

# Risk psychology and decision-making behavior of traders (Prospect Theory test)

Reza Khezri, Asgar Pakmaram\*, Rasool Abdi, Nader Rezaei

*Department of Accounting, Bonab Branch, Islamic Azad University, Bonab, Iran*

*(Communicated by Javad Vahidi)*

---

## Abstract

Prospect Theory basically describes how people evaluate profits and losses. This theory indicates that a person makes a certain choice, but does not expect a definite result. The present study predicts the causal relationships between the constructs of prospect theory including risk attitude, subjective accounting and overconfidence, and decision-making behaviour of traders resulting from mass behaviour, cognitive, and emotional bias. The statistical population is active traders in the capital market within the country and a standard questionnaire was used to collect data. The relevant analyzes were performed based on the Lineal Structural Relations approach after performing the reliability and validity tests of the sample data. The test results of the hypotheses showed that the structures of prospect theory have a significant effect on the decision-making behaviour of traders.

Keywords: Prospect Theory, Risk Psychology, Decision Making Behavior  
2020 MSC: 86A20, 91B05, 91G45, 90B50, 91E99

---

## 1 Introduction

The traditional financial theory states that the share price reflects its underlying value as well as the value of future cash flows. According to the perspective of the efficient market hypothesis, the price of securities reflects all the information available in the market and it is expected that the impact of any new information in the market will be reflected quickly in the stock prices of companies. According to this theory, investors have rational behaviour and seek to maximize their expected utility. Accordingly, stock price changes are related to systematic changes in the firm's core values. But the evidence suggests that there is a positive relationship between investors' emotional and cognitive tendencies and stock returns which have higher subjective ratings. As a result, the behavioural conditions of capital market participants should be examined based on emotional and environmental variables. In other words, in addition to fundamental factors, it is necessary to consider the impact of behavioural and emotional factors of investors on stock prices [11].

The financial basis of behaviour consists of the correspondence between the investor's feelings and the way the investor decides. Findings show that investors do not always behave rationally and without bias, as the current models show. According to psychological theories, human beings tend to keep certain events in their minds in the form of perceptions, and these mental perceptions sometimes have more effects than the events themselves on people's

---

\*Corresponding author

*Email addresses:* rezakhezri4819@gmail.com (Reza Khezri), pakmaram@bonabiau.ac.ir (Asgar Pakmaram), abdi\_rasool@yahoo.com (Rasool Abdi), naderrezaeimindoab@gmail.com (Nader Rezaei)

behaviour. Numerous studies have shown the irrational behaviour of individuals in investment and monetary matters [19]. Behavioural finance helps by formulating behavioural models, the trader can better understand his capital market and act better in overcoming some bottlenecks caused by behavioural patterns. Behavioural finance is examined at both micro and macro levels [38].

Numerous theories argue that behavioural investments are more important in the emergence of markets than in developed markets. Psychology, which is part of the social sciences, influences the behaviours of investors who trade in the stock market and is one of the strong arguments of investors who believe that behavioural investment theory is one of the behavioural components in that the market fluctuates. They are effective. Some behavioural components include Prospect Theory. This theory includes hatred of loss, hatred of remorse and condemnation, and mental reckoning [33]. In an economy, stocks should not only be viewed from the perspective of buying and selling, but also create a position in which financial managers will be located in the future and will be affected by the consequences of this movement. They realize that an environment has been created for them where they can easily make decisions about sound financial planning and move towards making good decisions. Stocks are one of the best-known positions in companies in which the company's capital grows [30].

Investors in behavioural portfolio theory do not view their portfolio as a whole, but as a set of subset accounts in which each subset is associated with a goal and each goal has a threshold level. In fact, investors look at the expected returns and the risk of each subset with the probability of failure to reach the return threshold level. Behavioural portfolio theory states that the efficient boundary is considered separately for each subjective account, and risk is the probability of not reaching the return threshold level rather than the standard deviation of returns [11]. Behaviourists of behavioural finance firmly believe that knowledge of psychological inclinations in the field of investment is absolutely necessary and requires serious development of the field of study, and for those who see the role of psychology in financial knowledge as a factor influencing stock markets and investor decisions, they know that it is difficult to accept the existence of doubts about the financial credibility of a behaviour [42].

Ignoring the behavioural components is very destructive for capital decisions because sometimes the investor is not rational and does not invest rationally and makes decisions without knowledge and only with behavioural components such as individual feelings and prejudices. Therefore, the purpose of this study with the help of behavioural financial theories, especially Prospect Theory, is to help traders make optimal investment decisions based on their preferences and interests, as well as the conditions of the decision environment. Therefore, the necessity of conducting research on the effect of risk psychology in the formation of the phenomenon of behavioural and emotional bias and mass behaviour is felt more than ever and the need to research the gap in this field in the Iranian capital market is needed. Given the existence of mass and irrational decision-making behaviour, the problem of this research is how to understand the decision-making behaviour of traders concerning the structures of risk psychology. Conducting research involves extensive activities to achieve scientific results and achievements in a careful search. Hence, this study seeks to answer the question that psychological constructs risk the decision-making behaviour of traders. In order to answer this question, the causal relationships of risk psychological constructs (risk attitude, subjective accounting and overconfidence) and traders' decision-making behaviour (mass behaviour, cognitive and emotional biases) are studied. The results of the present study are expected to help managers, financial analysts, investors and other stakeholders to better understand the decision-making structures of traders in relation to risk psychology and help them make the right financial and investment decisions. The present study has continued with the presentation of theoretical foundations and background of research related to the subject as well as explaining the research method and hypotheses derived from the problem and theoretical foundations of research and then explaining the results of testing the hypotheses. Finally, conclusions and practical suggestions are expressed.

## 2 Theoretical Foundations and Research Background

This research follows the Prospect Theory to lay the theoretical foundations. The first premise of Prospect Theory is how traders sometimes systematically ignore the theory of utility. [36] stated that when traders are making a loss, they then shift from risk aversion to risk-taking. The role of Prospect Theory in financial behaviour can be considered as the theory of desirability in financial behaviour and investment. Prospect Theory basically describes how individuals evaluate profits and losses, and this theory shows that a person makes a certain choice, but does not expect a definite result [9].

Some people invest and trade in order to control the company. Investors need a large number of shares in order to consolidate their position in terms of board members and make key decisions in the company in which they want to invest. Many researchers acknowledge that behavioural investment is one of the good areas for understanding and defining emotions, feelings and other behavioural components that affect investment decisions and performance [4].

Numerous theories and theories argue that behavioural investments are very important in the emergence of markets compared to developed markets. In classical economics, people are assumed to have fixed and cognitive expectations and to seek to maximize their expectations; another group finds that human beings face limitations in dealing with issues rationally [19].

Prospect Theory [36] and comprehensive landscape theory [37] in some cases violate (and evolve) the expected utility theory [41] and, in fact, Prospect Theory and theory Comprehensive perspectives have emerged in the critique of the theory of expected utility, and unlike the theory of expected utility, in the Prospect Theory the measurement of value is not based on the final asset, but this value is measured in terms of profit and loss [41]. In these two theories, compared to the expected utility theory, the value function has replaced the utility function and also the weighting function has replaced the probabilities. The research of [37] shows that the way of weighing the profit and loss is different in different people and also people in the same situation, according to their situation in terms of profit and loss, give different responses to the situation [22].

The presupposition of Prospect Theory is that investors have an individual basis for risk-taking, and most of the time they are more sensitive to risk based on their starting point. Prospect Theory, as an alternative theory for describing risky decisions, is an attempt to yoke off real-world violations from the theory of ultimate utility. This theory divides the process of behaviour and decision into two phases: first, the correction phase, in which in that initial analysis, the selection problem is performed and in the second, the evaluation phase, in which the corrected perspectives are evaluated and the desired perspective is selected. Prospect Theory is introduced as a topic to understand how the risk framework works in economic behaviours and expands the field of risk psychology. The three main areas of this theory are introduced as follows [40].

**Risk Attitude (Loss Avoidance):** One of the most important phenomena and topics in the theory of risky exposure and uncertainty is that loss has a greater emotional effect than the same amount of profit. The observed asymmetry between profitability and profitability is more than can be justified by the effects of income or risk aversion [17].

**Mental accounting:** Mental frameworks and accounts are part of Prospect Theory that addresses the tendency of people to place special events in different mental accounts based on physical characteristics. Mental accounting can help explain why investors are reluctant to re-adjust their turning point for a new stock [34]. The basic idea about mindful accounting is that investors tend to keep different types of risks or risks in mind when making decisions. In fact, mental accounting helps explain why, in a world free of transaction costs and open taxes, people differentiate between dividends and capital gains. Mental accounting is more about knowing the psychology of choice [26].

**Overconfidence:** Some investors and financial activists, with the support of experience and even sometimes their skills, enter into trades and trades that are unreasonable, in fact, some people about abilities such as predictability and their intelligence perceptions are overconfident. These people usually do not use the method of diversification and investment portfolio and, based on their personal judgment, buy the shares of a few limited companies and usually move in the opposite direction to other investors. Success in previous investments can lead to this false self-confidence, because people credit their successes more than failures and underestimate the risk. Typically, this is more in the early stages of investment and with a few continuous successes occurring and with increasing experience fades. These traders have higher trading volumes and trading sequences, but lower returns. This bias has an interesting feature, and that is that it is found more in knowledgeable and knowledgeable people, and leads to a decrease in the efficiency of these people in transactions. The first effect of overconfidence on investors is that these people trade more. A lot of trading is not bad in itself and does not pose a problem if the ability to analyze can cover trading costs [27].

Psychology, which is part of the social sciences, influences the behaviours of investors who invest in the stock market and is one of the strong arguments of investors who believe that behavioural investment theory is one of the behavioural components that fluctuate and fluctuate [2]. Ignoring the behavioural components of highly destructive capital decisions; Because when an investor is rational and invests rationally and makes decisions without knowledge of behavioural components such as personal feelings and prejudices, the result he will eventually achieve is to blame and condemn himself in a situation where he has devalued his stock [16].

Cognitive psychology considers man as an information-processing and problem-solving being. This view seeks to explain behaviour by studying the ways in which one pays attention to, interprets, and uses existing information. Cognitive psychology, like the psychoanalytic view, focuses on internal processes but emphasizes how people acquire and interpret information and use it to solve problems, rather than emphasizing desires, needs, and motivations. Unlike psychoanalysis, the psychological basis is not the underlying motivations, feelings, and conflicts, but the mental processes that we are aware of and can easily be evaluated. This approach contrasts with learning theories that consider the external environment to be the root cause of behaviour. Basically, a cognitive perspective focuses on current thoughts and problem-solving rather than personal history. In this perspective, the relationships between

emotions, motivations and cognitive processes and as a result, the overlap between cognitive perspective and other approaches are revealed [3].

Each cognitive bias can be explained as a pattern of deviation in judgment (individual to society), which occurs in a particular situation. The concept of this model is sometimes interpreted as a model of distortion of reality, which may depend on the judgment of people who are perceptual in certain situations and a number of independent factors that can be researched. The existence of some of these cognitive biases has been theoretically examined in psychology, others can be identified as pervasive beliefs in practice, and these beliefs themselves may even be the result of another cognitive bias. Cognitive psychology is the offspring of Gestalt psychology, introduced in the 1920s. The hallmark of the cognitive perspective is relatively little attention to the relationship between stimulus-response and neural activity. The main focus of this approach is on issues such as perception, problem-solving through intuition, decision making and understanding. Cognition is central to all of these processes. Hence cognition is a general concept that encompasses all forms of consciousness and includes perception, thinking, reasoning and judgment. The cognitive revolution encompasses all perspectives that attach great importance to these issues. Topics such as how and with what structure man understands, recognizes and solves problems, and how the mind perceives information received from the senses, or how human memory works and what its structure is, are major issues. Remarkable scientists in this field. Cognitive psychologists look at the mind as an information processor and their approach to studying the brain and mind is based on the similarity of brain function with the computer [3].

Collective behaviour as one of the important issues discussed in the financial behavioural paradigm, explains the situation in which individuals perform uniform and oriented behaviours in a given time period. If the reason for the collective behaviour is their use of shared information, then the collective behaviour is called false collective behaviour or unintentional collective behaviour [15]. Collective behaviour is divided into conscious and unconscious parts. Conscious collective behaviour is the conscious choice to ignore personal information and analysis and to follow and imitate collective behaviour. In fact, individuals may, for some reason, follow the decisions of others when consciously displaying collective behaviour. This type of collective behaviour is an undesirable phenomenon that can disrupt market efficiency by disrupting financial markets [12]. Hence, unconscious collective behaviour can be considered as a kind of characteristic of information behaviour. Intentional collective behaviour is an anomalous behavioural phenomenon that can lead to disturbances in the equilibrium relationship of asymmetric information and thus create uncertainty in the quality of financial information [7].

### 3 Experimental Background

In [31] study concluded that there is a negative relationship between financial literacy and behavioural biases of investors. In [39] study showed that the health crisis and the subsequent lockout is accompanied by an unprecedented change in the economic sentiment of investors. Their analysis shows that the change in sentiment is significantly more pronounced in the EU countries that suffered the most economically. In [8] a study showed that investors are all exposed to a diverse environment and are constantly changing and uncertain, and in this situation, they must create capabilities that can withstand and overcome times of financial crisis. Charles and Kasilingam [10] in their research seek to understand the effect of behavioural bias factors on investors' investment performance. They finally identified six factors of behavioural bias to understand their effect on investor performance, namely temperament, emotions, innovative methods, framework, personality and gambling. Finally, the research findings show that all the selected factors in this study have a significant effect on the investment performance of investors. In [18], the authors have established a link between a dynamic sales plan and the behaviour of traders. The results of this study showed that dynamic trading programs in different ways create rules in the transaction and show what traders should do and what not to do, and a dynamic trading program should cover all aspects of a trade. Cover and even determine the purpose of profit and loss and risk range to internalize those rules, criteria and strategies so as not to fall into the trap of capital market precipices.

[28] made a comparative study of the relationship between the stock market index and search volume in order to identify the behavioural pattern of stock market traders and explained the relationship between these two indicators to improve the behavioural conditions of market traders. [13] investigated the effect of investors' emotional behaviour and free-floating stocks on the stock returns of the Tehran Stock Exchange using the generalized torque method and concluded that the emotional behaviour of shareholders increased eleven free floating stocks. [17] studied the effect of investors' personality traits on investment performance with the mediating role of revelatory biases and concluded that there is a positive relationship between personality traits and revelatory biases.

## 4 Decision-Making Behavior of Traders

### 4.1 Traders Behavior Model

If investors in the market behave like a herd and imitate each other, the stock returns of each company will converge toward the average value of the market trend. So herd behaviour is based on the nonlinear negative relationship between CSAD cross-sectional deviation variables and the mean market return square  $R_{m,t}^2$ , as described in Equation (4.1):

$$CSAD_t = \alpha + \gamma_1 [R_{m,t}^2 + \varepsilon t] + y_2 R_{m,t}^2, \quad (4.1)$$

where CSAD represents the measure of the absolute cross-sectional deviation of [9] from the herd behavior of investors. They defined this criterion based on the CAPM model as described in Equation (4.2):

$$CSAD_t = \frac{1}{N_t} \sum_{i=1}^{N_t} |R_{i,t} - R_{m,t}|. \quad (4.2)$$

The CSAD criterion is calculated for each industry and takes into account the specific shares of that industry. In this study, following [35] and [6], the weighted approach is used to calculate the average market return. In addition, to calculate the stock returns of each company,  $r_{i,t}$  uses a series of adjusted prices with increasing capital and cash dividend as described in Equation (4.3):

$$r_{i,t} = \frac{(P_t - P_{t-1}) + DPS + \text{Priority} + \text{Award share}}{P_{t-1} + (1000 \times \text{Percentage of capital increase brought from the place})} \quad (4.3)$$

where  $P_{t-1}$  and  $P_t$  represent the base price and the daily price of the company, respectively, and the meaning of DPS is cash dividends paid. In addition, the daily market return is calculated using the total index of the Tehran Stock Exchange, TEPIX, as described in Equation (4.4):

$$R_{m,t} = (\ln TEPIX_t - \ln TEPIX_{t-1}) \times 100. \quad (4.4)$$

If there is herd behavior, it is expected to be negative and statistically significant in relation (4.1)  $y_2$ .

### 4.2 Generalized CSAD Model of Herd Behaviors

Based on what was stated in the Theoretical Foundations section and following [6] in this study, Equation (4.1) was reviewed and three new variables of  $turnover_{m,t}$  trading volume changes, an imaginary variable that the impact of nuclear crisis periods and market price bubbles Highlights Tehran's securities in the model, and the  $Sent_t$  sentiment index, which measures the degree and extent of investors' unrest and fear, is added to the description of Equation (4.5):

$$CSAD_t = \alpha + \gamma_1 |R_{m,t}| + \gamma_2 R_{m,t}^2 + \gamma_3 turnover_{m,t} + \gamma_4 Sent_t + \gamma_5 R_{m,t}^2 D_t + \gamma_6 turnover_{m,t} D_t + \gamma_7 Sent_t D_t + \varepsilon_t \quad (4.5)$$

where the variable of turnover share trading volume is defined by dividing the trading volume of shares on day A by the market value on day t. The variable of Santee Investors' Emotion Index, according to the availability of information from the Tehran Stock Exchange, is calculated based on the Capital Markets Emotion Index (EMSI) of Bandopadhyaya and Jones [5] as described in Equation (4.6):

$$EMSI = \frac{\sum (R_{ir} - \bar{R}_r)(R_{iv} - \bar{R}_v)}{\left[ \sum R_{ir} - \bar{R}_r^2 \sum R_{iv} - \bar{R}_v^2 \right]^{\frac{1}{2}}} \times 100, \quad (4.6)$$

where  $+100 \leq EMSI \leq -100$ . Also, the variables  $R_{ir}$  and  $R_{iv}$  are the daily return rank and the historical volatility rank, respectively (the average standard deviation of the daily return from the return of the previous five days for the company  $i$ ). The sample period considered in this study consists of important events such as 1) the stock price bubble in the Tehran Stock Exchange and 2) the nuclear crisis caused by the United States and the West against Iran's nuclear activities; Hence, the imaginary variable  $D_t$  during the above two turbulence periods takes a value of one and otherwise a value of zero. Finally, a negative coefficient of  $y_3$  in Equation (4.5) indicates a negative relationship between CSAD and trading volume and hence possible herd behaviour.

### 4.3 Herd behavior and unsystematic market conditioned volatility

Based on the above, in this study, the conditional non-systematic volatility of the average yield. The market is estimated based on the GJR-GARCH asymmetric approach using the maximum likelihood method [6] the two variables of trading volume changes and CSAD are added to the variance equation of the GJR model to examine their effect on the average non-systematic market condition volatility as described in Equation (4.7).

$$R_{m,t} = c + \varepsilon_t$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \xi_1 I_{[\varepsilon_{t-1} < 0]} \varepsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2 + \delta turnover_{m,t} + \gamma CSAD_t, \tag{4.7}$$

where it is an alternative to the average market return and the error statements  $(t\alpha_2, 0)\mathcal{L}$  t-IID are distributed independently and uniformly under the student t distribution with degree of freedom  $v$ . The coefficients  $\alpha_0, \alpha_1$  and  $\beta_1$  are bound to be positive with the condition  $\geq +0 + \alpha_1$ . The coefficient  $\mathcal{L}$  shows the effect of the lever that for negative shocks,  $0 > 1 - t$ ,  $\mathcal{L}$  more weight is placed on the conditional oscillation. The coefficient of 7 is expected to be negative if there is herd behaviour. Also, in concentrated and small markets, trading volume is expected to negatively affect market volatility ( $\alpha < 0$ ).

### 4.4 Disruptive traders

The conditional variances of the EGARCH model  $(p, d)$  are calculated as follows:

$$\log(\sigma_t^2) = \omega + \sum_{j=1}^q \beta_j \log(\sigma_{t-j}^2) + \sum_{k=1}^r \gamma_k \frac{\varepsilon_{t-1}}{\sigma_{t-1}} + \sum_{i=1}^p \alpha_j \left| \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \right| + v_t. \tag{4.8}$$

In the third step, the Generalized Dickey-Fuller Generalized Test (GSADF) is used to identify bubbles and bubble periods in the stock market price index introduced by [29]. The main feature of this test is that Allows for nonlinear dynamics and structural failure while examining multiple bubbles in a time series. As shown in Figure 1, in this test the starting point  $(r_1)$  is allowed to be in the range  $[r - r, 0]$  is variable. The GSADF statistic is defined as follows:

$$GSADF(r_0) = \begin{cases} \sup \{ADF_{r_1}^{r_2}\} \\ r_2 \in [r_0, 1] \\ r_1 \in [0, r_2 - r_0] \end{cases} \tag{4.9}$$

In the last step, the logit regression model is used to assess the role of traders in the bubble disturbance. (3) is known as the general equation of "logit regression".

$$\log \left[ \frac{p_i}{(1 - p_i)} \right] = Z = \alpha + \sum_{i=1}^k b_i X_i. \tag{4.10}$$

In this study, the dependent variable  $(z)$  is the logarithm of the bubble probability, the independent variables  $(X_i)$  also include the control variables and the emotional variables. Similar to the normal distribution function, the probability that  $Y_i = 1$  is equal to:

$$P(Y_i = 1|X_i'') = G(\acute{X}_i\beta) = \frac{1}{1 + e^{-\acute{X}_i\beta}} = \frac{e^{\acute{X}_i\beta}}{1 + e^{\acute{X}_i\beta}} \tag{4.11}$$

and the probability that  $Y_i = 0$  is equal to:

$$P(Y_i = 0|X_i) = 1 - P(Y_i = 1|X_i) = \frac{1}{1 + e^{\acute{X}_i\beta}}. \tag{4.12}$$

Mass behavior in time: [21] provide the following equation for mass measurement:

$$H_{mt}^* = \frac{1}{N_t} \sum_{i=1}^{N_t} \left( \frac{b_{imt}^s - 1}{\hat{\sigma}_{\varepsilon it} / \hat{\sigma}_{mt}} \right)^2 \tag{4.13}$$

what we have in this regard:

$H_{mt}$  : The amount of mass behavior at time  $t$ ,  
 $it_{\mathcal{L}}$  :  $\alpha$  Standard deviation of the residuals of the regression equations,  
 $m_t$  :  $\alpha$  standard deviation of monthly market returns and

$$b_{imt}^s = \frac{cov(r_{it}, r_{mt})}{var(r_{mt})} = \frac{\hat{\sigma}_{imt}^2}{\hat{\sigma}_{mt}^2}. \tag{4.14}$$

Various studies have shown that  $\beta$  is not a fixed number over time and is changing. The temporal variations of  $\beta$  can be measured by different methods.

**Research Hypotheses**

- Hypothesis 1: Risk attitude affects cognitive bias.
- Hypothesis 2: Risk attitude has an effect on emotional bias.
- Hypothesis 3: Risk attitude affects mass behaviour.
- Hypothesis 4: Mental accounting has an effect on cognitive bias.
- Hypothesis 5: Mental accounting has an effect on emotional bias.
- Hypothesis 6: Mental accounting has an effect on mass behaviour.
- Hypothesis 7: Excessive confidence affects cognitive bias.
- Hypothesis 8: Excessive confidence affects emotional bias.
- Hypothesis 9: Excessive confidence affects mass behaviour.

The model is the relationship between the theoretical level and the work of collecting and analyzing information. Models include signs and symptoms, that is, the properties of some experimental phenomena (including their components and relationships) are logically expressed through interrelated concepts. Thus, the model reflects reality and integrates certain aspects of the real world that relate to the problem under consideration, illuminates the major relationships between these aspects, and finally allows empirical testing of the theory according to the nature of these relationships. After testing the model, a better understanding of some parts of the real world is obtained. In short, the model is a device consisting of concepts, hypotheses and indicators that facilitate the selection and collection of information needed to test the hypothesis [23]. Therefore, according to the above argument, hypotheses and theoretical foundations in tracing the role of information behaviour resulting from risk psychological structures and decision-making behaviour of traders, the conceptual model of the research is formulated as Figure 1:

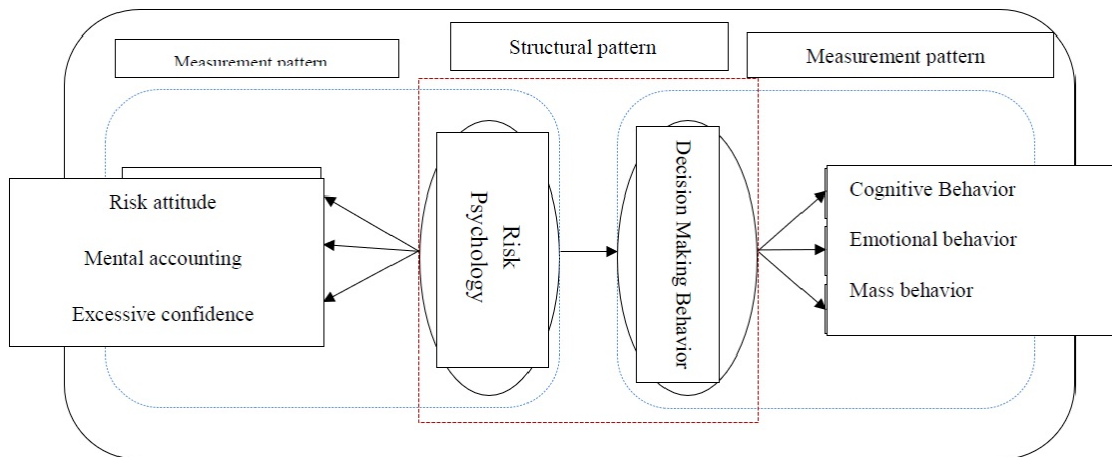


Figure 1: Conceptual model of research

**5 Methodology**

The purpose of this study is to predict the causal relationships between traders’ decision-making behaviour due to risk psychology. This research is applied in terms of purpose and in terms of data collection methods, it is a

qualitative descriptive-analytical based on a structural modelling approach. The type of research in terms of approach is qualitative to understand the relationship between factors affecting the decision-making behaviour of traders, the emergence strategy was used. This method was introduced in the 1970s at the University of Gothenburg in Sweden with the aim of gaining a deep understanding of the different concepts of a phenomenon in different people. The phenomenon is a method that is in the realm of interpretive paradigm and is based on the same experiences and different perceptions of people from a certain phenomenon in a certain group of people. The inventors believe that if people perceive different experiences or concepts of a phenomenon and link them together in a larger structure, they can provide a more complete picture and understanding of the experienced phenomenon. Phenomenology is based on the paradigm of interpretivism. Interpretive scholars begin their work with the premise that access to reality (specific reality or socially constructed reality) is possible only with social constructs such as language, self-awareness, and shared meanings. Researchers in this strategy try to understand the meanings that people give to phenomena [14] To test the hypotheses by structural equation modelling, version 3.2.7 of smart-pls statistical software was used. When the volume of observations is small or does not have a normal distribution, it is preferable to use software such as smart-pls [32] The path model of least partial squares is defined by two sets of linear structural equations (internal model or structural model and external model or measurement model). The structural model determines the relationship between latent variables and the measurement model determines the relationship between latent variables and observed markers. Also, he used the online questionnaire method 6 and in person in the data collection stage and the structural equation modelling approach based on partial least squares 7 in the inference stage. In this regard, in the present study, based on the specific method of this modelling [32], the maximum sample size is 10 times the highest relationships in the structural sector to distribute a questionnaire among active traders (with at least three years of trading experience In the country's capital market, information was collected online and in person through social networks. References led to the distribution of 101 questionnaires, of which 11 were rejected due to inadequacy or inaccuracy of data, bringing the number of correct observations to 90 samples. Regarding the adequacy of sample size in structural equation modelling, it should be said that to obtain valid and generalizable results, according to the theory of [11], the sample size should be estimated at a ratio of 10 per parameter and other studies 5 Have been proposed for each parameter [20, 24]. Therefore, according to the structural model of this study, the existing observations (questionnaire) (90 cases) are statistically sufficient.

In the present study, the endogenous variable of traders' decision-making behaviour (cognitive behaviour, emotional behaviour and mass behaviour), independent variables of Prospect Theory constructed in the form of risk psychology (risk attitude, subjective accounting and overconfidence) by standard questionnaire Has been measured. The questions of this questionnaire are taken from the research of [10] and [44] to measure the research structures. In addition, in order to develop and localize research tools appropriate to the country's environment and confirm its validity, the views of university professors and the country's capital market experts were used. Table 1 shows the information about the research variables.

Table 1: Research model variables

Structure	Role	Type	Structure	Number of questions
Risk attitude	Independent	Perceptual	Reflective	5
Mental accounting	Role	Type	Structure	4
Excessive confidence				4
Cognitive Behavior				4
Emotional behavior	Independent	Perceptual	Reflective	5
Mass behavior				6

## 6 Research Findings

Table 2 provides the demographic information for the statistical sample. About 80% of the respondents were male and more than 70% of them had a master's degree or higher, and it is noteworthy that this group of people had better participation in terms of accepting the answer to the questionnaire and the quality of the answer.

### 6.1 Test and analyze hypotheses

In the research model, the variables were modelled as higher-level reflective structures. The steps and methods used are according to Table 3.



Table 2: Demographic information of the respondents

Variable	group	Abundance	Percentage
Gender	Man	72	80
	Female	18	20
Levels of education	Bachelor and lower	63	70
	Master and above	27	30

Table 3: summarizes the steps of data analysis

Evaluation of the measurement model (External credit)	Reliability	Reliability of indicators	
		Check for one-dimensionality	Cronbach's alpha Composite reliability
	Narrative	Convergent (AVE) and diagnostic validity	
		Differential validity	Fresnel and Locker criteria
Structural model evaluation (Internal validity)	Correlation of structures and multiple alignment (VIF)		
	Path coefficient estimation		
	Determination coefficient (R2)		
	Predictor communication		
Review of model quality indicators	Shared Credit Check		
	Check the credit of Hashu		
	Goodness-of-fit (GOF) and root mean square root (SRMR)		
Testing hypotheses	Investigation of Z significance coefficients related to each of the hypotheses		

In order to evaluate the measurement model (external model), the reliability and validity of structures and indicators are evaluated. Cronbach's alpha and composite reliability for each of the model structures were greater than 0.7. Also, all indicators had the necessary reliability. In order to evaluate the validity of the model constructs, convergent validity and diagnostic validity were used. The average criterion of variance extracted to evaluate the convergent validity of all model constructs is more than 0.5, and considering that the root of the average variance extracted in the diameter of the matrix is more than the correlation or structure with other structures, so the criterion is acceptable. Therefore, the quality of model structures has good validity.

Table 4: Check the quality of the measurement model

Structure	Cronbach's alpha	Combined reliability	Convergent validity
Risk attitude	0.783	0.785	0.783
Mental accounting	0.737	0.737	0.736
Excessive confidence	0.751	0.800	0.761
Cognitive Behavior	0.837	0.849	0.842
Emotional behavior	0.798	0.818	0.797
Mass behavior	0.844	0.853	0.847

In order to evaluate the structural model (internal model), after calculating the path coefficients, factor loads and variance explained by the variables by the PLS algorithm, the significance of paths and factor loads is investigated using the bootstrap method to obtain t values. Significant results of the routes are shown in Table 5.

As shown in Table 5, the relationship between research structures and their significance; the path of overconfidence on mass behaviour and cognitive behavior is significant, therefore, the existence of the effect of overconfidence on mass behavior and cognitive behavior is confirmed at the 90% confidence level. The path of mental accounting on emotional behavior, mass behavior and cognitive behavior is significant, so the existence of the effect of mental accounting on emotional behavior, mass behavior and cognitive behavior is confirmed at a 90% confidence level. The path of risky attitude on emotional behavior and mass behavior is significant, therefore, the existence of the effect of risky attitude on emotional behavior and mass behavior is confirmed at a level of 90% confidence. Also, the path of overconfidence on emotional behavior and the path of risky attitude on cognitive behavior are not significant and the existence of the effect of overconfidence on emotional behavior and the effect of risky attitude on cognitive behaviour is not confirmed at 90% confidence level.

Table 5: Investigating the Relationships between Research Structures and Their Significance

Direction	Path coefficient	Standard deviation	Significance level (Sig> 90%)	Interpretation
Overconfidence → Emotional Behavior	-0.192	0.168	0.338	Rejection
Excessive confidence → Mass behavior	-0.310	0.142	0.096	No rejection
Overconfidence → Cognitive Behavior	0.342	0.157	0.085	No rejection
Mental accounting → Emotional behavior	0.404	0.167	0.064	No rejection
Mental accounting → Mass behavior	0.328	0.137	0.068	No rejection
Mental accounting → Cognitive behavior	0.314	0.172	0.099	No rejection
Risk Attitude → Emotional Behavior	0.554	0.119	0.050	No rejection
Risk Attitude → Mass Behavior	0.759	0.221	0.001	No rejection
Risk Attitude → Cognitive Behavior	0.177	0.174	0.310	Rejection

In the measured and structural models studied, the average commonality is used to measure the fit of the external model and the coefficient of determination R2 is used to fit the structural model. The average subscription value represents the percentage of changes in the indicators that are justified by the corresponding construct, and researchers have reported an acceptable level for statistical subscription greater than 0.5 [25]. Given the values of R2, which indicates the ability of the model to describe the structure, the proposed model has a good fit.

Table 6: Evaluation of Structural model quality and goodness of fit

Model / structure	SRMR	R2	R2adj	F2
Risk attitude				0.143
Mental accounting	0.015	0.720	0.713	0.103
Excessive confidence				0.212

The following modified model will be as follows:

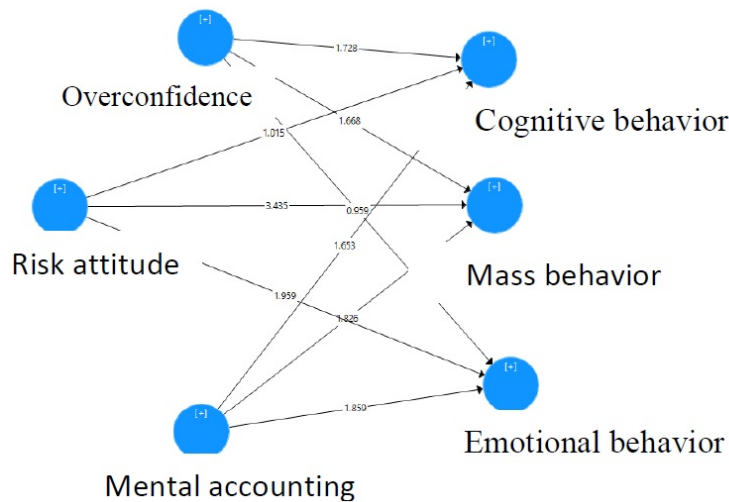


Figure 2: Results of the modified model t test

## 7 Conclusion and Discussion

Emotional and cognitive behaviors have significant effects on human movements and actions; however, in some cases, these factors have received less attention from researchers than external factors, while understanding the behavioral processes and their consequences is very important for traders in financial markets [43]. [31] in a study concluded that there is a negative relationship between financial literacy and behavioral biases of investors. Charles and Kasilingam [10] sought to understand the effect of behavioral bias factors on investor investment performance, and they finally identified six behavioral bias factors to understand their effect on investor performance, which are temperament,

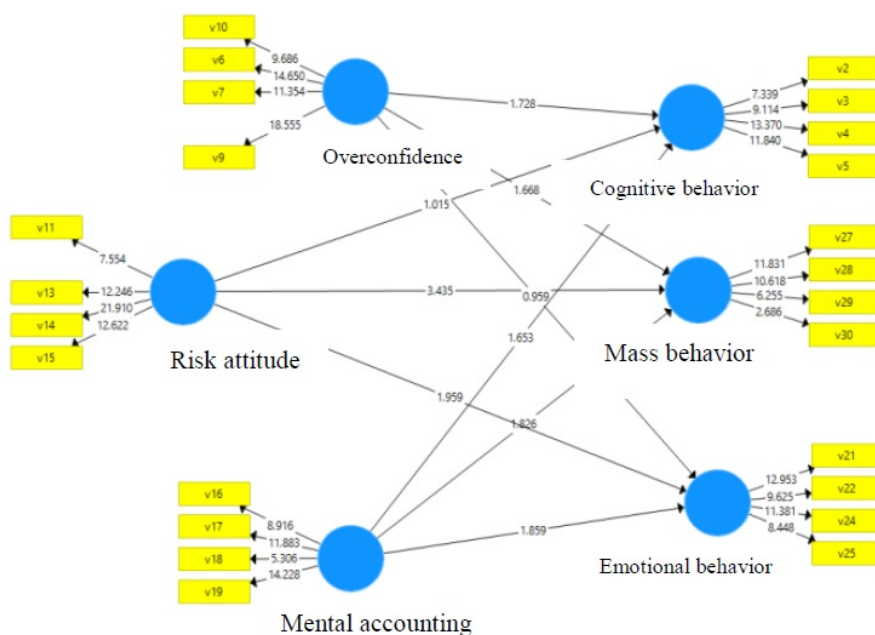


Figure 3: Structural coefficients of the modified model

emotions, and methods. Innovation, framework, personality and gambling that finally the research findings show that all the selected factors of this research have a significant effect on the investment performance of investors. The results of [22] research showed that the mass behaviors of border traders in financial markets are due to their overconfidence and also in the research of [1] it was found that the majority of traders suffer from behavioral bias They are strongly influenced by the market climate and the opinions of other traders, and this shows that these investors are more massive, and some traders rely on their individual capabilities due to overconfidence bias. Lead to irrational decisions.

In this study, it was found that overconfidence as one of the constructs of perspective theory has a negative and significant effect on cognitive behaviour and mass behaviour of traders, while in [?] research is not significant in this direction. Also, the results showed that mental accounting as another construct of Prospect Theory has a positive and significant effect on cognitive behaviour, emotional behaviour and mass behaviour of traders, which with the results of [1, 22, 31, 44] align. Risk attitude as the third construct of Prospect Theory has a positive and significant effect on the emotional behaviour and mass behaviour of traders, which is consistent with the results of [10], [44] and [22]. The results also showed that overconfidence has no significant effect on traders' emotional behaviour and risk attitude on traders' cognitive behaviour. Therefore, according to the research results, it is suggested that in order to maximize the interests of shareholders and traders and pay attention to the interests of stakeholders in the framework of Prospect Theory, their optimal decision-making decision at the time of trading by creating a suitable environment to strengthen Provide structures related to cognitive, mass, and emotional behaviours and ultimately improve the high-yield trading process. Therefore, actual and potential traders are advised to pay more attention to the discussion of risk psychology resulting from the structures of risk attitude, subjective accounting and overconfidence and to include it in their decision-making models. Because some of these structures are an effective factor in transactional behaviour resulting from cognitive, mass and emotional structures and can be the basis for their optimal decision making. In fact, part of the behavioural finance issues has been raised in Prospect Theory; But traders need to be aware of more behavioural finance issues in order to achieve a more optimal and desirable trade. In this regard, it is suggested that conditions and restrictions be applied to enter the capital market and the capital market regulatory bodies of the country are suggested to make a decision in this regard. It is suggested that investment consulting and trading companies determine the amount of these biases and the level of risk-taking of individuals and do their consulting accordingly, thus making raising capital easier and, of course, more efficient.

With each research, the way is opened to a new path and the continuation of the way requires other research; Therefore, in future research, it is suggested that the role of information entropy in the behaviour of traders in different conditions and industries, as well as the effect of behavioural norms on the level of risk of traders. Also, like any other research, the present study has some limitations that need to be addressed. Lack of access to all traders active in the country's capital market is one of the limitations of this study, which has led to a reduction in the statistical sample.

## References

- [1] J. Aduda, *The behaviour and financial performance of individual investors in the trading shares of companies listed at the Nairobi stock exchange*, Kenya J. Financ. Invest. Anal. **1** (2012), no. 3, 33–60.
- [2] A. Anderson, J. Henker and S. Owen, *Limit order trading behavior and individual investor performance*, J. Behav. Financ. **6** (2005), no. 2, 71–89.
- [3] A. Atefifar and A. Soleimani Bashli, *Financial behavior*, Aylar Publications, 2019.
- [4] B. Aziz and M. Abdoloh Khan, *Behavioral factors influencing individual investor's investment decision and performance, evidence from Pakistan stock exchange*, Int. J. Res. Financ. Market. **6** (2016), 74–86.
- [5] A. Bandopadhyaya and A.L. Jones, *Measuring investor sentiment in equity markets*, J. Asset Manag. **7** (2006), no. 3, 208–215.
- [6] A. Ben Saïda, *Herding effect on idiosyncratic volatility in US industries*, Financ. Res. Lett. **23** (2017), 121–132.
- [7] S. Bikhchandani and S. Sharma, *Herd behavior in financial markets: a review*, Working paper, IMF Institute, 2000.
- [8] P. Centobelli, R. Cerchione and M. Ertz, *Managing supply chain resilience to pursue business and environmental strategies*, Bus. Strategy Envir. **29** (2020), no. 3, 1215–1246.
- [9] E.C. Chang, J.W. Cheng and A. Khorana, *An examination of herd behavior in equity markets: an international perspective*, J. Bank. Finance **24** (2000), no. 10, 1651–1679.
- [10] A. Charles and R. Kasilingam, *Impact of selected behavioural bias factors on investment decisions of equity investors*, Ictact J. Manag. Stud. **2** (2016), no. 2, 297–311.
- [11] Y. Chen, Z. Wang and Z. Zhang, *Mark to market value at risk*, J. Economet. **208** (2019), no. 1, 299–321.
- [12] T.C. Chiang and D. Zheng, *An empirical investigation of herd behavior: evidence from international perspective*, Working Paper, Drexel University, 2008.
- [13] O. Dadar and S.M. Jafari, *The effect of investors sentiment and free float on stock return in TSE listed companies by using generalized method of moments (GMM)*, J. Invest. Knowledge **9** (2016), no. 34, 317–331.
- [14] H. Danaei Fard, S.M. Alwani and A. Azar, *Qualitative research methodology in management: a comprehensive approach*, Saffar Pub, Tehran, 2011.
- [15] R. Demirer and A.M. Kutan, *Does herding behavior exist in Chinese stock market?*, J. Int. Financ. Markets Inst. Money **16** (2006), 123–142.
- [16] F. Dezoort and S.E. Salterio, *The effects of corporate governance experience and financial-reporting and audit knowledge on audit committee members' judgments*, Audit.: J. Practice Theory **20** (2001), no. 2, 31–47.
- [17] A. Ebrahimi Lifshagard, K. Pakizeh Kamran and K. Raisifar, *Investigating the effect of investors' personality traits on investment performance with the mediating role of revelation biases*, Financ. Knowledge Secur. Anal. **12** (2019), no. 42, 107–128.
- [18] A.S. Farley, *The master swing trader toolkit: the market survival guide*, McGraw Hill Professional, 2010.
- [19] M. Grinblatt and B. Han, *Prospect theory, mental accounting, and momentum*, J. Financ. Econ. **11** (2005), no. 2, 119–133.
- [20] J.F. Hair, W.C. Black, B.J. Babin and R.E. Anderson, *Multivariate Data Analysis*, Prentice Hall, 2010.
- [21] S. Hwang and M. Salmon, *Market stress and herding*, J. Empir. Finance **11** (2004), no. 4, 585–616.
- [22] L. Kengatharan and N. Kengatharan, *The influence of behavioral factors in making investment decisions and performance*, Asian J. Financ. Account. **6** (2014), no. 1.
- [23] G. Khaki, *Research method with an approach to dissertation writing*, Eighth edition, Tehran, Bazetab Publications, 2011.
- [24] K.H. Kim and P.M. Bentler, *Data modeling: structural equation modeling*, In J.L. Green, G. Camilli and P.B. Elmore (Eds.): *Handbook of complementary methods in education research*, Routledge, 2012.

- [25] A. Lim and J. Sinnakkannu, *Empirical analysis on the speed of stock price adjustment to firm specific and market wide announcements*, Inti College Malaysia, 2003.
- [26] A. Merilkas and D. Prasad, *Factor influencing Greek investor behavior on the Athens stock exchange*, J. Bus. **66** (2003), no. 1, 1–20.
- [27] L.T.B. Ngoc, *Behavior pattern of individual investors in stock market*, Int. J. Bus. Manag. **9** (2013), no. 1.
- [28] A. Panahi and A. Habibi Rad, *Explaining the relationship between bitcoin price in business financial transactions and search volume in order to identify its behavioral pattern: a comparative study between countries*, Strategic Budget Financ. Res. **10** (2021), no. 37, 141–169.
- [29] P.C.B. Phillips, S.P. Shi and J. Yu, *Specification sensitivity in right tailed unit root testing for explosive behaviour*, Oxford Bull. Econ. Statist. **76** (2014), no. 3, 315–333.
- [30] M. Pompian, *Behavioral finance and wealth management: how to build optimal portfolios that account for investor biases*, John Wiley and Sons, Inc. 2006.
- [31] N. Rasool and S. Ullah, *Financial literacy and behavioural biases of individual investors: empirical evidence of Pakistan stock exchange*, J. Econ. Finance Admin. Sci. **25** (2021), no. 50, 261–278.
- [32] A. Rezazadeh and A. Davari, *Structural equation modeling with PLS software*, Second Edition, Tehran, Jihad Daneshgahi Pub. 2014.
- [33] I.G. Sarason and B.R. Sarason, *Abnormal psychology: The problem of maladaptive behavior*, New Jersey, Prentice Hall, 2005.
- [34] R.J. Shiller, *Human behavior and efficiency of the financial system*, in: J.B. Taylor and M. Woodford (ed.), *Handbook of macroeconomics*, Elsevier, (1999).
- [35] L. Tan, T.C. Chiang, J.R. Mason and E. Nelling, *Herding behavior in Chinese stock markets: an examination of A and B shares*, Pacific-Basin Finance J. **16** (2008), no. 1–2, 61–77.
- [36] A. Tversky and D. Kahneman, *Judgment under uncertainty: Heuristics and biases*, Science **185** (1971), no. 4157, 1124–1131.
- [37] A. Tversky and D. Khaneman, *Rational choice and the framing of decisions*, J. Bus. **59** (1986), no. 4, S251–S278.
- [38] E.E. Umphress, J.B. Bingham and M.S. Mitchell, *Unethical behavior in the name of the company: The moderating effect of organizational identification and positive reciprocity beliefs on unethical pro-organizational behavior*, J. Appl. Psych. **95** (2010), 769–780.
- [39] W. Van der Wielen and S. Barrios, *Economic sentiment during the COVID pandemic: evidence from search behaviour in the EU*, J. Econ. Bus. **115** (2021), 105970.
- [40] N.M. Waweru, E. Munyoki and E. Uliana, *The effects of behavioral factors in investment decision-making: a survey of institutional investors operating at the Nairobi Stock Exchange*, Int. J. Bus. Emerg. Markets **1** (2008), no. 1, 24–41.
- [41] Y.-F. Wen, *Capital investment decision, corporate governance, and prospect theory*, Proc. Soc. Behav. Sci. **5** (2010), 116–126.
- [42] P. Xidonas, C. Hassapis, J. Soulis and A. Samitas, *Robust minimum variance portfolio optimization modelling under scenario uncertainty*, Econ. Model. **64** (2017), 60–68.
- [43] W. Xuan, S. Jieqiong, S. Shan and Z. Yan, *Urban ecological regulation based on information entropy at the town scale a case study on Tongzhou district, Beijing city*, Proc. Environ. Sci. **13** (2012), 1155–1164.
- [44] J. Yao, C. Ma and W.P. He, *Investor herding behaviour of Chinese stock market*, Int. Rev. Econ. Financ. **29** (2014), 12–29.