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Behavioral Biases in Investment: Overconfidence, Disposition Effect, and Herding Behavior

Muhammad Hasnain Ali[1], Abou Bakar[2], Muhammad Sajid Tufail[3], Fatima Mazhar[4]

[1] PhD Scholar, Institute of Banking and Finance, Bahauddin Zakariya University Multan, Pakistan. Email: m.hasnainali270@gmail.com
[2] Professor, Institute of Business Management and Administrative Sciences, The Islamia University of Bahawalpur, Pakistan. Email: aboubakar01@hotmail.com
[3] Lecturer, Institute of Management Sciences, Bahauddin Zakariya University, Multan, Pakistan. Email: sajidtufail@bzu.edu.pk
[4] Assistant Professor, Department of Management Sciences, The Government Sadiq College Women University, Multan, Pakistan. Email: fatima.mazhar@gscwu.edu.pk

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ABSTRACT

This section introduces the research by outlining the importance of understanding behavioral biases in investment decisions, particularly within the context of retail investors in Pakistan. This research work primarily intends to find out the influence of behavioral biases over investors' investment decisions. The population of this research are individual investors investing in Pakistan Stock Exchange. The research design of this study is quantitative. The sample size of current research was 400 individual investors. The survey assessed several types of biases, including overconfidence, disposition effect, and herding behavior. The result outcome indicated that with an increased number of such biases present, it significantly influences the investment decisions of investors. This study specifically indicates that respondents are often subject to overconfidence, the disposition effect, and herding behavior, and finally the factors that lead to relatively poor investment decisions. These results underline the identification and need for tackling these biases within the financial decision-making domain. Financial professionals, comprising advisors and educators, are better placed with skills on how to design strategies that deter more adverse consequences of these biases. They can enhance investment quality in decision-making by well-directed training programs and advisory services. Therefore, this study underscores the pivotal role that behavioral finance plays in improving investor outcomes and calls for the rectification of behavioral bias to attain more informed and rational investment decisions.

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Corresponding Author's Email: sajidtufail@bzu.edu.pk

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1. Introduction

The process of investment decision-making has seen considerable changes over the years. The investment playground previously was one dominated by pension funds, hedge

funds, and investment banks. After the intrusion of technology and enhanced information availability, brought about by the democratization of financial markets, the playing field changed for retail investors, now getting to participate in investment activities with new strength. Retail investors are defined as the group of individual and small investors who invest their personal funds in financial instruments, including stocks and bonds, mutual and exchange-traded funds, among others (Quang, Linh, Van Nguyen, & Khoa, 2023; Xu, Yüksel, & Dinçer, 2023). The present paper aims to shed more light on the determining factors that affect the investment decisions of this group and offer insight into what their implications are on the financial markets.

There would be a few significant factors behind why and how retail investors became a very significant force in the investment environment. The first would be technology, most importantly the prevalence of the use of the internet, along with the emergence of digital commerce platforms, which has set up the stage that has now made financial markets accessible to a lot more people. The introduction of online trading provides an opportunity that is much easy and convenient for retail investors to execute their deals without the intermediaries making transaction costs. The use of mobile apps and investment platforms has greatly increased, and this factor plays a major role in fueling the participation of individual investors in the financial markets by tracking investments in real time and making easily informed decisions.

Behavioral finance has assumed great importance of late, as it tries to understand the psychological and cognitive factors that influence the various decision-making by investors. The impact of combined behavioral biases specifically overinvesting, disposition, risk-aversion bias, and herding behavior on investment decision-making has not yet been explored in plenty of detail in the Pakistani environment (Kim, Thompson, & Kim, 2023; Widyatama & Narsa, 2023). This aspect has not been conclusively studied about financial literacy being a moderator to alleviate the ill effects of these biases. The literature is rare and not elaborate relative to the impact of behavioral biases and financial literacy in investor decision-making in the Pakistani context. Such studies being conducted in diverse countries for improving the understanding of researchers have similarly enhanced the interest to know those unique cultural, economic, and social factors that impact investor behavior in Pakistan. As no local research has been made into this area, the findings in other contexts may not be generalized because there is a lack of contextual studies in this realm, and hence the question for a local study becomes more theory-backed and almost a necessity to respond to the concerns that investors in a local context might have (Ansari, Albarrak, Sherfudeen, & Aman, 2023; Bihari et al., 2023; Quang et al., 2023).

A major concern is the overconfidence bias exhibited by the investors of Pakistan. Overconfident investors tend to undervalue risk and overvalue their ability to earn returns and thus may make less optimal investment decisions and be more financially susceptible. Also reported are fairly common dispositions in Pakistan; investors have shown an inclination to hold on to underperforming investments for a longer period compared to profitable investments. These biases might be of important significance in causing suboptimal portfolio performance and a reduction in their returns to investors (Goyal, Gupta, & Yadav, 2023; Mishra & Mishra, 2023).

It is important to add that investment decisions in Pakistan could be affected by risk aversion bias—that is, a preference for safer options despite the possibility of greater returns—and herding behavior, whereby investors follow the pack rather than make decisions through their own discernment. Hence, they may result in unfavorable effects on portfolio diversification and destabilize the overall market; hence, it affect the financial market's growth and development in Pakistan (Elvira, Sutejo, & Marciano, 2022; Sherani, Naeem, & Shah, 2023).

The research questions focus on examining the impact of specific behavioral biases—overconfidence, herding behavior, and disposition effect—on investment decisions among Pakistani investors.

The main research question of this study is to investigate whether behavioral biases effect on investors' investment decision? The specific research questions of the study are as follows:

- Does over-confidence effect on investors investment decision?
- Does herding behaviour effect on investors investment decision?

2. Literature Review

2.1. Theoretical Background of the study

Ajzen (1991) built on the rational action concept to come up with the theory of planned behaviour (TPB). The TPB is one of the legitimate notions that can explain human behaviour. Perceptions and perceived control as the two key components of the motivating factors are other facets of human behavior this theory postulates. Attitude, according to one definition, refers to the extent to which an individual is rewarded or punished for performing a given behavior. Another factor that the TPB relies on when predicting an individual's likely future behavior in a situation where choice is not present is perceived behavioral control. According to the theory of planned behaviour, it is argued that behavioural intentions and actions are significantly determined by attitude towards the behaviour, perceived social norms, and the theory of planned behaviour (TPB) (Conner, 2014).

2.2. Overconfidence and investment Decision

The discussion on overconfidence highlights its pervasive influence on retail investors, often leading to suboptimal investment decisions due to an overestimation of one's own skills and knowledge. The overconfidence effect is a cognitive bias that creates an overestimate of one's judgment and ability, beyond reason. There are several subtypes of overconfidence that can be observed within the sphere of retail investing. First, the investors would have a self-illusion that they are capable of choosing the right stocks; this can lead to overtrading or over-concentration of their portfolios on certain stocks (Quang et al., 2023). In addition, the investors may under-price the risk associated with their investments, thereby they do not diversify their investment portfolios adequately. Some investors may develop a tendency towards speculation that may prove unhelpful to their investment goals and performance since it takes into account one's ability to locate the right time to invest in a particular security (Toma, 2023).

The behaviour of retail investors that was described by the overconfidence effect can be explained by several factors. Another important factor is related to the financial data and information's availability and accessibility. Heeb, Kölbel, Paetzold, and Zeisberger (2023) have pointed out that increase in social media and financial trading applications and information sharing websites have flooded retail investors with information. It is often the case that due to availability of information the investors overestimate their skills as they may think that they have the edge over the other investors. At the same time, the use of social media and virtual investment communities can create an echo chamber that will enhance overconfidence through the confirmation bias (Gu, 2023).

The overconfidence effect is also compounded by the so-called illusion of control. The idea of 'agency' is often invoked by retail investors, even in situations where agency may be constrained or nonexistent. Such a perceptual distortion could lead to an overconfidence level in ones ability to predict the market volatilities. Additionally, previous performances in

investment can boost confidence of an investor and this may lead to overconfidence and therefore underestimation of future risks (Ali, Choi-Meng, Aw, Puah, & Barut, 2024).

2.3. Herding Behaviour and Investment Decision

This section explores herding behavior, emphasizing its role in causing market inefficiencies and increased volatility due to collective decision-making based on the actions of others. The herding behaviour among the retail investors has been one of the most investigated topics of the financial literature and economics. Several research works have sought to determine why people engage in this behavior, its effects, and ramifications. Knowledge of the herding effect is important because it may change the nature of the market, the price of assets, and the efficiency of the market. Several reasons can explain why retail investors may engage in herding (Raut, 2020). There is the effect of social contagion and information copying, as people use the actions of others as a benchmark for their decisions. However, there are other factors such as limited information, cognitive biases, and the need to follow the herd and gain approval from others that also lead to herding effect (Adil, Singh, & Ansari, 2022).

Herding behaviour can have rather severe implications. This can cause more fluctuations in the market, amplify prices bubbles or crashes, and skew the pricing of assets. Furthermore, herding may force the individual investors to make decisions that are out of character or their risk tolerance or investment horizon, which would not be ideal for investment (Saraih et al., 2017). Analyzing the herding effect in the context of retail investors throws light on the nature of markets, the behavior of investors, and the efficient functioning of the market. Thus, policymakers, market participants, and regulators can derive suitable measures to counter herding's adverse consequences and enhance the overall decision-making of retail investors (Mishra & Mishra, 2023).

2.4. Disposition Effect and Investment Decision

Here, the disposition effect is discussed as a critical factor leading to poor investment outcomes, with investors holding onto losing investments and selling winning ones prematurely. The theoretical background of the disposition effect can be traced back to the premises of prospect theory. Thus, in prospect theory, it is identified that the manner in which the potential gains and losses are presented affects the decisions taken by the people (Garcia, 2013). According to the theory, loss aversion is a behaviour that is exhibited in people by the fact that losses are felt to be far more psychologically costly than gains of equivalent value (Dhar & Zhu, 2006).

The disposition effect has been evidenced in various financial markets in a series of empirical investigations. A study performed by Grable and Rabbani (2023) relied on a large sample of trading history of individual traders. The study found out that the investors were ready to cut their winning stocks (winners) while at the same time averse to cut their losing stocks (losers). This behaviour persisted to surface in spite of efforts to control other factors, including trading costs and taxation. The disposition effect has been evidenced in various tests that have been made in different countries and markets thus making it highly portable (da Costa Jr, Paraboni, & Goulart, 2023).

The consequences of the disposition effect for investment performance are therefore not insignificant. Holding the profitable investments for a shorter period, and keeping the unprofitable ones for a longer time, may lead to losses on one hand, and the missing out on gains on the other hand. This behaviour has the propensity of leading to a decline in the total yields on investment as mentioned in the aforementioned conduct. A large number of studies

have analyzed the effects of the disposition effect on investment performance. Guenther and Lordan (2023) carried out a study that showed that 'self-made' individual investors who had a highly developed disposition effect had a significantly low performance compared to those who had a weak disposition effect.

2.5. Hypothesis of the Study

H1: There is a significant effect of overconfidence on Investors investment decisions
H2: There is a significant effect of herding behaviour on Investors investment decisions
H3: There is a significant effect of disposition effect on Investors investment decisions.

2.6. Theocratical Model

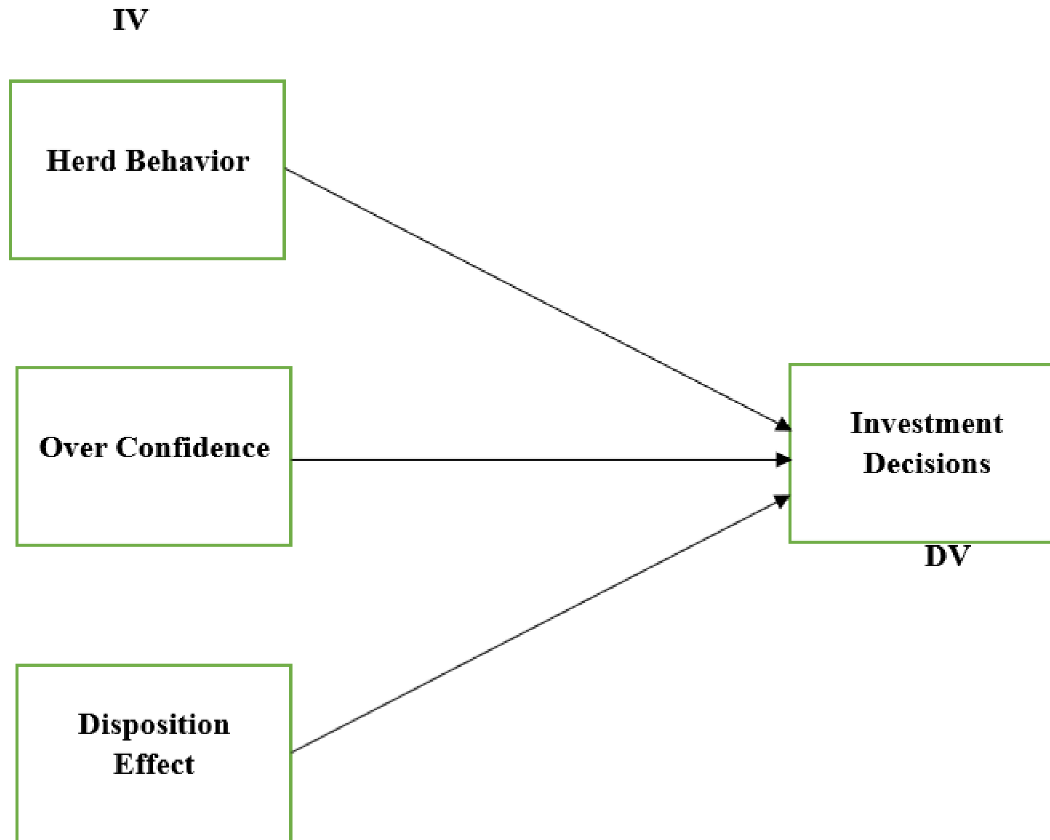

Figure 1: Theocratical Model

3. Methodology

The methodology employed a cross-sectional survey design with a structured questionnaire to collect quantitative data from retail investors in Lahore, Pakistan. Convenience sampling was used due to accessibility considerations.

3.1. Research Design

Research design refers to the overall plan or map of the study and the structure of the research endeavour. The present study will be cross-sectional survey in nature. Information was collected from a sample of investors by the administration of a structured survey questionnaire. This specific design enables the collection of data at a specific time and enables the assessment of relations between variables (Bloomfield & Fisher, 2019).

The present study has opted for quantitative research as its main methodology. The goal is to collect data for quantitative research with a view of establishing correlation coefficients between variables. The use of a certain approach makes it possible to review put forward theories and to apply some statistical operations in order to draw important conclusions (Verschuren, 2003). Consequently, the study employed cross-sectional survey technique to obtain data from a sample of investors. To obtain quantitative data of the variables of interest, the study used structured questionnaires.

The study design adopted is cross-sectional whereby data is collected at one point in time only. This approach is useful in determining the interactions between variables at a particular point in time and hence provides precious information on the existing correlations (Dyckhoff & Kasah, 2014). The data collection will take three months in which the survey will be distributed to potential participants. It helps in getting a good number of samples within the required time and also ensures a proper representation of the populace.

The target population for the current research is the active retail investors who are seeking to invest at the Pakistan Stock Exchange in Lahore. The study was conducted in Lahore. A retail investor is an individual that invests their own money directly in the shares of stocks of their choice. While compared with institutional investors the volumes of retail investors are typically smaller. The target population for the study was of N equaling 400, though in this specific research study it was planned. The researcher administered 480 questionnaires to the respondents and 400 responded to the questionnaires. On the same, response rate was 83. 33%. This number, which was derived from power analysis in other studies in the same subject, is regarded as sufficient for quantitative studies. If the sample size is large, it is expected that the results presented will reflect the population as it really is. This may be attained by having a sufficient number of participants.
The method of sampling that was decided to use for this investigation was convenience sampling, (Sharma, 2017). This method is suitable where accessibility and convenience form part of the considerations when conducting the investigations. In this particular case, the retail investors in the city of Lahore would be sampled for the research depending on their willingness to participate in the research. Convenience sampling was done through accessing the investor communities online, investment seminars and forums.

The data acquisition procedure was comprised of two primary phases: concerning the adoption of the questionnaire and its dissemination (Zaza et al., 2000). The process of developing the questionnaire meant that items had to be carefully screened to try and capture overconfidence, herding behaviour, the disposition effect and investment decisions. The present study used adapted scales, which has been used in other similar study.

To provide the validity of the collected data such measures were taken into consideration. First, surveys adapted from previous academic studies were used to measure overconfidence, herding behaviour, disposition effect and investment choices. These scales have been used in previous studies to measure their reliability and validity and the findings have shown that the scales have fairly good psychometric properties. Further, in the research study, different methods are employed to enhance the credibility of the data collected. In this study, to eliminate any bias in the data collected, the following steps were taken: completing the questionnaire to the respondents in a similar manner, providing clear instructions to the respondents, assuring the respondents of anonymity and confidentiality of their responses, and running data cleaning exercise to identify any outlier or wrong response in the collected data.

Modern historians employ various analytical tools in order to make conclusions and draw important inferences from the data obtained. Two of the most common methods of analysis used by the researcher for the analysis of the data collected are descriptive analysis using Statistical Package for the Social Sciences (SPSS) and inferential analysis using Partial Least

Squares Structural Equation Modeling (SEM) also known as SMART PLS. This study used SMART PLS SEM due the data nature.

4. Data Analysis

The data analysis section details the use of Structural Equation Modeling (SEM) to assess the reliability and validity of constructs, and to test the hypotheses concerning the impact of behavioral biases on investment decisions.

4.1. Measurement Model

In order to assess the construct reliability of the lower-order construct, the researcher used two commonly used methods - Cronbach's alpha and composite reliability. According to standard practice, the minimum threshold for both these measures is 0.7 (Boyd & Reuning-Elliott, 1998). Table 1 displays the results of the analysis, which indicate that all constructs in the model are reliable. The Cronbach's alpha and composite reliability for each construct exceed the minimum threshold of 0.7, providing evidence of their internal consistency.

Table 1
Construct Reliability

	Cronbach's Alpha	Composite Reliability
Herd Behavior	0.794	0.857
Over Confidence	0.871	0.907
Disposition Effect	0.908	0.936
Investment Decisions	0.954	0.959

Table 2 All the HTMT values are less than the threshold of 0.85, so the constructs of Herd Behavior, Over Confidence, Disposition Effect, and Investment Decisions have proper discriminant validity.

Table 2
Construct Validity (HTMT)

	HB	OC	DE	ID	FL
Herd Behavior	0.812				
Over Confidence	0.674	0.675			
Disposition Effect	0.639	0.545	0.699		
Investment Decisions	0.759	0.69	0.696	0.761	

4.2. Assessment of Structural Model:

Table 3
Path Coefficients

	Original Sample (O) Direct Effect	T Statistics	P Values
Herding Behaviour_ -> Investment Decision	0.087	1.76	0.033
Over Confidence_ -> Investment Decision	0.613	15.339	0.000
Disposition effect -> Investment Decision	0.292	6.681	0.020

Table 3 shows the results extracted from PLS-SEM for the purpose of showing the significance regarding the impact of exogenous variables on endogenous variables. The table shows that all exogenous variables have a significant impact on endogenous variables. The researcher accepts direct hypothesis because all the independent variables and moderating

variable has significant direct effect with the investment decisions making of retail investors at 0.01 and 0.05 levels of significance.

4.3. Discussion

H1: There is a significant effect of overconfidence on investors investment decisions

This discussion reinforces the findings by comparing them with previous research, highlighting the consistent impact of behavioral biases across different contexts and the implications for financial markets and investor education. The findings of the research demonstrated a significant impact of overconfidence on the decision-making procedures of investors. The aforementioned findings augment the current corpus of literature on behavioral finance and furnish significant perspectives on the function of overconfidence in the process of investment decision-making (Pikulina, Renneboog, & Tobler, 2017). The correlation between overconfidence and the decision-making process of investors is consistent with prior research conducted in the respective domain. Numerous academic studies have provided evidence that excessive self-assurance can exert a noteworthy influence on the financial decision-making of individuals, resulting in prejudiced assessments and suboptimal investment selections (D'Acunto, 2015; Pikulina et al., 2017; Ullah, Ullah, & Rehman, 2017). The present study strengthens prior research, thereby furnishing additional substantiation for the impact of overconfidence in the realm of investment (Quang et al., 2023). The repeated results that have been noted in different research may therefore be attributed to cognitive and psychological effects of overconfidence. Those who possess overconfidence are likely to do the following: underestimate risks, overestimate rewards, and be highly predisposed to engaging in risky speculation. The existence of biases may lead to suboptimal decisions, which in the long run, may lead to poor financial performances and thereby financial losses to the investors (Rahayu, Ali, Aulia, & Hidayah, 2022).

H2: There is a significant effect of herding behaviour on investors investment decisions

The results of the present study have provided empirical evidence to support the hypothesis that 'Herding behaviour' influences the investment decisions of the investors to a considerable extent. The findings of the present study corroborate with previous research conducted in this line of research and, therefore, add to the existing body of knowledge on the topic (Iram, Bilal, & Ahmad, 2023). The findings of the empirical analysis of the herding behavior's effects on investors' decisions prove that people follow the herd instinct when making decisions regarding investment (Dewan & Dharni, 2019; Garcia, Austgen, Pierre, Hasenbein, & Kutanoglu, 2022; Gu, 2023; Hussain, Sadiq, Rasheed, & Amin, 2022). The present study suggests that behavior and decision of peers influences investors to a great extent and this results in a clustering effect in financial markets. Therefore, herding conduct may impact on the behavior of the market, and this may mean that the market can be characterized by increased volatility and perhaps irrational price movements. The similar findings in our study and prior academic research suggest that herding behaviour is not an isolated case but rather commonplace (Jain, Walia, Kaur, & Singh, 2022). The fact that this phenomenon has been observed in different research works suggests that there is strong confidence in its endurance in the world of finance. The above-mentioned results stress the importance of incorporating the herding behavior into the framework of analysis of the market movement and the decision-making process of individual investors (Kumar & Goyal, 2015).

H3: There is a significant effect of disposition effect on investors investment decisions

The empirical analysis presented in this paper suggests that the disposition effect plays an important part in the manner investors make choices. Consequently, the findings achieved are consistent with previous research studies implemented in the domain and strengthen the

notion that the disposition effect plays a significant role in the development of investment decisions (da Costa Jr et al., 2023; Danbolt, Eshraghi, & Lukas, 2022). The influence of the disposition effect on investors' decision-making has been confirmed, thus obtaining the evidence that individuals react to their gains and losses in the stock market by holding on to their stocks that they have already lost money on and selling off their stocks which have given them profits. The literature has shown that investors also have a proclivity to hold underperforming stocks for a longer time than they do outperforming stocks, which makes investors have a bias in their portfolio and thus imply that investors have suboptimal investment outcomes. The aforementioned behaviour is in line with the 'disposition effect', a known phenomenon in behavioral finance. The disposition effect was confirmed to be present in individual investors by the following research by Ahn (2022); Da Costa Jr, Goulart, Cupertino, Macedo Jr, and Da Silva (2013); da Costa Jr et al. (2023); Guenther and Lordan (2023).

5. Conclusion

The conclusion aggregates the inferences drawn from this analysis and comments on the requirement of greater financial literacy to reduce impact of cognitive biases on investment decisions. The present study has deeply discovered the impact of behavioral biases viz., overconfidence, herding behavior and disposition effect on investment decisions by Pakistani retail investors. The results highlight just that, i.e., how these cognitive biases contribute to influencing the decision-making making it suboptimal in terms of Investments.

Overconfidence, or the belief in oneself to be greater than his abilities warrant can lead an investor/head of a company into taking too much risk and poor performance. The actions of herding behaviour amplify market inefficiencies – greater volatility and irrational prices, which can again have a negative impact on the stability in financial system. They can also contribute to long-term financial underperformance in the form of the disposition effect, or an investor's tendency to sell winning investments too soon and hold losing ones over time.

Each of these insights has important implications for researchers, policy makers and investors. The study is of interest to academics and contributes a developing market context to the existing literature on behavioral finance. These findings have implications for policymakers in designing programs to improve financial literacy and counteracting the negative effects of behavioral biases. It is important for investors to identify and combat those biases, as stopping such mistakes can ultimately lead one step closer in attaining an objective investment decision making.

Further research might address the impact of other behavioral biases on investment decisions and or effectiveness interventions target to reduce such bias. Moreover, future research could examine a moderator such as age and socio-economic status on the susceptibility to these biases.

Author's Contribution:

Muhammad Hasnain Ali: Conceptualized the study, contributed to the research design, and played a significant role in data collection and analysis.

Abou Bakar: Assisted in the formulation of the research hypothesis, provided statistical expertise, and participated in the interpretation of the results.

Muhammad Sajid Tufail: Led the overall research project, supervised the entire study process, and coordinated between the authors.

Fatima Mazhar: Contributed to literature review, data collection, and preparation of the survey instruments.

Conflict of interest/ Disclosures:

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References

Adil, M., Singh, Y., & Ansari, M. S. (2022). How Financial Literacy Moderate the Association between Behaviour Biases and Investment Decision? *Asian Journal of Accounting Research, 7*(1), 17-30. doi:https://doi.org/10.1108/AJAR-09-2020-0086

Ahn, Y. (2022). The Anatomy of the Disposition Effect: Which Factors Are Most Important? *Finance research letters, 44*(1), . doi:https://doi.org/10.1016/j.frl.2021.102040

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational behavior and human decision processes, 50*(2), 179-211. doi:https://doi.org/10.1016/0749-5978(91)90020-T

Ali, M., Choi-Meng, L., Aw, E. C.-X., Puah, C.-H., & Barut, A. (2024). Real Estate Investment Decisions in Covid-19 Crisis: The Effect of Perception and Behavioral Biases. *International Journal of Housing Markets and Analysis, 17*(1), 32-47. doi:https://doi.org/10.1108/IJHMA-12-2022-0173

Ansari, Y., Albarrak, M. S., Sherfudeen, N., & Aman, A. (2023). Examining the Relationship between Financial Literacy and Demographic Factors and the Overconfidence of Saudi Investors. *Finance research letters, 52*(3), 103582. doi:https://doi.org/10.1016/j.frl.2022.103582

Bihari, A., Dash, M., Muduli, K., Kumar, A., Mulat-Weldemeskel, E., & Luthra, S. (2023). Does Cognitive Biased Knowledge Influence Investor Decisions? An Empirical Investigation Using Machine Learning and Artificial Neural Network. *VINE Journal of Information and Knowledge Management Systems*. doi:https://doi.org/10.1108/VJIKMS-08-2022-0253

Bloomfield, J., & Fisher, M. J. (2019). Quantitative Research Design. *Journal of the Australasian Rehabilitation Nurses Association, 22*(2), 27-30.

Boyd, B. K., & Reuning-Elliott, E. (1998). A Measurement Model of Strategic Planning. *Strategic management journal, 19*(2), 181-192. doi:https://doi.org/10.1002/(SICI)1097-0266(199802)19:2<181::AID-SMJ945>3.0.CO;2-Z

Conner, M. (2014). Extending Not Retiring the Theory of Planned Behaviour: A Commentary on Sniehotta, Presseau and Araújo-Soares. *Health Psychology Review, 9*(2), 141-145. doi:10.1080/17437199.2014.899060

D'Acunto, F. (2015). Identity, Overconfidence, and Investment Decisions. *Available at SSRN 2641182*. doi:http://dx.doi.org/10.2139/ssrn.2641182

Da Costa Jr, N., Goulart, M., Cupertino, C., Macedo Jr, J., & Da Silva, S. (2013). The Disposition Effect and Investor Experience. *Journal of Banking & Finance, 37*(5), 1669-1675. doi:https://doi.org/10.1016/j.jbankfin.2012.12.007

da Costa Jr, N., Paraboni, A. L., & Goulart, M. (2023). Disposition Effect and Reference Points: An Experimental Study. *Plos one, 18*(4), . doi:https://doi.org/10.1371/journal.pone.0284171

Danbolt, J., Eshraghi, A., & Lukas, M. (2022). Investment Transparency and the Disposition Effect. *European Financial Management, 28*(3), 834-865. doi:https://doi.org/10.1111/eufm.12329

Dewan, P., & Dharni, K. (2019). Herding Behaviour in Investment Decision Making: A Review. *Journal of Economics, Management and Trade, 24*(2), 1-12.

Dhar, R., & Zhu, N. (2006). Up Close and Personal: Investor Sophistication and the Disposition Effect. *Management science, 52*(5), 726-740.

Dyckhoff, H., & Kasah, T. (2014). Time Horizon and Dominance in Dynamic Life Cycle Assessment. *Journal of Industrial Ecology, 18*(6), 799-808.

Elvira, V., Sutejo, B. S., & Marciano, D. (2022). *The Effect of Financial Literacy and Demographic Factors on Behavioral Biases of Investors During a Pandemic.* Paper presented at the 19th International Symposium on Management (INSYMA 2022).

Garcia, M., Austgen, B., Pierre, B., Hasenbein, J., & Kutanoglu, E. (2022). *Risk-Averse Investment Optimization for Power System Resilience to Winter Storms.* Paper presented at the 2022 IEEE/PES Transmission and Distribution Conference and Exposition (T&D).

Garcia, M. J. R. (2013). Financial Education and Behavioral Finance: New Insights into the Role of Information in Financial Decisions. *Journal of economic surveys, 27*(2), 297-315. doi: https://doi.org/10.1111/j.1467-6419.2011.00705.x

Goyal, P., Gupta, P., & Yadav, V. (2023). Antecedents to Heuristics: Decoding the Role of Herding and Prospect Theory for Indian Millennial Investors. *Review of Behavioral Finance, 15*(1), 79-102. doi:https://doi.org/10.1108/RBF-04-2021-0073

Grable, J. E., & Rabbani, A. (2023). The Moderating Effect of Financial Knowledge on Financial Risk Tolerance. *Journal of risk and financial management, 16*(2), 137. doi:https://doi.org/10.3390/jrfm16020137

Gu, W. (2023). Impact of Managers' Overconfidence Upon Listed Firms' Entrepreneurial Behavior in an Emerging Market. *Journal of Business Research, 155*(1), . doi:https://doi.org/10.1016/j.jbusres.2022.113453

Guenther, B., & Lordan, G. (2023). When the Disposition Effect Proves to Be Rational: Experimental Evidence from Professional Traders. *Frontiers in psychology, 14*(2), 1091922. doi:https://doi.org/10.3389/fpsyg.2023.1091922

Heeb, F., Kölbel, J. F., Paetzold, F., & Zeisberger, S. (2023). Do Investors Care About Impact? *The Review of Financial Studies, 36*(5), 1737-1787. doi:https://doi.org/10.1093/rfs/hhac066

Hussain, M., Sadiq, S., Rasheed, M. H., & Amin, K. (2022). Exploring the Dynamics of Investors' Decision Making in Pakistan Stock Market: A Study of Herding Behavior. *Journal of Economic Impact, 4*(1), 165-173. doi:https://doi.org/10.52223/jei4012220

Iram, T., Bilal, A. R., & Ahmad, Z. (2023). Investigating the Mediating Role of Financial Literacy on the Relationship between Women Entrepreneurs' Behavioral Biases and Investment Decision Making. *Gadjah Mada International Journal of Business, 25*(1), 93-118.

Jain, J., Walia, N., Kaur, M., & Singh, S. (2022). Behavioural Biases Affecting Investors' Decision-Making Process: A Scale Development Approach. *Management Research Review, 45*(8), 1079-1098. doi:https://doi.org/10.1108/MRR-02-2021-0139

Kim, S., Thompson, E. K., & Kim, C. (2023). Credit Rating and Managerial Behavior in Investment Decision Making: Evidence from the Korean Market. *Journal of behavioral and experimental finance, 37*(3), . doi:https://doi.org/10.1016/j.jbef.2023.100791

Kumar, S., & Goyal, N. (2015). Behavioural Biases in Investment Decision Making–a Systematic Literature Review. *Qualitative Research in financial markets, 7*(1), 88-108. doi:https://doi.org/10.1108/QRFM-07-2014-0022

Mishra, P. K., & Mishra, S. K. (2023). Do Banking and Financial Services Sectors Show Herding Behaviour in Indian Stock Market Amid Covid-19 Pandemic? Insights from Quantile Regression Approach. *Millennial Asia, 14*(1), 54-84. doi:https://doi.org/10.1177/09763996211032356

Pikulina, E., Renneboog, L., & Tobler, P. N. (2017). Overconfidence and Investment: An Experimental Approach. *Journal of Corporate Finance, 43*(4), 175-192. doi:https://doi.org/10.1016/j.jcorpfin.2017.01.002

Quang, L. T., Linh, N. D., Van Nguyen, D., & Khoa, D. D. (2023). Behavioral Factors Influencing Individual Investors' Decision Making in Vietnam Market. *Journal of Eastern European and Central Asian Research (JEECAR), 10*(2), 264-280. doi:https://doi.org/10.15549/jeecar.v10i2.1032

Rahayu, R., Ali, S., Aulia, A., & Hidayah, R. (2022). The Current Digital Financial Literacy and Financial Behavior in Indonesian Millennial Generation. *Journal of Accounting and Investment, 23*(1), 78-94. doi:https://doi.org/10.18196/jai.v23i1.13205

Raut, R. K. (2020). Past Behaviour, Financial Literacy and Investment Decision-Making Process of Individual Investors. *International Journal of Emerging Markets, 15*(6), 1243-1263. doi:https://doi.org/10.1108/IJOEM-07-2018-0379

Saraih, U. N., Aris, A. Z. Z., Karim, K. M., Samah, I. H. A., Sa'aban, S., & Mutalib, S. A. (2017). Relationships between Organizational Commitment, Ocb, Organizational Justice and Turnover Intention: Evidence from Educational Institution in Malaysia. *Review of Integrative Business and Economics Research, 6*(2), 64.

Sharma, G. (2017). Pros and Cons of Different Sampling Techniques. *International journal of applied research, 3*(7), 749-752.

Sherani, A. W., Naeem, A., & Shah, M. (2023). Following the Crowd or Making Informed Choices? The Impact of Heuristic and Prospect Biases on Portfolio Management and Performance: Evidence from Pakistan's Stock Market Downturn in 2022. *International Journal of Business and Management Sciences, 4*(1), 203-221.

Toma, F.-M. (2023). A Hybrid Neuro-Experimental Decision Support System to Classify Overconfidence and Performance in a Simulated Bubble Using a Passive Bci. *Expert Systems with Applications, 212*(2), . doi:https://doi.org/10.1016/j.eswa.2022.118722

Ullah, I., Ullah, A., & Rehman, N. U. (2017). Impact of Overconfidence and Optimism on Investment Decision. *International Journal of Information, Business and Management, 9*(2), 231.

Verschuren, P. (2003). Case Study as a Research Strategy: Some Ambiguities and Opportunities. *International journal of social research methodology, 6*(2), 121-139. doi:https://doi.org/10.1080/13645570110106154

Widyatama, A., & Narsa, I. M. (2023). The Use of Visual Presentations for Integrated Reports in the Investment Decision-Making Process. *Journal of Applied Accounting Research, 24*(1), 106-133. doi:https://doi.org/10.1108/JAAR-09-2021-0238

Xu, X., Yüksel, S., & Dinçer, H. (2023). An Integrated Decision-Making Approach with Golden Cut and Bipolar Q-Rofss to Renewable Energy Storage Investments. *International Journal of Fuzzy Systems, 25*(1), 168-181. doi:https://doi.org/10.1007/s40815-022-01372-2

Zaza, S., Wright-De Agüero, L. K., Briss, P. A., Truman, B. I., Hopkins, D. P., Hennessy, M. H., . . . Teutsch, S. M. (2000). Data Collection Instrument and Procedure for Systematic Reviews in the Guide to Community Preventive Services. *American journal of preventive medicine, 18*(1), 44-74. doi:https://doi.org/10.1016/S0749-3797(99)00122-1