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Does Investment Literacy Reduce the Impact of Investors' Cognitive Biases? (Role of Gender Difference)

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ABSTRACT

This study examined the role of investment literacy in reducing cognitive biases in investment decisions, particularly availability bias, overconfidence bias, and herding bias. Using a quantitative explanatory approach, data were collected from 392 stock investors in Indonesia through surveys. The study employed Multi-Group Analysis (MGA) to assess the moderating effect of gender on the relationship between investment literacy and cognitive biases. The findings indicated that higher investment literacy significantly reduced all three biases, enabling investors to process information more objectively, assess their abilities more realistically, and make independent decisions. However, the moderating effect of gender was only significant in the relationship between investment literacy and overconfidence bias, while it had no significant impact on availability bias and herding bias. These results underscore the importance of investment literacy in minimizing irrational decision-making. The findings have practical implications for investors in improving their financial decision-making, for policymakers in designing effective financial education programs, and for academics in further developing behavioral finance research.

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1. INTRODUCTION

Investment in the capital market is an economic activity that has a major impact on a country's economic growth. However, although the capital market offers great profit potential, market players often do not take investment decisions rationally (Athur, 2014). One of the main causes of this behavior is cognitive bias, which is a deviation in decision-making that is influenced by psychological and emotional factors. Cognitive biases, such as overconfidence, loss aversion, and anchoring, can cause investors to make suboptimal decisions, resulting in substantial financial losses (Shah et al., 2018). This phenomenon is an important concern, especially in efforts to build a more efficient and stable capital market ecosystem. Investment literacy has been identified as one of the key factors that can help reduce the impact of cognitive bias (Wangzhou et al., 2021). Investment literacy includes knowledge, understanding, and skills that enable individuals to make more informed and rational investment decisions (Weixiang et al., 2022). In this context, investment literacy not only acts as an educational

tool, but also as a risk mitigation mechanism that can increase the competitiveness of individual investors in the capital market. However, the effectiveness of investment literacy in reducing the impact of cognitive bias is not uniform, but is influenced by various demographic factors, one of which is gender differences.

Gender differences in investment behavior have been a topic of interest in behavioral finance (Hira & Loibl, 2008; Hsu et al., 2021; Marinelli et al., 2017). Previous studies have shown that men and women have different characteristics in terms of risk tolerance, decision-making, and perceptions of the capital market (Hsu et al., 2021). Men tend to be more confident and willing to take risks, while women are more cautious and conservative in their investments (Gompers et al., 2022). These differences may affect the extent to which investment literacy can reduce cognitive biases in each gender group. However, although investment literacy and gender have been widely studied separately, studies examining the interaction between the two in the context of cognitive bias are still limited (Adil et al., 2022; Hsu et al., 2021). In addition, in the Indonesian capital market landscape, the level of financial literacy in general, including investment literacy, is still relatively low compared to developed countries (Rozi et al., 2021; Sasikirono et al., 2023). This makes investors in Indonesia more susceptible to cognitive bias. In this condition, research that examines whether investment literacy can effectively reduce cognitive bias, taking into account gender differences, is very relevant.

Investment literacy plays an important role in reducing various cognitive biases that often influence investor decisions in the capital market, including overconfidence bias, availability bias, and herding bias (Weixiang et al., 2022). Investment literacy helps investors understand the limitations of their knowledge and encourages more data-based decision making. Investors who have a good understanding of the concepts of risk and diversification tend to be more careful in estimating potential profits and are not reckless in excessive trading (Koumou, 2020). Yulianis and Sulistyowati (2021) show that investors who have a higher level of financial literacy are better able to avoid mistakes due to overconfidence, because they understand that the market does not always move according to individual expectations. Investors who have high investment literacy will be more critical in filtering information and will not immediately react to sensational news or temporary trends (Krische, 2019), when a stock experiences a price spike due to positive news, investors who have a good understanding of investment will still conduct a fundamental analysis first to determine whether the price increase is supported by the company's actual performance or just temporary market euphoria (Li et al., 2020). Investment literacy teaches that decisions made based on valid and data-based information will be more profitable in the long run compared to decisions that are only based on the availability of popular information (Alaaraj & Bakri, 2020). Thus, investors who have high literacy will be more rational in responding to market news and are more likely to make decisions supported by strong analysis.

Investment literacy plays a role in equipping investors with a deeper understanding of financial principles, such as the intrinsic value of assets and factors that fundamentally affect stock prices (Arora & Chakraborty, 2023). With this knowledge, investors become more confident in conducting independent analysis and are not easily influenced by other people's decisions. Investors who understand stock valuation calculations will not rush to buy stocks that are rising drastically just because many other people are buying them, but will consider whether the stock price still makes sense based on relevant financial ratios (Mutia et al., 2024). Therefore, investment literacy is an effective tool in building a more analytical and disciplined mindset in investing, thereby reducing the negative impacts of follower behavior that often causes speculative bubbles and market instability.

This study not only contributes theoretically to broadening the understanding of the relationship between investment literacy, cognitive bias, and gender, but also has practical implications. Gender differences in investment behavior are often caused by social, psychological, and cultural factors that shape individuals' mindsets from an early age. Men as the primary risk takers in the family can influence how they approach investment, while women may be more influenced by the need for long-term financial security. As a result, women tend to be slower to adopt high-risk investment strategies, even when they have adequate levels of investment literacy. This condition raises the question: do efforts to improve investment literacy need to be adjusted based on gender to

maximize results? In the Indonesian context, the influence of local culture and norms can also reinforce gender differences in investment behavior. For example, in some regions, women often have more limited access to formal financial education, so that their investment literacy levels lag behind men. Theoretically, this study contributes to enriching the literature in the field of behavioral finance, especially in understanding the dynamics of the interaction between investment literacy, cognitive bias, and gender. In practice, the results of this study are expected to be a guide for policy makers, educational institutions, and investment service providers in designing programs and policies that not only reduce the impact of cognitive bias, but also increase broader and more equitable financial inclusion. Thus, this study is not only academically relevant, but also has strategic value in supporting economic development based on financial literacy in Indonesia.

2. RESEARCH METHOD

This study applies an explanatory quantitative approach, which aims to explain the reasons behind a phenomenon and test the validity of a theory (Neuman, 2014). In data collection, this study uses a survey method conducted online and offline by targeting stock investors in Indonesia who meet the predetermined sample criteria. The sample was determined using a purposive sampling technique, which allows the selection of respondents based on certain characteristics relevant to this study (Hair et al., 2019). To analyze the data obtained, this study applies two stages of testing. The first stage is testing the research instrument, which includes validity testing and reliability testing with standards that have been established in the academic literature. The second stage involves testing the research hypothesis using mediation analysis, following the analysis procedures recommended in previous studies. With this approach, this study is expected to provide a deeper understanding of the phenomenon being studied and support the validity of the theory used as the basis for the research.

The development of research instruments aims to ensure that the tools used can produce accurate and relevant data in answering research questions. This process begins with defining the variables to be studied, where each main variable related to the research topic must be identified and clearly defined. After that, the dimensions related to each variable are determined, as well as the preparation of indicators or questions used to measure each dimension. The study also considered the potential for common method bias (CMB), as recommended in previous studies, to reduce method bias that often occurs in the survey approach (Malhotra et al., 2006; Podsakoff et al., 2003).

Table 1. Operational Definition and Variable Measurement

Construct	Definition	Measurement Item	Source
Investment Literacy	An individual's understanding of the concepts, risks, and strategies associated with investing, about various investment instruments, such as stocks, bonds, mutual funds, and property, and the ability to make investment decisions. (Van Rooij et al., 2012).	What is the main function of the stock market. Which of the following assets shows the highest price fluctuations over time. What happens to investment risk when investors allocate their money to various assets. What is indicated by a beta (risk coefficient) of less than 1. Which of the following statements is true regarding mutual funds. If interest rates fall, bond prices will fall. Is this statement correct. Will buying a single common stock provide a higher rate of return than buying a stock mutual fund. Do investments that offer above-average returns tend to have above-average risk?	(Salem, 2019).
Availability Bias	The level of dependence a person has on available information can influence the way he or she makes decisions (Tversky & Kahneman, 1974)	I will buy the shares suggested by my friend. I will buy shares based on information from the internet. I will buy shares based on information obtained from shares of other companies in similar industries.	(Abdin et al., 2017; Nada & Moa'mer, 2013).

Construct	Definition	Measurement Item	Source
		I will buy shares of a company based on information suggested by financial experts. I consider information from close friends or colleagues as a reliable reference source in purchasing my shares.	
Overconfidence bias	An unwarranted belief in one's intuitive reasoning, judgment, and cognitive abilities (Pompian, 2011).	I am an experienced investor. I feel more confident in my investment choices than my colleagues or friends. I can predict future stock price movements by conducting various analyses. I am a smart investor in the capital market. I am always confident that I will make a profit when selling/buying stocks.	(Abdin et al., 2017; Nada & Moa'mer, 2013).
Herding Bias	The tendency of individuals to follow the actions or decisions of the majority in a group, often without considering in-depth personal analysis or opinions (Pompian, 2006).	I make investments based on the decisions of the majority of other investors. I make investment decisions when the market is in a bullish condition (rising market conditions). I confidently make decisions that are different from the majority of investors in the market Rapid movements in the capital market do not affect my decisions.	(Salem, 2019).

Source: data processed by researchers, 2025.

3. RESULTS AND DISCUSSIONS

Descriptive Statistics

The characteristics of respondents in this study include gender, age, and investment experience. In terms of gender, the majority of respondents were male, 210 people or 54%, while women were 182 people or 46%, although there were slightly more male respondents. This may reflect that interest in investment activities is not only dominated by one gender, but is spread quite evenly among men and women. However, this difference can also be influenced by certain social or cultural factors that encourage men to be more active in investing. In terms of age, the majority of respondents are in the productive age range, namely 20-30 years, which is 78% of the total respondents. This age range is considered a financially productive period, where individuals tend to start actively managing their finances and looking for investment opportunities to develop their assets. The age group under 20 years old, which reached 21%, shows that the younger generation is starting to be interested in the world of investment from an early age, although their experience is likely still limited. Meanwhile, only a few respondents were over 30 years old, indicating that this age group may be less involved in the study or have different investment patterns.

Table 1. Respondent Characteristics

Profile	Amount	Percentage
Gender		
Male	210	54%
Female	182	46%
Age		
>20	80	21%
20-30	307	78%
31-40	5	1%
Investment experience		
1-5th	248	63
6-10th	134	34%
>10th	10	3%

Source: data processed by SPSS 26.

The investment experience of the respondents shows that the majority have relatively short experience, namely 1-5 years, as many as 63% of the total respondents. This indicates that many of them are still in

the early stages of building an investment portfolio. Respondents with 6-10 years of experience reached 34%, indicating a more experienced group but still in the development stage. Meanwhile, only 3% of respondents have more than 10 years of experience, reflecting that long-term investment is still not in great demand or has not been the main focus of most respondents. This data illustrates that the majority of respondents are in the exploration and learning phase in the world of investment, especially among young people.

Validity and Reliability

Table 2. Results of Convergent Validity Testing

Variables	Item	Factor Loading	AVE	Decision
Availability Bias	AB1	0.867	0.726	Valid
	AB2	0.860		Valid
	AB3	0.753		Valid
	AB4	0.877		Valid
	AB5	0.896		Valid
Overconfidence Bias	OB1	0.891	0.825	Valid
	OB2	0.927		Valid
	OB3	0.900		Valid
	OB4	0.925		Valid
	OB5	0.897		Valid
Herding Bias	HB1	0.844	0.694	Valid
	HB2	0.851		Valid
	HB3	0.799		Valid
	HB4	0.838		Valid

Source: data processed by SmartPLS 3.

The table above explains the validity test for three variables, namely availability bias, overconfidence bias, and herding bias, based on the factor loading and Average Variance Extracted (AVE) values. Factor loading shows the strength of the relationship between each item and the measured variable, while AVE shows the extent to which the indicators in one variable are correlated with each other. In the availability bias variable, there are five items (AB1 to AB5) with factor loading values of 0.867; 0.860; 0.753; 0.877; and 0.896, respectively. All of these items are declared valid because their factor loading values are above 0.7, which is the minimum threshold for validity. The AVE value for this variable is 0.726, which also exceeds the minimum standard of 0.5, so it can be concluded that this variable has good validity overall. For the overconfidence bias variable, there are five items (OB1 to OB5) with factor loading values between 0.891 and 0.927. All of these items are valid because their factor loading values are far above 0.7.

The AVE value of 0.825 indicates that this variable has a very strong internal correlation, indicating that its indicators are able to measure the concept of overconfidence bias well. In the herding bias variable, there are four items (HB1 to HB4) with factor loading values of 0.844; 0.851; 0.799; and 0.838, respectively. All of these values also exceed the threshold of 0.7, so all of these items are valid. The AVE value of 0.694, which is close to 0.7, indicates that this variable has quite good validity. Thus, the three variables in this table are declared valid for use in further analysis because they meet the validity requirements based on the factor loading and AVE values.

Table 3. Results of Discriminant Validity Test and Reliability Test

Construct	CA	CR	1	2	3
Availability Bias	0,908	0,930	**0,852**		
Herding Bias	0,860	0,901	0,081	**0,833**	
Overconfidence Bias	0,947	0,959	0,210	0,228	**0,908**

Source: data processed by SmartPLS 3.

The results of the discriminant validity and reliability tests in this study indicate the level of reliability and validity of each construct tested. Construct reliability is measured using Cronbach's Alpha (CA) and Composite Reliability (CR), while discriminant validity is evaluated through the average variance

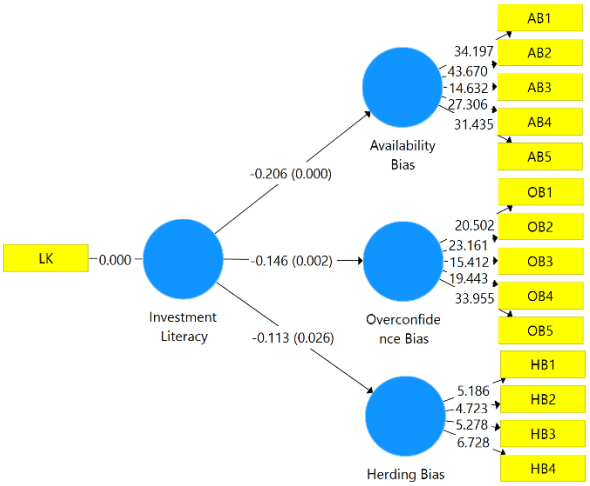
extracted (AVE) value, with the square root of AVE displayed on the diagonal of the table. For the availability bias construct, the CA value of 0.908 and the CR of 0.930 indicate very good reliability because both exceed the minimum threshold of 0.7. The AVE root value for availability bias is 0.852, which is greater than the correlation value with other constructs, thus meeting the discriminant validity criteria. Furthermore, for the herding bias construct, the CA value of 0.860 and the CR of 0.901 also indicate strong reliability. The AVE root value of 0.833 is greater than the correlation value with availability bias (0.081) and overconfidence bias (0.228), which indicates that this construct has good discriminant validity. Finally, for the overconfidence bias construct, a very high reliability value is shown by CA of 0.947 and CR of 0.959. The AVE root value of 0.908 is also higher than the correlation with availability bias (0.210) and herding bias (0.228), which confirms the discriminant validity of this construct. Overall, the results of this analysis indicate that all constructs meet the criteria for strong internal reliability, as indicated by the high CA and CR values. In addition, discriminant validity is also met, because the AVE root value for each construct is greater than its correlation with other constructs. This indicates that each construct is unique in measuring the intended variable without any significant overlap with other constructs. These findings support the quality of the measuring instruments used in the study and strengthen the validity of the data analysis results.

Table 4. Results of testing the research model

Hypothesis		Direct Effect	Moderating Effect	Decision
H1	Investment Literacy -> Availability Bias	-0.206 (0.000)	-	Supported
H2	Investment Literacy -> Overconfidence Bias	-0.146 (0.002)	-	Supported
H3	Investment Literacy -> Herding Bias	-0.113 (0.026)	-	Supported
H4a	Gender*Investment Literacy -> Availability Bias	-	-0.032 (0.771)	Not- Supported
H4b	Gender*Investment Literacy -> Overconfidence Bias	-	-0.262 (0.009)	Supported
H4c	Gender*Investment Literacy -> Herding Bias	-	-0.081 (0.822)	Not- Supported

Source: data dioleh SmartPLS 3; Notes: **P < 0.01, *P < 0.05, n=392.

The results of hypothesis testing in this research model show the relationship between investment literacy and various types of bias in investment decision making, as well as the moderating role of gender on the relationship. First, hypothesis H1 reveals that investment literacy has a significant negative direct effect on availability bias with a coefficient value of -0.206 and a p-value of 0.000 (p <0.01). This indicates that the higher a person's investment literacy, the less likely they are to be affected by availability bias in investment decision making. Second, hypothesis H2 shows a significant negative effect of investment literacy on overconfidence bias with a coefficient of -0.146 and a p-value of 0.002 (p <0.01). This means that better investment literacy can reduce the tendency of individuals to have excessive confidence in their investment abilities. Third, hypothesis H3 finds that investment literacy also has a significant negative effect on herding bias, with a coefficient of -0.113 and a p-value of 0.026 (p <0.05), indicating that higher literacy can reduce the tendency to follow mass behavior in investment decision making.



Figuere 1. Hypothesis testing

Meanwhile, for the moderating effect of gender on the relationship between investment literacy and various biases, the results show significant differences in several biases. For hypothesis H4a, gender moderation on the relationship between investment literacy and availability bias is not significant, with a coefficient of -0.032 and a p-value of 0.771. This indicates that the effect of investment literacy on availability bias does not differ significantly between men and women. However, hypothesis H4b reveals that gender has a significant moderating effect on the relationship between investment literacy and overconfidence bias, with a coefficient of -0.262 and a p-value of 0.009 ($p < 0.01$). This means that the role of investment literacy in reducing overconfidence bias differs significantly between men and women, with a high probability that gender strengthens or weakens the relationship. Finally, for hypothesis H4c, gender moderation on the relationship between investment literacy and herding bias is not significant, with a coefficient of -0.081 and a p-value of 0.822. Thus, gender does not affect the relationship between investment literacy and the tendency to follow mass behavior.

Gender, Investment Literacy and Cognitive Bias

The results of the hypothesis testing in this study have a strong relationship with the concept of bounded rationality proposed by Herbert Simon. This theory explains that individuals cannot always make completely rational decisions due to limited information, cognitive capacity, and time available to analyze and process information (Pittenger et al., 2023). The relationship between investment literacy, cognitive bias, and gender moderating factors can be understood within the framework of bounded rationality. The negative effect of investment literacy on availability bias, overconfidence bias, and herding bias shows that individuals who have a better understanding of investment tend to be able to overcome cognitive limitations that are the main source of these biases. Availability bias occurs when individuals rely more on information that is easy to remember than on more accurate and relevant information (Rasheed et al., 2018). Investment literacy plays an important role in overcoming these limitations by equipping individuals with skills and understanding that enable them to evaluate information more critically, so that they do not only rely on memory or subjective experience (Krische, 2019; Seraj et al., 2022). This is in line with the concept of bounded rationality, where investment literacy functions as a mechanism that expands an individual's cognitive capacity in decision-making. In addition, the effect of investment literacy in reducing overconfidence bias shows that individuals who have a better understanding of investment tend to be more realistic in assessing their own abilities (Ahmad & Shah, 2022; Seraj et al., 2022). This bias often arises because individuals do not fully understand the complexity of the market or have excessive confidence in their analytical abilities (Ahmad & Shah, 2022). In the context of bounded rationality, investment literacy provides additional information that allows individuals to make more optimal decisions even though they are still within

the limitations of the information and cognitive abilities they have. Furthermore, herding bias can also be explained through the perspective of bounded rationality. This bias occurs when individuals follow the decisions of others because they feel they do not have enough information or expertise to make decisions independently (Ding & Li, 2019). Investment literacy helps individuals build confidence to analyze data independently and make decisions based on logic and rational considerations, rather than simply following trends or social pressure (Adil et al., 2022; Seraj et al., 2022). Thus, investment literacy plays a role in reducing dependence on group behavior and encouraging individuals to act more rationally despite limited access to information and time available (Bellofatto et al., 2018).

The moderating role of gender shows that the effect of gender on the relationship between investment literacy and availability bias is not significant (Cupák et al., 2021). This indicates that the ability of investment literacy to reduce this bias is universal and is not influenced by gender, consistent with the view that availability bias is related to individual cognitive patterns rather than gender differences (Rasheed et al., 2018; Tversky & Kahneman, 1974). However, the fourth hypothesis part b shows that gender significantly moderates the relationship between investment literacy and overconfidence bias (Hsu et al., 2021). Previous studies have shown that men tend to be more susceptible to overconfidence bias than women (Barber & Odean, 2001; Hamurcu & Hamurcu, 2021), so investment literacy may have a greater impact on reducing this bias in men. Finally, the fourth hypothesis part c shows that gender moderation on the relationship between investment literacy and herding bias is not significant. This indicates that the effect of investment literacy on reducing the tendency to follow the group is independent of gender (Adil et al., 2022; Hsu et al., 2021), supporting the argument that herding bias is more influenced by social pressure and less related to individual factors such as gender (Kawshala et al., 2020; Loang & Ahmad, 2020).

4. CONCLUSION

This study confirms that investment literacy plays an important role in reducing investors' cognitive biases, especially availability bias, overconfidence bias, and herding bias. Investors with better investment understanding tend to be more objective in evaluating information, more realistic in assessing their abilities, and more independent in making decisions without being influenced by the behavior of other investors. Meanwhile, the role of gender as a moderator is only significant in the relationship between investment literacy and overconfidence bias, while availability bias and herding bias do not show significant differences based on gender. The results of this study have several benefits for various parties. For investors, these findings emphasize the importance of improving investment literacy to avoid decision-making influenced by cognitive bias, so that it can produce a more rational investment strategy and reduce the risk of loss. For the government, this study can be a basis for designing more effective financial education and literacy policies to create a more stable and efficient capital market ecosystem. For academics, these findings contribute to the development of behavioral finance theory and open up opportunities for further research on other factors that can influence cognitive bias in investment. Future research can examine in more depth other factors that moderate the relationship between investment literacy and cognitive bias, such as investment experience, market regulation, or cultural differences. In addition, qualitative or experimental approaches can also be used to better understand the psychological mechanisms behind investment decisions. Further studies can also expand the scope of the sample to various groups of investors, including retail and institutional investors, to obtain a more comprehensive picture of the influence of investment literacy on capital market behavior.

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