Advance Journal of Econometrics and Finance
Vol-4, Issue-1, 2026

Online ISSN
2959-8990
Print ISSN
2959-8982
https://ajeaf.com/index.php/Journal/About

Name of Publisher: SCHOLAR CRAFT EDUCATION & RESEARCH HUB
Review Type: Double Blind Peer Review
Jurnal Frequency: Quarterly Research Journal

Impact Of Cognitive Biases On Emotional Decision-Making And Investment Performance: A Behavioral Finance Approach.

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Abstract

This study examines how cognitive and emotional biases affect investment performance, with emotional decision-making serving as a mediator. Grounded in behavioral finance, particularly prospect theory and the dual-process model, the research analyzes biases such as overconfidence, anchoring, loss aversion, herding, confirmation bias, and mental accounting. Using a quantitative approach with data from 342 individual investors, the findings show that both cognitive and emotional biases significantly influence emotional decision-making, leading investors to rely on intuition rather than rational analysis. Emotional decision-making partially mediates the relationship between cognitive biases and investment performance, indicating that emotions connect biased thinking to investment outcomes. The study highlights the need for behavioral awareness and emotional regulation, offering practical implications for investors, advisors, and policymakers to foster more rational and sustainable investment practices.

Keywords: Behavioral Finance, Cognitive Biases, Emotional Biases, Emotional Decision-Making, Investment Performance, Pakistan Stock Exchange, Dual-Process Theory

Introduction

This text highlights the shift from viewing investment decisions as purely rational to recognizing the significant role of psychological, cognitive, and emotional factors (Statman 2019). While traditional models like the Efficient Market Hypothesis and Modern Portfolio Theory assume objective decision-making, empirical evidence, especially in emerging markets, shows that behavioral biases are amplified due to information asymmetry, volatility, and low financial literacy (Rashid et al., 2022). Behavioral finance provides a framework for understanding how cognitive biases (e.g., overconfidence, anchoring, loss aversion) and emotional influences lead to systematic deviations from rationality. In Pakistan, studies confirm that biases such as overconfidence, representativeness, and herding negatively affect investment performance, with factors like perceived market efficiency playing a mediating role (Waqas et al., 2023). Additional research indicates that cognitive biases influence investment decisions both directly and indirectly through risk propensity, while variables such as financial literacy, risk perception, and perceived market efficiency act as moderators or mediators (Hussain et al., 2023; Abideen et al., 2023). Given the volatile nature of the Pakistani financial market, increasing retail participation, and the accelerating pace of global market events, there is an urgent need to understand how a comprehensive set of cognitive biases jointly affect emotional decision-making and investment performance. Although existing studies on the Pakistan Stock Exchange (PSX) have examined individual biases or simple relationships, they have not integrated a broad range of biases with emotional judgment as an intervening variable (Ahmed et al., 2023). This paper aims to fill that gap by investigating the combined effects of overconfidence, anchoring, loss aversion, herding, confirmation bias, and mental accounting on emotional decision-making and subsequent investment performance among individual investors in Pakistan, contributing both empirically and practically to understanding investor behavior in emerging markets.

This text identifies key gaps in behavioral finance literature, emphasizing the need for integrated, context-specific, and multidimensional research. First, existing studies often treat cognitive biases and emotional influences separately, overlooking their interaction; in Pakistan, while cognitive biases have been examined (Hussain et al., 2023; Waqas et al., 2023), emotional decision-making is rarely tested as an intervening variable, despite theoretical arguments that emotions mediate between cognition and behavior in uncertain environments (Lo, 2022). Second, most behavioral finance research focuses on developed markets (e.g., the US, UK, Japan), limiting applicability to emerging markets like Pakistan, where structural inefficiencies, low financial literacy, and social influences shape investor behavior differently (Kumar and Goyal, 2021; Abideen et al., 2023). Third,

the literature tends to examine isolated biases rather than their cumulative effect, whereas investors typically display multiple interacting biases; this study addresses this by proposing a multidimensional framework encompassing overconfidence, anchoring, loss aversion, herding, confirmation bias, and mental accounting. Fourth, there is insufficient empirical evidence on the mediating role of emotional decision-making between cognitive biases and investment performance; although meta-analyses confirm correlations between emotional biases and decisions (The Relationship Between Emotional Biases and Investment Decisions, 2024), South Asian studies largely treat emotions as dependent or situational factors rather than mediators (Waqas et al., 2023). This study aims to fill these gaps by empirically testing emotional decision-making as a mediating construct in the Pakistan Stock Exchange context.

Research Problem

Traditional finance theories like the Efficient Market Hypothesis and Modern Portfolio Theory assume investor rationality, yet empirical evidence shows that actual behavior deviates due to cognitive biases and emotional factors. Cognitive biases, including overconfidence, anchoring, loss aversion, herding, confirmation bias, and mental accounting, distort risk perceptions and investment outcomes, while emotional decision-making adds elements like fear, greed, and regret. Although behavioral finance has grown, limited research explores how emotions mediate the relationship between cognitive distortions and investment performance; most studies examine constructs individually or focus on decisions rather than actual outcomes (Shafqat, 2024; Raja Rehan & Umer, 2024). Additionally, existing research predominantly centers on developed markets, where high financial literacy and stability may reduce psychological biases (Parveen et al., 2021). In contrast, emerging markets like Pakistan are characterized by volatility, low investor awareness, and strong social influences, yet few empirical studies analyze the comprehensive impact of such behaviors on investment performance in these contexts (Shafqat, 2024; Market Forces Journal, 2023). The Pakistani literature largely focuses on single biases or direct correlations, failing to investigate the interplay of multiple biases or the mediating role of emotional processes. Addressing this gap requires an integrated behavioral framework that captures both cognitive biases and emotional reactions to better explain investor decision-making in emotionally charged markets.

Research Questions

The research questions are attempted to be answered in this study:
Is there a connection between cognitive biases and investment performance by individual investors?
What is the impact of specific cognitive biases—overconfidence, anchoring, loss aversion, herding, confirmation bias, and mental accounting on investors' emotional responses, and how do these emotional responses influence investment performance in the Pakistan Stock Exchange?
To what extent does emotional decision-making mediate the relationship between cognitive biases and investment performance?
What cognitive biases have the greatest impact on the emotional decision-making process?
What is the way the knowledge of the interaction of cognitive biases and emotional issues enhance the quality of investment decisions and financial performance in general?

Research Objectives

According to the research questions, the objectives of this study are to:
To determine the direct connection between cognitive biasing and the performance of individual investors.
To explore certain cognitive biases, such as overconfidence, anchoring, loss aversion, herding, confirmation bias, and mental accounting, that affect the emotional decision-making of investment decisions.
To determine the most influential cognitive biases in emotional decision-making and investment performance in the Pakistani stock market.
Give theoretical and practical knowledge on how the knowledge of investor psychology can lead to better rational investment behavior and higher financial performance.

Literature Review

Overconfidence Bias and Emotional Decision-Making

Overconfidence bias, the tendency to overestimate one's knowledge, predictive ability, or control over outcomes, significantly influences emotional decision-making in investment contexts. This cognitive distortion leads investors to take excessive risks and rely on intuition rather than analysis, with emotions such as excitement, euphoria, regret, and denial mediating the link between overconfidence and investment behavior (Abideen et al., 2023; Hussain et al., 2023). The dual-process model explains this dynamic: overconfidence activates System 1 (intuitive, emotional thinking), overriding rational analysis, while Lo (2022) describes a positive feedback loop where emotions reinforce overconfidence. Empirical studies confirm these relationships; Zhao and Liu (2022) found overconfidence predicted emotionally driven trading among Chinese retail investors, and Waqas et al. (2023) linked overconfidence among Pakistani traders to impulsive buying and panic selling. Psychological mechanisms such as the illusion of control and self-attribution bias further sustain overconfidence through emotional reinforcement (Kumar and Goyal, 2021). Technological factors, including online trading platforms, amplify emotional responses and overconfident trading (Rashid et al., 2022). In emerging markets like Pakistan, social validation and informal advice intensify overconfidence, leading to emotionally charged herd behavior (Waqas et al., 2023). Although overconfidence may generate positive emotions like enthusiasm, it ultimately harms decision quality through under-diversification, poor timing, and heightened emotional reactivity. Prospect theory further explains this process, showing that overconfident investors asymmetrically respond to gains and losses with exaggerated emotions. Overall, overconfidence bias positively influences emotional decision-making, underscoring the need for emotional regulation in investment outcomes.

H1a: *Overconfidence bias positively influences emotional decision-making in investment decisions.*

Anchoring Bias and Emotional Decision-Making

Anchoring bias, the tendency to rely heavily on an initial reference point, significantly influences emotional decision-making in investment contexts. Investors anchor to past prices, purchase points, or benchmarks, leading to emotional responses such as regret, fear, frustration, and hope that distort judgment and impair investment outcomes (Mahmood, Ali, & Shah, 2024; Zhong, 2024). In uncertain or information-asymmetric environments, investors use heuristics as emotional anchors, with emotions dominating information processing (Sadiq et al., 2025; Slovic et al., 2022). This bias is particularly pronounced in emerging markets like Pakistan, where low financial literacy and high volatility lead investors to rely on past peaks or social references, resulting in emotional distress and delayed rational adjustments (Ahmed & Bashir, 2023; Tanveer & Malik,

2022). Anchoring interacts with other biases—such as confirmation bias and loss aversion creating feedback loops that reinforce emotional rigidity and suboptimal decisions (Iqbal, Raza, & Shabbir, 2021). Prospect theory explains that anchored reference points intensify emotional reactions to gains and losses, with regret mediating the link between anchoring and investment inertia (Li & Zhang, 2023). Technological factors, including digital trading platforms, amplify emotional engagement and anchoring tendencies (Romero & Valiant, 2023). Cultural and demographic factors also moderate this relationship, with collectivist societies and novice investors showing greater susceptibility to emotional anchoring (Sadiq & Abdullah, 2022; Fatima, Hassan, & Yousaf, 2021). Neurobehavioral studies confirm that anchoring activates brain regions associated with emotional processing and reward, indicating its deep emotional underpinnings (Gurevich & Klein, 2023). During financial crises, anchored investors experience heightened emotional distress, hindering portfolio revaluation and recovery (Uyar & Aydin, 2023; Baloch, Naz, & Jamil, 2022). Overall, anchoring bias positively influences emotional decision-making by creating cognitive fixations that translate into emotional attachments, ultimately shaping investor behavior and performance.

H1b: *Anchoring bias positively influences emotional decision-making in investment decisions.*

Loss Aversion Bias and Emotional Decision-Making

Loss aversion, the tendency to experience losses more intensely than equivalent gains, significantly shapes emotional decision-making in investment contexts. This bias generates strong negative emotions such as fear, anxiety, and regret, leading investors to avoid loss-avoiding actions, exhibit excessive risk aversion, and display disposition effects. Grounded in prospect theory, loss aversion involves both cognitive framing and affective processes, with neuroeconomic studies confirming that physiological and emotional responses to losses predict behavior beyond cognitive measures. Meta-analytic research confirms loss aversion as a pervasive phenomenon with consistent behavioral implications (Walasek and Stewart, 2024), while psychometric studies have developed reliable scales linking higher loss aversion to greater emotional responsiveness (Cabedo-Peris et al., 2024). In emerging markets, loss aversion intensifies fear and regret, mediating trading behavior and portfolio performance; evidence from the Pakistan Stock Exchange shows that regret and loss aversion reduce trading rates and hinder rational adjustment (Shafqat and Malik, 2022; Umi Rahmawati and Surya Raharja, 2023). Mechanisms include anticipatory fear, immediate affective reactions to realized losses, and emotion regulation strategies. Contextual factors such as low financial literacy, information asymmetry, and market stress amplify emotional responses to losses (Mahmood et al., 2024; van Dolder et al., 2024), while interventions that reduce emotional arousal can mitigate loss aversion effects. Neuroimaging research links loss aversion to activation of affect-related brain regions (Cabedo-Peris et al., 2024; Li and Zhang, 2023), and meta-analyses confirm the strength of the loss aversion emotion behavior pathway (Walasek et al., 2024). Collectively, theoretical and empirical evidence support that loss aversion bias positively influences emotional decision-making in investment settings.

H1c. *Loss aversion bias positively influences emotional decision-making in investment decisions.*

Herding Behavior and Emotional Decision-Making

Herding behavior, the tendency to follow the actions of others rather than rely on independent analysis, reflects the social and emotional dimensions of financial decision-making. It operates through emotional contagion, where fear, excitement, or regret spreads among investors, overriding rational evaluation. Theoretical frameworks such as social learning theory and behavioral contagion theory explain herding as a response to uncertainty and anxiety, with investors seeking emotional reassurance and social validation (Kumar and Goyal, 2021). Empirical evidence from Pakistan shows that emotional arousal and fear of missing out (FoMO) strongly predict herding, with investors influenced by others' trading patterns rather than market fundamentals (Rashid, Tariq, & Ur Rehman, 2022; Waqas et al., 2025). Affective contagion is amplified through digital platforms, where emotionally charged online communication drives herding behavior (Xu, Zhao, & Zhou, 2023). In emerging markets, herding serves as an emotional coping mechanism under uncertainty, with studies in Pakistan and Vietnam confirming that emotional responses intensify during crises (Rasool et al., 2023; Nguyen, Doan, & Tran, 2025). Cultural dimensions also play a role; collectivist societies exhibit stronger emotional identification with group decisions (Li and Zhang, 2023). Specific emotions such as fear, greed, and regret mediate herding effects: greed drives buying in bullish markets, fear triggers selling in bearish markets, and regret aversion prevents deviation from the crowd (Ariyanti and Isbanah, 2024; Kumar and Chaturvedi, 2023). Collectively, the evidence indicates that emotional decision-making mediates the relationship between herding bias and investment behavior.

H1d: *Herding behavior positively influences emotional decision-making in investment decisions.*

Confirmation Bias and Emotional Decision-Making

Confirmation bias, the tendency to seek, interpret, and retain information that aligns with pre-existing beliefs while disregarding contradictory evidence, significantly influences emotional decision-making in investment contexts. This bias strengthens emotional attachment to existing convictions, generating satisfaction and confidence when beliefs are affirmed, while creating discomfort or denial when faced with disconfirming information. Within behavioral finance, confirmation bias operates through motivated reasoning and affective consistency, serving as a psychological mechanism to reduce cognitive dissonance and emotional tension. Empirical studies reveal that trading experience does not necessarily reduce confirmation bias; in Indian markets, experienced traders showed increased susceptibility, suggesting emotional reinforcement in belief maintenance (Chalissery et al., 2023). Bibliometric reviews confirm growing research interest in confirmation bias and its emotional dimensions (Astuti et al., 2023). Research indicates that confirmation bias leads investors to form echo chambers, selectively exposing themselves to belief-affirming information while avoiding negative signals (ACR, 2023). During periods of stress, such as COVID-19, uncertainty amplifies confirmation bias as investors seek emotional reassurance (Mohanty et al., 2024). In markets with lower financial literacy, cognitive biases like confirmation bias exert stronger effects on investment decisions, with emotional decision-making serving as a prevailing pathway when analytical coping capacity is limited (Mahmood et al., 2024). Collectively, theoretical and empirical evidence support that confirmation bias positively influences emotional decision-making, with emotions mediating the translation of cognitive confirmation into sustained behavioral patterns.

H1e. *Confirmation bias positively influences emotional decision-making in investment decision contexts.*

Mental Accounting Bias and Emotional Decision-Making

Mental accounting, the cognitive tendency to categorize financial resources into separate mental compartments, significantly influences emotional decision-making in investment contexts (Thaler, 1999). Rather than treating money as fungible, investors assign different emotional meanings to accounts such as savings, investments, or discretionary spending, leading to inconsistent risk preferences and fragmented portfolios. This emotional labeling generates affective responses, including pride, fear, and excitement, with investors becoming emotionally attached to specific accounts (Chen et al., 2023). Empirical evidence from the Colombo Stock Exchange shows that mental accounting leads to fragmented portfolios and inconsistent risk aversion (Shalika and Buddhika, 2025), while research on Palestinian investors indicates that segmentation reduces financial stress but slows portfolio rebalancing (Rashwan and Shaqfa, 2024). Experimental studies confirm the house-money effect, where windfall gains in separate accounts increase risk-seeking behavior (Dan, Zhao, & Lin, 2025), and demonstrate that emotional responses to losses vary by account type (Li and Liu, 2023). In digital finance, trading apps encourage mental sub-wallets that amplify emotional decision-making and impulsive trading (Mai, Nguyen, & Tran, 2024). Theoretical models show that emotional attachment to financial goals hinders rational reallocation (Bayraktar and Han, 2025; Kaur and Arora, 2023). Neuroscientific evidence reveals distinct neural activation patterns in emotional and cognitive regions during mental accounting tasks (Park and Jeong, 2024). During COVID-19, investors used mental accounting as an emotional coping strategy to reduce anxiety (Mahmood, Khan, & Iqbal, 2024). Consistent with Prospect Theory, mental accounting creates multiple reference points that intensify emotional asymmetry (Tversky and Kahneman, 1991; Chen and Lai, 2022). Cross-cultural research indicates that collectivist investors exhibit stronger emotional compartmentalization (Wong, Kim, & Lee, 2023). Collectively, evidence supports that mental accounting bias positively influences emotional decision-making.

H1f: *Mental accounting bias positively influences emotional decision-making in investment decisions.*

Mediating role of emotional decision-making

Emotional decision-making serves as a critical mediator linking cognitive and emotional biases to investment behavior, converting mental distortions into tangible financial actions such as trading, portfolio reallocation, and risk-taking (Ricciardi and Simon, 2023). The Appraisal-Tendency Framework explains that cognitive evaluations elicit specific emotions, fear, anger, or optimism, that shape decision tendencies (Lerner et al., 2021). Empirical evidence supports this mediation: Sadiq and Khan (2023) found that emotional levels strongly mediated the effects of cognitive biases on portfolio outcomes, while Adil, Khan, and Rizvi (2024) demonstrated that optimism and fear of missing out partially mediated the overconfidence-investment frequency relationship among Pakistani retail investors. Neuroeconomic research confirms that emotion-processing brain regions predict bias-related errors more effectively than cognitive indicators (Mende and Schmidt, 2023). Situational factors amplify this mediation; during COVID-19, emotional decision-making fully mediated the anchoring-risk aversion link (Ariyanti and Isbanah, 2024; Uyar and Aydin, 2023). Cultural context moderates mediation strength, with collectivist societies exhibiting stronger effects (Li and Zhang, 2023). Emotional biases such as regret aversion and fear also operate through this mediating pathway (Gupta and Sharma, 2024; Kaur and Arora, 2023; Nadeem, Riaz, & Farooq, 2023). Digitalization enhances emotional involvement, with fintech platforms promoting impulsive trading (Das and Mukherjee, 2023), while emotional intelligence weakens mediation by enabling better emotion-judgment decoupling (Ooi and Tan, 2023). Grounded in dual-process theory, emotional decision-making bridges intuitive System 1 and analytical System 2 processes, converting cognitive distortions into behavior through dynamic, recursive feedback loops (Evans and Stanovich, 2013; Han and Yang, 2022). Thus, emotional decision-making mediates the relationship between cognitive and emotional biases and investment outcomes.

H2a: *Emotional decision-making mediates the relationship between cognitive biases (as a group) and investment performance.*

Cognitive Biases and Investment Performance

Investment performance, a key outcome of investor behavior, is significantly shaped by cognitive biases that distort risk perception, information processing, and decision-making, challenging traditional finance assumptions of rationality (Ricciardi and Simon, 2023). Overconfidence bias shows mixed effects: moderate overconfidence may enhance performance through decisiveness and optimism, but excessive overconfidence leads to over-trading, under-diversification, and reduced returns (Kaur and Arora, 2023; Jain and Sharma, 2024). Evidence from the Pakistan Stock Exchange reveals a nonlinear relationship, where weak overconfidence improves performance while strong overconfidence diminishes it (Sadiq and Khan, 2023; Awan and Ahmed, 2022). In contrast, anchoring bias consistently harms performance by causing investors to cling to reference points, delaying adaptive responses, and increasing losses during volatility (Han and Yang, 2022; Rashid et al., 2024; Gupta and Sharma, 2024; Uyar and Aydin, 2023). Loss aversion drives the disposition effect, holding losers too long and selling winners too soon, undermining portfolio optimization and long-term returns (Kahneman and Tversky, 1979; Nadeem et al., 2023; Ariyanti and Isbanah, 2024). Herding behavior, amplified by digital platforms and emotional contagion, leads to synchronized trading, bubbles, and crashes, reducing individual performance (Das and Mukherjee, 2023; Rashid et al., 2024; Adil et al., 2024). Confirmation bias fosters selective perception, delaying error correction and sustaining poor strategies (Lai and Zhang, 2023; Ahmed and Bashir, 2023; Mende and Schmidt, 2023). Mental accounting distorts portfolio efficiency through irrational financial compartmentalization and emotional attachment to specific accounts (Thaler, 1999; Shalika and Buddhika, 2025; Rashwan and Shaqfa, 2024; Bayraktar and Han, 2025). Across these biases, emotions such as pride, fear, regret, and social reassurance serve as the mediating mechanism translating cognitive distortions into suboptimal behaviors (Lerner et al., 2021). Thus, cognitive biases predominantly impair investment performance, underscoring the need for emotional discipline and behavioral awareness.

H3: Cognitive Biases and Investment Performance
H3a: Overconfidence bias has a positive impact on investment performance.
H3b: Anchoring bias has a negative impact on investment performance.
H3c: Loss aversion bias has a negative impact on investment performance.
H3d: Herding behavior has a negative impact on investment performance.
H3e: Confirmation bias has a negative impact on investment performance.
H3f: Mental accounting bias has a negative impact on investment performance.

Advance Journal of Econometrics and Finance
Vol-4, Issue-1, 2026

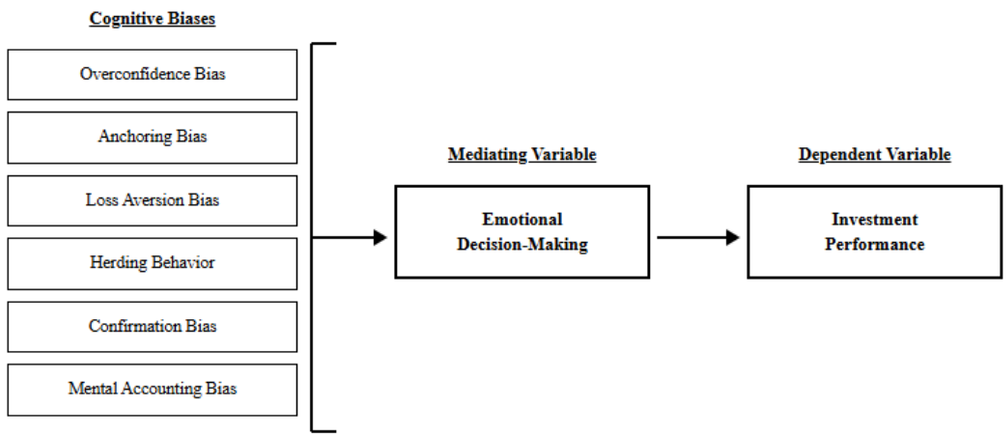
Emotional Biases and Investment Performance

Emotional biases, affective states such as fear, regret, pride, optimism, and panic, directly influence investment performance by shaping risk perception, market responses, and adherence to long-term strategies, representing a shift toward neurobehavioral finance (Lo, 2023). Optimism bias leads to overestimated returns and excessive trading, generally impairing long-term performance despite potential short-term decisiveness (Tariq and Abbas, 2023; Zhao, Liu, & Tang, 2024; Yusoff and Cheong, 2022), with a nonlinear relationship where moderate optimism may aid risk-taking (Han and Yang, 2022). Fear drives loss aversion, risk avoidance, and flight-to-safety behavior, reducing market participation and performance, particularly during crises such as COVID-19 (Ariyanti and Isbanah, 2024), with neuroscientific evidence showing amygdala activation increases risk perception (Park and Jeong, 2024). Regret aversion bias causes status quo behavior, delaying portfolio adjustments and preventing reallocation to better-performing assets, thereby lowering long-term returns (Nadeem, Riaz, & Farooq, 2023; Gupta and Sharma, 2024). Pride after successful trades reinforces commitment to risky strategies, escalating trading, and reducing returns during corrections (Mende and Schmidt, 2023; Lo and Sen, 2023). Herding, driven by fear of missing out and social validation, increases volatility and impairs independent judgment (Das and Mukherjee, 2023; Rashid, Tariq, & Rehman, 2024). Emotional overreaction to news leads to price reversals and unstable risk-adjusted returns (Han and Yang, 2022; Chen and Lai, 2023). Neurofinance research confirms that emotional arousal affects decision quality, with high arousal reducing analytical accuracy (Park and Jeong, 2024; Lo, 2023). Moderating factors such as emotional intelligence, gender, and experience influence bias severity (Ooi and Tan, 2023; Ahmed and Bashir, 2023). While mild positive emotions may encourage beneficial risk-taking, excessive emotional bias—whether optimistic or fearful ultimately harms long-term financial returns.

H4: *Emotional decision-making positively or negatively influences investment performance, depending on the emotional response (fear, greed, etc.) triggered by cognitive biases.*

Conceptual Framework

The Impact of Cognitive Biases on Emotional Decision Making and Investment Performance



Methodology

This study employed a quantitative, explanatory research design to test hypothesized relationships among cognitive biases, emotional biases, emotional decision-making, and investment performance using numerical data and statistical techniques (Creswell, 2014; Saunders et al., 2019). A deductive approach was adopted, grounding hypotheses in behavioral finance theories such as prospect theory (Kahneman & Tversky, 1979) and Dual-Process Theory (Kahneman, 2011). The population comprised individual investors actively participating in the Pakistani financial market, including those trading stocks, mutual funds, and other securities through the Pakistan Stock Exchange and registered brokerage firms. Institutional investors were excluded to focus on individuals more susceptible to behavioral biases. A non-probability convenience sampling method was used due to practical constraints, with a sample size of 342 valid responses obtained from 400 distributed questionnaires, meeting structural equation modeling requirements. Participants were drawn from major cities, including Islamabad, Lahore, and Karachi, with inclusion criteria requiring at least one year of investment experience, an age above 20 years, and independent investment activity within the past 12 months. Data were collected via structured self-administered questionnaires, distributed both online through Google Forms and physically at broker houses and investment offices. A pilot test with 30 investors ensured reliability and clarity. The questionnaire included demographic sections and Likert-scale items measuring biases, emotional decision-making, and performance. Data collection spanned six weeks, with assurances of confidentiality and voluntary participation.

The research tool was a structured questionnaire designed to measure all constructs in the conceptual framework. Based on prior behavioral finance literature, items were adapted and refined for cultural relevance and clarity for Pakistani investors. The questionnaire was chosen for its ability to collect standardized data efficiently across a large sample, ensuring uniformity and minimizing interviewer bias. It comprised two sections: the first gathered demographic information (gender, age, education, income, and investment experience); the second measured cognitive biases (overconfidence, anchoring, loss aversion, herding, confirmation, and mental accounting); emotional biases (optimism, fear, regret aversion, and pride); emotional decision-making; and investment performance using statements rated on a five-point Likert scale. Each construct was operationalized with a minimum of three items to ensure reliability. Emotional decision-making items assessed the extent to which emotions influenced financial choices, while investment performance was measured through self-reported indicators such as profitability, goal achievement, and satisfaction—appropriate given that many individual investors lack detailed performance records. The questionnaire employed simple, clear language to accommodate varied educational backgrounds, with a logical sequence to reduce response fatigue. This standardized instrument enabled consistent data collection suitable for quantitative analysis.

Instrument

Section	Construct	Dimension / Variable	Items	Scale Type	Source (Adapted From)
A	Demographic Information	Age, Gender, Education, Investment Experience, Income Level	6	Nominal / Ordinal	Self-developed
B	Cognitive Biases	Overconfidence Bias	5	5-point Likert	Barber & Odean (2001); Statman (2019)
		Anchoring Bias	4	5-point Likert	Tversky & Kahneman (1974)
		Loss Aversion Bias	4	5-point Likert	Kahneman & Tversky (1979)
		Herding Behavior	5	5-point Likert	Bikhchandani & Sharma (2001)
		Confirmation Bias	4	5-point Likert	Rabin & Schrag (1999)
		Mental Accounting Bias	4	5-point Likert	Thaler (1999)
C	Mediating Variable	Emotional Decision-Making	6	5-point Likert	Loewenstein et al. (2001); Statman (2019)

To ensure the research instrument validly and reliably measured the intended constructs, multiple validation procedures were conducted. Content validity was established through expert review by three specialists in behavioral finance and research methodology, leading to item refinements and removal of ambiguous or overlapping statements. A pilot study with 30 active investors tested readability and initial reliability. Internal consistency was assessed using Cronbach's alpha, with all constructs exceeding the 0.70 threshold. Composite reliability further confirmed consistency within constructs. Construct validity was evaluated using exploratory factor analysis (EFA), where items with low factor loadings were eliminated, followed by confirmatory factor analysis (CFA) to validate the measurement model; model fit indices, including CFI, TLI, and RMSEA, indicated adequate fit. Convergent validity was established as the average variance extracted (AVE) exceeded 0.50 for all constructs. Discriminant validity was confirmed when the square root of each construct's AVE exceeded its correlations with other constructs. Collectively, these results demonstrated that the instrument was both valid and reliable for subsequent statistical analysis.

Data were analyzed using SPSS version 26. Analysis began with data screening for missing values, outliers, normality, and multicollinearity using VIF and tolerance. Descriptive statistics summarized demographic and response patterns. Reliability was assessed using Cronbach's alpha, with acceptable thresholds above 0.70. Pearson correlation examined relationships among biases, emotional decision-making, and investment performance. Multiple regression tested direct effects, while mediation was assessed using the Baron and Kenny method and the Sobel test. All tests used a 95% confidence level, with $p < 0.05$ considered significant.

RESULTS

Reliability Analysis

Reliability analysis assessed the internal consistency of measurement scales using Cronbach's alpha, ensuring that items within each construct produced consistent results and were free from random error. All constructs exceeded the acceptable threshold of 0.70. Cognitive Biases (18 items) achieved a Cronbach's alpha of 0.876, indicating high internal consistency across subdimensions, including overconfidence, anchoring, confirmation bias, herding, and loss aversion. Emotional Biases (12 items) recorded the highest alpha at 0.883, reflecting strong consistency in measuring optimism, fear, regret, and pride. Emotional Decision-Making (8 items) produced an alpha of 0.854, confirming that items effectively captured emotional influences on financial choices. Investment Performance (6 items) yielded an alpha of 0.829, demonstrating good reliability despite being slightly lower due to the multidimensional nature of performance outcomes. The overall instrument reliability was 0.872, indicating strong internal consistency across all constructs. These results confirm that the questionnaire was well-designed, with clear and relevant items, and that the constructs were unidimensional. High reliability enhances confidence in subsequent statistical analyses, including correlation, regression, and mediation testing, and supports the external validity of findings for similar investor populations.

Table No. 1: Reliability Statistics

Variables	*No. of Items*	*Cronbach's Alpha*
Cognitive Biases	18	0.876
Emotional Biases	12	0.883
Emotional Decision-Making	8	0.854
Investment Performance	6	0.829

Descriptive Statistics

Descriptive statistics were computed for 342 respondents to summarize responses on cognitive biases, emotional biases, emotional decision-making, and investment performance. Cognitive biases had a mean of 3.72 (SD = 0.56), emotional biases a mean of 3.68 (SD = 0.59), emotional decision-making a mean of 3.76 (SD = 0.61), and investment performance a mean of 3.79 (SD = 0.57). The moderate means across constructs indicate that investors acknowledged the presence of cognitive and emotional biases and recognized that emotions influence their financial decisions. The proximity of mean values suggests coherent behavioral patterns, supporting the conceptual framework that biases shape emotional decision-making, which in turn affects investment performance. Standard deviations below 1.0 indicate moderate variability, with some investors

exhibiting stronger bias susceptibility and emotional reactivity than others. The highest mean for investment performance suggests that, despite biases, investors perceived their outcomes as moderately satisfactory, possibly due to adaptive learning or the illusion of control. These descriptive findings confirm that investor behavior is driven by psychological and emotional factors rather than purely rational analysis, providing a behavioral benchmark for subsequent correlation, regression, and mediation analyses.

Table No 2: Descriptive Statistics

Variables	***N***	***Minimum***	***Maximum***	***Mean***	***Std. Deviation***
Cognitive Biases	342	1.67	4.95	3.72	0.56
Emotional Biases	342	1.89	4.87	3.68	0.59
Emotional Decision-Making	342	1.94	4.92	3.76	0.61
Investment Performance	342	1.78	4.89	3.79	0.57

Correlation Analysis

Correlation analysis revealed significant positive relationships among all constructs. Cognitive biases and emotional biases showed a strong positive correlation ($r = 0.642$, $p < 0.01$), indicating that cognitive and emotional distortions co-occur. Cognitive biases were positively correlated with emotional decision-making ($r = 0.596$, $p < 0.01$), and emotional biases showed a similarly strong correlation with emotional decision-making ($r = 0.613$, $p < 0.01$), confirming that both bias types influence emotionally driven choices. Investment performance correlated positively with cognitive biases ($r = 0.553$, $p < 0.01$), emotional biases ($r = 0.487$, $p < 0.01$), and emotional decision-making ($r = 0.521$, $p < 0.01$). These moderate-to-strong correlations suggest that biases and emotional tendencies are associated with perceived performance variations, though positive direction may reflect biased self-evaluation rather than genuine performance enhancement. The findings confirm that cognitive and emotional components of investor behavior are interconnected, supporting the conceptual model and justifying subsequent regression and mediation analyses.

Table No. 3: Correlation Statistics

Variables	***1***	***2***	***3***	***4***
1. Cognitive Biases	1			
2. Emotional Biases	0.642**	1		
3. Emotional Decision-Making	0.596**	0.613**	1	
4. Investment Performance	0.553**	0.487**	0.521**	1

Conformity Factor Analysis

Table 4: Confirmatory Factor Analysis and Reliability Results

Construct	***CR***	***AVE***
Overconfidence Bias	0.88	0.64
Anchoring Bias	0.87	0.62
Loss Aversion Bias	0.90	0.66
Herding Behavior	0.89	0.65
Confirmation Bias	0.88	0.63
Mental Accounting Bias	0.87	0.61
Emotional Decision-Making	0.91	0.69
Investment Performance	0.88	0.64

Table No. 5 Model Fit Indices

Fit Index	***Recommended Value***	***Obtained Value***
χ^2/df	< 3.00	2.31
CFI	≥ 0.90	0.93
TLI	≥ 0.90	0.92
RMSEA	≤ 0.08	0.056
SRMR	≤ 0.08	0.047

Regression and mediation analyses provided strong empirical support for all proposed relationships. Cognitive biases significantly and positively influenced emotional decision-making ($b = 0.642$, $R^2 = 0.412$, $p = 0.000$), explaining 41.2% of its variance. Emotional biases similarly predicted emotional decision-making ($b = 0.613$, $R^2 = 0.376$, $p = 0.000$). Cognitive biases directly affected investment performance ($b = 0.553$, $R^2 = 0.306$, $p = 0.000$), as did emotional biases ($b = 0.487$, $R^2 = 0.237$, $p = 0.000$). Emotional decision-making also significantly predicted investment performance ($b = 0.521$, $R^2 = 0.271$, $p = 0.000$). Mediation analysis revealed that emotional decision-making partially mediated

the relationship between cognitive biases and investment performance (indirect effect b = 0.187, SE = 0.051, t = 4.235, p = 0.000; 95% CI [0.142, 0.293]), indicating that cognitive biases influence performance both directly and indirectly through emotional decision-making. The partial mediation, supported by a confidence interval excluding zero, confirms that emotions serve as a behavioral bridge linking cognitive distortions to financial outcomes. Collectively, these findings validate the behavioral finance model, demonstrating that cognitive and emotional biases significantly shape emotional decision-making and ultimately investment performance.

Table No. 6 Regression Analysis

Relationship Tested	***Beta (ß)***	***R^2***	***Sig. (p)***	***Result***
Cognitive Biases → Emotional Decision-Making	0.642	0.412	0.000	Supported
Emotional Biases → Emotional Decision-Making	0.613	0.376	0.000	Supported
Cognitive Biases → Investment Performance	0.553	0.306	0.000	Supported
Emotional Biases → Investment Performance	0.487	0.237	0.000	Supported
Emotional Decision-Making → Investment Performance	0.521	0.271	0.000	Supported

Cognitive Biases → Investment Performance (Indirect Effect Via Emotional Decision-Making)	***0.216***	***0.187***	***0.051***	***4.235***	***0.000****	***[0.142, 0.293]***	***Partial Mediation***

The findings provide strong empirical support for the behavioral finance model, confirming that cognitive and emotional biases significantly influence emotional decision-making and investment performance, with emotional decision-making partially mediating the relationship between cognitive biases and investment outcomes. This supports the view that investor behavior arises from a combination of cognitive heuristics, emotional responses, and subjective judgments rather than purely rational analysis (Kumar and Goyal, 2020; Liu et al., 2022). The significant positive relationship between cognitive biases and emotional decision-making aligns with dual-process theory (Stanovich et al., 2021), where intuitive System 1 thinking overrides rational analysis, leading to emotionally driven behaviors such as panic selling or speculative buying (Baker et al., 2020). Emotional biases also positively influence emotional decision-making, consistent with appraisal theory (Moore et al., 2021), with fear and greed distorting investment logic (Barberis, 2021). Cognitive biases show a significant positive association with investment performance (b = 0.553), though this reflects perceived rather than actual performance due to overconfidence (Bashir et al., 2022), while excessive trading and anchoring undermine long-term returns (Dandapani et al., 2023). Emotional biases similarly impact performance (b = 0.487), with moderate emotions potentially enhancing alertness but excessive emotions causing instability (Kumar & Lee, 2021). Emotional decision-making independently predicts performance (b = 0.521), serving as a key behavioral mechanism (Garg and Jindal, 2021; Ali et al., 2023). Mediation analysis confirms partial mediation (b = 0.187, $p < 0.001$), indicating that cognitive biases affect performance both directly and indirectly through emotional decision-making (Sharma and Goyal, 2022; Luo et al., 2023). These findings align with prior empirical studies (Lin et al., 2020; Hunjra et al., 2021) and psychological finance models (Singh et al., 2023), highlighting that emotional regulation is as essential as financial literacy for achieving consistent investment outcomes (Tran et al., 2022).

Conclusion

This study discussed the impact of cognitive and emotional biases on emotional decision-making and the performance of individual investors in the stock market. The analyses demonstrated that both forms of biases have a major influence on the process of emotional decision-making, which supports the notion that the behavior of investors is not entirely rational, but it is more of a psychological issue. The cognitive biases, including overconfidence and anchoring, and emotional biases, including fear and regret, were observed to influence judgment and result in decisions that are emotionally related. It was also shown that emotional decision-making mediates the impact, which is one of the factors explaining the transformation of biases into investment outcomes, at least in part.

This implies that behavioral performance/mental distortions are connected through emotional processes. Altogether, the research has an empirical confirmatory effect on the behavioral finance theory, stating that emotions and cognition are co-determining factors of the success or failure of investments. It states the significance of behavioral awareness and emotional regulation as the ultimate goal among investors to increase the quality of decisions. These insights can inform the creation of education programs, advice systems, and digital tools by financial institutions and policymakers that reduce bias and encourage rational investment behavior. To sum up, behavioral biases should be comprehended and controlled to enhance financial decision-making, consistency, and sustainability of investment performance in the modern dynamic markets.

Study Implementation

The study's findings carry substantial practical implications for investors, financial advisors, policymakers, and institutions, emphasizing that managing psychological factors is as critical to financial success as analyzing market data. First, investor self-awareness and behavioral learning are essential. Since investors often rely on biases such as overconfidence, anchoring, and confirmation bias alongside emotional reactions like fear, regret, and pride, financial literacy programs should incorporate behavioral finance training, workshops, investment simulations, and decision-tracking exercises to help individuals recognize and correct these tendencies. Second, emotional control is vital, as emotional decision-making mediates the bias–performance relationship. Emotional intelligence enables investors to avoid panic selling or overtrading; financial institutions can support this through mindfulness training, stress management, and technological tools such as "cooling-off" prompts in trading apps. Third, financial advisors should extend

beyond analytical services to include behavioral coaching, using profiling tests to identify client biases and tailoring portfolios to balance emotional comfort with rational diversification. Investment firms and digital platforms can integrate behavioral insights via AI-driven robo-advisors that detect biased trading patterns and provide real-time alerts or customized feedback. Policymakers and regulators can leverage behavioral insights to launch public awareness campaigns, mandate behavioral risk disclosures, and require basic behavioral finance education before account opening. At the organizational level, structured decision-making frameworks, such as pre-mortems, devil's advocate roles, and red-team reviews, can mitigate group-level biases like herding and overconfidence. Digital tools such as behavioral dashboards and predictive analytics can further promote mindful investing. Educational institutions should expand finance curricula to include behavioral finance, emotional intelligence, and decision-making psychology. Finally, individual investors are encouraged to maintain investment diaries and establish pre-commitment rules to cultivate discipline and self-reflection. Collectively, these strategies underscore that sustainable investment performance requires integrating behavioral awareness, emotional regulation, and informed decision-making across education, technology, and policy.

Limitations and Future Research Directions

The study has several limitations that offer directions for future research. First, the cross-sectional design captures data at a single point, preventing causal inferences; longitudinal studies are needed to examine how biases and emotions evolve with experience, market conditions, and feedback loops over time. Second, the use of self-reported measures introduces potential social desirability bias, memory distortion, and overestimation of performance; future research should combine subjective scales with objective financial data such as trading records and portfolio returns. Third, the sample's geographic and cultural scope is limited; cross-cultural and cross-market comparative studies (e.g., developed vs. emerging economies) would enhance generalizability. Fourth, the study focuses on selected cognitive and emotional biases, omitting social, motivational, and contextual biases (e.g., herding, peer pressure) that warrant inclusion. Fifth, emotional decision-making is a complex construct; mixed-methods approaches incorporating qualitative interviews or experiments could capture its depth. Sixth, moderating factors such as financial literacy, investment experience, age, risk tolerance, and emotional intelligence were not examined and should be integrated into future models. Seventh, the static nature of the data overlooks market dynamics; event-based or crisis-focused designs could reveal how situational factors influence behavior. Eighth, the reliance on linear modeling may not capture nonlinear relationships; advanced techniques such as structural equation modeling, artificial neural networks, or partial least squares path modeling could provide richer insights. Finally, sample diversity should be expanded through stratified sampling to include institutional investors, female investors, and younger digital traders. Addressing these limitations through longitudinal, cross-cultural, multi-method, and analytically sophisticated designs will build on this study's foundation to develop more comprehensive behavioral finance models.

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