards productive investments, increased production, and gross national growth, and all this would consequently lead to the creation of jobs, an increase in the per capita income and ultimately bring public welfare. So a strong mechanism must push these savings into productive sectors and financial needs. In terms of capital supply, investors should try to invest their savings in a place that has the highest efficiency (Ameli and Ramazani, 2014, 63).

Increasing the contribution of investors in markets, followed by increasing the investment markets' complexity, leads to a predictive behavior in investors' financial activities. Many academic studies seek to science and knowledge about financial behaviors that can help development of governments and organizations and financial institutions. The prediction of financial behaviors can help improve and stabilize financial markets. Predicting financial behavior indicates how investors use financial markets. Some believe that prediction of financial behavior leads to the prediction of risk-taking behavior (Barasinska, 2017, 24). This study aims to provide a local paradigm to predict the financial behavior of investors in Iran's stock market.

Theoretical foundations and research backgrounds

The opinion of behavioral finance, founded by the combination of psychology and finance, states that psychology plays a role in financial decision-making. Since cognitive mistakes and deviations affect investment theories, they also affect financial options. Nowadays, the idea of a rational behavior in an investor who always seeks to maximize her/his expectations is not enough to justify the behavior and reaction of markets. Therefore, behavioral finance can be considered as a paradigm in which financial markets are studied using paradigms with two basic assumptions of traditional paradigm, maximizing expected utility and perfect rationality.

In behavioral finance, it is argued that to find an answer to the experimental puzzles in the financial field, sometimes it is necessary to accept the possibility that some economic factors are not quite rational. But according to Robert Olsen, behavioral finance does not try to show that rational behavior is wrong, but it attempts to demonstrate the applications of psychological decision-making processes in understanding and predicting financial markets. There are different dimensions and approaches in the field of behavioral finance: 1) perceptual illusions and behavioral finance, 2) behavioral finance and behavioral assumptions, 3) behavioral biases (Darabi and Chenari Bouquet,

2015, 79). Now, the different aspects and approaches in the field of behavioral finance will be fully described:

1) Perceptual illusions and behavioral finance: Although the neoclassical theory of economics refuses to engage in the psychology of markets and investments, behavioral finance theory states that cognitive mistakes have an important effect on financial decision-making. Perceived mistakes affect the investor's decisions and ultimately, market outcomes include:

A) Anchoring and adjustment: People use the available information when predicting future phenomena or value of something, and then adjust it. B) Information access errors: This concept is key in analyzing intuitive thinking, in innovative decisions as well as access. Access is the exchange of the specific mental content that enters into the mind. C) The limited view: Due to the closed or restricted view of some investors are affected. There are several reasons why the investor is in such a situation. One of the most important causes is lack or neglect of quantitative tools in the evaluation of investments. D) Psychological projection error: This mistake occurs when the investor is extending a recent event or act or event created in the short term to the future or the long term. E) Emotional factors and internal effects: these factors play a major role in individual decisions and can influence on the financial markets (Rahnama Roodposhti and Salehi, 2010, 114).

2) Behavioral finance and behavioral assumptions: behavioral finance and prospect theory are known to be consistent with behavioral economics and with Simon's descriptions, which identify certain assumptions in conventional financial wisdom, and these consistencies can be subdivided empirically and analytically. This critical literature on conventional financial reason is focused on the form of the expected utility function, prioritizing maximum utility and the means by which selections take place among different alternatives (Rahnama Roodposhti and Zandieh, 2012, 58).

3) Behavioral biases: In behavioral finance, behavioral traits that affect the process of the decision-making process are also studied. These traits are called behavioral biases. Various studies investigated the types of perceptual mistakes and how these mistakes affect investors' financial decisions on financial markets and concluded that the decisions of investors are affected by several mistakes (Fadaeinejad et al., 2015, 12). The sources of behavioral bias in decision-making are as follows:

1) Bounded rationality and that human beings experience cognitive bias. 2) Time limitation of individuals in short-term periods, people have to make a lot

of decisions, so there is no time to investigate accurately. 3) Emotional factors affect human judgement. 4) Social factors and humans' attachments to society make it possible to consider some social variables such as attention to group decisions (Eslami Bidgoli and Kordlouie, 2010, 27). One of the most known figures in behavioral finance is Professor Shefrin of Santa Clara University. In a joint study, professor Statman and Professor Shefrin (1984) studied dividend dilemmas. Statman and Shefrin (1985) pointed that investors keep the loser stock too much and sell the winner stock too soon. From his point of view, this phenomenon was called the dispositional phenomenon, a behavior known as fear of regret. Another scientist in the field of behavioral finance is Werner De Bont who published an article in cooperation with Professor Taler (1985) in the field of overly responsive stakeholders.

They proceeded to investigate whether the stock market was more reactive. The results of their study show that more reaction of investors to good and bad news causes the previous losers to be priced out of the real extent and the previous winners have priced too much. Thus, people give a lot of weight to the new experience (Rahnama Roodposhti and Zandieh, 2012, 34). Shleifer and Statman were two academic researchers in behavioral finance development. The Journal of Financial Expertise (1999) presented an article entitled "Behavioral Finance: Past Battles and Future Engagements" by Statman. Shleifer in 2000 published a book entitled "Inefficient Market: An Introduction to Behavioral Finance" at Oxford University. However, Professor Shefrin (2007), published (Behavioral Corporate Finance: Decision that Create Value). It should be noted that the first book itself, entitled "beyond greed and anxiety: understanding the behavioral finance and the psychological well-being of investment," has predicted the disappearance of the bubble price bubble. Reb (2008) predicted that an increase in regret would result in more accurate decision-making.

However, he published this in an article entitled "Regret aversion and decision process quality: Effects of regret salience on decision process carefulness." Villatoro (2009) by examining the relationship between the occurrence of herding behavior and the extent of Good's reputation it is stated that the more famous managers are those who tend to rely more on their private information and vice versa. In the effect of willingness and reduction of caution, evidence from Thailand regarding individual investor's decision-making was discussed in an article by DE Weaver and Shannon (2010). They concluded that the investor's interest in the stock market concerning the long-term and over-reliance stock was not satisfactory because they withdraw from any

information processing role and instead suggested that the effect of a particular sample is a particular example of the reduction of caution and consciousness. Investors will pay less attention to the information and investigate new analyses when making decisions about the emerging markets, and they are not in a hurry to sell them, the overall result of these studies has shown that investors' caution and vigilance decreases. Herding behavior in the Indian and Chinese stock markets was examined by Lao and Singh (2012).

The results of this study showed that herding behavior exists in both markets, and the extent to which this behavior extends depends on market conditions. Herding behavior is high in the Chinese market and high trading volumes led to market stagnation. In India, herd behavior occurs when fluctuations occur in market conditions. Herd behavior is more common during big market fluctuations in both markets. In an article entitled "Regret, disappointment and the endowment effect," Martinez et al. (2011) concluded that the effect of ownership is that the minimum selling price of a particular product exceeds the purchase price limit. Emotions affect the effect of ownership. The negative feelings of frustration and remorse have a certain effect on the evaluation of the cargo, and they found that the induction of regret eliminates the effect of classical ownership while frustration has reverse effects. These findings indicate the necessity of a particular emotion approach to understanding factors which have effects on decision-making.

An interesting article was the study of the investor and investor willingness effect by Da Costa et al. (2013). What they were looking for in this paper is whether an investment experience can reduce the tendency of inclination or not? That is to say, the fact that the investors hold more losses to keep stocks in interest. The results showed that investors are less affected. A review of the behavior of investor herding on the Chinese stock market was done by Yao et al (2014). They concluded that investors showed different levels of herding behavior, and this was more common in industry levels and was stronger for the largest and smallest stocks, and for growth stocks compared top value stocks. The herding behavior in the slack markets is more evident. Therefore it is safe to say that herding behavior has decreased over time. In another research, Tang and Baker (2016) studied self-control and financial expertise as two factors. In this study, which was carried out in the United States, different companies were selected to study in this factor that the investment in each area is different. However, the results showed that the financial expertise of individuals is more effective than the financial behavior of these investment companies. of course, the self-control factor can have significant effects in

some cases. Thus, improving and enhancing the degree of expertise of investors can improve the financial behavior of investment companies. Seuntjens et al. (2016) study issues and problems of financial behavior in different markets. Their research showed that the economic orientations and the level of markets expectations, along with attitudes to profitability, can affect the financial behavior of investors and evaluated their level of relations with financial behavior. In this study, more than 389 capital companies were investigated and studied. In a study, Stromback et al. (2017) reviewed 2063 Swedish investors. Their findings suggest that individuals such as their tendency to save and adhere to financial commitments have resulted in improving the financial behaviors of investors.

Methodology

Since the present research seeks to provide a paradigm for predicting the financial behavior of Iranian stock market investors using the interpretive structural paradigm (ism); to expand the scope of behavioral finance knowledge in this field a semi-structural interview with Iranian experts has been done to identify the variables. Also MICMAC analysis was used to determine the variables and their effectiveness. Mutual analysis outcome shows the relationship between variables, and these relationships can be displayed in form of graphs and figures by MICMAC software (Salmani et al, 2016:7). So this research is a mixed (qualitative- quantitative) study.

And this comes despite the fact that the librarian method has been used to prepare the theoretical foundations and research background. The research population of this study includes a group of Iranian experts and academic experts familiar with behavioral finance. The following factors were considered in selecting research population: PhD degree, member faculty in universities, more than 10 years' work experience, having research in the field (financial behavior), membership in stock market for 10 years and also investors of stock market with more than 10 years experiences.

Using the purposive sampling method at the beginning of the study, the number of subjects was identified as the sample of primary experts, and then the required data were collected. Theoretical saturation of this research was achieved when additional data did not help to complete and specify dimensions of research and the obtained data of the interviews of the fifteen experts were similar. To ensure this, in addition to presenting a paradigm to some members of the qualitative section of the feedbacks, the qualitative section of the feedbacks showed that individuals asked for theoretical explanation of the

research were reliable and had no recommendations for conducting new interviews with individuals or individuals. The status of the experts in the research shows that most of the experts in the research have a scientific and research background in the universities and most of them have an executive record in Tehran stock exchange. In addition to these two categories, percent of experts with long history, investments and activity in Tehran stock exchange have higher education. The average of the work experience of the academic experts and the executive factors of the Tehran stock exchange between the years and the experiments date, and the experience of investment experts are two years of activity, indicating a good experience and a thorough acquaintance with the dimensions of the financial behavior of investors at different levels.

To increase the validity and reliability of the qualitative section, by providing feedback to interviewees, to raise the validity, and by putting them in the stream of research so that they will not affect their accountability, the internal validity of the context has been increased significantly. For this purpose, after conducting each interview, the results were presented to interviewees and interviewees described the points that they had about pattern. This was done after each interview to perform an interview with any presumption and orientation. Besides, to increase the reliability of this section, it was attempted to organize structured processes for recording, writing and interpreting recognized data. Furthermore, the exploitation of the research team's guidance was considered to evaluate and implement the interviews to enhance the reliability of the research. In this study, the required categories were extracted from the ventricle.

Research findings

In the qualitative section, 24 variables were achieved by interviewing experts: self-control (A), Optimism (B), consultative thinking (C), greed (D), Financial Knowledge (E), financial education (F), objective financial knowledge (G), self- esteem (H), mental financial knowledge (I), personal financial management (J), financial self- efficacy (K), economic status of society (L), cash flow (M), risk management (N), saving management (O), investing knowledge (P), financial experiences (Q), personal factors (R), environmental factors (S), background of financial behavior (T), psychological projection (U), understanding errors (V), arbitrage (W), bias (X), and in the next stage, the quantitative analysis has been indicated.

Interpretive structural paradigm

Sage developed the interpretative structural paradigm in 1977. It deals with the classification of factors and the identification of relationships between criteria. The structural paradigm approach is an effective and efficient methodology for subjects in which qualitative variables are interdependent at different levels of importance. Using this technique, we can explore the relationships and dependencies between qualitative variables (Charan et al., 2008). Following are all the steps required to develop the desired paradigm using the ism technique (Govindan et al., 2012). Structural paradigm and implementation steps in this study are discussed in this thesis.

MICMAC analysis

The analysis is based on penetration power (influence) and dependence rate (affect) of each variable and allows for further investigation of the range of each variable. In this analysis, the variables are divided into four groups: self-dependent, dependent, interface and independent. Self-dependence and power steering: these criteria are generally separated from the system because they have poor connections with the system.

Changes in these variables do not cause serious change in the system. Dependent variable: these variables have a strong dependency and poor leadership; these variables are based on strong influence and slight influence on the system. Independent: these variables have little dependence and high steering, i.e. High influence and low influence on the characteristics of these variables. The relation between these variables is high dependence and high steering power in terms of influence and effectiveness of these criteria is very high, and every little variation on these variables causes substantial changes in the system.

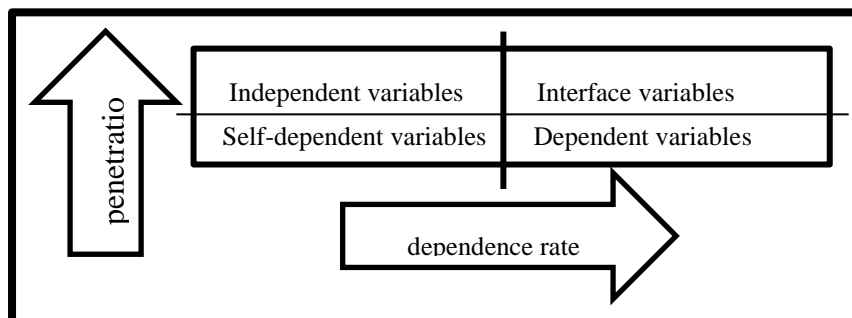


Figure 1: dependence rate and guidance power in the method

Findings of ISM method

Self-interaction matrix formation

In the first step, we form the structural matrix of the research using the point of view of the respondents to form the structural self-interaction matrix of the criteria as a couple together and based on this spectrum: v: the factor I will cause the jth column factor to be realized. A: column j causes the realizations of row I. X: both line and column factors contribute to each other (factor I and j have two-way relationships). There is no connection between the line factor and the column. The self-interaction matrix is listed in table 1.

Table 1. Structural self-interaction matrix

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
A		O	X	V	X	X	X	X	X	X	X	A	V	V	V	X	X	V	A	A	V	V	O	V
B			O	O	O	O	O	V	O	O	O	A	A	V	V	O	A	V	A	A	X	V	V	V
C				V	V	A	X	V	X	V	V	X	X	V	V	V	A	V	A	A	O	V	V	O
D					A	A	A	A	A	A	A	A	A	O	V	A	A	X	A	A	V	V	V	V
E						A	A	O	A	V	V	A	X	X	X	A	X	V	A	A	O	V	V	V
F							V	O	V	V	V	X	V	V	V	V	V	V	A	A	V	V	V	V
G								O	X	V	V	A	V	V	V	V	X	V	A	O	V	V	V	V
H									A	O	O	A	O	O	O	O	O	X	A	O	V	O	O	O
I										V	V	A	V	V	V	V	A	O	A	A	V	V	V	V
J											V	X	V	V	V	V	A	A	A	A	O	V	V	V
K												X	X	V	V	A	A	A	A	A	O	V	V	V
L													V	V	V	A	V	V	V	V	O	V	V	V
M															X	X	A	A	A	A	O	O	O	V
N																X	A	A	A	A	A	O	V	V
O																	A	A	A	A	A	O	V	V
P																		A	V	A	A	O	V	V
Q																		X	A	X	O	V	V	V
R																			A	A	V	V	O	V
S																				A	V	V	V	V
T																					V	V	O	V
U																						X	O	V
V																							V	X
W																								X
X																								

Source: research findings

In the second step, converting structural matrixes to (1, 0) led to following table:

Table 2. The initial access matrix

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
A	·	·	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
B	·	·	·	·	·	·	·	∩	·	·	·	·	·	∩	∩	·	·	∩	·	·	∩	∩	∩	∩
C	∩	·	·	∩	∩	·	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
D	·	·	·	·	·	·	·	·	·	·	·	·	·	·	∩	·	·	∩	·	·	∩	∩	∩	∩
E	∩	·	·	∩	·	·	·	·	·	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
F	∩	·	∩	∩	∩	·	∩	·	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
G	∩	·	∩	∩	∩	·	·	·	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
H	∩	·	·	∩	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	∩	·	·	·
I	∩	·	∩	∩	∩	·	∩	∩	·	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
J	∩	·	·	∩	·	·	·	·	·	·	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
K	∩	·	·	∩	·	·	·	·	·	·	·	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
L	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
M	·	∩	∩	∩	∩	·	·	·	·	·	∩	·	·	∩	∩	·	·	·	·	·	·	·	∩	∩
N	·	·	·	·	∩	·	·	·	·	·	·	·	∩	·	∩	·	·	·	·	·	·	∩	∩	∩
O	·	·	·	·	∩	·	·	·	·	·	·	·	∩	∩	·	·	·	·	·	·	·	∩	∩	∩
P	∩	·	·	∩	∩	·	·	·	·	·	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
Q	∩	∩	∩	∩	∩	·	∩	·	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
R	·	·	·	∩	·	·	·	∩	·	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
S	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
T	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
U	·	∩	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	∩	·	∩
V	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	·	∩	·	∩

Source: research findings

As it has been illustrated in table 2, if V is symbol of ij, the number of 1 must be insert and 0 is in opposite of it; also if A is symbol of ij, so 0 must instar in it and 1 is insert in its opposite site. Also if X is the symbol if ij, 1 must be insert in it and 0 must be insert in its opposite site. Finally if o is symbol of ij, 0 must be inserting in it and opposite of it. So the early matrix is achieved by these relationships. Once the initial matrix is achieved, internal consistency should be established. Table 3 was formed based on a special law in structural paradigmging. Now, in the first step of adapting the access matrix, the initial access matrix should be checked if $i, k, j, k, i, j \neq 0$. That is, if criterion a has a relationship with criterion b and criterion b is related to

criterion c, then a criterion a must has a relationship with c. For instance, if the switching variable leads to the changing variable, and the switching variable leads to a non-stationary variable, the output variable must also result in a non-stationary variable. This consistency is added to the initial access matrix using secondary relationships that may not exist. In table 1, the cells that were shown with x-rays are the relationships developed in the adapted matrix.

Table 3. The adapted initial access matrix

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Influence strength
A	1	* 1	1	1	1	1	1	1	1	1	1	* 1	1	1	1	1	1	1	0	* 1	1	1	* 1	1	23
B	1	1	0	* 1	* 1	0	0	1	0	* 1	* 1	0	* 1	1	1	0	* 1	1	0	0	1	1	1	1	16
C	1	* 1	1	1	1	* 1	1	1	1	1	1	1	1	1	1	1	* 1	1	* 1	* 1	* 1	1	1	* 1	24
D	0	* 1	0	1	* 1	0	0	* 1	0	* 1	* 1	0	* 1	* 1	1	0	* 1	1	0	0	1	1	1	1	15
E	1	* 1	* 1	1	1	* 1	* 1	* 1	* 1	1	1	1	1	1	1	* 1	1	1	0	* 1	* 1	1	1	1	23
F	1	* 1	1	1	1	1	1	* 1	1	1	1	1	1	1	1	1	1	1	* 1	* 1	1	1	1	1	24
G	1	* 1	1	1	1	* 1	1	* 1	1	1	1	* 1	1	1	1	1	1	1	0	* 1	1	1	1	1	23
H	1	* 1	* 1	1	* 1	* 1	* 1	1	* 1	* 1	* 1	0	* 1	* 1	* 1	* 1	* 1	1	0	0	1	* 1	* 1	* 1	21
I	1	* 1	1	1	1	* 1	1	1	1	1	1	* 1	1	1	1	1	* 1	* 1	0	0	1	1	1	1	22
J	1	* 1	* 1	1	* 1	* 1	* 1	* 1	* 1	1	1	1	1	1	1	1	* 1	* 1	* 1	* 1	* 1	1	1	1	24
K	1	* 1	* 1	1	* 1	* 1	* 1	* 1	* 1	* 1	1	1	1	1	1	* 1	* 1	* 1	* 1	* 1	* 1	1	1	1	24
L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	* 1	1	1	1	1	* 1	1	1	1	24
M	* 1	1	1	1	1	0	* 1	* 1	* 1	* 1	1	* 1	1	1	1	* 1	* 1	* 1	0	0	* 1	* 1	1	1	21
N	* 1	* 1	* 1	* 1	1	0	0	0	0	* 1	* 1	0	1	1	1	0	* 1	* 1	0	0	* 1	1	1	1	16
O	* 1	* 1	* 1	* 1	1	0	0	0	0	* 1	* 1	1	1	1	1	0	* 1	* 1	0	0	* 1	1	1	1	16

P	1	*	*	1	1	1	*	*	*	*	*	1	1	1	1	1	*	1	*	*	*	1	1	1	24
Q	1	1	1	1	1	1	*	1	*	1	1	1	*	1	1	1	1	1	*	1	*	1	1	1	24
R	*	*	*	1	1	0	*	1	*	1	1	1	*	1	1	1	*	1	1	*	1	1	*	1	22
S	1	1	1	1	1	1	1	1	1	1	1	1	*	1	1	1	1	1	1	*	1	1	1	1	24
T	1	1	1	1	1	1	*	*	1	1	1	1	*	*	1	1	1	1	1	1	1	1	*	1	24
U	0	1	0	0	0	0	0	0	*	1	0	0	0	0	0	0	0	0	*	1	0	0	1	1	9
V	0	*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	5
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	1	3
X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	1	4	
ependance rate	19	22	18	20	20	14	16	19	16	20	20	15	20	21	21	16	20	21	9	13	23	24	24	24	

Source: research findings

In the next step, which is determined by the level of variables, the set of input criteria (prerequisite) and output (the achievement) for each criterion is calculated, and then the common factors are determined. In this step, the criterion has the highest level that the output set (achieved) is equal to the shared set. After identifying the variable or the variables, the row and the columns are repeated from the table and repeat the operation on the other criteria. The outputs and inputs are derived from the initial access matrix (table 3), for this, the number of 1s per row represents the output and the number of 1s in the column equal to input that is given in table 4 for the first level.

Table 4. level 1 measures

Metric name	Output	Input	Sharing	Level
A	ABCDEFGHIJKLMNQRSTU VWX	ABCEFGHIJKLMNQRST	ABCEFGHIJKLMNQP RT	
B	ABDEHJKMNOQRUVWX	ABCDEFGHIJKLMNQRST UV	ABDEHJKMNOQRUV	
C	ABCDEFGHIJKLMNQRST UVWX	ACEFGHIJKLMNQRST	ACEFGHIJKLMNQP RST	

D	BDEHIKMNOQRUVWX	ABCDEFGHIJKLMNQRST	BDEHIKMNOQR	
E	ABCDEFGHIJKLMNQRSTU VWX	ABCDEFGHIJKLMNQRST	ABCDEFGHIJKLMNO PQRT	
F	ABCDEFGHIJKLMNQRST UVWX	ACEFGHIJKLPQST	ACEFGHIJKLPQST	
G	ABCDEFGHIJKLMNQRSTU VWX	ACEFGHIJKLPQRST	ACEFGHIJKLPQRT	
H	ABCDEFGHIJKLMNQRUV WX	ABCDEFGHIJKLPQRSTU	ABCDEFGHIJKMPQR U	
I	ABCDEFGHIJKLMNQRUV WX	ACEFGHIJKLPQRST	ACEFGHIJKLPQR	
J	ABCDEFGHIJKLMNQRST UVWX	ABCDEFGHIJKLMNQRST	ABCDEFGHIJKLMNO PQRST	
K	ABCDEFGHIJKLMNQRST UVWX	ABCDEFGHIJKLMNQRST	ABCDEFGHIJKLMNO PQRST	
L	ABCDEFGHIJKLMNQRST UVWX	ACEFGIJKLPQRST	ACEFGIJKLPQRST	
M	ABCDEGHIJKLMNQRUV WX	ABCDEFGHIJKLMNQRST	ABCDEGHIJKLMNO QR	
N	ABCDEJKMNOQRUVWX	ABCDEFGHIJKLMNQRST U	ABCDEJKMNOQRU	
O	ABCDEJKMNOQRUVWX	ABCDEFGHIJKLMNQRST U	ABCDEJKMNOQRU	
P	ABCDEFGHIJKLMNQRST UVWX	ACEFGHIJKLPQRST	ACEFGHIJKLPQRS T	
Q	ABCDEFGHIJKLMNQRST UVWX	ABCDEFGHIJKLMNQRST	ABCDEFGHIJKLMNO PQRST	
R	ABCDEGHIJKLMNQRSTU VWX	ABCDEFGHIJKLMNQRST U	ABCDEGHIJKLMNO QRTU	
S	ABCDEFGHIJKLMNQRST UVWX	CFJKLPQST	CFJKLPQST	
T	ABCDEFGHIJKLMNQRST UVWX	ACEFGJKLPQRST	ACEFGJKLPQRST	
U	BHNORUVWX	ABCDEFGHIJKLMNQRST UVX	BHNORUVX	
V	BUVWX	ABCDEFGHIJKLMNQRST UVWX	BUVWX	1
W	VWX	ABCDEFGHIJKLMNQRST UVWX	VWX	1
X	UVWX	ABCDEFGHIJKLMNQRST UVWX	UVWX	1

Source: research findings

In Table 4, level 1 metrics are extracted, which include measures of V which represent the understanding errors, W represents arbitrage and X bias. Indeed recognition error, orbitrage and bias are in the first level of paradigm. To

determine the second-level criteria, now it is appropriate to remove the row and the columns of these three criteria from the initial access matrix and re-perform the input and output calculations. The results of the operation are listed in table 5.

Table 5. Level 2 metrics

etric name	Output	Input	Sharing	Level
A	ABCDEFGHIJKLMNQRSTU	ABCEFGHIJKLMNQRS T	ABCEFGHIJKLMNQRST	
B	ABDEHJKMNOQRU	ABCDEFGHIJKLMNQRSTU	ABDEHJKMNOQRU	2
C	ABCDEFGHIJKLMNQRSTU	ACEFGHIJKLMNQRST	ACEFGHIJKLMNQRST	
D	BDEHJKMNOQRU	ABCDEFGHIJKLMNQRST	BDEHJKMNOQR	
E	ABCDEFGHIJKLMNQRSTU	ABCDEFGHIJKLMNQRST	ABCDEFGHIJKLMNQRST	
F	ABCDEFGHIJKLMNQRSTU	ACEFGHIJKLPQST	ACEFGHIJKLPQST	
G	ABCDEFGHIJKLMNQRSTU	ACEFGHIJKLPQRST	ACEFGHIJKLPQRT	
H	ABCDEFGHIJKMNOQRU	ABCDEFGHIJKLPQRST U	ABCDEFGHIJKMPQRU	
I	ABCDEFGHIJKLMNQRSTU	ACEFGHIJKLPQRST	ACEFGHIJKLPQR	
J	ABCDEFGHIJKLMNQRSTU	ABCDEFGHIJKLMNQRST	ABCDEFGHIJKLMNQRST	
K	ABCDEFGHIJKLMNQRSTU	ABCDEFGHIJKLMNQRST	ABCDEFGHIJKLMNQRST	
L	ABCDEFGHIJKLMNQRSTU	ACEFGIJKLPQRST	ACEFGIJKLPQRST	
M	ABCDEGHIJKLMNQRSTU	ABCDEFGHIJKLMNQRST	ABCDEGHIJKLMNQRST	
N	ABCDEJKMNOQRU	ABCDEFGHIJKLMNQRSTU	ABCDEJKMNOQRU	2
O	ABCDEJKMNOQRU	ABCDEFGHIJKLMNQRSTU	ABCDEJKMNOQRU	2
P	ABCDEFGHIJKLMNQRSTU	ACEFGHIJKLPQRST	ACEFGHIJKLPQRST	
Q	ABCDEFGHIJKLMNQRSTU	ABCDEFGHIJKLMNQRST	ABCDEFGHIJKLMNQRST	
R	ABCDEGHIJKLMNQRSTU	ABCDEFGHIJKLMNQRSTU	ABCDEGHIJKLMNQRST U	2
S	ABCDEFGHIJKLMNQRSTU	CFJKLPQST	CFJKLPQST	
T	ABCDEFGHIJKLMNQRSTU	ACEFGJKLPQRST	ACEFGJKLPQRST	
U	BHNORU	ABCDEFGHIJKLMNQRSTU	BHNORU	2

Source: research findings

In Table 5, level 2 criteria are extracted which include measures B which represent optimism, N represents risk management, O represents saving management, R represents personal factors and U represents psychological projection. To determine the level of the third level, the row and column of the five criteria must also be omitted from the initial access matrix and re-performed the input and output calculations. The results are presented in Table 6.

Table 6: Level 3 metrics

Metric name	Output	Input	Sharing	Level
A	ACDEFGHIJKLMPQT	ACEFGHIJKLMPQST	ACEFGHIJKLMPQT	
C	ACDEFGHIJKLMPQST	ACEFGHIJKLMPQST	ACEFGHIJKLMPQST	
D	DEHJKMQ	ACDEFGHIJKLMPQST	DEHJKMQ	3
E	ACDEFGHIJKLMPQT	ACDEFGHIJKLMPQST	ACDEFGHIJKLMPQT	3
F	ACDEFGHIJKLMPQST	ACEFGHIJKLPQST	ACEFGHIJKLPQST	
G	ACDEFGHIJKLMPQT	ACEFGHIJKLMPQST	ACEFGHIJKLMPQT	
H	ACDEFGHIJKMPQ	ACDEFGHIJKLMPQST	ACDEFGHIJKMPQ	3
I	ACDEFGHIJKLMPQ	ACEFGHIJKLMPQST	ACEFGHIJKLMPQ	
J	ACDEFGHIJKLMPQST	ACDEFGHIJKLMPQST	ACDEFGHIJKLMPQST	3
K	ACDEFGHIJKLMPQST	ACDEFGHIJKLMPQST	ACDEFGHIJKLMPQST	3
L	ACDEFGHIJKLMPQST	ACEFGIJKLMPQST	ACEFGIJKLMPQST	
M	ACDEGHIJKLMPQ	ACDEFGHIJKLMPQST	ACDEGHIJKLMPQ	3
P	ACDEFGHIJKLMPQST	ACEFGHIJKLMPQST	ACEFGHIJKLMPQST	
Q	ACDEFGHIJKLMPQST	ACDEFGHIJKLMPQST	ACDEFGHIJKLMPQST	3
S	ACDEFGHIJKLMPQST	CFJKLPQST	CFJKLPQST	
T	ACDEFGHIJKLMPQST	ACEFGJKLPQST	ACEFGJKLPQST	

Source: research findings

In Table 6, level 3 metrics are extracted which include criterion D represents greed, E represents Financial Knowledge, H represents self-esteem, J represents personal financial management, K represents financial self-efficacy, M represents cash flow, and Q represented financial experiences. To determine the fourth-level criteria, the row and column of the seven criteria must also be removed from the initial access matrix and re-performed the input and output calculations. The results are presented in Table 7.

Table 7. Level 4 metrics

Metric name	Output	Input	Sharing	Level
A	ACFGILPT	ACFGILPST	ACFGILPT	4
C	ACFGILPST	ACFGILPST	ACFGILPST	4
F	ACFGILPST	ACFGILPST	ACFGILPST	4
G	ACFGILPT	ACFGILPST	ACFGILPT	4
I	ACFGILP	ACFGILPST	ACFGILP	4
L	ACFGILPST	ACFGILPST	ACFGILPST	4
P	ACFGILPST	ACFGILPST	ACFGILPST	4
S	ACFGILPST	CFLPST	CFLPST	
T	ACFGILPST	ACFGLPST	ACFGLPST	

Source: research findings

In Table 7, level 4 metrics are extracted which include measures, A represents self-control, C represents consultative thinking, F represents financial education, G represents objective financial knowledge, I represents mental financial knowledge, L represents the economic status of society and P represents investment knowledge. Now to determine the fifth-level criteria, the row and column of these seven measures will be eliminated from the initial access matrix and re-performed the input and output calculations. The results are shown in Table 8. At this level, the criteria include S representing the environmental factors and T the background of financial behavior.

Table 8: level 5 metrics

Metric name	Output	Input	sharing	Level
S	ST	ST	ST	5
T	ST	ST	ST	5

Source: research findings

ISM interaction network

In the fifth step, the ISM interaction network is drawn using the levels obtained from the criteria. If there is a relationship between the two variables, i and j , we denote it by a directed arrow. The resulting final diagram is represented by deleting the intrusions and using the segmentation of the surfaces obtained in Figure 2.

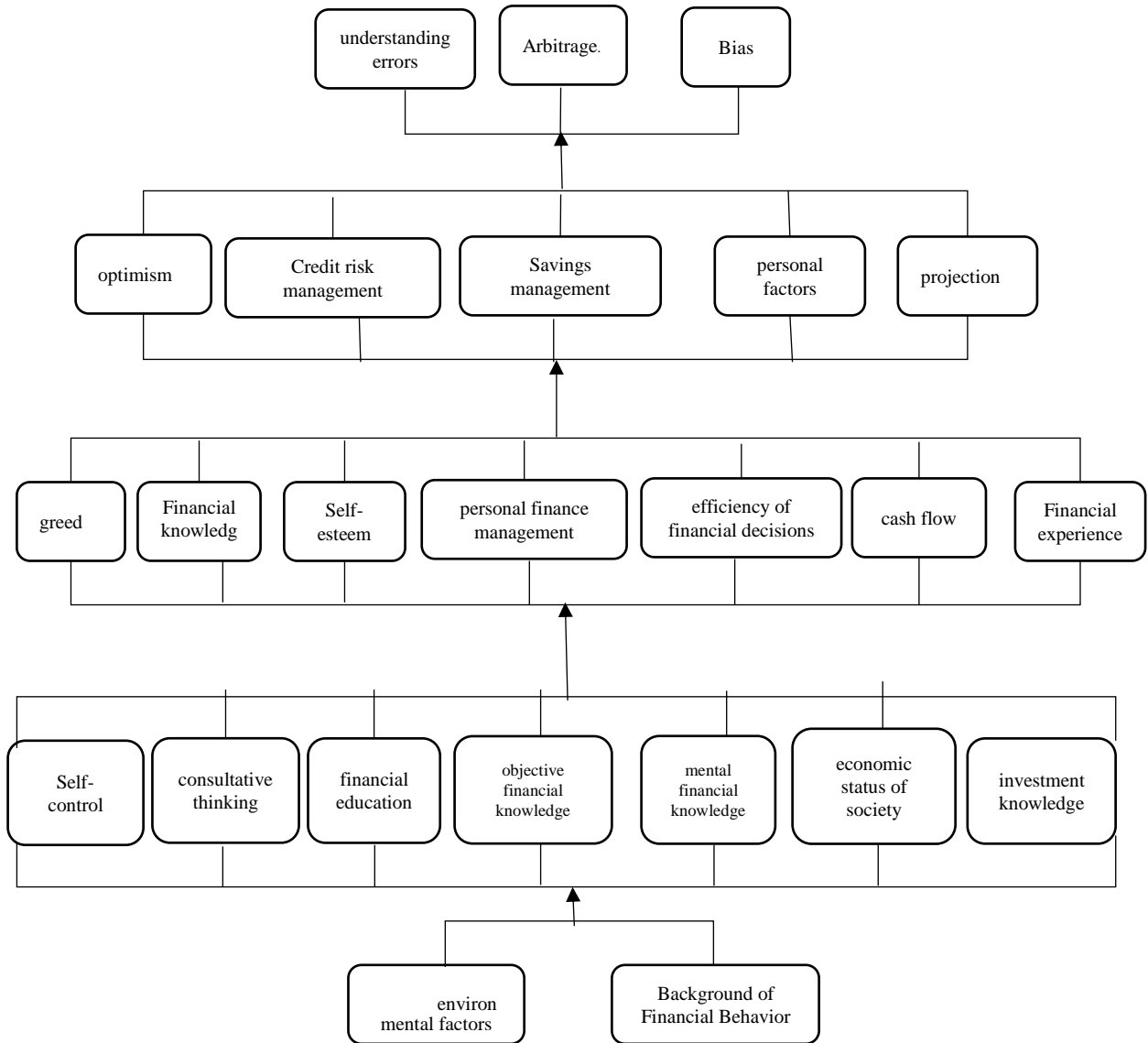


Figure 2. The project ISM paradigm

According to figure 2, the research paradigm consists of five levels, which are two criteria of environmental factors and the background of financial behavior at the five and the most effective criteria. The first level of the paradigm is at the disposal of three measures of perceptual mistakes, arbitrage, and bias, which are characterized by criteria.

MICMAC analysis

The research paradigm can now be shown in terms of power and influence power, as shown in figure 2. Accordingly, only s criterion which represents environmental factors is independent variables. This means that the variable of environmental factors has low dependence and high lead, in other words, strong influence and low influence on the characteristics of this variable. Criteria U, V, W, and X represent psychological projection, understanding errors, arbitrage, and bias, respectively, these variables have a strong attachment and weak guidance, these variables are mainly affected and have little influence. The other variables are interface type, these variables have high dependence and high conductivity. In other words, the impact of these variables is very high and any small change on these variables causes major changes.

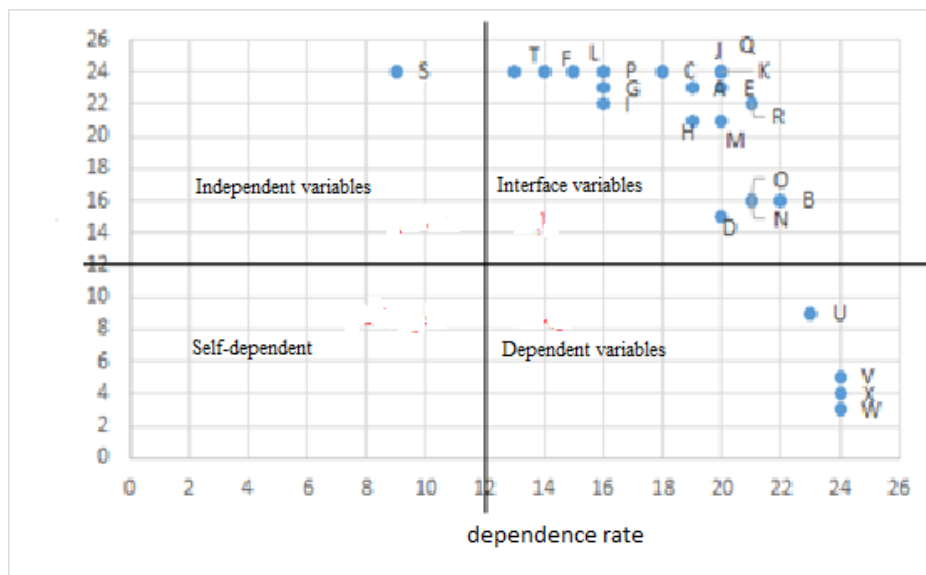


Figure 3: The influence of the influence-dependency power matrix

Discussion and conclusions

Self-control investors can prevent emotional reactions in stock markets and increase the predictability of their behavior. Lack of self-control among investors can lead them to herd behavior in financial markets that often lead to undesirable results in investment. The third level of this research has been an attempt to investigate variables of greed, financial literacy, self-esteem, personal financial management, financial decisions, cash flow, and financial

experience. Greed affects the financial behavior of investors. Avarice and greed have different effects such as an incentive to gain higher income and greater savings to prevent the existence of financial problems and have consequences such as greed rather than high investment and liquidity that brings big financial problems. Another variable at this level is the financial literacy paradigm. The financial literacy level of investors affects their financial behavior. To acquire financial literacy, a set of knowledge and skills should be learned. This knowledge helps investors make decisions that are effective in saving and investing. If investors have adequate financial literacy, their financial behavior could lead to the acceptable outcomes.

The reason is that the appropriateness of the investor's financial literacy is always accompanied by rational and irrational decisions. Therefore, improving the skill level of investors or interest in investment should be put on the agenda of decision-makers and investment sector executives in the country's economy so that the stock exchange can play its role in the economy by relying on appropriate financial and literate investors. From the perspective of self-esteem, self-esteem is the most important factor in an individual's life and the factor that determines his success or failure in different stages of life. Low self-esteem increases anxiety that lead to poor individual performance. One of the valuable findings of this research is self-esteem that affects investor behavior and predicts their behavior. Experts believe that experience has shown people with higher self-esteem and better performance.

Low self-esteem in investors makes them confused in their decisions. For cultivating individuals and investors with good self-esteem, people should take careful planning from childhood and adolescence with the help of parents and institutions of education in the country. In many countries, the concept of personal finance is still unfortunately alien to many people. If you want assets, income, liabilities and all of your finances. Personal finance is one of the best tools to know where your customers are. Personal financial management will facilitate investments, bank accounts, and credit cards and give you a clear picture of its performance. The tool will give you an overview of the status quo and show where you spend your money. Personal financial management is considered in comparison to accounting and corporate finance and administration. The variable that this research has found to predict the financial behavior of investors in Iran.

Personal financial management as apps and software at the beginning of the project did not many facilities to their users. Using artificial intelligence has revolutionized this field, and now the tools of personal financial management

have introduced many new possibilities to users. Unfortunately, in Iran, personal financial management has serious growth obstacles; from the culture and lifestyle of people to banks that prevent deals with these businesses, but it seems that their promotion and development by national media and higher education centers can eliminate these barriers. However, managing a person's finances requires something beyond knowledge and financial literacy. A person needs a sense of confidence and self-assertion. This personal characteristic is self-efficient in psychological sources and studies. The efficiency of financial decisions and their level in investors is very effective in their financial behavior. Financial decisions support financial management in individuals and investors. Cash flow is another variable in the third level of this research. Increasing or decreasing cash flow always affects the financial behavior of investors and investors by using personal financial management and other variables identified in this study makes financial behavior rational. Financial experience of other variable investors is at the third level of this paradigm. Experienced and inexperienced investors differ from each other.

Thus, more experienced financial investors usually have more rational and predictable behavior. In the second level, the paradigm includes projections, personal factors, savings management, credit risk management, and optimism. Projection is a defensive mechanism in which individuals unconsciously impute their desires, actions, and behaviors to others. Investors that have a projection feature do not accept responsibility for the mistakes and their investments and leave it to others. The projection plane can change the financial behavior of investors. The decisions of each investment person are influenced by his personal factors. These factors include age, stage of life, occupation, economic status, lifestyle, personality, and personal image. The crucial importance of money or anything about financial skills, money acquisition, and money management in our lives is neither taught at school nor in universities. Saving management is a significant variable that is identified in this research and ability or weakness in saving management can create different behaviors from investors in the country.

It is appropriate for the country's schools and universities to take action to educate the savings of savings. Credit risk management is another important variable that is known at the third level of this paradigm. Credit risk stems from the fact that the contracting party cannot or will not fulfill the contractual obligations. Credit risk and its management affect investor behavior in the stock exchange. Optimism is a variable which always affects the financial behavior of investors. Experts believe that investors that enjoy high optimism and operating at low investment levels will increase corporate investment

levels. While investors with low level of optimism in firms with high investment levels lead to a decrease in investment. At the first and second level of this paradigm, arbitrage variables are cognitive biases. Simultaneous purchase and sale of an asset for profit from different prices are said. The extent of arbitrage in any market must affect the financial behavior of investors. Limits to arbitrage make rational investors unable to use arbitrage opportunities because it requires accepting some risks. This is very important for the financial behavior of investors. Another variable bias in this level is the research paradigm. Bias means not being neutral or impartial towards a phenomenon, event, belief, value, or so on.

In the behavioral biases, investors based on past performance of firms have specific mental categories in their minds to predict future events and seek similarities in firms' performance. Usually, biases cause investors to interpret the processes as wrong and this in turn affects their financial behavior. Therefore, investors should learn by spending periods of analysis of stock market trends that make their interpretation away from any bias to obtain good results. Since perception affects behavior, a wrong perception also affects behavior. Perceptual illusions and biases are due to investors' tendency to prefer shortcuts and excessive emphasis on experience, unfounded feelings, hallucinations and calculations of thumb and generally with reality. Although some of these mistakes may have positive results, but the probability of negative results are much higher.

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