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Rethinking Behavioral Biases: Cognitive vs Contextual Heuristics Through Mediating Role of Risk Perception in China's Stock Market

(Penilaian Semula Bias Tingkah Laku: Perbandingan antara Heuristik Kognitif dan Heuristik Kontekstual melalui Peranan Pengantaraan Persepsi Risiko dalam Pasaran Saham China)

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ABSTRACT

This study examines whether cognitive heuristics (overconfidence and anchoring) and contextual heuristics (herding and availability) influence individual investors' decision-making in China's stock market through risk perception. Using survey data from 398 individual investors and structural equation modelling, the results show that risk perception partially mediates the effects of cognitive heuristics but fully mediates those of contextual heuristics. Importantly, the contribution lies not in confirming mediation per se, but in demonstrating distinct psychological pathways through which different heuristic categories influence investment decision-making. This dual-pathway mechanism suggests that contextual heuristics rely more heavily on external information environments, whereas cognitive heuristics operate through both direct judgment shortcuts and perceived risk. The findings extend behavioral finance research by integrating heuristic classification with risk perception and providing evidence from an emerging market. These insights have implications for investor education and policy design, particularly in AI-driven information environments where behavioral biases and risk perception may be amplified.

Keywords: Cognitive heuristics; contextual heuristics; behavioral biases; individual investors; decision-making

ABSTRAK

Kajian ini meneliti sama ada heuristik kognitif (keyakinan berlebihan dan penambatan) serta heuristik kontekstual (tingkah laku ikut-ikutan dan ketersediaan) mempengaruhi pembuatan keputusan pelaburan pelabur individu dalam pasaran saham China melalui persepsi risiko. Dengan menggunakan data tinjauan daripada 398 pelabur individu dan pemodelan persamaan berstruktur, hasil kajian menunjukkan bahawa persepsi risiko memediasi secara separa kesan heuristik kognitif, tetapi memediasi sepenuhnya kesan heuristik kontekstual. Sumbangan utama kajian ini bukan sekadar mengesahkan kewujudan kesan pengantaraan, tetapi menunjukkan laluan psikologi yang berbeza melalui mana kategori heuristik yang berlainan mempengaruhi pembuatan keputusan pelaburan. Mekanisme laluan berganda (dual-pathway mechanism) ini menunjukkan bahawa heuristik kontekstual lebih bergantung pada persekitaran maklumat luaran, manakala heuristik kognitif beroperasi melalui kedua-dua jalan pintas pertimbangan secara langsung dan persepsi risiko. Dapatan kajian ini memperluas penyelidikan kewangan tingkah laku dengan mengintegrasikan pengelasan heuristik dengan persepsi risiko serta menyediakan bukti daripada pasaran sedang pesat membangun. Penemuan ini mempunyai implikasi terhadap pendidikan pelabur dan reka bentuk dasar, khususnya dalam persekitaran maklumat yang dipacu oleh AI, di mana bias tingkah laku dan persepsi risiko berpotensi diperkukuh.

Kata kunci: Heuristik kognitif; heuristik kontekstua; bias tingkah laku; pelabur individu; pembuatan keputusan

INTRODUCTION

Classical finance assumes that investors behave rationally and are risk-averse when making decisions (Markowitz 1952). For example, the efficient market hypothesis (EMH) proposed by Fama (1970) assumes that arbitrage opportunities cannot persist because markets are efficient and assets prices immediately incorporate available information. Accordingly, investors should not accept additional risks without corresponding returns. In practice, however, investors may exhibit loss-aversion, as proposed by prospect theory proposed (Kahneman & Tversky 1979), and may be reluctant to sell financial assets at a loss despite being exposed to greater risks. This occurs because investors are influenced not only by fundamental and technical information but also by emotions and cognitive limitations, as highlighted in behavioral finance. In consequence, researchers have increasingly focused on behavioral finance in recent decades.

As a supplement to classical finance, behavioral finance provides a novel perspective for analyzing investors' decision-making process. According to behavioral finance, investors cannot consistently make fully rational decisions due

to informational, temporal, and cognitive limitations (Simon 1955). Hence, investors decisions are not necessarily those that objectively maximize utility but rather those that subjectively satisfy their preferences, especially under uncertain market conditions, based on their own information processing and cognitive limitations (Ahmad & Shah 2022). Investors tend to employ heuristics or other mental shortcuts to simplify the decision-making process and reduce perceived risks (Shah et al. 2018). However, the application of heuristics does not reduce actual risk. Instead, heuristics may impair investors' reasoning and judgement, distort their risk perceptions, and consequently contribute to irrational decisions (Ahmad & Shah 2022).

Compared with developed markets, emerging markets possess distinctive institutional characteristics that may influence investors' decision-making processes (Raut et al. 2020; Ahmad & Wu 2022; Das & Panja 2022; Xia et al. 2024). China represents a particularly appropriate research context because its stock market is characterized by substantial government intervention, a prominent role of state-owned enterprises (SoEs), and limited transparency despite ongoing regulatory reforms (Dang et al. 2019; Ahmad & Wu 2022; Xia et al. 2024). In particular, inadequate information disclosure and limited market transparency may make it difficult for individual investors to obtain complete, timely, and reliable information when making investment decisions. Under such conditions, investors may rely more heavily on external informational cues, market sentiment, and the observed behavior of other investors to compensate for information uncertainty, thereby increasing their reliance on contextual heuristics, particularly herding and availability heuristics (Shiri et al. 2016; Ahmad & Shah 2022). This issue is particularly relevant in China, where individual investors account for approximately 99% of all market participants and may therefore be more susceptible to heuristic-driven decision-making. Examining behavioral biases in the Chinese stock market thus provides an appropriate setting for this study and contributes to a better understanding of how institutional characteristics influence investors' decision-making behavior.

Although various behavioral biases, including overconfidence, anchoring, availability, and herding, have been widely studied in behavioral finance (Tversky & Kahneman 1974; Kahneman & Tversky 1979; Ahmad & Shah 2022), existing studies have predominantly examined these biases independently or focused primarily on their direct effects on investment decision-making. Comparatively little attention has been devoted to systematically contrasting different categories of heuristics within a unified analytical framework. From a theoretical perspective, treating heuristics as a broad and relatively homogeneous form of cognitive shortcut may not sufficiently account for the different psychological origins through which they shape investors' judgments. In particular, heuristics arising primarily from investors' internal cognitive processes may operate differently from those triggered or reinforced by external informational and social environments. This limitation creates a theoretical gap in explaining whether distinct heuristic categories influence investment decision-making through homogeneous or heterogeneous psychological mechanisms. More importantly, although risk perception has frequently been identified as an important psychological mechanism affecting decision-making, previous studies have generally regarded it as a common mediating variable without examining whether different heuristic categories operate through distinct psychological mechanisms. Consequently, it remains unclear whether cognitive heuristics and contextual heuristics influence investment decision-making through homogeneous or heterogeneous mediation processes, particularly in stock markets characterized by limited transparency and inadequate information disclosure.

To address these research gaps, this study distinguishes heuristics into cognitive heuristics and contextual heuristics according to their underlying psychological origins. Specifically, overconfidence and anchoring are classified as cognitive heuristics because they primarily originate from investors' internal cognitive judgments, whereas herding and availability are classified as contextual heuristics because they are more closely associated with external informational environments and social influences. Using risk perception as the mediating variable, this study investigates whether these two categories of heuristics influence investment decision-making through structurally different psychological pathways in the Chinese stock market. By examining multiple representative heuristics within a unified analytical framework, this study extends the existing behavioral finance literature by providing a more comprehensive understanding of the psychological mechanisms through which different heuristic categories influence investment decision-making.

Accordingly, this study makes three primary contributions to the behavioral finance literature. First, it distinguishes cognitive heuristics from contextual heuristics within a unified analytical framework, providing a more systematic understanding of how different heuristic categories influence investment decision-making. Second, rather than merely confirming the mediating role of risk perception, this study demonstrates that risk perception performs different mediating roles across heuristic categories, acting as a full mediator for contextual heuristics but only a partial mediator for cognitive heuristics. These findings indicate that different heuristic categories influence investment decision-making through structurally different psychological pathways. Third, by providing empirical evidence from the Chinese stock market, this study extends the existing behavioral finance literature by demonstrating how the institutional characteristics of an emerging market, including government intervention, limited transparency, and inadequate information disclosure, may shape heuristic-driven investment behaviour among individual investors.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

HEURISTICS

Heuristics are simplified decision-making approaches that individuals employ to address complex problems under

conditions of cognitive resources (Groner et al. 1983). In behavioral finance, heuristics can be classified according to the primary sources of information on which investors rely when forming judgments (Simon 1995; Gigerenzer et al. 1999). Recent literature continues to recognize heuristic biases as important determinants of stock market investment decision-making, particularly under conditions of uncertainty and limited information (Shah & Butt 2024). Empirical evidence further indicates that heuristics can influence actual securities investment decisions in real-world financial settings (Piotrowski & Bünnings 2024). Specifically, this study distinguishes between cognitive heuristics, grounded in bounded rationality, and contextual heuristics, informed by ecological rationality.

Based on Simon's (1955) concept of bounded rationality, investors are constrained by limited cognitive capacity and therefore rely on internally generated mental shortcuts when processing complex information. Specifically, overconfidence and anchoring are classified as cognitive heuristics because both arise primarily from internal cognitive processes, relying on personal beliefs or initial reference points to simplify investment judgments (Jain et al. 2022; Shah & Butt 2024). In contrast, ecological rationality argues that decision-making is adaptive to environmental structures, whereby individuals utilize cues available within their informational and social environments (Gigerenzer et al. 1999). Accordingly, herding and availability are classified as contextual heuristics because they are driven primarily by external informational and social cues rather than internally generated judgments (Baker & Ricciardi 2014; Gigerenzer et al. 1999). This distinction provides the theoretical foundation for examining whether internally and externally driven heuristics influence investment decision-making through different psychological mechanisms.

BEHAVIORAL BIASES AND INVESTMENT DECISION-MAKING

OVERCONFIDENCE BIAS

Overconfidence refers to the tendency of individuals to overestimate the accuracy of their judgments, the precision of their information, or the reliability of their abilities when forming investment expectations (Fischhoff et al. 1977). Consistent with bounded rationality, overconfident investors tend to rely on internally generated beliefs rather than objectively processing all available information, making overconfidence an influential cognitive heuristic in investment decision-making (Tversky & Kahneman 1974).

Previous studies have reported mixed findings regarding the influence of overconfidence bias on investment decision-making. Ahmad and Shah (2020), Shah et al. (2018) and Weixiang et al. (2022), found that overconfidence negatively affects investment decision-making because investors tend to underestimate potential risks, rely on limited information, and engage in excessive trading under complex and uncertain market conditions. In contrast, Raut et al. (2020) and Das and Panja (2022) reported a positive relationship, arguing that overconfident investors are more likely to rely on their own analyses and act decisively when making investment decisions. These inconsistent findings may reflect differences in market conditions, investor sophistication, and financial literacy, which can influence whether confidence enhances decisiveness or develops into a judgmental bias. Therefore, the following relationship is hypothesized.

H_1 Overconfidence bias has a significantly positive impact on individual stock investors' decision-making.

ANCHORING BIAS

Anchoring is the tendency of individuals to rely heavily on initial values or reference points when making subsequent judgments or decisions (Tversky & Kahneman 1974). Consistent with bounded rationality, investors may simplify complex investment decisions by relying on readily available reference points rather than comprehensively processing new information (Simon 1995). Accordingly, anchoring is regarded as a cognitive heuristic because investment judgments are primarily influenced by internally selected reference points.

In stock markets, investors may anchor their judgments to purchase prices, historical highs or lows, or previous investment experiences (Jain et al. 2022; Cao et al. 2021; Jain et al. 2020). Reliance on initial reference points may limit the adjustment of investment judgments when new market information becomes available, thereby increasing the likelihood of biased decisions (Andersen 2010). Previous studies have reported inconsistent findings regarding the influence of anchoring bias on investment decision-making. Shah et al. (2018) found that anchoring negatively affects investment decision-making by contributing to estimation errors and missed investment opportunities. In contrast, Raut et al. (2020) reported a positive relationship, suggesting that reliance on anchors may enable investors to make decisions more efficiently when information is limited. These divergent findings may reflect differences in information availability, market uncertainty, and investors' ability to adjust their initial judgments as new information emerges. Therefore, the following hypothesis is proposed.

H_2 Anchoring bias has a significantly positive impact on individual stock investors' decision-making.

HERDING BIAS

Herding refers to the tendency of individuals to imitate or follow the actions of others rather than rely on their own

information or judgments (Kumar & Goyal 2015). Consistent with ecological rationality, investors may adapt to complex and uncertain market environments by relying on external informational and social cues when personal information is limited or difficult to evaluate (Gigerenzer et al. 1999). Accordingly, herding is regarded as a contextual heuristic because investment judgments are shaped primarily by surrounding market behavior rather than internally generated beliefs.

The mechanism of herding originated from informational cascade models, which suggest that individuals may follow others when they perceive public signals or group actions to be more reliable than their own information (Banerjee 1992). This mechanism is particularly relevant in emerging stock markets such as China, where retail investors dominate market participation and the government plays an active role in the stock market (Tan et al. 2024). Government intervention can also influence the information environment in which investors make decisions. Evidence from China suggests that government intervention may reduce price informativeness and encourage investors to pay greater emphasis on government-related information rather than on fundamental information (Dang et al. 2024). Under such conditions, following the majority may be perceived as an adaptive response to uncertainty, although it may also contribute to biased investment decisions.

Previous studies have reported inconsistent findings regarding the influence of herding on investment decision-making. Ahmad and Wu (2022), Gupta and Shrivastava (2022), and Raut et al. (2020), reported significant positive relationship, suggesting that investors with limited financial literacy or lower confidence in their own analytical abilities are more likely to rely on others when making investment decisions. However, empirical evidence from other markets has reported weaker or even negative relationships, indicating that the influence of herding may vary across market environments and investor characteristics. Therefore, the following hypothesis is proposed.

H_3 Herding bias has a significantly positive impact on individual stock investors' decision-making.

AVAILABILITY BIAS

Availability is the tendency of individuals to assess the likelihood or importance of an event based on information that comes to mind readily or attracts attention within their environment (Tversky & Kahneman 1973). Consistent with ecological rationality, investors may simplify investment decision by relying on salient information that is readily accessible within their informational environment rather than comprehensively processing all relevant information (Gigerenzer et al. 1999). Accordingly, availability is regarded as a contextual heuristic because investment judgments are influenced primarily by the accessibility of external information rather than internally generated reasoning.

Previous studies have reported mixed findings regarding the influence of availability bias on investment decision-making. Shah et al. (2018) found that availability bias negatively affects investment decision-making by increasing misjudgments and reducing potential investment benefits. In contrast, Rasheed et al. (2018) and Khan et al. (2021) reported positive relationships, arguing that investors may rely on readily accessible information when market complexity and limited financial literacy make comprehensive information processing difficult. These divergent findings may reflect differences in information environments, market conditions, and investors' ability to distinguish salient information from relevant information. This perspective is particularly relevant in emerging stock markets such as China, where active government participation and a developing information environment may influence the information to which investors pay attention (Tan et al. 2024). Evidence from China also suggests that government intervention can affect the information environment and investors' attention to market-related information (Dang et al. 2024). Under such conditions, investors with limited attention may rely more heavily on salient and readily accessible market information when evaluating investment opportunities, thereby increasing the relevance of availability bias. Therefore, the following hypothesis is proposed.

H_4 Availability bias has a significantly positive impact on individual stock investors' decision-making.

BEHAVIORAL BIAS AND RISK PERCEPTION

Risk perception refers to the subjective assessment of the probability of losses associated with an action or decision under conditions of uncertainty (Slovic 1987). In behavioral finance, investors frequently rely on heuristics to simplify complex investment decisions; however, these mental shortcuts may distort the assessment of actual market risks, resulting in a discrepancy between perceived and objective risk (Ahmad & Shah 2020). Consequently, risk perception represents an important psychological mechanism through which heuristic-driven biases influence investment behavior.

Consistent with bounded rationality, cognitive heuristics may alter investors' risk perception through internally generated judgments. For example, overconfidence tends to reduce perceived risk by encouraging excessive confidence in one's own knowledge and abilities (Parveen et al. 2020), whereas anchoring may distort risk assessment by causing investors to rely excessively on historical reference points rather than current market information (Jain et al. 2023b). Accordingly, previous studies generally report that both overconfidence and anchoring are negatively associated with risk perception (Ahmad & Shah 2020). By contrast, ecological rationality suggests that contextual heuristics influence risk perception through external informational and social cues. Herding may reduce perceived risk because conformity with the majority can create a sense of security, particularly under uncertain market conditions (Almansour et al. 2023). Similarly,

the effect of availability depends on the nature of the information that is most readily accessible. Easily recalled positive information may reduce perceived risk, whereas salient negative information may increase it (Barbosa & Fayolle 2007). Based on these theoretical arguments and prior empirical findings, the following hypotheses are proposed.

H_5 Overconfidence bias has a significantly positive impact on individual stock investors' risk perception.
H_6 Anchoring bias has a significantly positive impact on individual stock investors' risk perception.
H_7 Herding bias has a significantly positive impact on individual stock investors' risk perception.
H_8 Availability bias has a significantly positive impact on individual stock investors' risk perception.

RISK PERCEPTION AND INVESTMENT DECISION-MAKING

Risk perception plays a central role in investment decision-making because investors generally respond to their subjective assessment of uncertainty rather than to objective market conditions alone (Kahneman & Tversky 1979; Slovic 1987). According to prospect theory, individuals evaluate potential gains and losses relative to perceived outcomes, causing differences in risk perception to influence investment choices under uncertainty (Kahneman & Tversky 1979). Previous empirical studies consistently demonstrate that risk perception is an important determinant of investment decision-making (Fitriasari et al. 2025). Investors with higher perceived risk tend to behave more cautiously, whereas lower perceived risk is associated with greater willingness to invest in risky assets (Almansour et al. 2023; Ahmad & Shah 2020; Shah et al. 2018). Accordingly, the following hypothesis is proposed.

H_9 Risk perception has a significantly positive impact on individual stock investors' decision-making.

MEDIATING ROLE OF RISK PERCEPTION

As discussed above, heuristic-driven biases influence how investors process and interpret information under uncertainty, thereby shaping their perceptions of investment risk. Rather than responding solely to objective market conditions, investors assess risk through subjective information-processing, which may subsequently influence their investment decisions. Accordingly, risk perception provides a theoretical mechanism through which both cognitive and contextual heuristics affect investment decision-making.

From an information-processing perspective, cognitive and contextual heuristics influence risk perception through different psychological pathways. Cognitive heuristics, such as overconfidence and anchoring, originate primarily from internally generated judgments consistent with bounded rationality (Simon 1955) and may affect investment decision-making both directly and indirectly by shaping investors' perceptions of investment risk. In contrast, contextual heuristics, including herding and availability, rely mainly on external informational and social cues consistent with ecological rationality (Gigerenzer et al. 1999). These cues may first influence investors' subjective perceptions of market risk before affecting subsequent investment decisions. This distinction is also consistent with the risk-as-feelings framework (Loewenstein et al. 2001), which suggests that behavioral responses are shaped by subjective perceptions of uncertainty during information evaluation. Accordingly, risk perception is expected to play a relatively stronger mediating role for contextual heuristics than for cognitive heuristics.

Previous empirical findings generally support the mediating role of risk perception, although the extent of mediation varies across different market contexts. Jain et al. (2023b) reported that risk perception partially mediates the relationships between overconfidence, anchoring, and availability biases and investment decision-making in India. Similarly, Almansour et al. (2023) found full mediation for overconfidence and partial mediation for herding in the Saudi stock market, whereas Ahmad and Shah (2020) reported full mediation for overconfidence but no mediating effect for herding in Pakistan. These mixed findings suggest that the mediating role of risk perception may depend on differences in market environments and information-processing contexts. Therefore, the following hypotheses are proposed.

H_{10} Risk perception mediates the relationship between overconfidence bias and individual stock investors' decision-making.
H_{11} Risk perception mediates the relationship between anchoring bias and individual stock investors' decision-making.
H_{12} Risk perception mediates the relationship between herding bias and individual stock investors' decision-making.
H_{13} Risk perception mediates the relationship between availability bias and individual stock investors' decision-making.

The proposed research model is illustrated in FIGURE 1.

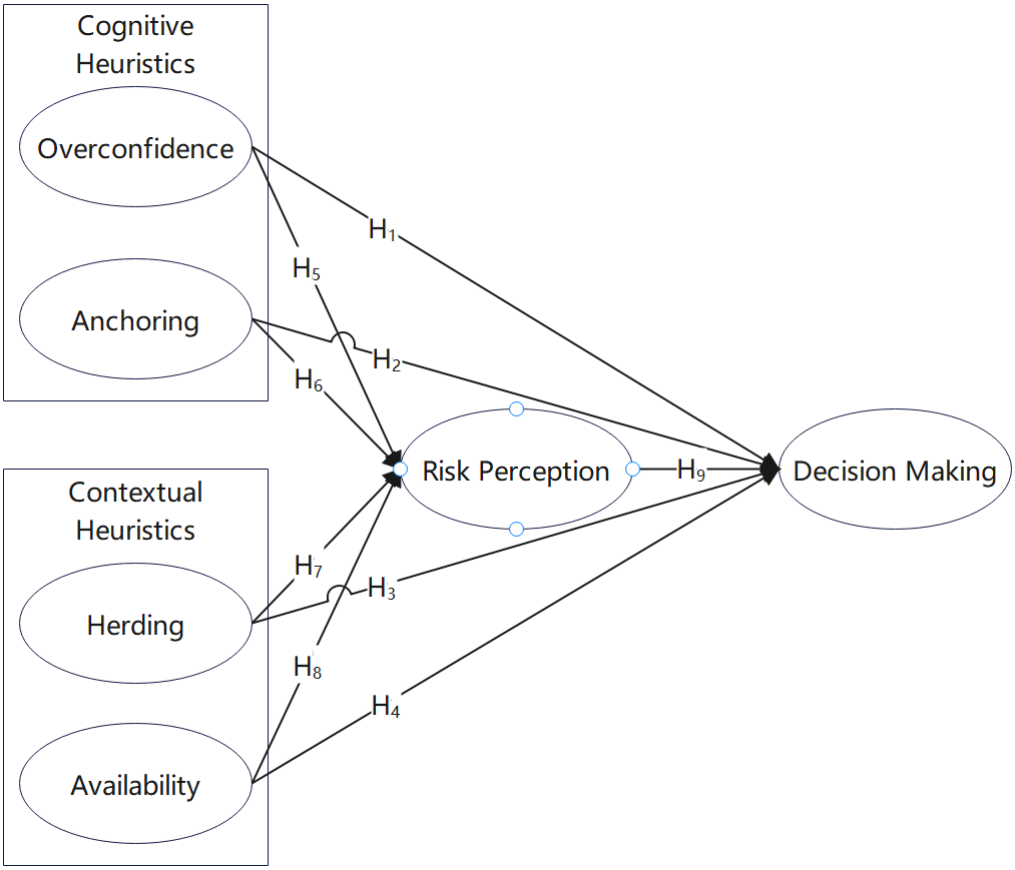


FIGURE 1. The proposed research model of this study

METHODOLOGY

RESEARCH DESIGN

The objective of this study is to investigate whether and how behavioral biases influence investment decision-making through the mediating role of risk perception. Accordingly, a deductive approach was adopted because the study tests hypotheses derived from established theories (Sekaran 2006). A cross-sectional research design was also employed to examine the hypothesized relationships among the study variables using data collected at a single point in time.

SAMPLING AND DATA COLLECTION

SAMPLE SIZE

Slovin' s formula, as shown in Equation (1), was applied because it is appropriate when the population size is known (P.H. & Uchil 2020). This approach is considered suitable for the present study because the population of individual investors in China' s stock market can be identified with reasonable accuracy. According to the official 2024 statistical report of the China Securities Depository and Clearing Corporation Limited (CSDC), the total number of individual investors was 236,235,800, resulting in a required sample size of approximately 400 respondents based on Slovin's formula.

$$n = N/ (1+Ne^2) \quad (1)$$

where *n* is the total sample size of 399.999, which is around 400, *N* is the total population, and *e* is the margin of error, set at 0.05, corresponding to a 95% confidence level.

SAMPLING TECHNIQUE

After reviewing previous studies examining similar topics and market conditions, including Ahmad and Wu (2022), Ahmad (2021), and Ahmad and Shah (2020), a convenience purposive sampling technique was considered appropriate for this study because of its cost-effectiveness and potential for achieving a high response rate compared with other sampling methods, such as random and snowball sampling (Guan & Yaacob 2025). Probability sampling methods were considered

impractical because not every member of the target population could reasonably be selected from a population exceeding 200 million individuals. Snowball sampling was also considered unsuitable because interactions between initial and subsequent respondents could introduce bias into the findings, particularly given the study's focus on herding bias.

DATA COLLECTION

A structured questionnaire was adopted for data collection because it enables efficient data collection from a large number of respondents while ensuring standardized responses (Bryman & Bell 2007). Given the relatively non-transparent information environment of China's stock market, questionnaire-based data collection was considered appropriate for examining behavioral biases among individual investors. The questionnaire was developed using a reliable online platform (Tencent Questionnaire) and distributed through links posted on several online investment forums, with measures taken to protect respondents' confidentiality and privacy (Mouna & Jarboui 2015). Before the main survey, a pre-test involving two behavioral finance experts and three potential respondents was conducted to assess the face and content validity of the questionnaire. Subsequently, a pilot test was conducted by distributing 120 questionnaires, yielding 86 valid responses after data cleaning. The Cronbach's alpha values for all constructs exceeded the recommended threshold of 0.70, indicating satisfactory internal consistency (Hair et al. 2019). The target population comprised Chinese individual investors who held trading accounts and had trading experience on the Shanghai and Shenzhen stock exchanges. A total of 691 questionnaires were distributed, of which 398 valid responses were retained for subsequent analysis after incomplete and ineligible questionnaires were excluded. Ethical approval for this study was obtained from the relevant institutional research ethics committee prior to data collection. All procedures complied with institutional, national, and international ethical standards.

MEASUREMENT

A structured questionnaire comprising screening, demographic, and measurement sections was employed in this study. Three screening questions were included to establish respondent eligibility, while four demographic questions collected information on gender, age, education level, and investment experience. The measurement section consisted of 33 items assessed using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The measurement scales for all constructs were adapted from established instruments used in previous studies. Specifically, the four items measuring overconfidence bias and the six items measuring investment decision-making were adapted from Jain et al. (2023a). The four items measuring anchoring bias, three items measuring availability bias, and three items measuring risk perception were adapted from Jain et al. (2023b). The four items measuring herding bias were adapted from Ahmad and Wu (2022). All measurement items were adapted to the context of individual investors in China's stock market while retaining the original meaning of the respective constructs.

DATA ANALYSIS PROCEDURE

Data were analyzed using IBM SPSS Statistics and SmartPLS. For the final dataset, SPSS was used to generate demographic statistics and assess common method bias (CMB), whereas SmartPLS was employed to estimate the partial least squares structural equation model (PLS-SEM). PLS-SEM was selected because it is appropriate for prediction-oriented research involving non-normal data and non-probability sampling (Hair et al. 2022). The analysis proceeded in two stages: First, the measurement model was evaluated in terms of indicator reliability, convergent validity, discriminant validity, and multicollinearity. Second, the structural model was assessed through hypothesis testing and estimation of the path coefficients.

RESULTS AND FINDINGS

DEMOGRAPHICS

As shown in TABLE 1, the final sample comprised 398 respondents, of whom 61.81% were female and 38.19% were male. The largest proportion of respondents were aged between 31 and 46 years (50.75%), held a bachelor's degree (61.31%), and had 3 to 5 years of investment experience (29.65%). Respondents from other age groups, educational levels, and investment-experience categories were also well represented, indicating demographic diversity among the sampled Chinese individual stock investors.

TABLE 1. Demographic profile

Category		Frequency	Proportion
Gender	Male	152	38.19 %
	Female	246	61.81 %
Age	18 - 30 years	128	32.16 %
	31 - 45	202	50.75 %
	46 - 60	57	14.32 %
	60 above	11	2.76 %
Education level	Senior high school diploma and below	16	4.02 %

	College degree	52	13.07 %
	Bachelor degree	244	61.31 %
	Postgraduate degree	85	21.36 %
	Others	1	0.25 %
Investment experience	Less than 3 years	104	26.13 %
	3 - 5 years	118	29.65 %
	5 - 10 years	92	23.12 %
	10 years and more	84	21.11 %

COMMON METHOD BIAS (CMB)

The cross-sectional design adopted in this study means that data for dependent, mediating, and independent variables were collected at a single point in time, which may give rise to common method bias (CMB) and inflate correlations because the data were obtained from the same source (Podsakoff et al. 2003). Therefore, Harmon's one-factor test was conducted utilizing exploratory factor analysis (EFA) in SPSS to assess the presence of CMB (Eichhorn 2014). The test results showed that a single factor accounted 28.17% of the variance, which is below the 50% threshold suggested by Podsakoff et al. (2003). Thus, CMB is unlikely to be a concern in this study.

MEASUREMENT MODEL

The measurement model was assessed before estimating the hypothesized relationships in the structural model. The measurement model comprises two types of structures: reflective and formative (Sarstedt et al. 2016), which differ in how indicators measure their respective constructs. According to Hair et al. (2019), for a reflective measurement model, in which indicators reflect their respective constructs, indicator loadings, internal consistency reliability, convergent validity, and discriminant validity should be assessed sequentially.

Indicator loadings refer to the extent to which each individual indicator (observed variables) reflects its underlying constructs (latent variables) (O' Leary-Kelly & Vokurka 1998). As shown in TABLE 2, the SmartPLS results indicated that the outer loadings of all indicators exceeded the recommended threshold of 0.5 (Jan et al. 2022), supporting indicator reliability. Next, composite reliability (CR) was used to assess the internal consistency reliability of each construct based on its indicators (Fornell & Larcker 1981). The results showed that the CR values of all constructs exceeded the recommended threshold of 0.7 (Shiau et al. 2019), indicating satisfactory internal consistency reliability. Moreover, convergent validity assesses the extent to which the indicators of a construct collectively measure the same underlying construct (Hair et al. 2019). The average variance extracted (AVE) values, which were used to assess convergent validity, all exceeded the recommended threshold of 0.5 (Hair et al. 2010), confirming convergent validity.

TABLE 2. Outer loadings, composite reliability (CR), and average variance extracted (AVE)

Construct	Item	Loading	CR	AVE
Overconfidence	OC1	0.765	0.848	0.584
	OC2	0.810		
	OC3	0.787		
	OC4	0.689		
Anchoring	AC1	0.620	0.806	0.512
	AC2	0.782		
	AC3	0.691		
	AC4	0.757		
Herding	HD1	0.693	0.807	0.511
	HD2	0.731		
	HD3	0.676		
	HD4	0.757		
Availability	AB1	0.714	0.806	0.581
	AB2	0.816		
	AB3	0.753		
Risk Perception	RP1	0.737	0.785	0.550
	RP2	0.792		
	RP3	0.694		
Decision-making	DM1	0.824	0.908	0.622
	DM2	0.797		
	DM3	0.794		
	DM4	0.828		
	DM5	0.649		
	DM6	0.826		

Furthermore, discriminant validity refers to the extent to which each construct is distinct from the other constructs (Hair et al. 2019). The criterion proposed by Fornell and Larcker (1981), and the heterotrait-monotrait (HTMT) ratio proposed by Henseler (2015) are commonly used to assess discriminant validity. However, the HTMT ratio was employed in this study because it has been shown to have greater sensitivity and specificity than the Fornell-Larcker criterion (Rasoolimanesh et al. 2019). As shown in the HTMT matrix in TABLE 3, two values exceeded the recommended threshold value of 0.9 (Voorhees et al. 2016), initially indicating a potential lack of discriminant validity. Nevertheless, Henseler et

al. (2015) noted that when an HTMT value exceeds a threshold of 0.9, discriminant validity may still be established the bootstrapped confidence interval, does not include the value "1". Accordingly, bootstrapping was conducted at the 5% significance level. The results in TABLE 4 confirmed discriminant validity, as none of the confidence intervals included the value "1".

TABLE 3. HTMT matrix

	AB	AC	DM	HD	OC	RP
AB						
AC	0.708					
DM	0.219	0.427				
HD	0.919	0.641	0.326			
OC	0.235	0.420	0.916	0.350		
RP	0.650	0.552	0.484	0.624	0.428	

Notes: AB = Availability; AC = Anchoring; DM = Decision-making; HD = Herding;
OC = Overconfidence; RP =Risk Perception

TABLE 4. Bootstrapping results for checking discriminant validity

	Lower bound	Upper bound	Whether Uncover "1"
AC <-> AB	0.587	0.816	Yes
DM <-> AB	0.127	0.332	Yes
DM <-> AC	0.317	0.534	Yes
HD <-> AB	0.839	0.991	Yes
HD <-> AC	0.541	0.737	Yes
HD <-> DM	0.214	0.440	Yes
OC <-> AB	0.145	0.323	Yes
OC <-> AC	0.300	0.529	Yes
OC <-> DM	0.870	0.957	Yes
OC <-> HD	0.239	0.455	Yes
RP <-> AB	0.515	0.768	Yes
RP <-> AC	0.423	0.680	Yes
RP <-> DM	0.353	0.602	Yes
RP <-> HD	0.496	0.749	Yes
RP <-> OC	0.307	0.544	Yes

Notes: AC = Anchoring; AB = Availability: DM = Decision-making: HD = Herding;
OC = Overconfidence; RP =Risk Perception

STRUCTURAL MODEL

MULTICOLLINEARITY AND COEFFICIENT OF DETERMINATION (R^2)

Before testing the hypothesized relationships, multicollinearity was assessed using the variance inflation factor (VIF). Following Mason and Perreault (1991), VIF values below 3 indicate that multicollinearity is unlikely to bias the regression estimates. As shown in Table 5, all VIF values were below 1.8, confirming that multicollinearity was not a concern in the present study.

TABLE 5. Variance inflation factor (VIF) for multicollinearity

	AB	AC	DM	HD	OC	RP
AB			1.753			1.697
AC			1.448			1.426
DM						
HD			1.711			1.667
OC			1.168			1.124
RP			1.340			

Note(s): AB = Availability; AC = Anchoring; DM = Decision-making; HD = Herding;
OC = Overconfidence; RP =Risk Perception

The explanatory power of the structural model was assessed using the coefficient of determination (R^2). As reported in TABLE 5, the model explained 60.9% of the variance in investment decision-making ($R^2 = 0.609$) and 25.4% of the variance in risk perception ($R^2 = 0.254$). According to Hair et al. (2019), these values indicate moderate-to-high explanatory power for investment decision-making and acceptable explanatory power for risk perception. Overall, the results suggest that the proposed model has satisfactory in-sample explanatory capability. Its out-of-sample predictive performance is further evaluated using PLS-Predict, as reported in the Supplementary Material.

DIRECT EFFECTS

The hypotheses were examined through the bootstrapping technique, a resampling procedure available in SmartPLS. A total of 5000 resamples were utilized to assess the stability of path coefficient estimates, as an adequate number of bootstrap resamples can reduce variation between the original and mean values of regression path coefficients (Davcik 2014). TABLE 6 illustrates the direct effects among the variables. The bootstrapping results showed that overconfidence bias ($\beta = 0.707$, $p = 0.000 < 0.05$) and anchoring bias ($\beta = 0.080$, $p = 0.049 < 0.05$) had significant positive impacts on investment decision-making, supporting both H_1 and H_2. However, herding bias ($\beta = 0.035$, $p = 0.251 > 0.05$) and availability bias (β

= -0.050, p = 0.141 > 0.05) did not have significant impacts on investment decision-making, leading to the rejection of H_3 and H_4. The results further indicate that all four behavioral biases had significant positive effects on risk perception among Chinese retail investors. Specifically, overconfidence bias (β = 0.181, p = 0.000 < 0.05), anchoring bias (β = 0.128, p = 0.033 < 0.05), herding bias (β = 0.181, p = 0.003 < 0.05), and availability bias (β = 0.205, p = 0.001 < 0.05) were all found to significantly increase risk perception, thereby supporting H_5 to H_8. Finally, risk perception (β = 0.115, p = 0.022 < 0.05) had a significant positive effect on investment decision-making, thus supporting H_9.

TABLE 6. Direct effects

Hypothesis	Path	ß value	P values	Accept/Reject
H_1	OC -> DM	0.707	0.000	Accept
H_2	AC -> DM	0.080	0.049	Accept
H_3	HD -> DM	0.035	0.251	Reject
H_4	AB -> DM	-0.050	0.141	Reject
H_5	OC -> RP	0.181	0.000	Accept
H_6	AC -> RP	0.128	0.033	Accept
H_7	HD -> RP	0.181	0.003	Accept
H_8	AB -> RP	0.205	0.001	Accept
H_9	RP -> DM	0.115	0.022	Accept

Notes: OC = Overconfidence; DM = Decision-making; AC = Anchoring;
HD = Herding; AB = Availability; RP = Risk Perception

INDIRECT EFFECTS

TABLE 7 presents the indirect effects to determine whether risk perception mediates the relationships between behavioral biases and investment decision-making. The analysis helps to clarify the mechanism underlying the associations between behavioral biases and investment decision-making. According to Hair et al. (2022), a mediating effect is established when the confidence interval between the lower and upper bounds does not include zero (0). At the 5% significance level, the results indicated that risk perception mediated the relationships between all four behavioral biases and investment decision-making, as none of the confidence intervals include zero value (0). Accordingly, H_{10} to H_{13}, were supported.

TABLE 7. Indirect effects

Hypothesis	Path	ß value	Lower bound	Upper bound	Accept/Reject
H_{10}	OC -> RP -> DM	0.021	0.003	0.046	Accept
H_{11}	AC -> RP -> DM	0.015	0.001	0.042	Accept
H_{12}	HD -> RP -> DM	0.021	0.003	0.053	Accept
H_{13}	AB -> RP -> DM	0.023	0.004	0.054	Accept

Notes: OC = Overconfidence; RP =Risk Perception; DM = Decision-making; AC = Anchoring; HD = Herding; AB = Availability

TABLE 8 summarizes the mediation types and mechanisms identified through the path analysis. Risk perception exhibited complementary partial mediation in the relationship between overconfidence bias and investment decision-making, as both the direct and indirect effects were significant and positive. Similarly, complementary partial mediation was observed in the relationship between anchoring bias and investment decision-making. Conversely, risk perception fully mediated the relationships between herding bias and investment decision-making and between availability bias and investment decision-making, as only the indirect effects were significant, whereas the corresponding direct effects were not significant.

TABLE 8. Path analysis

Path	Significant or not	Path coefficients	Effect type	Mediation type	Mediation mechanism
OC -> DM	Yes	0.707	Direct	Complementary	Partial
OC -> RP -> DM	Yes	0.021	Indirect		
AC -> DM	Yes	0.080	Direct	Complementary	Partial
AC -> RP -> DM	Yes	0.015	Indirect		
HD -> DM	No	0.035	Direct		Full
HD -> RP -> DM	Yes	0.021	Indirect		
AB -> DM	No	-0.050	Direct		Full
AB -> RP -> DM	Yes	0.023	Indirect		

Notes: OC = Overconfidence; DM = Decision-making; RP =Risk Perception; AC = Anchoring;
HD = Herding; AB = Availability

To ensure the methodological rigor of the proposed model, additional analyses were conducted, including importance-performance map analysis (IPMA) and out-of-sample predictive assessment using PLS-predict at both the construct and indicator levels. The results consistently support the stability of the proposed structural relationships in both in-sample explanatory and out-of-sample predictive assessments. Detailed results are reported in the Supplementary Material.

DISCUSSION

DIRECT EFFECTS OF BEHAVIORAL BIASES ON INVESTMENT DECISION-MAKING

The findings indicate that overconfidence bias positively influences the investment decision-making of individual investors in China's stock market, consistent with Cao et al. (2021). Overconfident investors tend to rely on their own abilities and judgments rather than external information when making investment decisions, reflecting excessive confidence in their capacity to outperform the market (Das & Panja 2022). Consequently, they are more likely to overestimate their ability to identify profitable trading opportunities and engage in excessive trading, which may ultimately lead to irrational investment decisions (Jain et al. 2022; Raut et al. 2020; Shah et al. 2018).

The findings also demonstrate that anchoring bias positively influences the investment decision-making of Chinese individual investors, consistent with Raut et al. (2020). Investors affected by anchoring tend to rely on previously established reference points, including past investment experiences and salient price information, when evaluating investment opportunities (Suresh 2024; Weixiang et al. 2022). These reference points may include recent market prices, purchase prices, or historical price extremes, causing investors to insufficiently adjust their judgments in response to new market information (Chalissery et al. 2023; Jain et al. 2022; Kathpal et al. 2021). Consequently, anchoring may contribute to suboptimal trading decisions and reduced long-term investment performance (Kartini & Nahda 2021; Khan et al. 2017).

However, the empirical results indicate no significant association between the two selected contextual heuristics and the investors' decision-making. Regarding the insignificant direct effect of herding bias on investment decision-making, the findings suggest that individual investors may be less likely to rely on information from other market participants, such as brokers, analysts, and their peers, when making investment decisions. This finding contrasts with Raut et al. (2020), and Jain et al. (2022), who argue that investors affected by herding bias are prone to follow other investors, including peer groups, under complex and uncertain market conditions. One possible interpretation is that individual investors who are less affected by herding bias prefer to rely on their own skills and knowledge rather than external resources. This interpretation is consistent with Hossain and Siddiqua (2022), who report an insignificant effect of herding bias on individual investors and attribute this their reliance on their own capabilities when making investment decisions. From the psychological perspective, investors affected by herding may also be highly regret-averse. In other words, such investors may seek to avoid regretting losses resulting from not following others (Quaicoe & Eleke-Aboagye, 2021). Therefore, the insignificant direct effect of herding bias on individual investors' decision-making may also be related to the timing of data collection. Since the survey was conducted during an upward market phase, investors may have attributed readily obtained profits to their own abilities rather than to the general market uptrend, thereby weakening the effect of herding bias associated with regret aversion (Alsabban & Alarfaj 2020).

Regarding the insignificant direct effect of availability bias on investment decision-making, the findings suggest that individual investors may not be inclined to rely on readily recalled information emphasized by experts when investing in stocks. This contrasts with Jain et al. (2022), who posit that investors affected by availability bias may rely on information recalled from experts. One possible explanation is that individual investors may place greater confidence in their own judgements than in experts' recommendations because experts may also make suboptimal investment decisions and display behavioral biases (Bodnaruk & Simonov 2015). In addition, the results indicate that individual investors are not significantly influenced by availability bias in relation to newly released positive stock information. This may be due to investors recognizing that information released by listed companies can be selectively presented to attract attention (Khan et al. 2017). The insignificant direct effect of availability bias may also be related to the timing of data collection. of this study. Since the questionnaire was distributed during a bullish market period, investors may have been influenced by optimistic sentiment, which could have impaired the effect of availability bias on their investment decision-making and encouraged them to underweight negative information (Kumar & Lee 2006).

INDIRECT EFFECTS THROUGH RISK PERCEPTION

Regarding the indirect effects of mediation, the empirical results show that both overconfidence bias and anchoring bias influence individual investment decision-making directly and indirectly through risk perception, indicating partial mediation. In contrast, herding bias and availability bias exhibit significant indirect effect only, indicating full mediation. This distinction suggests that different categories of behavioral biases may operate through different psychological mechanisms, with risk perception playing an important role in connecting cognition, emotion, and behavior in investment decision-making.

The insignificant direct associations between herding bias and investment decision-making, and between availability bias and investment decision-making, may be related to the overall optimism and collective confidence associated with upward market phases. This interpretation is consistent with previous research suggesting that the influence of heuristic-driven investment behavior varies across market cycles. During bullish markets, widespread optimism and favorable investor sentiment may reduce perceived downside risk and encourage investors to attribute favorable outcomes to general market conditions rather than to their reliance on behavioral shortcuts (Baker & Wurgler 2007). In contrast, during bearish or highly uncertain market conditions, greater uncertainty and market volatility may heighten investors' reliance on external

information and social cues, making contextual heuristics processing more salient (Devenow & Welch 1996). During a bullish phase, following others' investment opinions may be perceived as a rational response to prevailing market conditions rather than as a behavioral bias, hence weakening the observable direct effect of herding bias. Likewise, the upward market characterized by positive news may make optimistic information more readily retrievable from memory, reducing the observable effect of availability bias. However, when risk perception serves as a mediator, both biases exhibit significant indirect effects. This suggests that herding bias and availability bias may influence investors' subjective assessment of risks rather than directly determining their investment behavior. Specifically, investors who observe widespread buying activity or are frequently exposed to positive public information may perceive lower market risks, resulting in more aggressive and optimistic investment decisions. These findings are consistent with risk-as-feelings theory (Loewenstein et al. 2001) and the concept of the availability heuristic (Tversky & Kahneman 1973).

These findings may also reflect the institutional characteristics of China's stock market highlighted in the Introduction. Compared with many mature capital markets, China's stock market is characterized by a substantial presence of state-owned enterprises, relatively strong government intervention, and an evolving information environment. These institutional characteristics may shape the information environment in which individual investors interpret market signals. Evidence from China suggests that government intervention can reduce price informativeness and increase investors' attention to government-related information rather than fundamental information (Dang et al. 2024). In a market environment where information may therefore be more difficult to interpret solely on the basis of fundamental signals, investors may rely more heavily on observable market behavior, public sentiment, and salient information as external cues. This is consistent with the contextual nature of herding and availability biases discussed above.

This institutional context may also help explain the observed full mediation of risk perception. Although herding and availability biases did not exhibit significant direct effects on investment decision-making, both significantly influenced investment decisions indirectly through risk perception. Rather than directly determining behavioral responses, external social and informational cues may first shape investors' subjective evaluation of market risk, which subsequently influences their investment decisions (Ahmad & Shah 2022; Fitriasari et al. 2025). This mechanism may be particularly relevant in the China's stock market, where government intervention and limitations in price informativeness can affect the information environment in which investors interpret external market signals (Dang et al. 2024). Thus, the full mediation observed for herding and availability may reflect the role of the Chinese market's information environment in making investors' interpretation of external cues more dependent on subjective risk evaluation. In this sense, the findings suggest that contextual heuristics may influence investment behavior not necessarily through a direct behavioral response, but through the psychological process by which investors assess the risks associated with the information and signals available to them.

Conversely, both overconfidence bias and anchoring bias display dual-path effects on investment decision-making, exerting both direct and indirect effects through risk perception. Overconfidence bias may lead investors to overestimate their knowledge, predictive accuracy, and ability to respond to market outcomes. During an upward market, investors may attribute gains to their personal abilities rather than favorable market conditions, reinforcing trading frequency and risk-taking intentions. Meanwhile, overconfident investors may perceive lower market risks because they trust their abilities to manage uncertainty, producing an additional indirect effect through reduced risk perception. These findings are consistent with Barber and Odean (2001) and Loewenstein et al. (2001), who suggest that both cognitive and emotional assessments of risk can be distorted by overconfidence bias.

Similarly, anchoring bias exerts both direct and indirect effects. Investors may rely excessively on initial values as reference points when forming judgments. Anchoring can directly affect investment decision-making by encouraging investors to retain current positions or maintain optimistic expectations during an upward market. At the same time, anchoring may distort investors' perceived market risks. Specifically, negative information may be underweighted, and market volatility underestimated when investment decisions are based on established reference points. Consequently, anchoring may influence investment decision-making both directly and indirectly through distorted risk perceptions.

IMPLICATION

THEORETICAL IMPLICATION

This study makes a significant theoretical contribution by empirically distinguishing two types of behavioral biases, cognitive heuristics and contextual heuristics, within an integrated model of investors' decision-making. Existing studies have typically examined these biases respectively. The findings of this study suggest that the two categories operate through different psychological mechanisms. Specifically, herding and availability biases, classified as contextual heuristics, affect investment decision-making only indirectly through risk perception, reflecting investors' reliance on external cues such as public information and social influences. In contrast, overconfidence and anchoring biases, classified as cognitive heuristics, exert both direct and indirect effects through risk perception, reflecting their origins in internal cognitive processes.

By revealing this dual-pathway framework, this study extends the heuristics-and-biases approach (Tversky & Kahneman 1974), and the ecological rationality perspective (Gigerenzer et al. 1999) to behavioral finance. Positioning risk perception as a mediating mechanism provides a fresh perspective on how different categories of heuristics influence

investment decision-making through both internal and external psychological processes. This dual-pathway pattern enriches existing behavioral finance theories by integrating the classification of cognitive biases with the mediating role of risk perception, thus offering a more nuanced explanation of investor psychology under different market conditions.

Although risk perception has been widely examined as a mediating variable in behavioral finance research in other countries, relatively few empirical studies have examined the relationship in the context of China's stock market. Given China's distinctive cultural characteristics, market structure, powerful government interventions, and relatively limited transparency in information disclosure, examining the mediating role of risk perception provides an important contextual perspective. More importantly, beyond reaffirming the mediating role of risk perception, this study extends previous research by demonstrating that its function differs across types of behavioral biases. Risk perception fully mediates the effects of contextual heuristics but only partially mediates the effects of cognitive heuristics, a distinction that has received limited attention in previous literature.

Finally, this study proposes a theoretical integration in which risk perception serves as a bridge between different heuristic categories and investment behavior. It synthesizes the heuristics-and-biases framework, the ecological rationality perspective, and risk perception to provide a comprehensive explanation of how internal cognition and external context jointly shape investors' decision-making. This theoretical synthesis extends behavioral finance research and provides a basis for future cross-contextual investigations of the psychological processes underlying investment decision.

PRACTICAL IMPLICATION

The study offers several important practical implications for investors, financial practitioners, and regulators. Overall, different intervention strategies are warranted because the findings indicate that contextual and cognitive heuristics influence investment decision-making through different psychological pathways. Specifically, contextual heuristics, such as herding and availability biases, affect investment decisions primarily through risk perception. External interventions that enhance investors' risk awareness may therefore help mitigate their influence, particularly during bullish market periods when risks may be underestimated. For example, the China Securities Regulatory Commission (CSRC), stock exchanges, and brokerage firms could strengthen risk disclosure requirements and incorporate timely risk reminders into trading platforms, ensuring that investors receive relevant risk information before making investment decisions.

Conversely, cognitive heuristics, such as overconfidence and anchoring biases, exert direct effects on investment decision-making and may therefore be less responsive to external risk reminders. Mitigating these biases requires more personalized and sustained interventions. Brokerage firms and investment platforms could provide portfolio-performance tracking tools, behavioral feedback, and cooling-off mechanisms during periods of unusually intensive trading to encourage greater reflection before investment decisions are made. Financial practitioners, such as investment advisors, can further enhance service quality by tailoring guidance according to investors' dominant heuristic tendencies. In addition, official investor-education programs coordinated by the CSRC could distinguish between contextual and cognitive heuristics, emphasizing risk-awareness training for the former and long-term debiasing strategies for the latter.

CONCLUSION

This study investigates whether and how cognitive and contextual heuristics influence individual investors' decision-making in China's stock market, and whether risk perception differentiates these effects. The findings demonstrate that cognitive and contextual heuristics influence investment decision-making through distinct psychological pathways. Specifically, overconfidence bias has a significant direct effect on investment decision-making, whereas the effects of contextual heuristics, particularly herding and availability biases, are transmitted primarily through investors' risk perception. These findings suggest that market conditions may weaken the direct influence of certain behavioral biases without eliminating their underlying psychological mechanisms.

Overall, this study contributes to the behavioral finance literature in several ways. First, it advances the theoretical understanding of heuristic-driven decision-making by distinguishing cognitive and contextual heuristics within a unified analytical framework and demonstrating their different mechanisms of influence. Second, by identifying the mediating role of risk perception, this study helps explain the inconsistent findings reported in previous research concerning the effects of behavioral biases on investment decision-making, particularly under bullish market conditions. Finally, the findings indicate that insignificant direct effects should not necessarily be interpreted as evidence of theoretical irrelevance; instead, they may reflect the influence of market conditions on investors' psychological processes.

From a practical perspective, the findings suggest that interventions should be tailored to the psychological mechanisms underlying different heuristic categories. External risk-awareness measures may be more relevant to contextual heuristics, whereas cognitive heuristics may require more personalized and sustained behavioral interventions. Accordingly, regulators, brokerage firms, and financial practitioners should adopt targeted strategies to strengthen investors' risk awareness while promoting more disciplined and reflective investment decision-making.

Despite these contributions, this study has several limitations. The use of a cross-sectional survey and self-reported data may limit causal inference and introduce response bias. Future research could employ longitudinal or experimental designs and incorporate objective behavioral or transaction data to further validate the proposed relationships. Emerging

technologies, particularly artificial intelligence (AI), machine learning, and big data analytics, provide promising methodological opportunities for future behavioral finance research. By leveraging large-scale longitudinal and transactional data, these technologies may reduce reliance on self-reported questionnaires, improve causal inference, and provide deeper insights into the dynamic evolution of behavioral biases across different market environments (Guan & Yaacob 2025).

Building upon the proposed classification of cognitive and contextual heuristics, future research could examine whether additional psychological mechanisms mediate the effects of different heuristic biases on investment decision-making. Incorporating other behavioral biases and alternative mediating variables could further extend the proposed framework and enhance understanding of the complex psychological processes underlying individual investors' decision-making across different market environments.

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