

Designing a Model of Investor Behavioral Biases with Emphasis on the Role of Financial Literacy

Alireza Khamesi¹, Abdullah Nazari^{2,*}, Hamidreza Jafari³ and Farhad Hanifi⁴



¹ Department of Management, Ab.C., Islamic Azad University, Abhar, Iran; 

² Department of Management, Ab.C., Islamic Azad University, Abhar, Iran; 

³ Department of Engineering, Ab.C., Islamic Azad University, Abhar, Iran; 

⁴ Department of Management, CT.C., Islamic Azad University, Tehran, Iran; 

* Correspondence: Abd.Nazari1353@ut.ac.ir

Citation: Khamesi, A., Nazari, A., Jafari, H., & Hanifi, F. (2027). Designing a Model of Investor Behavioral Biases with Emphasis on the Role of Financial Literacy. *Business, Marketing, and Finance Open*, 4(7), 1-19.

Received: 08 April 2026

Revised: 17 September 2026

Accepted: 24 September 2026

Initial Publication: 28 September 2026

Final Publication: 01 July 2027



Copyright: © 2027 by the authors. Published under the terms and conditions of Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License.

Abstract: This study aimed to design and empirically test a structural model of investor behavioral biases with particular emphasis on the effect of financial literacy among individual investors in Tehran. This quantitative, cross-sectional, descriptive-correlational study was conducted on 384 individual investors in Tehran selected through purposive and convenience sampling. Data were collected using a structured questionnaire assessing financial literacy and eleven behavioral biases, including overconfidence, representativeness, anchoring, availability bias, confirmation bias, loss aversion, regret aversion, disposition effect, mental accounting, herding behavior, and status quo bias. The measurement properties of the constructs were evaluated using confirmatory factor analysis, Cronbach's alpha, composite reliability, average variance extracted, and variance inflation factors. Pearson correlation analysis was used to examine bivariate relationships, and structural equation modeling was performed in AMOS to test the hypothesized effects of financial literacy on investor behavioral biases. Model fit was evaluated using χ^2/df , RMSEA, CFI, TLI, IFI, GFI, AGFI, and SRMR. Financial literacy was significantly and negatively associated with all behavioral biases ($p < 0.01$). In the structural model, financial literacy significantly reduced overconfidence ($\beta = -0.47$), herding behavior ($\beta = -0.44$), confirmation bias ($\beta = -0.43$), anchoring ($\beta = -0.39$), disposition effect ($\beta = -0.36$), representativeness ($\beta = -0.34$), status quo bias ($\beta = -0.32$), availability bias ($\beta = -0.31$), loss aversion ($\beta = -0.28$), regret aversion ($\beta = -0.26$), and mental accounting ($\beta = -0.23$), with all paths significant at $p < 0.001$. The model showed acceptable fit ($\chi^2/df = 2.43$, RMSEA = 0.061, CFI = 0.938, TLI = 0.929, IFI = 0.940, GFI = 0.914, AGFI = 0.901, SRMR = 0.052). Financial literacy plays a significant protective role against a broad range of investor behavioral biases, with stronger effects on cognitively and socially driven biases than on emotionally rooted tendencies. Strengthening financial literacy may therefore improve the quality of investment decision-making and reduce systematic behavioral errors among individual investors.

Keywords: Financial Literacy; Behavioral Biases; Investor Behavior; Investment Decision-Making; Overconfidence; Herding Behavior; Structural Equation Modeling.

1. Introduction

Investment decision-making is one of the most consequential forms of economic behavior because it requires individuals to allocate limited financial resources under conditions of uncertainty, incomplete information, fluctuating expectations, and varying levels of perceived risk. Classical financial theories traditionally conceptualized investors as rational agents who systematically process available information, assess the relationship between expected risk and return, and select investment alternatives that maximize expected utility. In actual financial markets, however, investment behavior frequently diverges from these assumptions. Individual

investors may rely on heuristics, emotions, prior experiences, social cues, subjective beliefs, and simplified rules of judgment when making decisions, particularly when market information is complex or ambiguous. Behavioral finance emerged to explain these systematic deviations from the assumptions of rational choice and has increasingly become a central framework for understanding why investors facing comparable information and market conditions may arrive at substantially different decisions. Contemporary reviews indicate that investor behavior is influenced by an interconnected set of cognitive, affective, social, informational, and contextual mechanisms rather than by objective financial information alone [1]. Systematic evidence further shows that behavioral biases constitute persistent determinants of investment decision-making across different markets and investor groups and cannot simply be treated as random decision errors [2]. Similarly, research synthesizing individual investment decisions has emphasized that investment choices arise from the interaction of investor-specific characteristics, attitudes toward risk, financial capabilities, market perceptions, and behavioral tendencies [3]. Accordingly, understanding investment behavior requires a framework capable of integrating rational financial competencies with the psychological mechanisms through which investors interpret market information and respond to uncertainty.

Behavioral biases refer to systematic patterns of judgment or decision-making that cause individuals to deviate from theoretically optimal or fully rational choices. In investment settings, such biases can affect virtually every stage of the decision process, including information acquisition, interpretation of market signals, estimation of probabilities, perception of gains and losses, portfolio selection, buying and selling behavior, and responses to market volatility. The expanding literature on financial behavior demonstrates that these deviations are neither isolated nor homogeneous; instead, they encompass multiple cognitive and emotional mechanisms that can reinforce one another and shape repeated patterns of investor conduct [4]. Comparative research on financial asset investors also shows that investment behavior varies according to investors' perceptions, experience, risk orientation, information-processing patterns, and responses to different market environments [5]. Among the most prominent biases identified in behavioral finance are overconfidence, representativeness, anchoring, availability bias, confirmation bias, loss aversion, regret aversion, the disposition effect, mental accounting, herding behavior, and status quo bias. Although each represents a theoretically distinct phenomenon, their practical consequences often overlap. For example, an investor who overestimates personal forecasting ability may trade too frequently, while another who gives disproportionate weight to easily recalled information may respond excessively to recent market developments. Investors may also maintain losing positions because realizing the loss is psychologically unpleasant, sell profitable positions prematurely to secure gains, or follow the behavior of other market participants instead of independently evaluating available evidence. These patterns illustrate why investment decisions cannot be fully understood merely through conventional indicators such as expected returns, variance, or portfolio diversification.

Overconfidence is particularly important in behavioral finance because it directly affects the degree to which investors trust their own knowledge, forecasts, and decision-making abilities. Overconfident investors may underestimate uncertainty, overestimate the precision of private information, and interpret successful past outcomes as evidence of superior investment skill. Empirical evidence from Japanese investors demonstrates that overconfidence is meaningfully associated with investors' tolerance of investment losses, highlighting the relevance of confidence judgments to responses under financial risk [6]. Research focusing on retail investors has similarly emphasized the importance of behavioral finance mechanisms in explaining investment decisions that depart from conventional rationality assumptions [7]. Overconfidence can also interact with other behavioral tendencies.

Confirmation bias may lead investors to selectively notice information consistent with their expectations, whereas anchoring may cause them to remain excessively influenced by reference values such as historical prices, initial forecasts, or purchase prices. Representativeness can encourage investors to extrapolate from recent performance or superficially similar situations without adequately considering underlying probabilities, while availability bias increases reliance on information that is recent, vivid, familiar, or easily retrieved from memory. Consequently, investment decisions can become systematically dependent on the manner in which information is perceived and processed rather than exclusively on the objective informational content itself.

Information sources are therefore central to behavioral investment processes. Investors rarely possess complete information and must determine which sources are sufficiently credible and relevant for their decisions. Evidence from Japanese investors indicates that individuals use heterogeneous information sources in making investment decisions and that the nature of these sources is an important component of actual financial behavior [8]. The availability and accessibility of information may be especially consequential in contemporary markets, where investors receive continuous streams of financial news, analyst opinions, social-media commentary, peer recommendations, trading-platform notifications, and informal investment advice. Access to information, however, does not guarantee unbiased processing. Social influences and investor involvement can affect the frequency of investment behavior alongside access to information and risk tolerance [9]. Herding behavior provides a clear illustration of this problem because investors may interpret the behavior of others as an informational signal and replicate majority behavior, even where independent analysis would suggest a different course of action. Empirical findings have demonstrated that herding behavior and financial literacy are both relevant to investment decision-making, alongside accounting information and perceived risk [10]. Such evidence highlights that financial markets are social as well as informational environments, and individual investment choices may reflect both personal judgment and perceived collective behavior.

Emotional and motivational mechanisms also complicate investor decision-making. Prospect-based interpretations of behavior suggest that individuals commonly evaluate potential outcomes relative to reference points and tend to experience losses more intensely than equivalent gains. Loss aversion can therefore encourage excessive conservatism, delayed realization of losses, or avoidance of otherwise appropriate investment opportunities. Regret aversion can similarly motivate investors to avoid choices that might subsequently produce feelings of responsibility or disappointment. The disposition effect, which describes the tendency to realize gains too early while holding losing assets too long, reflects the combined influence of reference dependence, loss aversion, and emotional responses to realized outcomes. Risk tolerance is consequently a central construct for explaining how investors translate perceptions of uncertainty into actual investment choices. Recent bibliometric evidence indicates that the relationship between risk tolerance and stock-market investment decisions has become an increasingly important line of inquiry within behavioral and investment research [11]. Evidence from Indonesian millennials likewise demonstrates that financial risk tolerance is shaped by multiple individual determinants and is crucial to understanding willingness to participate in uncertain financial choices [12]. Research in Japan has further shown that financial knowledge, attitudes, and behaviors are associated with investment loss tolerance, underscoring the importance of financial capability in investors' reactions to adverse outcomes [13]. Therefore, behavioral biases should not be viewed solely as cognitive errors; they frequently emerge from the interaction between cognition, emotion, perceived risk, and an investor's financial competencies.

Another important mechanism is mental accounting, through which individuals psychologically separate financial resources into different categories and treat economically equivalent funds differently depending on their

perceived origin, purpose, or designated use. In investment settings, mental accounting can lead investors to assess individual securities separately rather than considering total portfolio risk or to segregate gains from principal in ways that influence subsequent risk-taking. Research examining cryptocurrency investment has demonstrated meaningful relationships among financial literacy, investment decisions, overconfidence, and mental accounting, suggesting that cognitive biases and financial capabilities can operate simultaneously in highly uncertain investment environments [14]. Contemporary forms of investment, including cryptocurrency and digital assets, make such mechanisms particularly salient because rapid price changes, intensive media exposure, technological complexity, and speculative expectations can amplify heuristic processing. Recent evidence concerning digital asset investment intention among mutual-fund investors also demonstrates that investors' intentions toward emerging assets depend on multiple determinants rather than conventional return considerations alone [15]. These developments suggest that behavioral-finance models must be sufficiently broad to explain investment decisions across both traditional capital markets and new financial environments.

Temporal preferences constitute another source of deviation from standard financial rationality. Investors differ in the relative value they place on immediate versus delayed outcomes, which can influence saving, portfolio accumulation, and retirement-related investment behavior. Hyperbolic discounting reflects a tendency to disproportionately favor immediate rewards over future benefits and can undermine consistent long-term financial planning. Evidence among active Japanese investors aged 65 years and older has demonstrated that hyperbolic discounting is associated with asset accumulation for later life, illustrating the importance of intertemporal behavioral tendencies even among experienced investors [16]. More broadly, investment willingness may also be shaped by subjective well-being and behavioral-economic factors. Structural modeling of individual investors has suggested that happiness and behavioral-economic characteristics can contribute to differences in saving and investment willingness [17]. Such findings expand the behavioral-finance framework beyond isolated cognitive biases and indicate that financial choices are embedded in broader psychological processes affecting valuation, motivation, patience, and perceived well-being.

Within this multidimensional behavioral environment, financial literacy has attracted particular attention as a potential factor capable of improving investment decisions and reducing susceptibility to behavioral biases. Financial literacy generally refers to the knowledge, understanding, skills, and practical competencies required to comprehend financial concepts, evaluate alternatives, assess financial risks, and make informed decisions. For investors, relevant competencies include understanding inflation, interest and compounding, diversification, the time value of money, risk-return relationships, and the characteristics of financial instruments. Financial literacy may improve decision quality by enabling investors to interpret information more systematically, distinguish relevant signals from market noise, compare alternatives more effectively, and recognize the limitations of intuitive judgments. Research has shown that financial literacy can influence investment decisions directly while also functioning as a moderating variable in the relationships between other determinants and investment choices [18]. Studies of students and emerging investors likewise suggest that financial literacy forms part of a wider set of determinants affecting investment decision-making [19]. In this sense, financial literacy is not simply knowledge retained by an investor; it may operate as a cognitive resource that shapes how financial information is processed and how behavioral tendencies are translated into actual decisions.

The relationship between financial literacy and behavioral biases, however, is not necessarily straightforward. Financial knowledge can potentially reduce decision errors by improving analytical capability, yet knowledgeable investors may still remain vulnerable to psychological tendencies. Some forms of knowledge may even increase

subjective confidence faster than objective competence, thereby potentially strengthening overconfidence under certain conditions. For this reason, recent research has increasingly examined the nexus between financial knowledge and behavioral biases rather than assuming that higher literacy automatically produces fully rational investment behavior. Evidence specifically addressing the financial-knowledge-behavioral-bias relationship has highlighted the importance of examining how these constructs jointly affect individual investment decisions [20]. Research on investor cognition also suggests an interplay among financial literacy, cognitive processes, and adaptive decision mechanisms in determining investment behavior [21]. This perspective is important because financial literacy may influence different biases to different degrees. Biases that arise primarily from misunderstanding probabilities or financial principles may be particularly responsive to knowledge, whereas tendencies rooted more deeply in emotion, identity, reference dependence, or social imitation may persist despite relatively high levels of financial competence.

Accordingly, financial literacy should be considered alongside psychological characteristics when explaining investor behavior. Research questioning whether financial literacy alone is sufficient to explain investment decisions has emphasized that psychological characteristics add important explanatory value and that decision models based solely on financial knowledge are likely to be incomplete [22]. Similarly, studies examining overconfidence, herding, and loss aversion have shown that these biases affect investment decisions while financial literacy may alter or moderate their influence [23]. This distinction is theoretically significant. If financial literacy directly reduces the intensity of specific biases, educational interventions could potentially improve investment decision processes by enhancing analytical competence. If its influence is primarily moderating, however, financial literacy may function by changing the extent to which pre-existing cognitive or emotional tendencies affect observable investment choices. In either case, identifying the bias-specific relationships is more informative than treating behavioral bias as a single undifferentiated phenomenon.

The need for integrated modeling is also reinforced by systematic reviews of investor behavior. The behavioral finance literature has expanded considerably, but findings remain distributed across multiple constructs, populations, asset classes, and research designs. Reviews have identified a diverse set of antecedents of consumer investment behavior and emphasized the need for theoretically organized frameworks capable of integrating accumulated evidence [1]. A systematic review of behavioral biases has likewise demonstrated the repeated influence of multiple biases on investor decision-making while indicating substantial variation in how individual biases are conceptualized and tested across studies [2]. Reviews focused specifically on individual investment decisions have similarly called attention to the interaction of behavioral and financial determinants [3]. Bibliometric analysis of financial behavior and decision-making further shows that the domain has evolved toward increasingly interdisciplinary explanations incorporating psychology, behavioral economics, financial knowledge, and decision sciences [4]. These developments suggest that a useful empirical model should move beyond examining only one or two biases and instead assess a wider configuration of cognitive, emotional, and social tendencies simultaneously.

This need becomes particularly important in the context of individual investors operating in volatile capital markets. Unlike institutional investors, individual investors may have limited analytical resources, uneven access to professional advice, varying levels of financial education, and greater exposure to emotionally salient market movements and informal information channels. They may therefore be particularly susceptible to overreaction, social imitation, confidence errors, reference dependence, and selective information processing. At the same time, individual investors differ considerably in financial literacy, making it important to identify whether knowledge

and competence systematically distinguish investors who are more or less vulnerable to behavioral biases. Investment decisions are also increasingly made through digital platforms that reduce transaction costs and accelerate access to information, potentially increasing both the opportunities for informed investing and the frequency with which intuitive or impulsive decisions can be executed. The literature on digital assets, behavioral finance, risk tolerance, and information use demonstrates that contemporary investment behavior is situated at the intersection of financial competence, psychological tendencies, technological environments, and social information [9, 15]. Consequently, understanding the behavioral structure of individual investors requires attention not only to whether biases exist but also to how strongly each bias is associated with financial literacy.

Although prior research has provided valuable evidence concerning financial literacy, overconfidence, herding, loss aversion, risk tolerance, mental accounting, information sources, and other determinants of investment behavior, several gaps remain. First, many studies have examined a limited number of behavioral biases rather than constructing a comprehensive model encompassing multiple cognitive, emotional, and socially influenced tendencies simultaneously. Second, financial literacy has often been examined primarily as a direct antecedent of investment decisions, while less attention has been devoted to its differentiated relationships with specific behavioral biases. Third, the strength of these relationships may vary substantially across biases; for instance, financial literacy may be more strongly associated with overconfidence, confirmation bias, anchoring, or herding than with loss aversion or regret aversion. Fourth, differences across national and market contexts limit the direct generalization of results from Japanese, Indian, Indonesian, Nepalese, Thai, and other investor populations to the Iranian capital-market environment. Studies from these diverse contexts nevertheless provide convergent evidence that investor behavior reflects complex interactions among knowledge, cognition, emotions, risk tolerance, information processing, and social influence [7, 10, 13, 21]. An integrated examination within Tehran can therefore contribute context-specific evidence while extending the broader behavioral-finance literature.

The Iranian capital market provides a particularly relevant setting for such analysis because individual investors make decisions in an environment characterized by substantial informational complexity, economic uncertainty, changing market expectations, and considerable variation in investment experience and financial knowledge. Under these circumstances, systematic behavioral tendencies may exert meaningful effects on how investors interpret market movements and make portfolio decisions. A model that simultaneously incorporates financial literacy and a broad set of behavioral biases can offer both theoretical and practical value. Theoretically, it can clarify whether financial literacy functions as a general protective factor against behavioral deviations and whether this relationship differs across specific forms of bias. Practically, identifying the behavioral tendencies most strongly associated with financial literacy can help inform investor education, financial advisory practices, and market-development programs. Rather than assuming that generalized financial education uniformly improves investor rationality, evidence regarding bias-specific effects could facilitate more targeted interventions that address the particular cognitive, emotional, or social mechanisms through which investment errors arise. Recent evidence emphasizing the financial-knowledge and behavioral-bias nexus reinforces the importance of such an integrated perspective [20], while research demonstrating the continuing role of behavioral biases in retail investment choices underscores the need to test these relationships within specific market populations [7]. Therefore, the present study aimed to design and empirically test a structural model of investor behavioral biases with particular emphasis on the effect of financial literacy among individual investors in Tehran.

2. Methods and Materials

This study employed a quantitative, cross-sectional, descriptive-correlational research design and was conducted with the primary purpose of designing and empirically testing a structural model of investor behavioral biases while considering the role of financial literacy. The statistical population consisted of individual investors residing in Tehran who were actively involved in trading securities and other financial instruments in the Iranian capital market during 2026. Eligible participants were required to be at least 18 years of age, have an active trading account, possess at least one year of investment experience in the capital market, and have personally participated in investment decision-making during the preceding 12 months. Individuals whose investment activities were exclusively conducted by portfolio managers or other financial agents, as well as questionnaires with substantial missing responses or evident response patterns indicating insufficient attention, were excluded from the analysis. Because the population of active individual investors in Tehran was large and its precise size could not be reliably determined, the minimum sample size was estimated using Cochran's formula for large populations at a 95% confidence level, a 5% margin of error, and maximum population variability, resulting in a required sample of 384 participants. Accordingly, 384 investors were ultimately included in the statistical analyses. Participants were recruited through purposive and convenience sampling from brokerage offices, investment service centers, investor communities, and online groups related to the Tehran capital market. To increase the heterogeneity and representativeness of the sample, data collection sought to include investors with different levels of age, education, investment experience, portfolio size, and trading frequency. Before participation, the objectives of the research were explained to the respondents, participation was entirely voluntary, and respondents were informed that their information would remain confidential and would be used only for scientific purposes. No identifying information was included in the analytical dataset, and participants could discontinue participation at any stage without any consequences.

Data were collected using a structured questionnaire composed of three main sections. The first section gathered demographic and investment-related information, including age, gender, educational level, employment status, approximate length of investment experience, frequency of trading, and general characteristics of investment activity. The second section assessed investor behavioral biases. The measurement framework was developed on the basis of the principal cognitive and emotional biases identified in the behavioral finance literature and was designed to capture recurrent deviations from rational financial decision-making. The instrument covered major behavioral dimensions such as overconfidence, representativeness, anchoring, availability bias, confirmation bias, loss aversion, regret aversion, disposition effect, mental accounting, herding behavior, and status quo tendencies. Items described common judgments and behaviors that may arise when investors evaluate financial information, select securities, respond to market fluctuations, or decide whether to buy, hold, or sell assets. Responses were recorded on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating a stronger presence of the corresponding behavioral bias. Because the objective of the study was to develop and test an integrated model rather than to measure behavioral bias as a single homogeneous construct, the individual bias dimensions were treated as theoretically distinguishable latent variables within the measurement and structural models. The initial item pool was evaluated for clarity, relevance, representativeness, and conceptual consistency by a panel of specialists in financial management, behavioral finance, investment, and research methodology. Necessary modifications were subsequently made on the basis of expert feedback. Construct validity was evaluated through confirmatory factor analysis, while convergent and discriminant validity were

examined using standardized factor loadings, average variance extracted, composite reliability, and inter-construct correlation criteria. Internal consistency was assessed using Cronbach's alpha and composite reliability coefficients, with coefficients of 0.70 or higher considered indicative of satisfactory reliability.

The third section measured financial literacy as the principal explanatory and moderating construct of the proposed model. Financial literacy was conceptualized as the investor's capacity to understand fundamental financial concepts and appropriately apply such knowledge when evaluating investment alternatives and making financial decisions. The questionnaire therefore assessed knowledge and understanding of concepts such as interest and compound interest, inflation, time value of money, risk and return, diversification, financial instruments, and the relationship between investment risk and expected return. In addition to objective knowledge-oriented items, the instrument included items addressing the practical application of financial knowledge in investment decisions, such as evaluating available information before trading, comparing investment alternatives, considering risk diversification, and interpreting basic financial information. Objective knowledge items were scored according to the correctness of the responses, whereas application-oriented statements were evaluated using a five-point response scale. Scores were standardized where necessary before calculation of the overall financial literacy construct so that differences in response formats would not disproportionately influence the measurement model. Higher scores represented greater financial literacy. The content validity of the financial literacy component was reviewed by experts in finance and investment, and its construct validity was examined as part of the overall confirmatory measurement model. Internal consistency was evaluated using Cronbach's alpha and composite reliability. Before the main data collection, the complete questionnaire was pilot-tested with a small group of investors who had characteristics comparable to those of the main study population. Feedback obtained from the pilot administration was used to improve wording and comprehensibility and to identify ambiguous or redundant items before the final questionnaire was administered.

Data analysis was performed in several consecutive stages. Initially, the questionnaires were screened for completeness, response consistency, missing values, and potential data-entry errors. Descriptive statistics, including frequency, percentage, mean, standard deviation, minimum, maximum, skewness, and kurtosis, were calculated to describe the participants and the principal study variables. The distributional properties of the data were evaluated using skewness and kurtosis coefficients, and potential multivariate outliers were assessed before testing the proposed model. Correlations among financial literacy and the different dimensions of investor behavioral biases were examined using Pearson correlation coefficients. The reliability of the measurement scales was evaluated using Cronbach's alpha and composite reliability, with values of at least 0.70 regarded as satisfactory. Confirmatory factor analysis was then conducted to assess the measurement model. Standardized factor loadings were examined to determine indicator reliability, average variance extracted values of at least 0.50 were used as evidence of convergent validity, and discriminant validity was evaluated by examining the distinctiveness of the latent constructs and the relationships among them. Potential multicollinearity was also investigated using variance inflation factor values.

Following confirmation of the measurement model, structural equation modeling was employed to test the hypothesized relationships among financial literacy and the dimensions of investor behavioral biases and to evaluate the overall explanatory structure of the proposed model. The direct effects of financial literacy on behavioral biases were estimated using standardized path coefficients, and their statistical significance was assessed using critical ratios and corresponding probability values. Where theoretically specified, the role of financial literacy in reducing or modifying the strength of behavioral biases was examined within the structural

model. The overall adequacy of the model was assessed using multiple goodness-of-fit indices rather than relying on a single statistic. These indices included the chi-square to degrees-of-freedom ratio (χ^2/df), root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker–Lewis index (TLI), goodness-of-fit index (GFI), and incremental fit index (IFI). Values of χ^2/df below 3, RMSEA below approximately 0.08, and CFI, TLI, and IFI values above 0.90 were interpreted as evidence of an acceptable model fit. Standardized direct, indirect, and total effects were reported where applicable, and the explanatory power of the structural equations was assessed using squared multiple correlations. Statistical analyses were conducted using IBM SPSS Statistics version 26 and AMOS version 24, and the significance level for all inferential analyses was set at $p < 0.05$.

3. Findings and Results

A total of 384 individual investors from Tehran were included in the final analysis. Of the participants, 252 (65.6%) were men and 132 (34.4%) were women. The mean age of the respondents was 38.74 years ($SD = 8.91$), with ages ranging from 22 to 61 years. Regarding educational level, 51 participants (13.3%) held an associate degree or lower, 168 (43.8%) held a bachelor's degree, 131 (34.1%) held a master's degree, and 34 (8.9%) held a doctoral degree. In terms of investment experience, 74 respondents (19.3%) had between one and three years of experience, 143 (37.2%) had between four and six years, 105 (27.3%) had between seven and ten years, and 62 (16.1%) had more than ten years of investment experience. The mean duration of investment experience was 6.72 years ($SD = 4.11$). With respect to trading frequency, 89 investors (23.2%) reported trading several times per month, 162 (42.2%) reported trading one or more times per week, and 133 (34.6%) reported engaging in trading activities several times per week or almost daily. Overall, the demographic and investment profile indicated that the sample included investors with diverse educational backgrounds, different levels of market experience, and varying degrees of trading activity, providing an appropriate empirical basis for examining the relationships between financial literacy and behavioral biases.

Table 1. Descriptive Statistics and Correlations among Financial Literacy and Investor Behavioral Biases

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Financial literacy	3.71	0.68	1.00											
2. Overconfidence	3.44	0.73	-.42**	1.00										
3. Representativeness	3.26	0.69	-.31**	.46**	1.00									
4. Anchoring	3.37	0.71	-.35**	.41**	.44**	1.00								
5. Availability bias	3.21	0.67	-.29**	.36**	.43**	.39**	1.00							
6. Confirmation bias	3.34	0.72	-.38**	.48**	.39**	.45**	.41**	1.00						
7. Loss aversion	3.58	0.76	-.27**	.29**	.31**	.33**	.28**	.35**	1.00					
8. Regret aversion	3.41	0.74	-.25**	.31**	.28**	.30**	.32**	.34**	.51**	1.00				
9. Disposition effect	3.49	0.70	-.33**	.37**	.34**	.35**	.31**	.39**	.54**	.48**	1.00			
10. Mental accounting	3.18	0.66	-.24**	.28**	.33**	.30**	.35**	.32**	.37**	.34**	.40**	1.00		
11. Herding behavior	3.31	0.75	-.39**	.43**	.47**	.40**	.49**	.42**	.30**	.33**	.36**	.31**	1.00	
12. Status quo bias	3.29	0.68	-.30**	.34**	.36**	.42**	.35**	.37**	.44**	.41**	.46**	.38**	.39**	1.00

As shown in Table 1, the mean scores of the behavioral-bias variables ranged from 3.18 for mental accounting to 3.58 for loss aversion, indicating that all examined behavioral tendencies were present at moderate to relatively high levels among the participating investors. Financial literacy had a mean score of 3.71 ($SD = 0.68$), suggesting that, on average, respondents reported a relatively favorable level of knowledge and practical understanding of financial concepts. Financial literacy was significantly and negatively correlated with all behavioral-bias

dimensions. The strongest negative correlations were observed between financial literacy and overconfidence ($r = -0.42, p < 0.01$), herding behavior ($r = -0.39, p < 0.01$), confirmation bias ($r = -0.38, p < 0.01$), anchoring ($r = -0.35, p < 0.01$), and the disposition effect ($r = -0.33, p < 0.01$). These findings indicate that investors with higher financial literacy tended to exhibit lower levels of systematic judgment errors and emotionally driven investment behavior. All behavioral biases were also positively correlated with one another, with coefficients ranging from 0.28 to 0.54. The strongest positive relationships were found between loss aversion and the disposition effect ($r = 0.54, p < 0.01$), loss aversion and regret aversion ($r = 0.51, p < 0.01$), and availability bias and herding behavior ($r = 0.49, p < 0.01$). None of the correlations exceeded conventional thresholds indicating serious multicollinearity, suggesting that the constructs were related but empirically distinguishable and could appropriately be entered into subsequent measurement and structural analyses.

Table 2. Measurement Model Results for the Study Constructs

Construct	Standardized Loading Range	Cronbach's Alpha	Composite Reliability	AVE	VIF Range
Financial literacy	0.68–0.84	0.88	0.90	0.57	1.42–2.18
Overconfidence	0.71–0.86	0.87	0.90	0.64	1.39–2.11
Representativeness	0.69–0.83	0.84	0.88	0.59	1.31–1.98
Anchoring	0.70–0.85	0.86	0.89	0.61	1.36–2.06
Availability bias	0.67–0.82	0.82	0.87	0.56	1.28–1.94
Confirmation bias	0.72–0.87	0.88	0.91	0.66	1.44–2.21
Loss aversion	0.73–0.88	0.89	0.92	0.68	1.47–2.35
Regret aversion	0.70–0.84	0.85	0.89	0.61	1.35–2.09
Disposition effect	0.74–0.89	0.90	0.92	0.69	1.51–2.41
Mental accounting	0.66–0.81	0.81	0.86	0.55	1.26–1.88
Herding behavior	0.71–0.86	0.87	0.90	0.64	1.42–2.24
Status quo bias	0.68–0.83	0.84	0.88	0.58	1.33–2.02

The measurement-model results presented in Table 2 demonstrate satisfactory reliability and construct validity across all variables included in the proposed model. Standardized factor loadings ranged from 0.66 to 0.89 and were all statistically significant at $p < 0.001$, indicating that the observed indicators adequately represented their respective latent constructs. The lowest loading was observed within the mental accounting construct, whereas the highest loading was associated with the disposition effect; nevertheless, all standardized loadings exceeded the minimum acceptable level typically considered appropriate for confirmatory measurement models. Cronbach's alpha coefficients ranged from 0.81 to 0.90, and composite reliability coefficients ranged from 0.86 to 0.92. These values exceeded the recommended threshold of 0.70 and therefore confirmed satisfactory internal consistency for all constructs. The average variance extracted values ranged from 0.55 for mental accounting to 0.69 for the disposition effect, and all exceeded the threshold of 0.50, providing evidence of convergent validity. Furthermore, examination of the cross-construct relationships showed that the square roots of the AVE values were greater than the corresponding inter-construct correlations, supporting discriminant validity. The variance inflation factor values ranged from 1.26 to 2.41, considerably below the conservative threshold of 5, indicating that multicollinearity did not constitute a substantial problem in the measurement or structural models. Taken together, these findings provided sufficient support for the reliability, convergent validity, discriminant validity, and absence of problematic collinearity and therefore justified proceeding to structural equation modeling.

Table 3. Goodness-of-Fit Indices for the Proposed Structural Model

Fit Index	Obtained Value	Recommended Criterion	Interpretation
χ^2	1184.62	—	—
df	487	—	—
χ^2/df	2.43	< 3.00	Acceptable
RMSEA	0.061	< 0.08	Acceptable
CFI	0.938	> 0.90	Acceptable
TLI	0.929	> 0.90	Acceptable
IFI	0.940	> 0.90	Acceptable
GFI	0.914	> 0.90	Acceptable
AGFI	0.901	> 0.90	Acceptable
SRMR	0.052	< 0.08	Acceptable

The goodness-of-fit results in Table 3 indicate that the proposed structural model provided an acceptable representation of the observed data. The ratio of chi-square to degrees of freedom was 2.43, which was below the criterion of 3.00 and therefore reflected an acceptable level of discrepancy between the hypothesized covariance structure and the observed covariance matrix. The RMSEA value was 0.061 and the SRMR value was 0.052, both of which were below 0.08, suggesting that the residual approximation error of the model was within an acceptable range. The incremental fit indices also demonstrated satisfactory model performance, with CFI = 0.938, TLI = 0.929, and IFI = 0.940, all exceeding the recommended minimum value of 0.90. The absolute fit indices were likewise acceptable, with GFI = 0.914 and AGFI = 0.901. Collectively, these results indicate that the theoretical structure linking financial literacy to investor behavioral biases was empirically compatible with the data and that the estimated measurement and structural relationships could be interpreted with an acceptable level of confidence. Accordingly, the overall model was retained without the need for major post hoc modifications, and the standardized path coefficients were subsequently examined to determine the magnitude and statistical significance of the proposed effects.

Table 4. Structural Effects of Financial Literacy on Investor Behavioral Biases

Structural Path	Standardized β	SE	Critical Ratio	p-value	R ²
Financial literacy → Overconfidence	-0.47	0.058	-7.84	<0.001	0.22
Financial literacy → Representativeness	-0.34	0.061	-5.62	<0.001	0.12
Financial literacy → Anchoring	-0.39	0.060	-6.48	<0.001	0.15
Financial literacy → Availability bias	-0.31	0.064	-4.91	<0.001	0.10
Financial literacy → Confirmation bias	-0.43	0.059	-7.21	<0.001	0.18
Financial literacy → Loss aversion	-0.28	0.063	-4.37	<0.001	0.08
Financial literacy → Regret aversion	-0.26	0.065	-4.02	<0.001	0.07
Financial literacy → Disposition effect	-0.36	0.060	-5.96	<0.001	0.13
Financial literacy → Mental accounting	-0.23	0.066	-3.54	<0.001	0.05
Financial literacy → Herding behavior	-0.44	0.057	-7.51	<0.001	0.19
Financial literacy → Status quo bias	-0.32	0.062	-5.18	<0.001	0.10

The structural coefficients reported in Table 4 demonstrate that financial literacy had a statistically significant negative effect on every behavioral-bias dimension included in the proposed model. The strongest standardized effect was observed for overconfidence ($\beta = -0.47$, $p < 0.001$), indicating that investors with higher financial literacy were substantially less likely to overestimate the accuracy of their information, forecasting ability, or investment competence. Financial literacy also exerted a relatively strong negative effect on herding behavior ($\beta = -0.44$, $p <$

0.001) and confirmation bias ($\beta = -0.43$, $p < 0.001$), suggesting that financially knowledgeable investors were less dependent on the investment behavior of others and less inclined to selectively seek or interpret information that supported their pre-existing beliefs. Significant negative effects were also observed for anchoring ($\beta = -0.39$, $p < 0.001$), the disposition effect ($\beta = -0.36$, $p < 0.001$), representativeness ($\beta = -0.34$, $p < 0.001$), status quo bias ($\beta = -0.32$, $p < 0.001$), and availability bias ($\beta = -0.31$, $p < 0.001$). The effects on loss aversion ($\beta = -0.28$, $p < 0.001$), regret aversion ($\beta = -0.26$, $p < 0.001$), and mental accounting ($\beta = -0.23$, $p < 0.001$) were somewhat smaller in magnitude but nevertheless statistically significant. The explained variance coefficients further indicated that financial literacy accounted for 22% of the variance in overconfidence, 19% in herding behavior, 18% in confirmation bias, 15% in anchoring, 13% in the disposition effect, and between 5% and 12% of the variance in the remaining behavioral-bias dimensions. These results indicate that financial literacy functions as a systematic protective factor against a broad range of cognitive and emotional deviations in investment decision-making, although its explanatory power varies depending on the nature of the behavioral tendency. The results further suggest that cognitively oriented biases such as overconfidence, confirmation bias, anchoring, and herding may be more responsive to financial knowledge than deeply affective tendencies such as regret aversion and loss aversion.

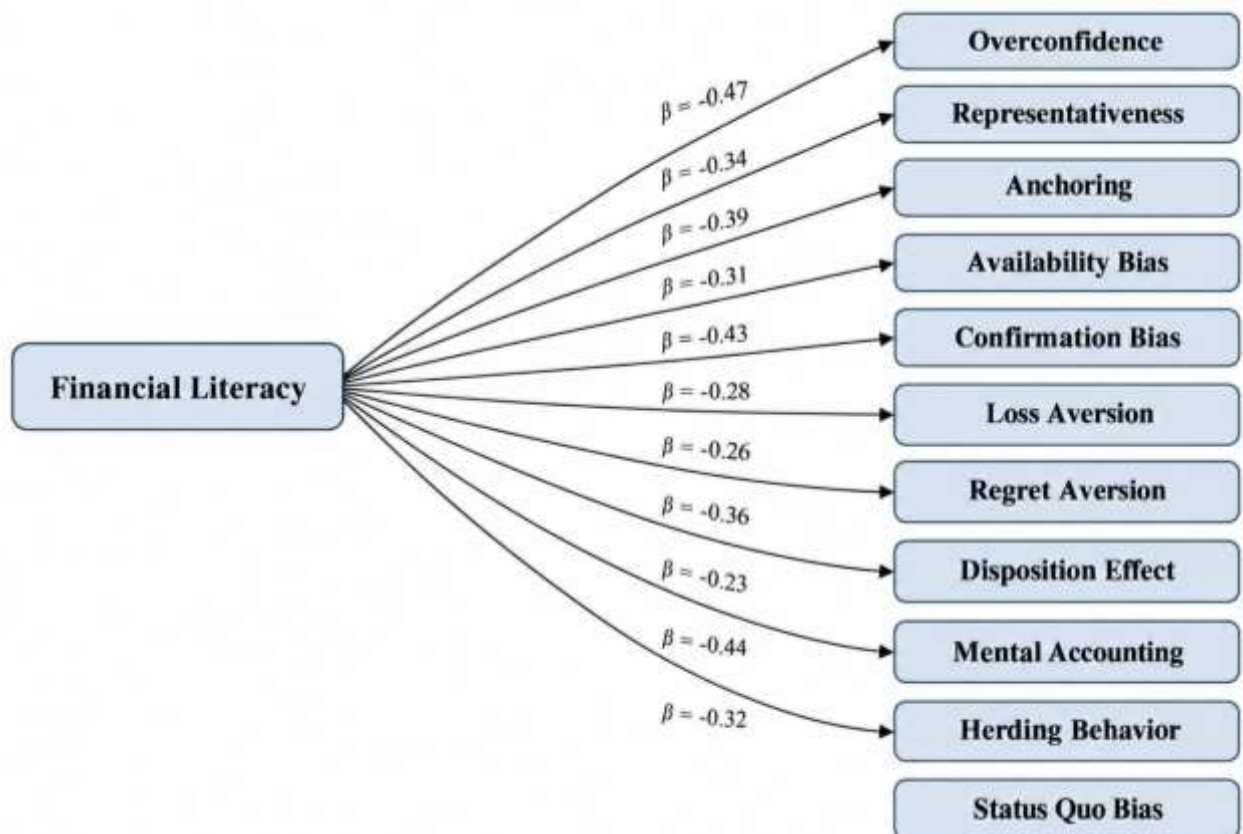


Figure 1. Standardized structural model of the effects of financial literacy on investor behavioral biases.

As illustrated in Figure 1, the final structural model confirmed a consistent inverse relationship between financial literacy and all dimensions of investor behavioral bias. The pattern of standardized coefficients indicates that the role of financial literacy was not uniform across the different forms of bias. Its strongest effects were associated with overconfidence, herding behavior, confirmation bias, and anchoring, all of which are closely related to the way investors acquire, interpret, and evaluate market information. By contrast, the comparatively smaller coefficients for mental accounting, regret aversion, and loss aversion suggest that emotional and reference-dependent behaviors may be more resistant to the corrective effects of financial knowledge alone. Nevertheless, all paths

remained statistically significant, supporting the central assumption of the proposed model that improved financial literacy is associated with lower susceptibility to both cognitive and emotional investment biases.

Taken together, the findings supported the overall conceptual framework of the study. Financial literacy was negatively associated with all investigated behavioral biases both at the bivariate level and within the structural model. The measurement model demonstrated acceptable reliability and validity, the overall structural model exhibited satisfactory fit, and all hypothesized paths from financial literacy to investor behavioral biases were statistically significant. The largest effects were found for overconfidence, herding behavior, confirmation bias, and anchoring, whereas relatively smaller but still meaningful effects were observed for mental accounting, regret aversion, and loss aversion. These results indicate that financial literacy constitutes an important explanatory variable in understanding differences in investor behavior and may contribute to reducing systematic deviations from rational investment decision-making among individual investors in the Tehran capital market.

4. Discussion and Conclusion

The present study was conducted to design and empirically test a structural model of investor behavioral biases with particular emphasis on the effect of financial literacy among individual investors in Tehran. The findings showed that financial literacy was significantly and negatively related to all examined behavioral biases, including overconfidence, representativeness, anchoring, availability bias, confirmation bias, loss aversion, regret aversion, disposition effect, mental accounting, herding behavior, and status quo bias. The structural model demonstrated acceptable fit, and all hypothesized paths from financial literacy to the behavioral-bias dimensions were statistically significant. The strongest negative effect of financial literacy was observed on overconfidence, followed by herding behavior, confirmation bias, and anchoring, whereas the weakest effects were observed for mental accounting, regret aversion, and loss aversion. These findings indicate that financial literacy is not merely associated with better financial knowledge but may function as a broader cognitive resource that reduces susceptibility to systematic judgment errors and socially or emotionally driven investment tendencies. The results are broadly consistent with behavioral-finance research emphasizing that investor decision-making reflects the interaction of financial knowledge, cognitive processes, psychological predispositions, risk perceptions, and social influences rather than purely rational evaluation of expected returns [1, 2]. They also support the view that investor behavior should be examined through integrated frameworks in which financial literacy and behavioral biases are modeled simultaneously rather than as unrelated determinants of investment decisions [3].

The strongest structural relationship identified in the study was the negative effect of financial literacy on overconfidence. This finding suggests that investors with greater financial knowledge were less likely to overestimate the accuracy of their own judgments, forecasting skills, or investment competence. Financially literate investors may have a better appreciation of uncertainty, diversification, market volatility, and the limits of prediction, which can reduce unwarranted confidence in personal information or intuition. This result is in line with evidence indicating that overconfidence is a central determinant of investment behavior and is closely associated with investors' responses to financial risk and losses [6]. The finding also corresponds with research demonstrating that behavioral biases, particularly overconfidence, can meaningfully influence retail investment decisions [7]. In addition, the result supports studies examining the interaction between financial knowledge and behavioral tendencies, which suggest that higher levels of financial competence can alter the extent to which confidence-related biases influence investment choices [20]. Nevertheless, the relationship should not be interpreted to mean that financial literacy entirely eliminates overconfidence. Rather, the magnitude of the path

coefficient indicates that greater literacy is associated with a meaningful reduction in this bias, while other psychological mechanisms may continue to influence subjective confidence.

The significant negative effect of financial literacy on herding behavior was another major finding. Investors with higher financial literacy appeared less likely to imitate the actions of other investors or rely excessively on prevailing market sentiment when making investment decisions. This relationship can be explained by the fact that financially literate investors are more capable of independently interpreting financial information, evaluating risk, and comparing investment alternatives, thereby reducing reliance on social cues as substitutes for personal analysis. This interpretation is consistent with evidence showing that herding behavior significantly affects investment decisions and interacts with other determinants such as risk perception, accounting information, and financial literacy [10]. The result is also consistent with findings showing that social influence and access to information are important determinants of investors' participation and investment frequency [9]. Furthermore, research examining financial literacy as a moderating factor has shown that literacy can weaken the behavioral impact of herding tendencies on investment decisions [23]. The present results therefore reinforce the argument that financial literacy can strengthen investors' analytical autonomy and reduce dependence on collective market behavior, especially in environments where information is abundant but uneven in quality.

Financial literacy also had a relatively strong negative effect on confirmation bias. This suggests that investors with higher financial literacy were less likely to selectively search for, interpret, or remember information that supported their pre-existing investment beliefs. Greater financial knowledge may encourage more systematic evaluation of contradictory evidence, more balanced assessment of investment alternatives, and greater awareness of the need to reconsider prior assumptions when market conditions change. Such a mechanism is compatible with broader findings that investment decisions are affected by the way investors process information and combine cognitive and psychological characteristics with available financial evidence [21]. It also supports research questioning whether financial literacy alone is sufficient and arguing that psychological characteristics must be considered when explaining investment decisions [22]. The present finding suggests that financial literacy contributes to improved information processing, but its effectiveness likely depends on the degree to which investors are willing to challenge their prior beliefs. Thus, literacy may reduce confirmation bias by improving analytical capability, while psychological openness and decision discipline may determine whether that capability is actually used.

A significant negative relationship was likewise found between financial literacy and anchoring. This indicates that financially literate investors were less likely to remain excessively influenced by initial reference points such as historical prices, purchase prices, prior forecasts, or arbitrary numerical benchmarks. Investors with greater knowledge of valuation, diversification, and market dynamics may be more capable of updating their judgments when new information becomes available rather than remaining attached to outdated anchors. This finding is consistent with the broader literature showing that investor behavior is frequently shaped by heuristic information processing rather than complete rational reassessment [2]. It is also compatible with evidence emphasizing the importance of information sources in investment decisions, because the ability to distinguish relevant new information from salient but outdated references is central to effective financial judgment [8]. The negative relationship between financial literacy and anchoring therefore suggests that knowledge can improve investors' capacity to revise expectations and reduce rigid dependence on initial reference points.

The results further demonstrated significant negative effects of financial literacy on representativeness and availability bias. In practical terms, financially literate investors appeared less likely to make investment judgments

based on superficial similarity, recent performance, vivid information, or easily recalled events. Representativeness can lead investors to infer future performance from recent trends without adequately considering base rates, while availability bias can cause disproportionate reliance on information that is recent, dramatic, or frequently encountered. The present findings can be interpreted as evidence that financial literacy strengthens investors' ability to distinguish between salient information and diagnostically useful information. This aligns with studies showing that information use is a critical part of investment behavior and that investors differ substantially in the types of information sources they rely upon [8]. It is also consistent with comparative evidence that investment behavior varies according to the way investors perceive and process financial information [5]. By improving familiarity with risk, diversification, and financial analysis, literacy may reduce the tendency to extrapolate mechanically from recent outcomes or highly visible market events.

The significant negative effect of financial literacy on the disposition effect represents another important result. Investors with higher financial literacy were less prone to hold losing investments excessively while realizing gains prematurely. The disposition effect is closely related to reference dependence, loss aversion, regret, and mental accounting, and therefore reflects both cognitive and emotional processes. Financial literacy may reduce this tendency by encouraging investors to evaluate assets according to expected future performance rather than acquisition price or unrealized gains and losses. The finding is consistent with research emphasizing the role of financial knowledge, attitudes, and behavior in shaping investors' tolerance for investment losses [13]. It also corresponds with literature highlighting risk tolerance as an important factor in stock-market investment decisions [11]. Greater literacy may therefore facilitate more disciplined portfolio rebalancing and reduce the emotional importance of reference prices, although the remaining variance indicates that affective reactions to gains and losses continue to matter.

Financial literacy also negatively affected loss aversion and regret aversion, although these coefficients were smaller than those found for overconfidence, herding, confirmation bias, and anchoring. This pattern is theoretically meaningful. Cognitive biases may be more directly responsive to knowledge and analytical skill, whereas emotional biases are often rooted in deeper affective responses that cannot be eliminated by information alone. Loss aversion reflects the tendency to experience losses more intensely than equivalent gains, while regret aversion reflects the desire to avoid future emotional discomfort associated with a poor decision. The findings suggest that financial literacy can partially reduce these tendencies by improving understanding of risk and long-term investment principles, but it may not fully offset emotional reactions to negative outcomes. This interpretation is supported by evidence showing that financial knowledge, attitudes, and behaviors are related to investment loss tolerance [13]. It is also compatible with findings on financial risk tolerance among younger investors, which demonstrate that responses to risk are determined by multiple personal and behavioral factors rather than financial knowledge alone [12]. Accordingly, the smaller coefficients for loss aversion and regret aversion imply that educational interventions may need to be complemented by behavioral strategies targeting emotional regulation and tolerance of uncertainty.

The weakest structural effect was observed for mental accounting. Although the relationship remained statistically significant, financial literacy explained relatively little of its variance. This finding suggests that investors may continue to mentally categorize financial resources even when they possess relatively strong financial knowledge. Mental accounting often reflects deeply ingrained habits regarding how individuals label, separate, and evaluate money, and such habits may persist despite greater understanding of portfolio theory or economic fungibility. The result is consistent with research showing that mental accounting in investment contexts

is associated with financial literacy, overconfidence, and investment decisions but is not reducible to any single factor [14]. It also supports the broader view that some behavioral tendencies remain psychologically resilient even among knowledgeable investors. Thus, while financial literacy can contribute to reducing mental accounting, changing this bias may require more explicit training in portfolio-level evaluation and integrated wealth management.

The negative relationship between financial literacy and status quo bias also deserves attention. Investors with greater financial literacy were less inclined to maintain existing investment positions simply because they represented the current default or familiar choice. Financial knowledge may increase willingness to reassess existing holdings, compare alternatives, and change investment strategies when conditions justify adjustment. This result is consistent with evidence suggesting that investor behavior is influenced by multiple cognitive and motivational forces and that financial decisions are often shaped by inertia, familiarity, and perceptions of risk [1]. It may also be related to temporal and intertemporal decision tendencies, such as those associated with asset accumulation and delayed financial outcomes [16]. Investors with stronger financial literacy may be better able to evaluate the opportunity cost of inaction and thus be less likely to maintain suboptimal positions due merely to familiarity or reluctance to change.

At a broader level, the findings support the proposition that financial literacy is an important but not exhaustive explanatory factor in investment behavior. The significant inverse relationships across all eleven biases indicate that literacy is associated with more disciplined and less biased decision-making, yet the explained variance for individual biases ranged from relatively modest to moderate levels. This pattern is consistent with research arguing that financial literacy alone does not fully account for investment decisions and that psychological characteristics must also be considered [22]. The findings also correspond with studies emphasizing the interaction between cognition, financial literacy, and investor behavior [21]. In addition, research on students and novice investors indicates that financial literacy is one among several determinants influencing investment decisions [19], while work examining financial literacy as a moderating variable demonstrates that its effects depend on the presence of other behavioral and contextual factors [18]. Consequently, the present results reinforce a multidimensional interpretation in which financial literacy improves decision quality but does not eliminate the influence of emotion, personality, social information, or market context.

The model also has implications for understanding investment behavior in increasingly digitalized financial environments. Contemporary investors have rapid access to social media, trading platforms, digital assets, and real-time market information, all of which can increase both analytical opportunities and behavioral vulnerability. Evidence concerning digital asset investment intention shows that investment behavior in technologically mediated markets is determined by multiple financial and psychological factors [15]. Likewise, research on cryptocurrency investment has demonstrated the interaction of financial literacy, overconfidence, mental accounting, and decision-making under conditions of high uncertainty [14]. The present findings suggest that financial literacy may become even more important in such environments because investors are continuously exposed to salient information, social influence, speculative narratives, and rapidly changing reference points. At the same time, literacy should not be assumed to provide complete protection against behavioral bias, particularly where emotional and social pressures are intense.

The results are also compatible with research emphasizing the role of broader behavioral-economic factors in willingness to save and invest. Investment decisions are not made in isolation from investors' psychological states, expectations, and perceptions of well-being. Structural evidence linking happiness and behavioral-economic factors

with saving and investment willingness demonstrates that financial behavior can be influenced by wider psychological conditions [17]. Similarly, the literature on individual investment behavior has increasingly moved toward integrated models that combine cognitive, affective, and contextual variables [4]. The present study contributes to this line of research by showing that financial literacy has differentiated effects across a broad spectrum of biases rather than a uniform influence on investor behavior. The larger effects for overconfidence, herding, confirmation bias, and anchoring and the smaller effects for mental accounting, regret aversion, and loss aversion suggest that the effectiveness of financial knowledge depends on the psychological mechanism underlying each bias.

Overall, the findings provide empirical support for a structured behavioral-finance model in which financial literacy operates as a broad mitigating factor across cognitive, emotional, and social biases. The results align with systematic reviews demonstrating the pervasive role of behavioral biases in investor decision-making [2] and with broader syntheses emphasizing the need to integrate financial knowledge with behavioral and psychological variables [1, 3]. They also extend prior findings by simultaneously examining a wide range of biases within one structural framework among individual investors in Tehran. The model therefore contributes to the literature by demonstrating that financial literacy is associated with lower susceptibility to multiple behavioral distortions, while also showing that the magnitude of this association differs substantially across bias categories.

The present study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design limits the ability to establish temporal or causal relationships between financial literacy and behavioral biases. Second, the use of self-report measures may have introduced common-method bias, social desirability, or inaccuracies in respondents' assessment of their own behavior. Third, although the sample included 384 individual investors from Tehran with varying educational and investment backgrounds, the findings cannot automatically be generalized to investors in other Iranian provinces, institutional investors, or individuals participating in different types of financial markets. Fourth, the model focused primarily on financial literacy as the central explanatory variable and did not simultaneously incorporate other potentially important factors such as personality traits, emotional regulation, income, wealth, market sentiment, investment horizon, digital-media exposure, or professional financial advice. Finally, the behavioral-bias constructs were examined through survey-based indicators rather than direct observation of actual trading behavior, and therefore the reported relationships reflect perceived or self-reported tendencies rather than verified transaction-level behavior.

Future research should extend the present model through longitudinal, experimental, and multi-source designs. Longitudinal studies could examine whether changes in financial literacy predict subsequent changes in behavioral biases over time, while experimental research could test whether targeted financial education reduces specific biases under controlled decision conditions. Future studies should also compare different investor groups, including novice and experienced investors, younger and older investors, institutional and retail investors, and participants in equity, cryptocurrency, mutual-fund, and other asset markets. Incorporating objective trading records, portfolio outcomes, and behavioral tasks alongside questionnaires would provide stronger evidence regarding the practical consequences of bias. Researchers may also examine potential mediating and moderating mechanisms, such as risk tolerance, emotional regulation, investment experience, financial self-efficacy, social influence, and digital information exposure. Cross-cultural and multi-city studies would be particularly valuable for determining whether the relationships identified in Tehran remain stable across different economic and institutional environments.

From a practical perspective, the findings indicate that investor education programs should move beyond the transmission of basic financial concepts and explicitly address common behavioral biases. Financial training should include exercises that help investors recognize overconfidence, question confirming evidence, avoid excessive reliance on reference prices, independently evaluate market information, and resist herd-driven decisions. Brokerage firms, financial advisors, investor associations, and capital-market regulators can incorporate behavioral-finance modules into educational initiatives and digital trading platforms. Decision aids, risk warnings, portfolio review prompts, diversification tools, and pre-trade reflection mechanisms may also help reduce impulsive or biased decisions. Because emotional biases such as loss aversion and regret aversion were less strongly associated with financial literacy, educational programs should also include strategies for managing emotional responses to volatility and losses rather than relying exclusively on knowledge-based interventions. A combined approach integrating financial education, behavioral awareness, and decision-support mechanisms may therefore provide the most effective means of improving investor judgment and reducing systematic decision errors.

Authors' Contributions

Authors equally contributed to this article.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

Acknowledgments

Authors thank all participants who participate in this study.

Conflict of Interest

The authors report no conflict of interest.

Funding/Financial Support

According to the authors, this article has no financial support.

References

- [1] A. Kumar, "Consumer Investment Behaviour: A Systematic Review Using <sc>TCM</sc> And <sc>ADO</sc> Frameworks," *International Journal of Consumer Studies*, vol. 49, no. 5, 2025, doi: 10.1111/ijcs.70110.
- [2] V. Negi, "Effect of Behavioural Biases on Investors' Decision Making: A Systematic Literature Review," *Metamorphosis*, vol. 24, no. 1, pp. 105-113, 2025, doi: 10.1177/09726225251319119.
- [3] R. Rahmah, N. Nugraha, Disman, and I. Purnamasari, "A Closer Look of How Individual Investor Make Investment Decision: Systematic Review," *Atestasi Jurnal Ilmiah Akuntansi*, vol. 6, no. 2, pp. 650-660, 2023, doi: 10.57178/atestasi.v6i2.728.
- [4] S. A. Novitasari, "Examining Financial Behavior and Decision-Making: A Bibliometric Study of Trends and Insights," *West Science Accounting and Finance*, vol. 1, no. 02, pp. 69-78, 2023, doi: 10.58812/wsaf.v1i02.132.
- [5] Y. Wang, "A Comparative Study of the Investment Behavior of Financial Asset Investors," *Highlights in Business Economics and Management*, vol. 15, pp. 296-301, 2023, doi: 10.54097/hbem.v15i.9460.
- [6] H. Nabeshima, S. Lal, Y. Himeno, M. S. R. Khan, and Y. Kadoya, "The Impact of Hyperbolic Discounting on Asset Accumulation for Later Life: A Study of Active Investors Aged 65 Years and Over in Japan," *Risks*, vol. 13, no. 1, p. 8, 2025, doi: 10.3390/risks13010008.
- [7] M. Aslam and S. Garg, "Behavioral Finance and Investment Decisions of Retail Investors in Indian Stock Markets," 2026, doi: 10.21203/rs.3.rs-9734809/v1.

- [8] S. Lal, A.-S. Sulemana, T. X. T. Nguyen, M. S. R. Khan, and Y. Kadoya, "Information Sources for Investment Decisions: Evidence From Japanese Investors," *International Journal of Financial Studies*, vol. 11, no. 4, p. 117, 2023, doi: 10.3390/ijfs11040117.
- [9] A. Singh and A. Biswas, "Dissecting Investment Frequency: Examining the Role of Social Influence, Investors' Perception of Gender Discrimination, Involvement, Access to Information and Risk Tolerance," *Social Responsibility Journal*, vol. 20, no. 10, pp. 2212-2236, 2024, doi: 10.1108/srj-11-2023-0671.
- [10] T. Gustiarum and I. Kusumawardhani, "The Effects of Financial Literacy, Accounting Information, Risk Perception and Herding Behavior on Investment Decision," *Journal of Business and Information Systems (E-Issn 2685-2543)*, vol. 5, no. 1, pp. 1-10, 2023, doi: 10.36067/jbis.v5i1.156.
- [11] H. Srivastava, S. Moid, and N. J. Rushdi, "Risk Tolerance and Stock Market Investment Decisions: A Bibliometric Analysis," *Metamorphosis*, vol. 24, no. 2, pp. 202-213, 2025, doi: 10.1177/09726225251348128.
- [12] S. Suherman, H. Kurniawati, and R. Mohidin, "Determinants of Financial Risk Tolerance: Evidence From the Indonesian Millennials," *Humanities and Social Sciences Letters*, vol. 11, no. 1, pp. 67-82, 2023, doi: 10.18488/73.v11i1.3300.
- [13] Y. Himeno *et al.*, "The Association of Financial Knowledge, Attitude, and Behavior With Investment Loss Tolerance: Evidence From Japan," *Risks*, vol. 13, no. 10, p. 204, 2025, doi: 10.3390/risks13100204.
- [14] A. Suriadi, A. D. Wibawa, and S. P. Hendratno, "The Effect of Financial Literacy, Investment Decision, and Overconfidence on Mental Accounting in the Term of Investing in Cryptocurrency," *E3s Web of Conferences*, vol. 426, p. 01047, 2023, doi: 10.1051/e3sconf/202342601047.
- [15] W. Jiaranaipayuk, A. Saengnoore, S. Vuthisopon, and K. Pattananupong, "Determinants of Digital Asset Investment Intention Among Mutual Fund Investors in Thailand," *Risks*, vol. 14, no. 5, p. 113, 2026, doi: 10.3390/risks14050113.
- [16] H. Nabeshima, M. S. R. Khan, and Y. Kadoya, "Overconfidence and Investment Loss Tolerance: A Large-Scale Survey Analysis of Japanese Investors," *Risks*, vol. 13, no. 8, p. 142, 2025, doi: 10.3390/risks13080142.
- [17] C. Devi, "Modeling the Impact of Happiness and Behavioral-Economic Factors on Saving and Investment Willingness: Evidence From Individual Investors in Himachal Pradesh Using SEM," 2026, doi: 10.21203/rs.3.rs-6941162/v1.
- [18] T. M. Fikriyah and D. Suhartini, "Analysis of Factors That Influence Investment Decisions With Financial Literacy as a Moderating Variable," *Indonesian Journal of Business Analytics*, vol. 3, no. 4, pp. 1363-1376, 2023, doi: 10.55927/ijba.v3i4.5200.
- [19] I. Andaris and S. Dasman, "Determinants of Investments Decisions in Economics and Business Faculty Students at Pelita Bangsa University," *Jurnal Eksplorasi Akuntansi*, vol. 6, no. 3, pp. 976-990, 2024, doi: 10.24036/jea.v6i3.1626.
- [20] T. S. Rani, "Unraveling the Financial Knowledge, Behavioral Bias Nexus in Individual Investment Decision Making: Evidence From Andhra Pradesh," 2026, doi: 10.21203/rs.3.rs-10922085/v1.
- [21] R. Nepal, P. Rajopadhyay, U. Rajopadhyay, and U. Bhattarai, "Interplay of Investor Cognition, Financial Literacy, and Neuroplasticity in Investment Decision Making: A Study of Nepalese Investors," *Journal of Business and Social Sciences Research*, vol. 8, no. 2, pp. 51-76, 2023, doi: 10.3126/jbssr.v8i2.62133.
- [22] M. Robba, A. Sorgente, M. R. Miccoli, and P. Iannello, "Is Financial Literacy Enough to Explain Investment Decisions? Understanding the Role of Psychological Characteristics," 2024, doi: 10.31234/osf.io/yd8u3.
- [23] F. Firmansyah, "The Influence of Overconfidence Bias, Herding Effect, and Loss Aversion on Investment Decisions in the Capital Market With Financial Literacy as a Moderating Variable," *Journal of Business Management Review*, vol. 4, no. 11, 2023, doi: 10.47153/jbmr411.8252023.