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Abstract

The study aims to (a) investigate the effect of heuristic biases (availability bias, overconfidence bias, anchoring bias) on investment decisions of the investors and (b) examine the mediating role of risk perception in the relationship between heuristic biases (availability bias, overconfidence bias, anchoring bias) and investment decisions. The prospect theory supports the mediation model. Questionnaires were sent to stock investors in ten major cities of Khyber Pakhtunkhwa. A total of 330 valid questionnaires were received, a response rate of 82.50%. The gathered data was initially analyzed using reliability test. This study found that heuristic biases (availability, overconfidence, anchoring) positively impact investment decisions. Furthermore, it was shown that the perception of risk significantly mediates between the relationship between the three heuristic biases (availability, overconfidence, and anchoring) and investment decision. The results of this research have important implications for the field of behavioral shortcuts in finance, and more especially for the implementation of heuristics in making investment decisions. The findings of the current research provide significant insights into the numerous behavioral biases that are shown by participants in the stock market as well as other stakeholders, including investors in securities, financial advisers, and lawmakers.

Keywords: Heuristics biases, prospect theory, investment decision, stock market

1. Introduction

The main reason for worries in decisions regarding investments is the involvement of several participants exhibiting different feelings and behavioral traits throughout the decision-making process (Sachdeva & Lehal, 2023). Traditional financial theories depend on an assumption that markets operate efficiently and participants behave rationally. The recent development of behavioral finance has placed questions on the efficiency of stock markets, because several anomalies remain unaddressed. Study by Khare & Kapoor, (2024); Rathi & Geetha, (2023) indicates individuals fail to evaluate all available information while investing, leading to irrational decision-making. Jain et al. (2023) stated that individuals exhibit ineptitude, irrationality, and inconsistency in their investment decisions. Behavioral finance investigates the influence of psychology on the actions of investors and analysts in finance. The decisions that investors make is influenced by their inherent biases (Che Hassan et al., 2023; Ghani et al., 2022).

Investors frequently show an unsatisfactory amount of self-control, resulting in irrational behavior. Rahmah & Purnamasari, (2023) revealed that recommendations are susceptible to behavioral biases; yet, competent financial guidance may assist people in surmounting these biases and making better informed and reasonable decisions. According to research by Guenther & Lordan, (2023) the influence of disposition is more common among individual investors compared to those in institutions. Stock market performance is influenced by macroeconomic factors, as determined by (Ahmad et al., 2023; Rashid, Jehan, & Kanval, 2023). There is no more essential factor in making investment decisions than behavior (Almansour, Elkrggli, & Almansour, 2023; Khan et al., 2022; Ma et al., 2023). According to Sood et al. (2023), within the environmental, social, and governance (ESG) criteria, the governance criterion is the most important thing that personal equity investors consider when making investments. A significant number of studies on behavioral finance have focused on the industrialized nations.

Pakistan is one of rising markets that have seen an absence of study. The current study contributes to the current body of knowledge by examining the role of risk perception as a mediator between behavioral biases and investment decision in the province of Khyber Pakhtunkhwa, Pakistan. Although behavioural finance is still in its early stages, the majority of empirical studies (e.g., Amish et al., 2024; Abdeldayem & Aldulaimi, 2024) have taken place in industrialized countries, particularly the United States. In contrast, research in developing economies has not been conducted (Manzoor et al., 2023; Oloyede et al., 2023). Behavioral finance, as a growing discipline, has mostly been explored via empirical study in developed countries, particularly the USA, as shown by works such as Ingale & Paluri, (2022). There is a significant scarcity of research in developing economies (Manzoor et al., 2024; Khan et al., 2022). The primary explanation for this may be because marketplaces in emerging nations are in a nascent stage of growth.

There has been very little study in the discipline of behavioral finance in Pakistan, despite the fact that researchers from developing nations have been actively engaging in this research over the past few decades (Awais, Khan, & Muhammad, 2023; Jain et al., 2023; Ahmad, 2024). There are a number of other compelling reasons for conducting the study in Pakistan. Firstly, countries that are developing confront a greater challenge when it comes to financial literacy compared to developed nations. This, in turn, affects the behavioural biases and the process of making investment decisions of those who invest in stocks. Secondly, the Pakistan economy is now more captivating to equity investors due to its stock market, which receives nine times more equity investments than any other market in the world.

2. Literature Review

2.1. Heuristics biases and investment decision

A heuristic is the technique that individual make decisions despite the presence of complexity and uncertainty. Jain et al. (2023) found that investors often make illogical judgments due to mental shortcuts instead of gathering and analyzing all the necessary

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information. Decisions are often made using heuristics when time is of the essence. Unfortunately, heuristics often lead to poor decision-making when used to decision-making processes. Heuristics may lead to a variety of illusions, such as gambler's fallacy, overconfidence, anchoring bias, and representativeness bias (Hasan et al., 2023). The term "heuristic" was used by Nordlöf et al. (2023) to describe three types of behavioural biases: anchoring, availability, and representativeness. According to Jain et al. (2023), the heuristics were broadened by He, (2022) to include the gamblers' fallacy and overconfidence.

In light of availability bias, investors generally concentrate their investment decisions on recent or readily remembered knowledge (Tversky & Kahneman, 2023). This bias might alter risk and opportunity perceptions, overemphasizing trends in the market or high-profile stocks. Investors concentrate a lot of attention on short drive knowledge about a phenomenon known as availability bias happens (Mittal, 2022). Investing decisions are profoundly affected by availability bias, based on study. Stocks that have already had large price gains or have received a lot of the attention of the media, for instance, are more likely to attract investors (Ballinari, Audrino, & Sigrist, 2022). According to research by Abideen et al. (2023), there is a significant association between availability bias and investing decisions. This means that investors choose to put their money into companies that they are already acquainted with or that have had recent success stories. When investors have a false perception of their own forecasting or risk-evaluating abilities, this is known as overconfidence bias (Özçelik & Kurt, 2024).

According to Ul Abidin et al. (2022), their propensity causes investors to trade too much and their investments to underperform. The relationship between overconfidence bias and financial investing decisions has been well-documented. Overconfident investors, based to research by Kumar, & Prince, (2023), for instance, are more likely to choose a riskier investing technique, which in turn reduces the performance of their portfolios. Saivasan & Lokhande, (2022) found that investors are a greater probability of show anchoring bias when they place a lot of importance on beginning knowledge, such as the initial price of a stock. As a result of this bias, investors have a tendency to see companies with lower beginning prices as being cheap (Damodaran, 2024; Broekema et al., 2022). According to the findings of a research conducted by Zhang et al. (2022), there is a positive and significant association between anchoring bias and investing decisions. This relationship indicates that investors are more motivated to acquire companies that have lower start values. Hence, the study builds below hypotheses,

H1: *There is positive and significant relationship between availability bias and investment decision.*

H2: *There is positive and significant relationship between overconfidence bias and investment decision.*

H3: *There is positive and significant relationship between anchoring bias and investment decision.*

2.2. Mediation effect of risk perception

Risk perception is an essential component in the making of decisions of equity investors and individuals (Wasiuzzaman, Chong, & Ong, 2022). Weixiang et al. (2022) developed a list of behavioral biases that influence an individual's perception of risk. These biases include heuristics, overconfidence, representativeness, anchoring, and more. In the past, numerous studies have confirmed the concept that investors' risk perceptions are influenced by behavioral biases (Ahmed et al., 2022). Additionally, a plethora of studies have been conducted which support the notion that risk perception influences how decisions are made of individuals (Ogundijo, Tas, & Onarinde, 2022; Starke et al., 2022).

The previous discussion indicates that risk perceptions is influenced by behavioral biases, and influence the decision-making of individuals. Risk perception can be categorized as a dependent variable in the context of its relationship with behavioral biases and as an independent variable in the context of investment decision. It is appropriate to consider risk perception as a mediator, as it serves as both the dependent and independent variable. Based on the review of literature, the following hypothesis and technique are to be applied are suggested for the study:

H4: *Risk perception as mediating mechanism between availability and investment decision.*

H5: *Risk perception as mediating mechanism between overconfidence bias and investment decision.*

H6: *Risk perception as mediating mechanism between anchoring bias and investment decision.*

2.3. Conceptual model

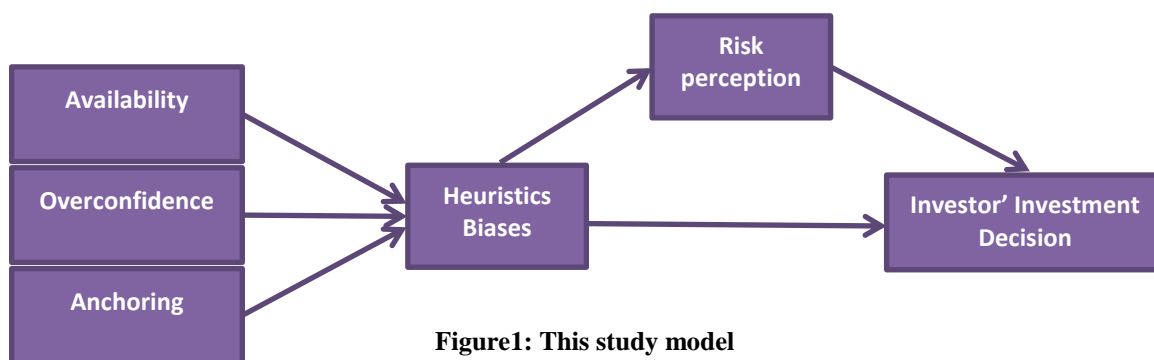


Figure1: This study model

3. Methods

3.1. Population and sample size

The target population for this study includes individual who are engaged in stock investments in the Pakistan stock market. The data for this study was gathered via a survey that included sending questionnaires to investors within ten major cities in Khyber Pakhtunkhwa, Pakistan. The data were collected from the ten major cities of Khyber Pakhtunkhwa, namely Peshawar, Mardan, Swabi, Kohat, Dera Ismail khan, Mansehra, Abbottabad, Mingora, Nowshera, and Kabal. The surveys are distributed using a

purposive sampling method. A total of 400 investors engaged in this research by completing questionnaires developed accordance to the established criteria. A response rate of 82.50% was obtained from the 330 investors who correctly completed their survey questionnaires.

In study sample, 296 of the participants were male, which accounted 89.7% of the total. 37.9% investors are between the ages of 29 and 38, while 22.5% have more than 15 years of experience in stock. (See Table 1)

Table 1: Investor’s demographic profile

Male	296 (89.7%)	Gender
Female	34 (10.3%)	
< 18 years	35 (10.6%)	Ages
19-28	74 (22.4%)	
29-38	125 (37.9%)	
> 38	96 (29.1%)	Income yearly
< 500000	59 (17.9%)	
600000-100000	90 (27.3%)	
1100000-1500000	123 (37.6%)	
> 15000000	58(17.6%)	Experience
< 5 years	33 (10.0%)	
6-10	96 (29.1%)	
11-15	127 (38.5%)	
> 15	74 (22.4%)	

Note: Coding Scheme: {Gender (“Male = 1, Female = 2”)} {“Ages” (“< 18 = 1, 19-28 = 2, 29-38 = 3, > 38 = 4”)} {“Income yearly (< 500000 = 1”, “600000-1000000 = 2”, “1100000-1500000 = 3”, “> 1500000 = 4”)} {“Experience (“< 5 years = 1”, “6-10 years = 2”, “11-15 years = 3”, “> 15 = 4”)}.

3.2. Measurement

The responses of the participants were evaluated on a five-point Likert scale; through a 1 indicating a strong disagree and 5 indicating a strong agree. (See table 2).

Table 2: Papers that were reviewed for the purpose of generating scale items

Variables	Items	References
Availability	06	Shikuku (2014); Waweru et al. (2008); Khan (2017); Parker and Decotiis (1983).
Overconfidence	03	Kengatharan and Navaneethakrishnan, (2014); Phan and Zhou (2014); Barber & Odean, (2001); Jain et al. (2023).
Anchoring	04	Kengatharan and Navaneethakrishnan, (2014); Waweru et al. (2008); Baker and Nofsinger (2002); Jain et al. (2023).
Risk perception	05	Huberman, (2001); Marwaha et al. (2014); Waweru et al. (2008); Jain et al., (2023).
Investment decision	07	Sarwar and Afaf (2016); Khan (2017); Sahi (2012), Bakar & Yi (2016), Banerji et al. (2020);

Table 3: Reliability test

Variables	Names	Questions	Cronbach alpha
Independent	Availability	06	0.902
	Overconfidence	03	0.884
	Anchoring	04	0.821
Mediating	Risk Perception	05	0.787
	Investment Decision	07	0.862

To ensure reliability of all components of each scale, the Cronbach’s alpha must be greater than 0.70. Thus, based on findings, values of all instrument availability, overconfidence, anchoring, risk perceptions, and investment decision, are greater than 0.7, which means that the scale utilized in this study is reliable. (See table 3)

Table 4: KMO and BTS test

	Availability	Predictors Overconfidence	Anchoring	Mediator Risk Perception	Dependent Investment Decision
KMO	.859	.837	.795	.748	.821
BTS	505.83	651.84	252.20	179.15	899.92
Sig	.000	.000	.000	.000	.000

The sample meets the requirements for sample adequacy, as shown in the table above. The KMO values higher than 0.50, corresponding with the aforementioned previous criteria. Thus, it clearly indicates that BTS values of the variables are significant; we identified support for alternative hypotheses. (See Tables 4)

Table 5: Hypotheses testing results

Sr.	Direct path	beta	T	p	Supported
H1	Availability → Investment decision	.45	7.986	.000	Yes
H2	Overconfidence → Investment decision	.25	5.319	.000	Yes
H3	Anchoring → Investment decision	.33	7.135	.000	Yes

To evaluate the proposed hypotheses, SPSS v23.0 was used to analyze regression on the dataset. As per findings, predictor 1 (availability) has significantly influenced investment decision of the investors ($B = .45$, $t = 7.986$, $p < .05$). Predictor 2 (overconfidence) also significantly influenced investment decision ($B = .25$, $t = 5.319$, $p < .05$). Furthermore, Predictor 3 (anchoring) significantly influenced investment decision ($B = .33$, $t = 7.135$, $p < .05$). Therefore, following these results, hypotheses H1, H2, and H3 are supported. (See table 5)

Table 6: Mediation test - 1

Relationship	Estimates	P	LLCI	ULCI
Availability → Risk perception	.4532	.000	.3507	.5556
Risk perception → Investment Decision	.6533	.000	.5130	.7936
Total effect	.4533	.000	.3412	.5655
Direct effect	.1573	.004	.0469	.2677
Indirect effect	.2960	.000	.2006	.3894
Sobel test		Z = 6.34		

Table 7: Mediation test-2

Relationship	Estimates	P	LLCI	ULCI
overconfidence → Risk perception	.7335	.000	.6517	.8153
Risk perception → Investment Decision	.2920	.001	.1184	.4655
Total effect	.7926	.000	.7034	.8817
Direct effect	.5784	.000	.4247	.7321
Indirect effect	.2142		.0795	.3460
Sobel test		Z = 3.27		

Table 8: Mediation test-3

Relationship	Estimates	P	LLCI	ULCI
Anchoring → Risk perception	.8959	.000	.8982	.9935
Risk perception → Investment Decision	.4635	.000	.3167	.6103
Total effect	.8548	.000	.7625	.9470
Direct effect	.4395	.000	.2852	.5938
Indirect effect	.4152		.2654	.2659
Sobel test		Z = 5.91		

The research investigated risk perception as a mediator between availability bias, overconfidence bias, and anchoring bias and investors' decisions about investments. As shown in Table 6, risk perception was examined as a mediator between availability bias and investors' investment decisions. The results of mediation analysis ($Z=6.34$, $P=.000$) indicate that risk perception as a partial mediator in the association between availability bias and investor' investment decision. Therefore, the H5 hypothesis of this research is supported. (See mediation test 1). The results shown in above Table 7 ($Z=3.27$, $P=.000$) indicate that risk perception mediates the relationship between overconfidence bias and investors' investment decision. Thus, the H6 hypothesis of this investigation is accepted. (See mediation test 2). Similarly, the results shown in Table 8 ($Z=5.91$, $P=.000$) indicate that risk perception mediates the relationship between anchoring bias and investors' investment decisions. Hence, we confirmed support for H7. (See mediation test 3)

4. Discussion

The research started with a brief study of previous literature about behavioral biases and their influence on stock investors' investment decisions in Khyber Pakhtunkhwa, Pakistan. A second-order model was constructed from the literature review and

then evaluated for reliability and validity. The study's findings provided conclusions on the impact of availability bias, overconfidence bias, and anchoring bias on investors' investment decisions.

The study findings indicated that availability bias significantly influenced investor's investments decision. This finding supports the concept that investors often rely on readily available data for investing decisions, rather than pursuing a broader and more representative dataset (Kumar & Prince, 2023). The positive relationship between availability biases and making investments decisions suggests that investors prefer companies or assets that are known or have received more recent attention. This effect may cause inappropriate investment in popular or popular assets, possibly leading to market inefficiencies and diminished portfolio cultural diversity. The results align with other studies showing the influence of availability bias on financial decision-making (Iram, Bilal, & Ahmad, 2023; Nobre et al., 2022). This research enhances understanding by emphasizing the importance of availability bias in making decisions about investments.

According to the results of the research, overconfidence bias significantly influenced investment decisions. Based on Cervellati, Pattitoni, & Savioli, (2022), this finding provides support to the contention that investors have a tend to overestimate their capacity to make accurate projections while simultaneously underestimating risk. Given the considerable positive association that exists between overconfidence bias and investing decisions, it can be determined that investors who express high levels of overconfidence are more likely to participate in investment strategies that involve a higher degree of risk. The results showed that anchoring bias significantly influenced investors' investment decisions. A past study by Hanlon, Yeung, & Zuo, (2022) concluded that investors often base their investment decisions on first-hand information, such as IPO pricing or past fluctuations in stock prices. This finding is consistent and supports this study finding.

The study's results shows that risk perception significantly influences the relationship between availability bias and investors' decisions about investments. When investors receive sensationalized reports claiming about a risk, they may exaggerate the impact owing to availability bias. Investors avoid clear of assets they regard as risky as a result of how they perceive the level of risk associated. The findings of this investigation reveal that risk perception significantly mediates the relationship between overconfidence bias and investors' decisions about investments. Understanding and addressing this relationship enables investors and professionals in finance to make decisions with greater understanding, resulting in better investment results and more efficient markets. Results show that a risk perception mediates the relationship between anchoring bias and investment decisions. Investors' risk perception is affected by anchoring bias, which causes them to either overestimate or underestimate potential risks. How they perceive risk is the main factor that influences their investing decisions. Anchoring bias almost influences investing decisions in an indirect way, via how individuals perceive risk.

5. Practical implications

This new study has major implications for changing our comprehension of heuristic biases and investment decision offering new pathways for accomplishment.

- Investors must safety measure their portfolios by understanding the impact of dramatic media coverage on their holding investments decisions, changing their information sources, and adopting a long-term view to mitigate spontaneous judgments.
- Investors may enhance earnings by recognizing the risks of overconfidence, pursuing alternative viewpoints, and using risk management measures to reconcile aggressive actions with sensible restraint.
- Investors could avoid price anchoring mistakes by evaluating numerous information points, establishing pragmatic objectives, and consistently re-evaluating their investing strategy to maintain consistency with developing conditions in the market.
- Investors have to understand the influence of availability bias on their perception of risk to make educated making investments decisions. Implementing effective risk management technologies and incorporating numerous points of view might reduce the impact of persuasive but deceptive media narratives.
- Understanding the inaccurate risk perception triggered by overconfidence bias can assist investors enhance earnings. With the help of systematic risk assessments along with customized guidance from experts, one can combine guarded foresight with confident decision-making.
- By being aware about how anchoring biases influence risk perception, investors may take steps for avoiding them. Alignment with developing market realities is achieved by the analysis of varied situations, optimization of portfolio allocation, and unchanged examination of investment strategies.

6. Future study and limitations

Several behavioral biases effect decisions made by investors regarding stock. Due to the fundamental uncertainty in decision-making, investors are subject to biases that lead them to believe that the risk associated with every decision is negligible. Study such as this sheds light on how risk perception works as mediator between behavioural biases (heuristics) and their investment decisions. To minimize unexpected losses, investors should pay attention to the risk associated with the investing decision and work to overcome these biases. A total of 330 from ten major cities' investors who worked as Stock Exchange traders represented the sample used in this study. It is still a limitation of the research, even though the sample size is adequate.

The scope of the study might be extended to include other regions from other province of Pakistan, for next study. Additionally, it has been noted that majority of the previous research has used traditional statistical techniques like SPSS to investigate whether behavioural biases affect the decision-making process of stock investors. Future research could utilize machine learning-based models, such as recurrent neural networks (RNN) and artificial neural networks (ANN), to estimate the influence of behavioral biases on stocks decisions made by investors.

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