Research Paper

# Identifying the Effective Factors on Investors' Behavior and Developing a Measurement Model

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ABSTRACT

The purpose of this study is to identify the components that affect investor behavior and develop a measurement model using the TOPSIS technique and confirmatory factor analysis approach. This correlational paper aims to identify the dimensions and structures influencing investor behavior. Initially, the TOPSIS technique is employed, followed by first-order confirmatory factor analysis and second-order factor analysis. The statistical population consists of individuals who have actively participated in the Tehran Stock Exchange for at least two years, with a sample size of 327. Convenience nonprobability sampling was utilized as the sampling method, and data was collected through a researcher-made questionnaire. Content validity was assessed through expert approval and Cronbach's alpha coefficient. The findings of this study reveal seven factors identified as influential factors on investor behavior, based on theoretical literature and research background, using the TOPSIS technique. Subsequently, using the confirmatory factor analysis approach, the research findings indicate that investor financial literacy and investor personality traits play the most significant role in investor behavior. Additionally, higher expected returns, rules and regulations, security, profitability, and position and location of investment are identified as the next influential priorities on investor behavior.

## 1 Introduction

A crucial factor for transforming an emerging country into a developed nation is economic growth [22]. The stock market serves as an indicator of the economy's current health, and investment performance reflects it [9]. Imperfections in capital markets often hinder the acquisition of financial resources, and these imperfections are typically attributed to information asymmetries [17]. The Tehran Stock Exchange has witnessed numerous sudden fluctuations over the past two decades. One notable instance occurred in January 2014 when the total index experienced a significant one-day fall [5]. Such sudden changes in stock prices, characterized by drops and jumps, have been extensively studied by financial researchers in relation to stock price behavior. Given the significance that

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investors attach to stock returns, the phenomenon of falling stock prices represents a substantial and atypical negative change that occurs without a major incident in the economy. It is often regarded as synonymous with negative stock skewness [32]. The emergence of these exceptions and unusual phenomena in the market poses serious challenges to traditional financial theories, which rely on the principles of rationality in economic factors and the efficient market hypothesis. According to these theories, competition among investors seeking extraordinary profits leads to stock prices always being close to their fundamental value [5]. The efficient market hypothesis asserts that if the capital market is sufficiently efficient, it promptly and strongly incorporates information, ensuring that stock prices accurately reflect events related to companies and disclosed information [20]. Consequently, the financial-behavioral view, a new approach in financial markets, highlights to theorists, analysts, and market participants that stock price changes are not solely dependent on core stock values but also on the irrational behaviors of investors, as measured by investor preferences [40]. Behavioral finance theory demonstrates that not all investors make perfectly rational decisions and may incorporate emotions and mental imagery into their decision-making process, resulting in incorrect choices. Additionally, there may be no fundamental reason for changes in security prices, with investor behavioral tendencies playing a pivotal role in determining prices [39].
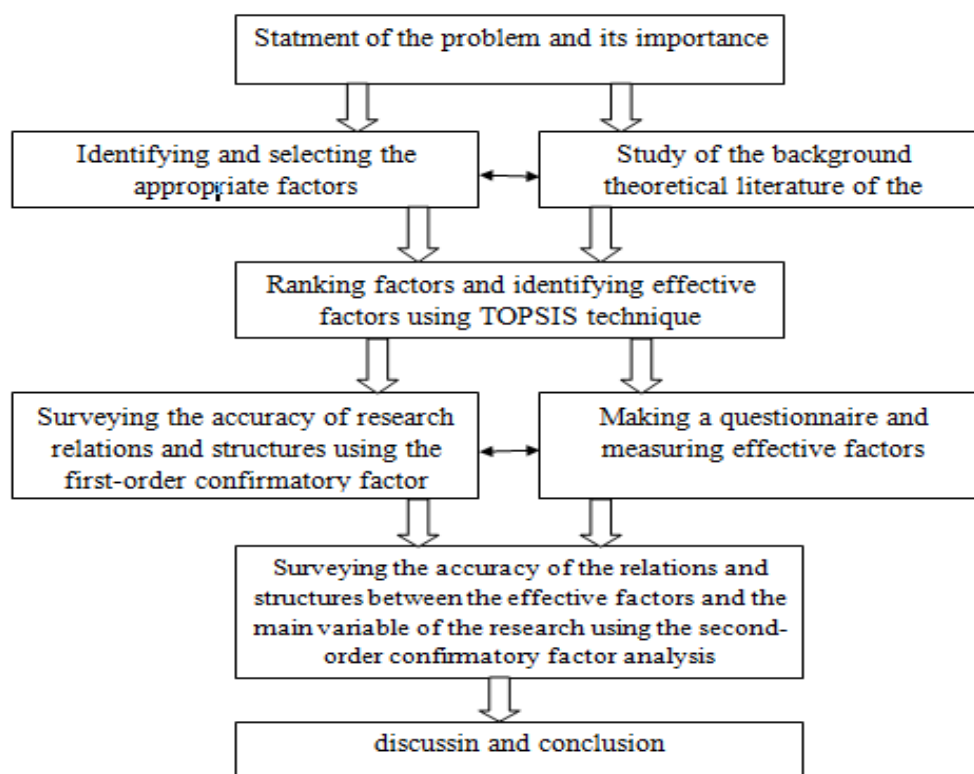


**Fig.1**: Research Stages

Investor behavior often stems from stereotypes or irrelevant information about stock values, leading to extreme reactions or subdued responses to positive or negative news. Prejudiced expectations, such as the tendency to speculate and investors' optimism or pessimism about the true value of stocks, contribute to stock misvaluation [20]. Company managers also exploit investors' behavioral tendencies by overestimating stock values, artificially inflating prices during periods when they aim to increase the stock price of their company [1]. Therefore, this article aims to identify and evaluate the factors influencing investor behavior using the TOPSIS technique. Subsequently, the behavior of

investors is measured using the confirmatory factor analysis approach. These findings can significantly contribute to managers' strategies for managing investor behavior and risk in the capital market. The paper is divided into several sections, starting with the introduction, followed by a review of the theoretical literature. The research method is then examined, and the research findings section describes the steps of equation analysis and modeling. Finally, the paper concludes with a discussion and a summary. An overview of the general research process can be seen in Fig. 1.

## 2 Literature Review and Theoretical Background

Stock market forcasting is a challenging task for investors and researchers in the financial market due to highly noisy,nonparametric, volatile, complex, non-linear dynamic and chaotic nature of stock price time series[12].Over the past few decades, the emergence of some unusual phenomena and exceptions in the financial markets has led to much criticism of financial theories. This fact created deep debates and feelings of distrust in the performance of traditional financial theories as important tools in valuing and forecasting asset prices and paved the way for the emergence of behavioral financial theory. Behavioral financial perspective states that some changes in stock prices have no fundamental reason and psychological factors play an important role in determining prices [40]. In fact, behavioral finance discards the initial assumptions of traditional financial theories and examines the decision-making process of investors and their reaction to different financial market conditions, with more emphasis on the personality, culture, and judgment of investors in investment decisions. [4]. Thus, the main shortcoming of behavioral finance theory is that it has dismantled the foundations of traditional financial theories while only identified the perceptual and behavioral errors of investors. There has been little discussion about the factors that influence the behavioral errors of investors and how to overcome or correct these errors, and most have focused on the role of psychology and sociology and reducing the role of accounting information [10].

Though, from a theoretical point of view the evidence shows that at the micro level, the emotional behaviors of investors depend on the quality and transparency of accounting information and are considered as assumptions of investors' judgments [20]. Many papers introduce the concurrency stock returns as an index of stock price awareness or a measure of the specific information of the company that has affected the stock price [18]. This result strongly supports Roll's hypothesis that "higher specific fluctuations in firm returns reflect more arbitrary transactions on private information" [6].Investors have long been provided with a more accurate understanding of the company's financial position by analyzing financial statements with different procedures and comparing companies with other competitors[21] but managers based on management information theory are always motivated to hide negative information and news from investors and accumulate it within the company. The result of this operation is that the business unit image looks better than the real situation and motivates people outside the organization to invest in business units [35], as a result, investors face the risk of adverse selection and opportunity cost [34]. The evidence is consistent with the view that short sellers are able to detect bad news hoarding by managers [8] on the other hand, managers can accumulate the limited amount of bad news. The reason is that when the volume of accumulated negative news reaches a certain threshold, it will be impossible and costly to refrain its disclosure for a longer period of time. As a result, the mass of unfavorable news, after reaching its peak, suddenly enters the market and this leads to a sharp decline in stock returns or falling stock prices [3]. Investors in the capital market instead of accounting forthe company's fundamental value make collective decisions based on their own perceptions and those of other investors, and short-term sales information may greatly influence their behavioral tendencies [13]. In general, short-term sales and disclosure of related

information are important factors in creating a crisis. In 2008, the disclosure of this factor was considered as a reason for the continuation of the downward trend in stock prices in the United States and subsequently in the world. [11]. Recently, various studies have been conducted on the investor behavior, as follows:

Abdollahi and Majdzadeh Tabatabai examined the effect of personality traits on financial risk-taking with regard to the moderating role of financial literacy and the results showed that emotional intelligence has a positive and significant effect on financial risk-taking and a source of control over financial risk-taking has a negative effect. Financial literacy also causes emotions to have less effect on financial decisions and risk-taking [2]. Bahar Moghaddam and Jokar investigated the effect of accounting information quality and information uncertainty on investors' tendencies using multivariate regression and the results showed that the quality of accounting information has a negative and significant relationship with investors' tendencies and information uncertainty have a positive and significant relationship with investor tendencies [4]. Bahar Moghadam and Jokar The findings of a study entitled "Mechanisms of investor tendencies and accounting information on stock market prices" showed that there is a positive and significant relationship between investors' tendencies and expected profit growth rate [5]. Talibnia and Metanat in a study entitled Investigating the moderating effect of information asymmetry on the relationship between cash dividend policy and the risk of future stock price falls of companies listed on the Tehran Stock Exchange" showed that dividend payment provides grounds for stock price falls[35].Badavar Nahandi and Babaei conducted a study entitled "The relationship between comparability of financial statements and the risk of falling stock prices with emphasis on the role of information asymmetry". The results show that there is a significant negative relationship between the comparability of financial statements and the risk of falling stock prices. Also, negative relationship is also exacerbated in conditions of high information asymmetry [3] Lotfi and Delshad conducted a study entitled "Information Content of Price and Synchronization of Stock Returns: Evidence from Information Theory and Noise ". The results of the study indicate that the synchronicity of stock returns has a negative and significant effect on the information content of stock prices and the amount of information content of stock prices has decreased with the increase of synchronicity of stock returns [26].

Rostami and Talebi conducted a study entitled "Short-Term Sales Restrictions and the Risk of Falling Stock Prices with an Emphasis on Investment Efficiency". The results showed that short-term sales restrictions positively affect the risk of falling stock prices. On the other hand, investment inefficiency has a positive effect on this relationship [32]. Ebrahimi Sarvalia et al in a study entitled "Determinants of the behavior of minority shareholders in the Tehran Stock Exchange based on structural equation modeling", using the Delphi technique and based on the theoretical literature and research background introduced 5 factors as the most influential factors on the behavior of investors including political factors,economic factors, psychological factors, corporate factors and the stock market organizational factors with the most prominent role of political factor[14]. Khademi Gerashi and Ghazizadeh in a study entitled " Study of Factors Affecting the Decision of Shareholders in the Tehran Stock Exchange based on the Structural Equation Model "using the path analysis method, they stated that political factors, market psychological factors, economic factors and financial factors of the company have the greatest impact on shareholders' decisions[23].Vakilifard et al, in a study entitled " Evaluation of Investor Behavior in Tehran Stock Exchange by Network Analysis Process Method" evaluated and ranked the behavior of investors, the results of which show that 40% of investors mass behavior, 33% of rational and logical behavior, 22% reactionary behavior and5% intuitive behavior, and their findings show that stock market factors, education and culture have the greatest impact on

shareholder behavior, respectively [37]. In foreign research, Gurbaxani and Gupte in a study in India showed that there is a significant relationship between measures taken to prevent the spread of COVID-19 and saving and investing' behavior of individuals so that in this period there is a 43% decrease in investment[19],also in another research Naseem et al examined the effect of COVID-19 disease on investment in the stock markets of China, Japan and the United States,and showed that negative emotions and pessimism have encouraged investors to stop investing in the stock market and as a result stock market' return is reduced[28].Paisarn et al in a study in thailand showed that men are more confident in investing than women,also investors under the age of 45,have a more diverse portfolio and this shows that demographic factors can also be effective in the behavior and classification of investors[30]. Nareswari et al in a study in Indonesia showed that sentiment investors, overconfidence, salience, overreaction and herd behavior positively affect investment decision making [27]. Tian examined the effect of discretionary disclosure on the synchronization of stock prices in companies listed on the New Zealand Stock Exchange.

The results of this study show that discretionary disclosure increases information transparency and increases investors' access to information ultimately reduces stock price concurrency [36]. Gao et al state that with increasing market and industry information and company-specific information, the synchronization of stocks and stock indexes will increase and decrease, respectively. In addition, investors will bear systematic risk [15]. Grawal et al examined the effect of voluntary disclosure of firm stability information on the synchronization of firm stock returns. The results of this study indicate that companies that voluntarily disclose more information about the stability of companies in accordance with the requirements of the statements of the Board of Accounting for Sustainable Development have lower stock returns synchronization than other companies [18]. Bai et al examined the effect of information disclosure on the synchronization of stock returns.

**Table 1**: Factors Adaptedfrom the Literature

| Identified factors | | |
|---|---|---|
| 1.Investment Profitability | 13.Book Value to Stock Market Value Ratio | 24.Investor Financial Literacy |
| 2. Higher Expected Returns | 14.Price-to-Profit Ratio 15. Investment Security | 25. Personality Traits |
| 3. Exchange Rate | | 26. Mass Behavior |
| 4. Inflation Rate | 16. Investment Rules and Regulations | 27. Formal and Informal News from Corporate Assemblies |
| 5. Oil Prices | 17. Investment Position and Location | 28. Informal News from Corporate Meetings and Programs |
| 6.Gold Prices | 18.Fundamental Analysis 19 Technical Analysis | |
| 7. Parallel Market Returns | | 29. Rumors and News Published on Websites |
| 8. Economic Growth | 20.Domestic Political Events | 30. Opinions of Brokers and Investment Consulting Companies. |
| 9. Bank Interest Rates | 21.Domestic Political Officials' Comments | |
| 10. Share Trading Volume | | |
| 11. Stock Liquidity | 22. Foreign Political Events | |
| 12.Company Market Value | 23. Foreign Political Officials' Comments | |

The researchers concluded that in companies whose financial statements are more transparent, investors use this type of information as the basis for decision-making rather than market-based information for the low cost of processing company-specific information[6].Soniya Garg in a study in India called " A study of factors influencing investor behavior towards gold as an investment avenue with factor analysis " using the factor analysis model points to three factors of investment security, higher expected returns and traditional values as effective factors on the investors behavior[16].Shim et al in a study in South Korea entitled " How investor behavioral factors influence investment

satisfaction, trust in investment company, and reinvestment intention" introduces 6 factors of profitability, security, liquidity, position, welfare, rules and regulations as factors influencing investor behavior, and their results indicate that investment position, liquidity and security have the greatest impact on investor behavior[33].In the end, Jank et al showed how disclosure requirements for large short-term situations affect investor behavior and stock prices[20]. Thus, given the literature and experts confirmation the number of 30 factors presented in Table 1 have been identified and formulated as factors affecting investors behavior for review and analysis.

## 3 Research Method

This is a correlational paper. At first, a pairwise comparison questionnaire was distributed and collected among 15 academic experts active in the stock exchange. Then, 7 factors with an ideal weight higher than 0.6 were selected from among 30 factors affecting investors' behavior using the TOPSIS Technique. The selected factors were used as the basis for the study and measurement of structural equation modeling and the application of first-order and second-order factor analysis in this paper. TOPSIS Solver Software was used to identify and rank the factors and analyze them. TOPSIS method is one of the techniques used in multi-criteria decision making (MCDM). In this method of decision making, there are a number of options and a number of criteria for decision making, which should be ranked according to the criteria, or each of them should be assigned an efficiency score. The general philosophy of the TOPSIS method is that two hypothetical options are defined using the available options. One of these options is a collection of the best values found in the decision matrix. This option is called the positive ideal (the best possible case). Another hypothetical option is defined that includes the worst case scenario. This option is called the negative ideal. Criteria can be positive or negative in nature, and their unit of measurement can be different. The criterion for calculating scores in the TOPSIS method is that the options are as close as possible to the positive ideal option and away from the negative ideal option.Therefore, a score is calculated per option and the options are ranked according to the scores. Also, SPSS and LISREL software were used for the statistical description section and modeling structural equations, respectively.

The statistical population cons5sts of people who have been active in the Tehran Stock Exchange for at least two years. Given the fact the current paper has used the structural equation modeling, so the rule of minimum number of samples (five times the number of questionnaire items) and maximum number of samples (fifteen times the number of questionnaire items) have been used. Given that 34 items are considered for the questionnaire, the maximum and minimum samples are 170 and 510, so in this study, the current paper selects the average of this number, i.e., 340 people as a sample. To prevent the exclusion of some questionnaires the number of 360 questionnaires were distributed among the samples, of which 337 questionnaires were returned to the researcher. After reviewing the questionnaires, it was found that 10 questionnaires were incompletely completed.Therefore, since the return rate of the questionnaire was higher than 90%, 327 questionnaires were used for the final analysis. The tool used in this research was a researcher-made questionnaire whose information is presented in Table 3. The opinions of 15 academic experts was used to evaluate the validity of the questionnaire content and to evaluate its reliability 34 questionnaires were distributed as a pre-test. Then, Cronbach's alpha was obtained for the questionnaire, all of which are higher than 0.7.

## 4 Data Analysis and Findings

As stated in the research methodology, Table 2 shows 30 factors affecting the investors behavior, which are ranked using the TOPSIS technique, and factors that have an impact weight above 0.6 are

selected and used as the basis for measuring by structural equations. (Factor analysis) Table 3 presents the theoretical support of the selected factors. Also, a questionnaire was designed for 7 selected factors, the information of which can be seen in Table 4.

## 4.1 TOPSIS Method

The Technique for Order Performance by Similarity to Ideal Solution (TOPSIS) is a simple and popular ranking method which selects the options that have the shortest distance from the positive ideal option and farthest distance from the negative ideal option at the same time. TOPSIS was originally introduced by Hwang and Yoon to solve multi- criteria decision-making problems and has been applied in diverse areas due to its comprehensibility and simplicity [29]. The concept of TOPSIS is that an alternative which is closest to the ideal solution and farthest from the negative ideal solution in a multi-dimensional computing space is the optimal choice. Therefore, the preference order of alternatives is yielded through comparing Euclidean distances. Supposed there are three alternatives $A_1$, $A_2$, and $A_3$ for a single choice. The distance between the alternative and the ideal solution needs to be compared. If the result is $A_2 < A_1 < A_3$, $A_2$ is closest to the ideal solution and $A_2$ is the optimal solution; $A_3$ is the worst choice. TOPSIS methodology applied in this study is described as follows [25]:

Step 1: Build a decision matrix (D) with values of criteria [25].

In the TOPSIS technique, m options are evaluated using n criteria. Therefore, each option is scored based on each criterion. These scores can be based on quantitative and real values or qualitative and theoretical. In either case, a decision matrix m * n must be formed. At this point, the (N) data must be normalized that seen in matrix(D) as follows:

$$D = \begin{array}{c} A_1 \\ A_2 \\ \vdots \\ A_i \\ \vdots \\ A_n \end{array} \begin{bmatrix} x_{11} & x_{12} & \cdots & \cdots & x_{1j} & x_{1n} \\ x_{21} & x_{22} & \cdots & \cdots & x_{2j} & x_{2n} \\ \vdots & \vdots & \cdots & \vdots & \vdots & \vdots \\ x_{i1} & x_{i2} & \cdots & \vdots & x_{ij} & x_{in} \\ \vdots & \vdots & \cdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \cdots & \cdots & x_{mj} & x_{mn} \end{bmatrix} \tag{1}$$

**Step 2:** Normalize the decision matrix ($D$) through the following equation [25].

In this step, we de-scale the scales in the decision matrix. So, each of the values of the vector size is divided by the same index that seen in equation2:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{n} x_{ij}^2}}, \quad j = 1, \dots, n, \quad i = 1, \dots, m. \tag{2}$$

**Step3**: Establish the weighted normalized decision matrix ($V$) as follows. [25].

$$V = \begin{bmatrix} w_1 r_{11} & w_2 r_{21} & \cdots & w_j r_{ij} & \cdots & w_n r_{1n} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ w_i r_{i1} & w_2 r_{i2} & \cdots & w_j r_{ij} & \cdots & w_n r_{in} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ w_1 r_{m1} & w_2 r_{m2} & \cdots & w_j r_{mj} & \cdots & w_n r_{mn} \end{bmatrix} \tag{3}$$

**Step 4**: Determine the ideal solution and negative ideal solution through the following equations 4 and 5. [25].

$$A^* = \{(maxV_{ij}|j \in J), (minV_{ij}|j \in J'), i \\ = 1,2,...m\} \\ = \{V_1^*, V_2^*, ..., V_j^*, ..., V_n^*\}. \tag{4}$$

$$A^- = \{(minV_{ij}|j \in J), (maxV_{ij}|j \in J'), i \\ = 1, 2, ... m\} \\ = \{V_1^-, V_2^-, ..., V_j^-, ..., V_n^-\}. \tag{5}$$

**Step5:** Compute the distance between ideal solution and negative ideal solution for each alternative.[25].

The distance of each option to the positive ideal of $S_i^*$ and the negative ideal of $S_i^-$ is obtained. As shown in Table 2, in this step we measure the distance between each option by the Euclidean method. That is, we find the distance between the options and the positive and negative ideal options that seen in equation 6 and 7:

$$S_i^* = \sqrt{\sum_{j=1}^n (V_{ij} - V_j^*)^2} , \quad i = 1, 2, ..., m. \tag{6}$$

$$S_i^- = \sqrt{\sum_{j=1}^n (V_{ij} - V_j^-)^2} , \qquad i = 1, 2, ..., m. \tag{7}$$

**Step6:** Calculate the relative closeness to the ideal solution of each alternative that seen in equation 8.[25].

$$C_i^* = \frac{S_i^-}{S_i^* + S_i^-}, \quad i = 1,2,...,m. \tag{8}$$

**Step7:** Rank the order of alternatives [25]

**Table 2**: Final Ranking of Selected Indicators by TOPSIS Method

| Options | The distance to the positive ideal | The distance to the negative ideal | Proximity to the ideal option | Results |
|---|---|---|---|---|
| Exchange rate | 0.073 | 0.091 | 0.555 | Rejected |
| Inflation rate | 0.075 | 0.051 | 0.405 | Rejected |
| Oil prices | 0.062 | 0.079 | 0.56 | Rejected |
| Gold price | 0.075 | 0.051 | 0.405 | Rejected |
| Parallel market returns | 0.104 | 0.063 | 0.377 | Rejected |
| Return on investment | 0.037 | 0.09 | 0.709 | Confirmed |
| Economic Growth | 0.105 | 0.028 | 0.211 | Rejected |
| Higher expected returns | 0.042 | 0.1 | 0.704 | Confirmed |

**Table 2**: Final Ranking of Selected Indicators by TOPSIS Method

| Options | The distance to the positive ideal | The distance to the negative ideal | Proximity to the ideal option | Results |
|---|---|---|---|---|
| Interest rate | 0.115 | 0.018 | 0.135 | Rejected |
| Share trading volume | 0.062 | 0.079 | 0.56 | Rejected |
| Investment security | 0.037 | 0.09 | 0.709 | Confirmed |
| Stock liquidity | 0.068 | 0.091 | 0.572 | Rejected |
| Investment rules and regulations | 0.035 | 0.094 | 0.729 | Confirmed |
| Market value of the company | 0.075 | 0.051 | 0.405 | Rejected |
| Position and location of investment | 0.052 | 0.083 | 0.615 | Confirmed |
| Book value to stock market value ratio | 0.093 | 0.055 | 0.372 | Rejected |
| Price to profit ratio | 0.051 | 0.075 | 0.595 | Rejected |
| Fundamental analysis | 0.063 | 0.075 | 0.543 | Rejected |
| Technical analysis | 0.072 | 0.069 | 0.489 | Rejected |
| Domestic political events | 0.09 | 0.037 | 0.291 | Rejected |
| Domestic political officials' comments | 0.096 | 0.066 | 0.407 | Rejected |
| Investment financial literacy | 0.03 | 0.102 | 0.773 | Confirmed |
| Foreign political events | 0.088 | 0.047 | 0.348 | Rejected |
| Foreignpolitical officials' comments | 0.068 | 0.091 | 0.572 | Rejected |
| Mass behavior | 0.089 | 0.083 | 0.483 | Rejected |
| Official and unofficial news from the company's assemblies | 0.093 | 0.055 | 0.372 | Rejected |
| Investor personality traits | 0.047 | 0.088 | 0.652 | Confirmed |
| Unofficial news of meetings and company programs | 0.098 | 0.058 | 0.372 | Rejected |
| Rumors and news published on Internet websites | 0.111 | 0.036 | 0.245 | Rejected |
| Opinions of brokers and investment consulting companies | 0.083 | 0.052 | 0.385 | Rejected |

As shown in Table 2, factors 6, 8, 11, 13, 15, 22 and 27 with an impact weight of more than 0.6 were identified as effective factors on investors' behavior, using the TOPSIS technique, then as input data for confirmatory factor analysis, will be measured.

**Table 3:** Selected Final Factors Affecting Investor Behavior by TOPSIS Method

| Theoretical support | Research variables |
|---|---|
| Grag [16], Shim et al. [33], Khademi et al [23] | Investment security |
| Yao et al [38], Shim et al [33], Talibnia &Metanat [35], Khaksarian et al [24] | Return on investment |
| Shim et al [33], Khademi et al [23] | Investment rules and regulations |
| Shim et al [33] | Position and location of investment |
| Yao et al [38], Grag [16], Shim et al [33], Talibnia &Metanat [35], Khademi et al [23], Khaksarian et al [24] | Higher expected returns for the investor |
| Bellofatto et al [7], Abdollahi & Majdzadeh Tabatabai [2], Khademi et al [23], Khaksarian et al [24] | Investor financial literacy |
| Panicker et al [31], Zhou & Huang [39], Bahar Moghadam & Jokar [4], Khademi et al [23], Khaksarian et al [24] | Investor personality traits |

As shown in Table 3, Theoretical support of 6 effective factors identified on the behavior of investors is shown, which shows that in different studies, these factors have been identified by different researchers.

**Table 4**: Information about the Research Questionnaire

| Research variables | Number of items | Items No. | Measurement | Cronbach's alpha coefficients |
|---|---|---|---|---|
| Investment security | 8 | 1-8 | Five-point scale | 0.889 |
| Return on investment | 5 | 9-13 | Five-point scale | 0.757 |
| Investment rules and regulations | 3 | 14-16 | Five-point scale | 0.715 |
| Position and location of investment | 3 | 17-19 | Five-point scale | 0.759 |
| Higher expected returns for the investor | 4 | 20-23 | Five-point scale | 0.747 |
| Investor financial literacy | 5 | 24-28 | Five-point scale | 0.757 |
| Investor personality traits | 6 | 29-34 | Five-point scale | 0.714 |
| Investor behavior | 34 | 1-34 | Five-point scale | 0.807 |

As shown in Table 4, Cronbach's alpha coefficient was used to evaluate the reliability of the investors' behavior questionnaire,it is observed that Cronbach's alpha coefficient for all factors is more than 0.7, So the questionnaire has a good reliability, Also, the validity of the questionnaire has been confirmed by behavioral finance experts and supervisor and advisor.

## 4.2 Statistical Description of Central Parameters

In the descriptive statistical part of the central indicators, according to the obtained results, the security of investment in the stock market with an average of 2.55 has the lower average. The highest average goes for the dimension of investment position and location with an average of 3.9. The amount of skewness and elongation is for all dimensions in the range of -0.5 to +0.5, so it can be said that the data distribution in this study is normal. The LISREL software was used in the structural equation modeling for the normality of the data. Table 5 presents the results:

**Table 5**: Results of Descriptive Statistics of Research Variables

| Model variables | No. | Mean | Variance | SD | Skewness | Elongation |
|---|---|---|---|---|---|---|
| Investment security | 327 | 2.557 | 0.78 | 0.88339 | 0.190 | -0.383 |
| Return on investment | 327 | 2.841 | 0.558 | 0.74649 | -0.441 | -0.209 |
| Investment rules and regulations | 327 | 2.8175 | 0.756 | 0.86669 | 0.149 | -0.302 |
| Position and location of investment | 327 | 3.9465 | 0.581 | 0.76205 | -0.451 | -0.432 |
| Higher investor expected returns | 327 | 3.1506 | 0.652 | 0.80764 | 0.056 | 0.020 |
| Investor financial literacy | 327 | 3.1248 | 0.579 | 0.76075 | 0.037 | -0.237 |
| Investor personality traits | 327 | 3.1366 | 0.811 | 0.90079 | -0.185 | -0.259 |

Given the results obtained from the study of central parameters, the dimensions of investment security, investment profitability and investment rules and regulations are in an unfavorable situation. However, the dimensions of higher expected returns, investor financial literacy and investor personality traits are not very favorable and are slightly higher than the average Likert scale. The only dimension that is desirable in terms of investor behavior is the position and location of the investment, which is desirable with a value of 3.96565.

## 4.3 Sampling Adequacy Test for Factor Analysis

Factor analysis has a very important role in identifying latent variables or the same factors through observed variables. In performing factor analysis, one must first ensure that the available data can be used for analysis. In other words, is the number of data (sample size and relationship between variables) appropriate for factor analysis or not? Hence, KMO index and Bartlett test are used. The KMO index is a sampling adequacy index that examines the small partial correlation between variables and thus determines whether the variance of the research variables is affected by the common variance of some latent and fundamental factors. If the KMO value is less than 0.5, the data will not be suitable for factor analysis, and if the value is between 0.5 to 0.69, factor analysis can be done with caution, but if the value is greater than 7. 0, the data correlations will be suitable for factor analysis. On the other hand, Bartlett test is used to ensure the appropriateness of the data for the correlation matrix that is the basis of the analysis.

Another Bartlett test states that correlation between variables is required and if the variables are independent, factor analysis is not a suitable method for the analysis. Table 6 shows that the KMO test values for the research variables and the total components are above 0.5, so the number of the sample is sufficient for factor analysis. On the other hand, the significance levels of Bartlett test for research variables and total components are less than 5%, i.e., there is a good relationship between data structure and data are suitable for factor analysis.

**Table 6:** Data Adequacy Test for Questionnaire Indicators

| Bartlett test | KMO | Sig |
|---|---|---|
| 6352.233 | 0.913 | 0.000 |

## 4.4 Confirmatory Factor Analysis

The main goal of confirmatory factor analysis is to determine the power of a predefined model with a set of observed data. In other words, confirmatory factor analysis seeks to determine whether the number of factors and the loads of the variables measured on these factors are consistent with what was expected based on theory and theoretical model. In other words, this type of factor analysis tests the degree of conformity between the theoretical structure and the experimental structure of research.
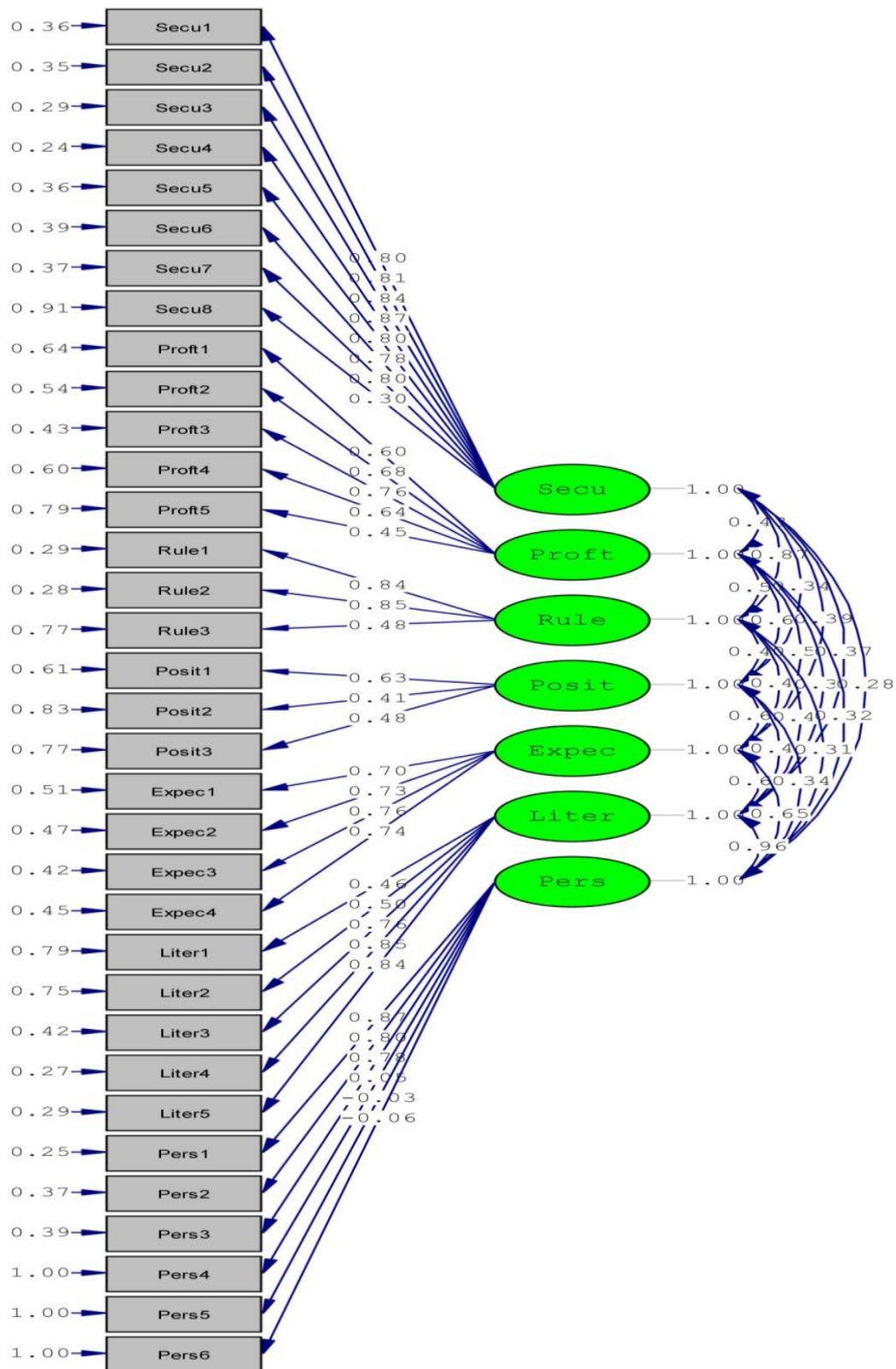
**Fig. 2:** First-order Factor Analysis of the Dimensions of Investor Behavior in the Standard Estimation Mode
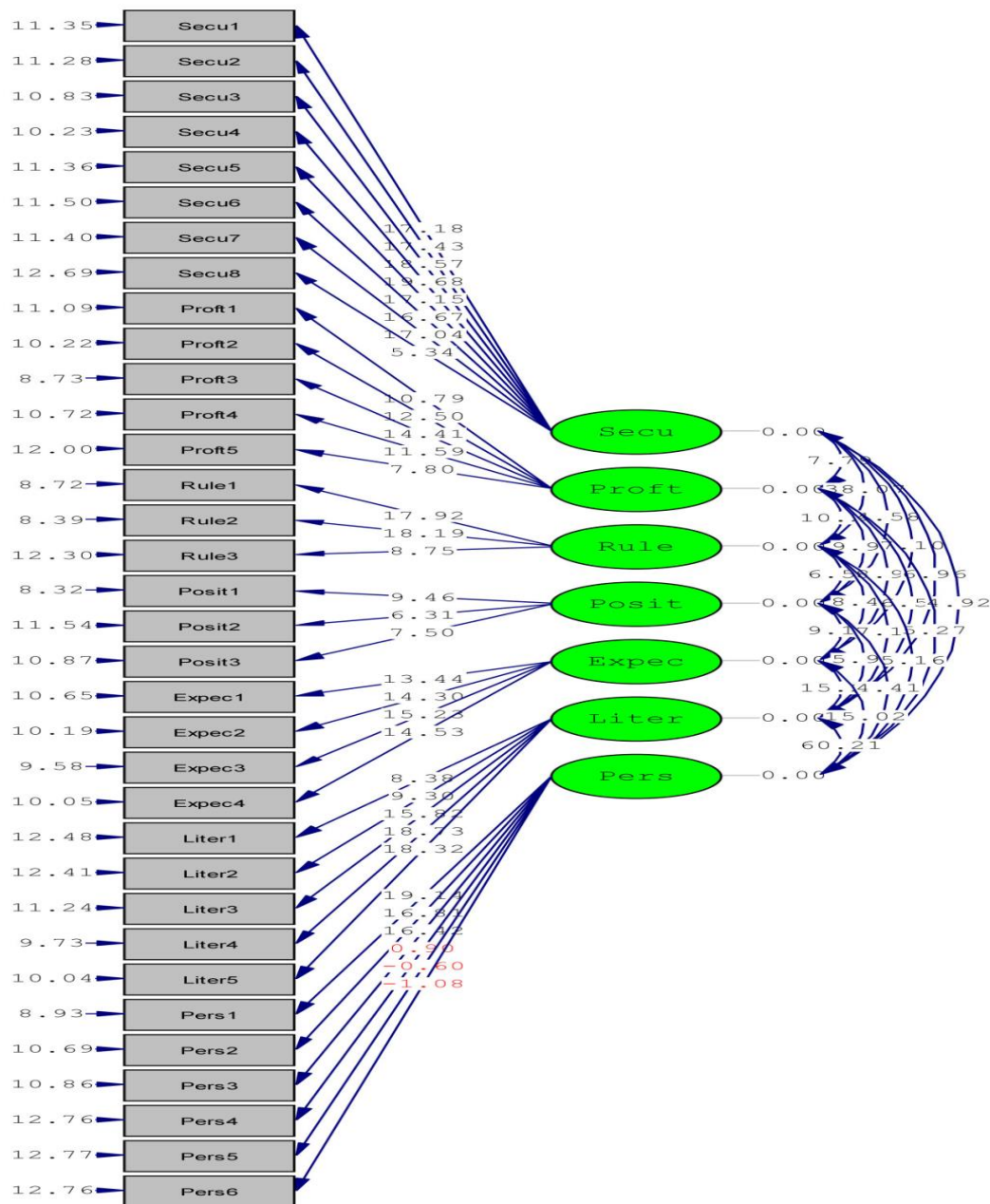
**Fig. 3:** First-Order Factor Analysis of the Dimensions of Investor Behavior in Significant Numbers

In other words, confirmatory factor analysis is formulated based on the literature and theoretical foundations, and the relationship between latent variables (factors) and explicit variables (items) and then the validity of the relationship and the structure of the research is tested by confirmatory factor analysis. Therefore, in this method, the relevant variables and indicators are selected based on the initial theory and then factor analysis is used to see if these variables and indicators are loaded on the predicted factors as expected, or their composition is changed and loaded on other factors. In this type of factor analysis, the researcher's basic premise is that each factor is relevant to a specific subset of indicators. The minimum necessary condition for confirmatory factor analysis is that the researcher

first of all assumes the number of factors in the model. The current paper uses first-order and second-order factor analysis, which are described and analyzed below.

### 4.4.1 First-Order Confirmatory Factor Analysis

First, first-order confirmatory factor analysis was used to check the accuracy of the items and whether the items relevant to each of the dimensions of investor behavior. In the first-order confirmatory factor analysis, two models are analyzed through structural equation modeling, one of which is the standard estimation mode and the other is the model in significant numbers. In standard estimation mode, the model examines the items through factor loading. The acceptable amount of factor loads in statistical texts are different from each other, but in most of these texts, factor loads less than 0.4 are rejected and factor loads higher than 0.4 are accepted. For more accuracy, the current paper considers accepting factor loads of 0.45 and factor loads less than this value is eliminated. The acceptable value of significant numbers is greater than 1.96 at the 95% confidence level. Figure 2 presents the first-order factor analysis of the dimensions of investor behavior in the standard estimation mode and Figure 3 presents the first-order factor analysis of the dimensions of investor behavior in significant numbers. Therefore, as shown in Figures 2 and 3, Questions(factors) 8,13,18,32,33 and 34 which were designed to measure the dimensions of investors' behavior were removed due to the low factor load of 0.45 and the number of items in the questionnaire is 28. Table 7 shows the fit indicators of the model for measuring the dimensions of investor behavior, which shows that the model used to measure factor loads and significant numbers is not appropriate in some indicators.
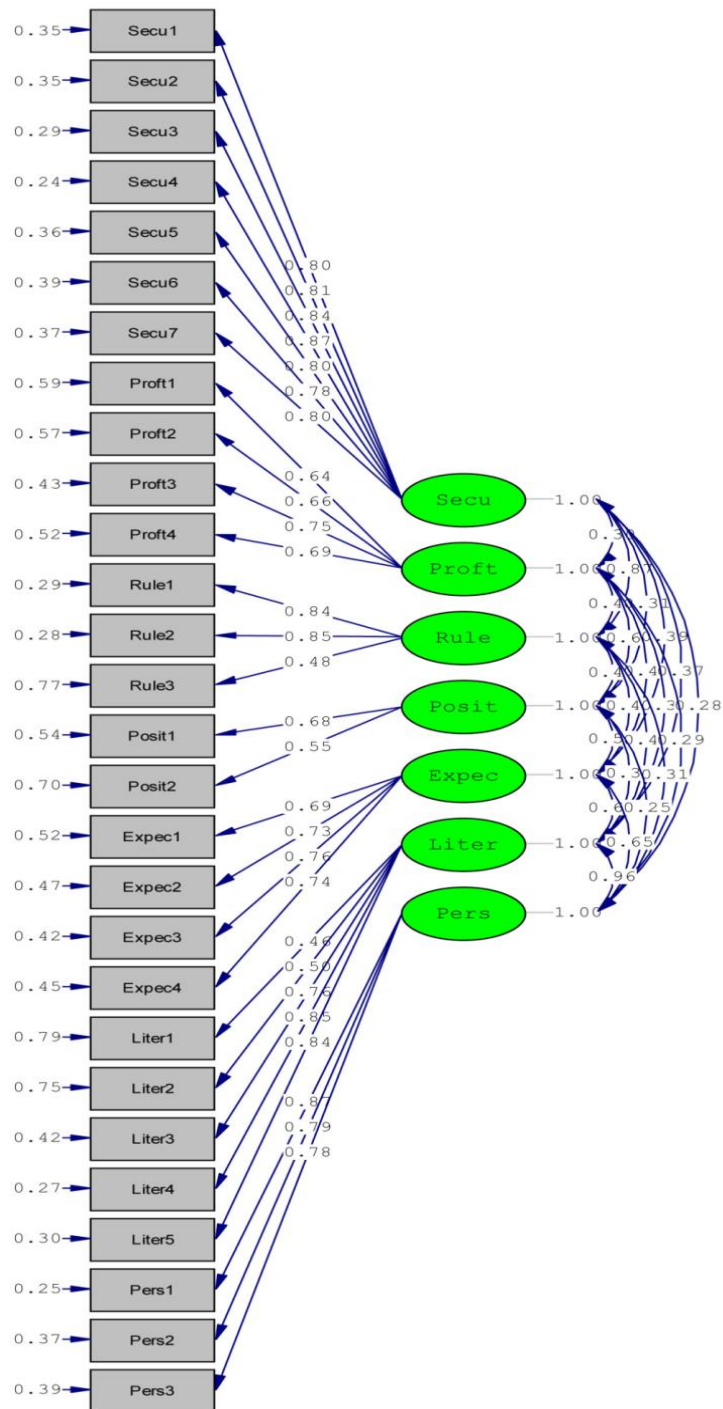
**Table 7**: Fit Indicators of the Model for Measuring the Dimensions of Iinvestor Behavior

|  | $x^2$ / df | RMSEA | AGFI | RFI | GFI | NFI | NNFI | CFI | IFI |
|---|---|---|---|---|---|---|---|---|---|
| Standard values | ≤ 3 | ≤0.1 | ≥0.8 | ≥0.8 | ≥0.9 | ≥0.9 | ≥0.9 | ≥0.9 | ≥0.9 |
| Model values | 3.92 | 0.083 | 0.86 | 0.83 | 0.92 | 0.91 | 0.93 | 0.91 | 0.91 |

The value of the RMSA indicator must be less than 3, which is greater than 3. Therefore, by removing the relevant items, the fit indicators are re-examined and the results are depicted in Table 8 and Figures 4 and 5, showing that the model or data collected from the statistical sample of the research has a good fit, that is, the items used to measure the dimensions of investor behavior are properly used and the structure is properly designed.

**Table 8**: Fitting the Model for Measuring the Dimensions of Investor Behavior after Eliminating Items with Low Factor Load

|  | $x^2$ / df | RMSEA | AGFI | RFI | GFI | NFI | NNFI | CFI | IFI |
|---|---|---|---|---|---|---|---|---|---|
| Standard values | ≤3 | ≤0.1 | ≥0.8 | ≥0.8 | ≥0.9 | ≥0.9 | ≥0.9 | ≥0.9 | ≥0.9 |
| Model values | 2.647 | 0.071 | 0.88 | 0.87 | 0.94 | 0.96 | 0.97 | 0.98 | 0.98 |

**Fig.4**: First-Order Factor Analysis of Investor Behavior Dimensions in Standard Estimation Mode after Eliminating Items with Low Factor Load
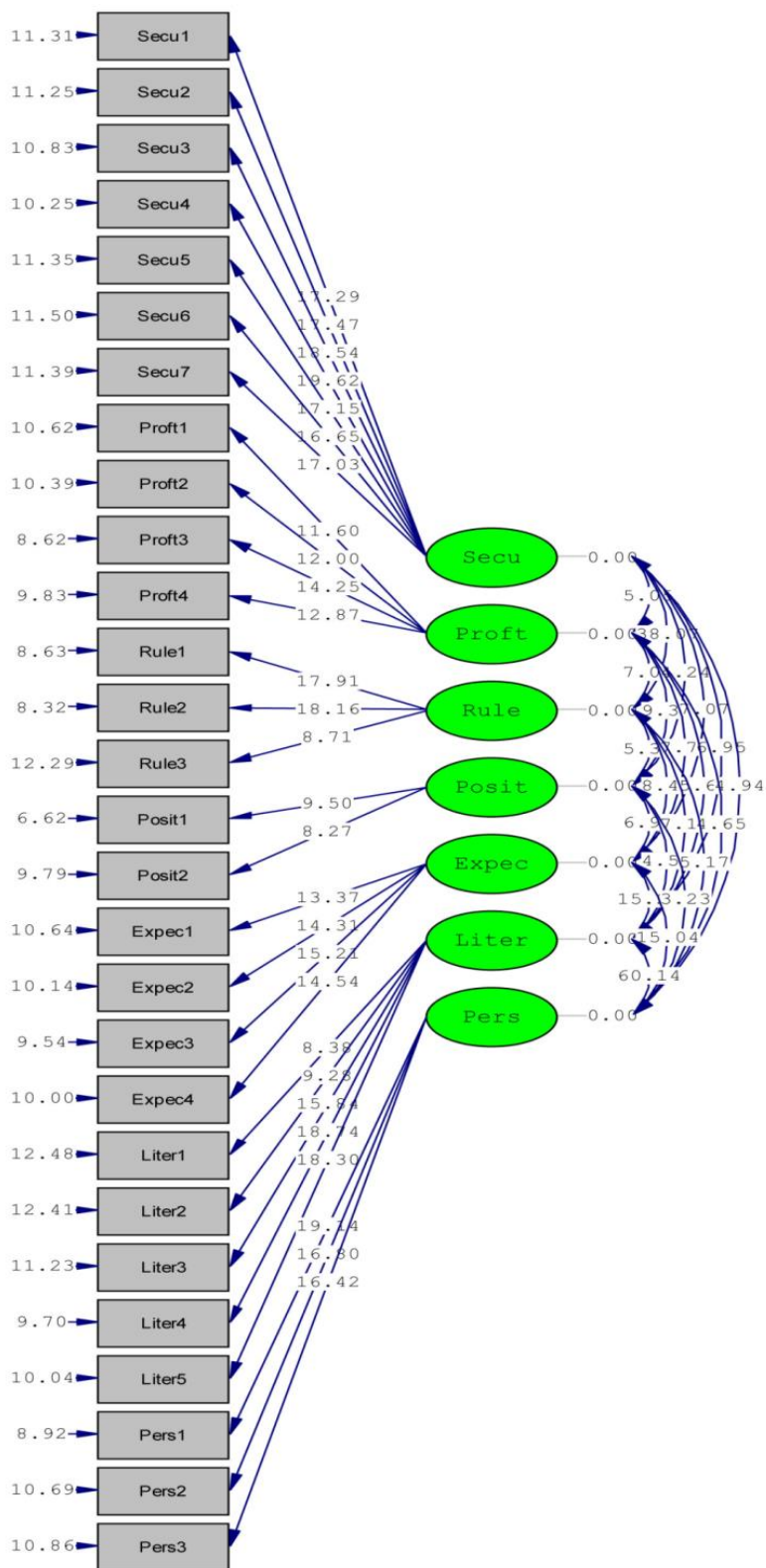
Chi-Square=871.85, df=329, P-value=0.00000, RMSEA=0.071

**Fig. 5**: First-Order Factor Analysis of the Dimensions of Investor Behavior in Significant Numbers after Eliminating Items with Low Factor Load

## 4.4.2 Second-Order Confirmatory Factor Analysis

Second-order factor analysis or higher-order factor analysis is an extended model of factor analysis. This method is based on hierarchical models. In second-order factor analysis, it is assumed that the latent variables themselves contribute to the common variance caused by one or more higher-order factors. In other words, second-order agents are actual agents. It can be said that second-order factor analysis is a very useful method for data analysis that provides high interpretive power to the researcher. As discussed in the first-order confirmatory factor analysis, six items were removed from the items designed to measure investor behavior.Table 9 presents the final results of the first-order factor analysis, which examines these dimensions and items for the second-order factor analysis.

**Table 9**: Number of Questions and Dimensions of Investor Behavior after Eliminating Items with Low Factor Load

| Research variables | Number of items | Items No. | Eliminated items |
|---|---|---|---|
| Investment security | 7 | 1-7 | 1 |
| Return on investment | 4 | 8-11 | 1 |
| Investment rules and regulations | 3 | 12-14 | ------- |
| Position and location of investment | 2 | 15-16 | 1 |
| Higher expected returns | 4 | 17-20 | ------- |
| Investor financial literacy | 5 | 21-25 | ------- |
| Investor personality traits | 3 | 26-28 | 3 |

In the second factor analysis examines the relationship between dimensions and the relevant main variable. Therefore, Table 10 presents the results of the second-order factor analysis d. Also, Figures 6 and 7 depict both standard estimation and significant numbers modes.

**Table 10:** Results of Second-Order Factor Analysis

| Dimensions of research | B | Sig | Result |
|---|---|---|---|
| Investment security | 0.4 | 6.7 | Confirmed |
| Return on investment | 0.38 | 5.53 | Confirmed |
| Investment rules and regulations | 0.44 | 6.73 | Confirmed |
| Position and location of investment | 0.34 | 5.12 | Confirmed |
| Higher expected returns | 0.69 | 9.8 | Confirmed |
| Investor financial literacy | 1 | 8.8 | Confirmed |
| Investor personality traits | 0.94 | 17.11 | Confirmed |

The Table 11 shows fit indicators of the model for measuring the dimensions of investor behavior and the investor behavior variable, showing that the model or data collected from the statistical sample of the research fits well, that is the dimensions used to measure the investor behavior variable are appropriate.

**Table 11**: Fit Indicators of the Model for Measuring the Dimensions of Investor Behavior after Eliminating Items with Low Factor Load

| | $x^2 / df$ | RMSEA | AGFI | RFI | GFI | NFI | NNFI | CFI | IFI |
|---|---|---|---|---|---|---|---|---|---|
| Standard values | ≤ 3 | ≤0/1 | ≥0/8 | ≥0/8 | ≥0/9 | ≥0/9 | ≥0/9 | ≥0/9 | ≥0/9 |
| Model values | 2.93 | 0.05 | 0.87 | 0.85 | 0.95 | 0.98 | 0.98 | 0.98 | 0.98 |
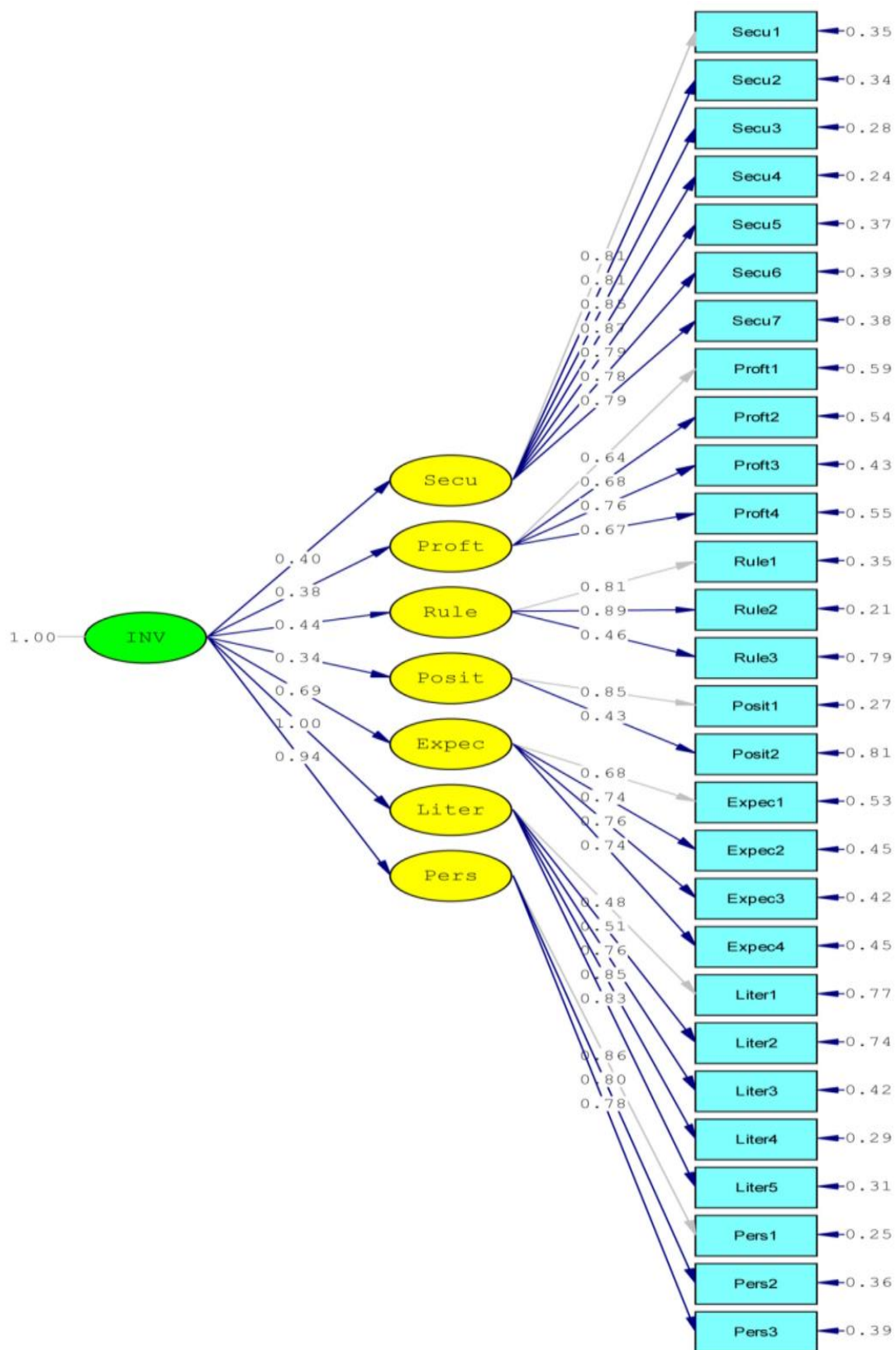
**Fig.6:** Second-Order Factor Analysis between Investor Behavior Dimensions and Investor Behavior Variable in Standard Estimation Mode
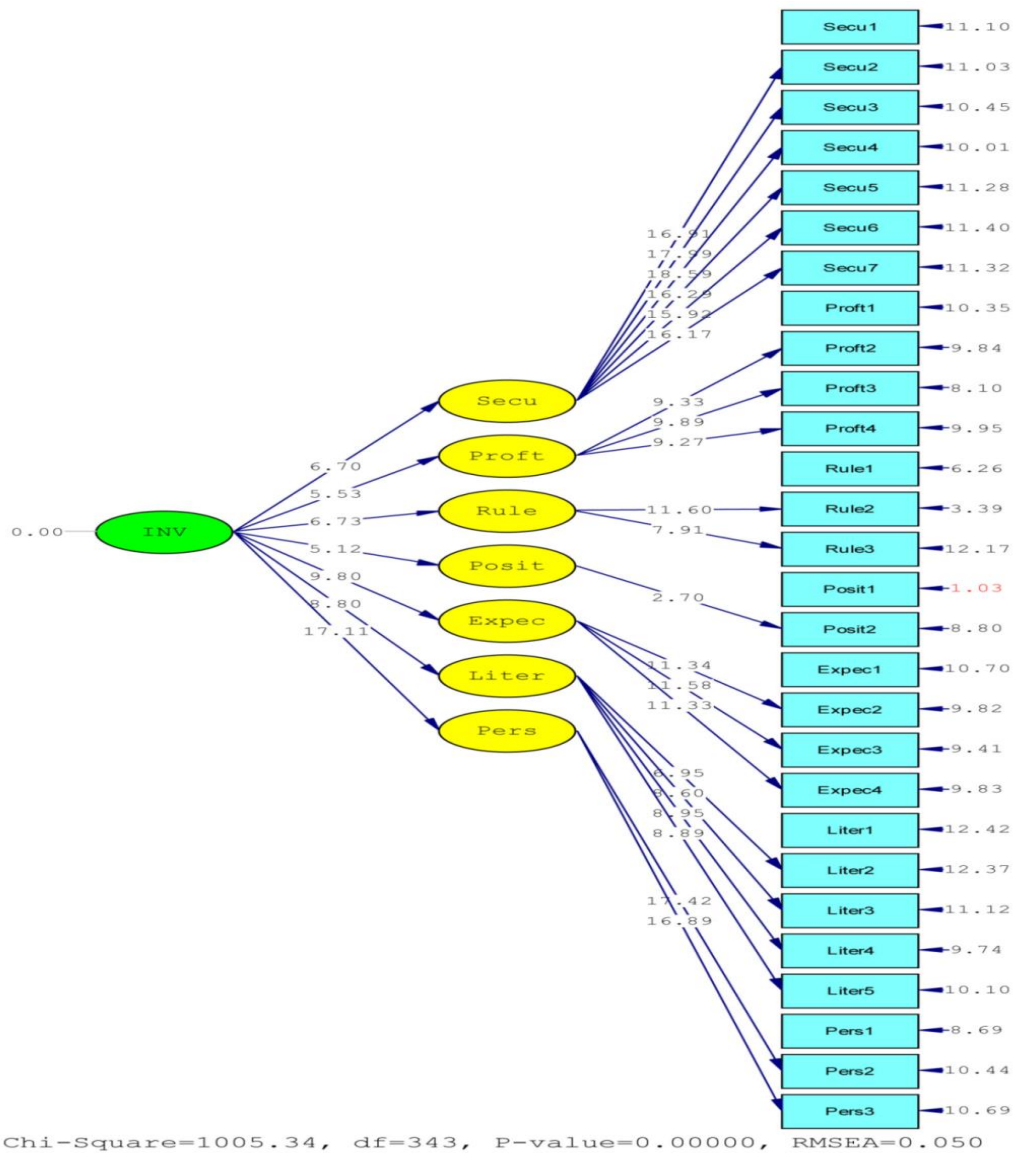
**Fig. 7**: Second-Order Factor Analysis between Investor Behavior Dimensions and Investor Behavior Variable in Estimating Significant Numbers

## 5 Conclusions, Discussions and Suggestions

In general, investors have certain behaviors and preferences in investing, Investors' behavior and preferences in their investment are influenced by several factors; Both internal and external factors. Factors influencing the type of investment of individuals can be divided into two categories: psychological factors and demographic factors. Psychological factors include mental attitudes, lifestyle, values, personality and some other intellectual factors. Demographic factors include gender, age, level of education, income, type of occupation and so on. The current paper, according to the findings of descriptive statistics and central parameters that the average factor of investment security is 2.55, which is lower than the average concludes that investors and capital market participants are not optimistic about maintaining their main capital in this market. In other words, they see their capital at risk. Also, they are not satisfied with the profitability and rules and regulations governing the stock market with the average of 2.8.4 and 2.81, respectively. It is worth noting that the average

value above 3 for the dimensions of financial literacy, investor personality traits and higher expected returns, indicates that although capital market activists and investors are somewhat financially literate, but still follow the other investors behavior in their decisions for the personality traits and emotionally risk-taking features. In other words, personality traits dominate the financial literacy of investors, which is consistent with that of the results of research by Vakilifard et al [37] and other research in this field. Also the results of statistical analysis indicate that financial literacy with a Beta coefficient of 1 and investor personality traits with a Beta coefficient of 0.94 are the two factors with the greatest impact on investor behavior. It is worth mentioning that expected return, rules and regulations, investmentsecurity, investment profitability, and position and location of the investment factors are next priorities with Beta coefficients 0.64, 0.44, 0.4, 0.38 and 0.34, respectively. Therefore, given the current paper results, it is suggested that the authoritiesand those involved in the Iranian capital market raise the level of financial literacy of capital by teaching tips, techniques and principles of investment to activists, especially new investors and activists. This leads to the management of investors' behavior, and investors display rational behavior instead of emotional behavior, and as a result, it manages and controls price fluctuations and stock market transactions resulting in improved investment securityand encouraged stock market activists and thus a dynamic and efficient capital market.

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