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The Influence of Behavioral Bias on Investment Decision with Risk Perception as a Mediating Variable: A Study on Generation Z at the Indonesia Stock Exchange

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Abstract: This study uses structural equation modeling to examine the direct and indirect relationships between behavioral biases and investment decisions with the mediating role of risk perception. This study was conducted among Generation Z individual investors who have been investing on the Indonesia Stock Exchange for several months to years. The behavioral biases examined include overconfidence bias, herding bias, and loss aversion bias, with data from 300 respondents collected through purposive sampling. The results show that risk perception mediates the relationship between overconfidence bias, herding bias, and loss aversion bias with investment decisions. Herding bias and loss aversion bias were found to have a direct relationship with risk perception. In addition, it was also found that herding bias, loss aversion bias, and risk perception have a direct relationship with investment decisions. This research is essential for investors to make more rational investment decisions and improve investment performance by recognizing the risks associated with behavioral biases. The increasing number of retail investors and Generation Z on the Indonesia Stock Exchange demands sound investment decisions. Behavioral biases often trigger irrational decisions and errors in portfolio management, while risk perception can strengthen or weaken the impact of behavioral biases on investment decisions. This study contributes theoretically to investment and behavioral finance, particularly regarding the mediating effect of risk perception.

Keywords: Overconfidence Bias, Herding Bias, Loss Aversion Bias, Risk Perception, Investment Decision

INTRODUCTION

In the era of globalization, investment has become an increasingly popular trend as part of personal financial management strategies. This is reflected in the significant growth of retail investors on the Indonesia Stock Exchange (IDX) over the past five years. In 2020, the number

of individual investors increased by 56.5%, followed by a 50% increase in 2021. This positive trend continued with a 60% rise in 2022, 22% in 2023, and 17% in 2024. As of July 2024, the total number of individual investors reached 13,303,214. In addition to the increase in the number of investors, most individuals over the past five years have come from Generation Z. According to Oblinger and Oblinger (2005), this group is primarily under 30 years old and was born between 1995 and 2009.

According to data from the Custodian Sentral Efek Indonesia (KSEI) 2024, the proportion of Generation Z investors was 54.90% in 2020, rising to 58.58% in 2021 and reaching 59.43% in 2022. However, it slightly decreased to 57.57% in 2023 and 55.20% in 2024. The dominance of Generation Z in the investor proportion in Indonesia drives the selection of this group as the research object. Familiar with digital investment platforms, Generation Z often relies on financial advice from social media and friends, increasing the risk of making mistakes due to difficulties distinguishing accurate from inaccurate information. Additionally, Generation Z, being relatively young, tends to experience behavioral biases due to a lack of experience compared to senior investors (Fathin & Hersugondo, 2022). Generation Z also tends to think short-term and follow popular trends (Hidayat et al., 2023; Kertati, 2018)

This research is based on the grand theory of behavioral finance theory. Behavioral finance studies how psychology affects financial, business, and financial market decisions (Sutejo et al., 2023). This theory also explains how psychological factors can influence an individual's investment decision-making, often leading to irrational behavior in financial markets (Anisyah et al., 2023). This theory contrasts with the Efficient Market Hypothesis Theory (EMH), which states that all available information is reflected in asset prices, allowing the market to operate efficiently and rationally (Rehmat et al., 2023). Behavioral finance theory is supported by prospect theory and bounded rationality theory, which highlight the limitations of human rationality (Rehmat et al., 2023). According to (Sutejo et al., 2023), prospect theory is an economic behavior theory that describes how individuals make decisions among several alternatives involving known probabilities and risks they may face in the future. Meanwhile, the bounded rationality theory from (Kahneman and Tversky, 1979) explains that individuals often make decisions based on limited information, short time frames, and cognitive constraints, which means financial decisions are not always entirely rational.

The primary concept used is investment decision-making. According to Moueed et al. (2015), humans are inherently inclined to behave irrationally when making investment decisions. However, Parveen et al. (2020) emphasize that rational and disciplined behavior is essential for success as an investor in the stock market. Behavioral biases can affect an investor's final decision regarding whether to invest (Marciano and Wijaya, 2021). Therefore, actions that may trigger irrationality should be avoided. In this context, the research aims to explore the impact of behavioral biases such as Overconfidence, herding behavior, and loss aversion on investment decision-making. This study also explores how risk perception as a mediator can help reduce the negative impact of these biases and enhance the quality of investment decisions among Generation Z. With a deeper understanding of these factors; it is hoped that investors can make wiser, more informed decisions, minimizing the risks they face in the market.

This study has several specific objectives: (1) To evaluate the impact of Overconfidence on investment decision-making among Generation Z investors; (2) To evaluate the impact of Overconfidence on risk perception among Generation Z investors; (3) To evaluate the impact of herding behavior on investment decision-making among Generation Z investors; (4) To evaluate the impact of herding behavior on risk perception among Generation Z investors; (5) To evaluate the impact of loss aversion on investment decision-making among Generation Z investors; (6) To evaluate the impact of loss aversion on risk perception among Generation Z investors; (7) To evaluate the impact of risk perception on investment decision-making among

Generation Z investors; (8) To evaluate the role of risk perception as a mediator between overconfidence and risk perception among Generation Z investors; (9) To evaluate the role of risk perception as a mediator between herding behavior and risk perception among Generation Z investors; (10) To evaluate the role of risk perception as a mediator between loss aversion and risk perception among Generation Z investors.

METHOD

The type of research used in this study is quantitative research. The data source for this study is primary data collected through surveys distributed to a population of Generation Z investors who have invested in the Indonesia Stock Exchange, with 300 respondents. The questionnaire includes questions regarding the influence of various variables, such as overconfidence bias, herding behavior bias, and loss aversion bias on investment decisions. This study also uses risk perception as a mediating variable. The sample size in this study is 50 individual investors.

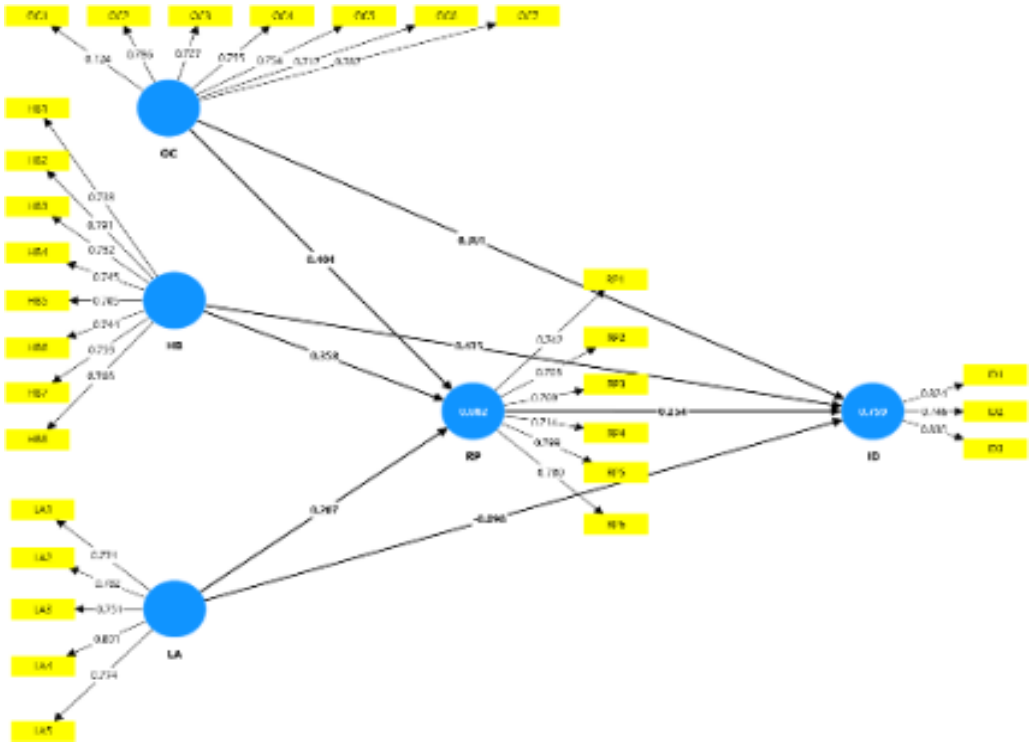
The measurement level used in this study is the interval scale. This level of measurement is applied to both the dependent and independent variables. The study also uses a Likert scale, allowing respondents to answer based on how much they agree or disagree with the statement. The Likert scale used consists of five points: strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). This scale provides flexibility in data analysis and result interpretation. This study employs a non-probability sampling technique with purposive sampling. Purposive sampling is a technique used to select samples based on specific considerations (Sugiyono, 2007).

This study uses Structural Equation Modeling (SEM) with the SmartPLS 4.0 program for data processing. SmartPLS is used to statistically analyze the data after conducting missing data analysis. SmartPLS is the most suitable software for predicting small data sets. SEM is applied to examine the proposed direct and indirect relationships. As a multivariate statistical technique, SEM combines latent and observed variables to evaluate structural theory. This study employs the Partial Least Squares (PLS) approach, part of the equation model in Structural Equation Modeling (SEM). PLS processes questionnaire data and tests the relationship between exogenous and endogenous variables. Data processing is carried out using SmartPLS 4 software. The analysis technique in PLS is divided into two main models: the outer and inner models. The outer model includes indicators such as convergent validity, discriminant validity, and composite reliability. Meanwhile, the inner model is used to test R-Square and estimate for path coefficients.

RESULTS AND DISCUSSION

Measurement Model Testing (Outer Model)

Based on the outer model analysis results processed using SmartPLS 4.0, several critical pieces of information are obtained for model interpretation. The tests include convergent validity, discriminant validity, and composite reliability, which aim to evaluate the validity and reliability of the measurement model comprehensively.



Source: Processed by the Researcher (2024)

Figure 1. Outer Model (Measurement Model)

Outer Loadings

Table 1. Outer Loadings Value

	OC	HB	LA	RP	ID
OC1	0,724				
OC2	0,786				
OC3	0,727				
OC4	0,755				
OC5	0,754				
OC6	0,717				
OC7	0,787				
HB1		0,738			
HB2		0,791			
HB3		0,752			
HB4		0,745			
HB5		0,705			
HB6		0,744			
HB7		0,759			
HB8		0,766			
LA1			0,774		
LA2			0,782		
LA3			0,751		
LA4			0,801		
LA5			0,774		
RP1				0,742	

RP2	0,705	
RP3	0,769	
RP4	0,714	
RP5	0,799	
RP6	0,780	
ID1		0,824
ID2		0,746
ID3		0,830

Source: Processed by the Researcher (2024)

Convergent validity can be assessed using the outer loading values, which evaluate the relationship strength between each indicator and the variable it represents. An indicator is considered valid in measuring the variable if its outer loading value exceeds 0.7. Based on Table 1 above, all indicators for the variables of Overconfidence (OC), Herding Behavior (HB), Loss Aversion (LA), Risk Perception (RP), and Investment Decision (ID) have outer loading values greater than 0.7. Therefore, it can be concluded that each indicator for both exogenous and endogenous variables meets the validity criteria for measuring the designated variables.

Cross Loading

Table 2. Cross Loading Value

	OC	HB	LA	RP	ID
OC1	0,724	0,675	0,656	0,674	0,605
OC2	0,786	0,726	0,714	0,750	0,677
OC3	0,727	0,633	0,662	0,626	0,644
OC4	0,755	0,693	0,686	0,702	0,608
OC5	0,754	0,720	0,691	0,694	0,608
OC6	0,717	0,634	0,660	0,663	0,613
OC7	0,787	0,698	0,670	0,702	0,660
HB1	0,650	0,738	0,684	0,658	0,613
HB2	0,720	0,791	0,684	0,718	0,680
HB3	0,709	0,752	0,713	0,682	0,619
HB4	0,688	0,745	0,662	0,700	0,668
HB5	0,636	0,705	0,645	0,648	0,605
HB6	0,691	0,744	0,692	0,702	0,660
HB7	0,687	0,759	0,666	0,683	0,636
HB8	0,682	0,766	0,666	0,681	0,626
LA1	0,693	0,704	0,774	0,706	0,610
LA2	0,683	0,704	0,782	0,670	0,599
LA3	0,694	0,694	0,751	0,685	0,593
LA4	0,735	0,721	0,801	0,723	0,666
LA5	0,698	0,677	0,774	0,687	0,607
RP1	0,660	0,684	0,674	0,742	0,632
RP2	0,678	0,663	0,638	0,705	0,600
RP3	0,730	0,710	0,678	0,769	0,652
RP4	0,664	0,665	0,651	0,714	0,606

RP5	0,728	0,729	0,725	0,799	0,682
RP6	0,675	0,666	0,667	0,780	0,610
ID1	0,695	0,690	0,640	0,654	0,824
ID2	0,651	0,656	0,619	0,652	0,746
ID3	0,674	0,700	0,645	0,709	0,830

Source: Processed by the Researcher (2024)

In addition to assessing indicator validity through convergent validity, it is also essential to conduct discriminant validity testing, measured using cross-loading values. Cross-loading is used to evaluate the relationship strength between each indicator and the variable it represents. An indicator is considered valid if its cross-loading value with its original variable is higher than its cross-loading values with other variables. Based on Table 2 above, each indicator shows the highest value for its original variable compared to its cross-loading values with other variables, indicating that the questions or indicators are valid.

Average Variance Extracted (AVE)

Table 3. Average Variance Extracted Value

Variable	Average Variance Extracted (AVE)
Overconfidence (OC)	0,563
Herding Behavior (HB)	0,563
Loss Aversion (LA)	0,603
Risk Perception (RP)	0,566
Investment Decision (ID)	0,642

Source: Processed by the Researcher (2024)

Average Variance Extracted (AVE) is used to test convergent validity. In measurement models, AVE indicates the extent to which the Variance of the indicators can be explained by the latent variable being measured. Based on Table 3 above, the AVE values for each variable in this study reach ≥ 0.5. Thus, it can be concluded that all variables meet the established AVE criteria.

Composite Reliability

Composite reliability is a test used to assess the internal consistency of constructs in the model. This test aims to ensure that the indicators for each latent variable consistently measure the construct they represent. A composite reliability value is considered to meet the reliability standard if it exceeds 0.7, indicating that the indicators consistently measure their respective variables. Table 4 below shows each latent variable's composite reliability value above the 0.7 threshold. Therefore, all variables in the model exhibit a high level of reliability and are consistent in measuring the designated constructs.

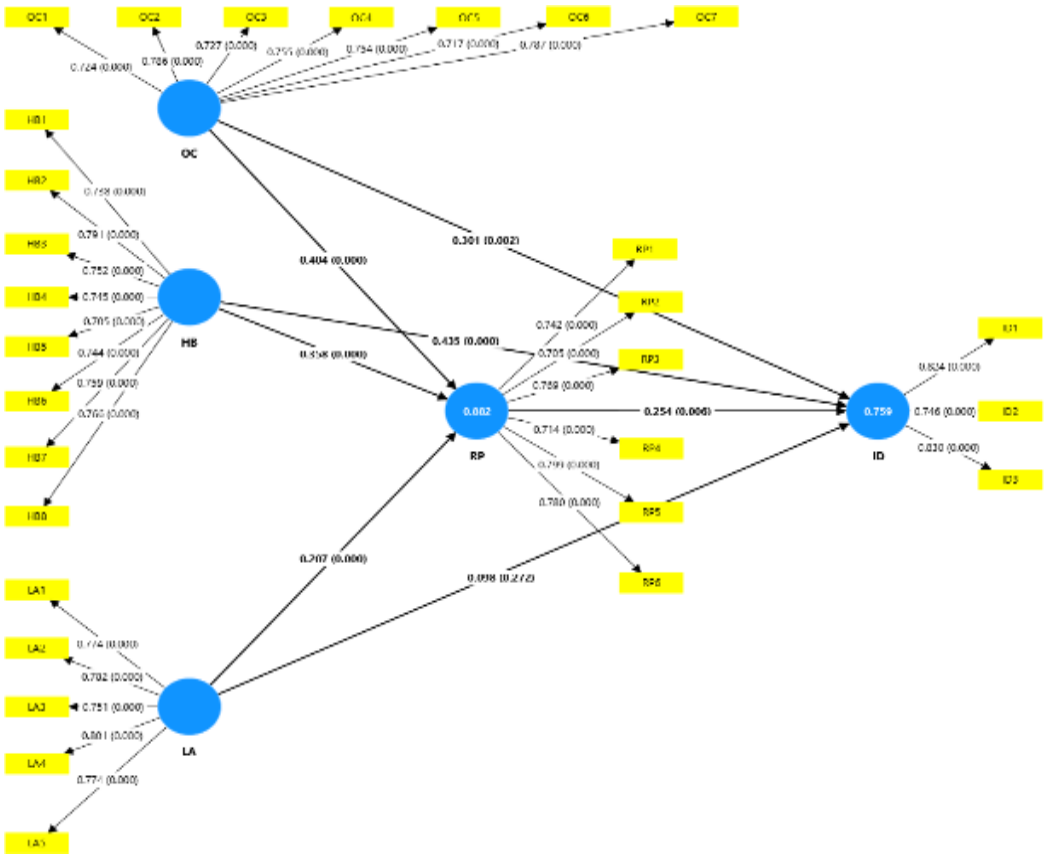
Table 4. Composite Reliability Value

Variable	Composite Reliability
Overconfidence (OC)	0,872
Herding Behavior (HB)	0,890
Loss Aversion (LA)	0,836
Risk Perception (RP)	0,848
Investment Decision (ID)	0,721

Source: Processed by the Researcher (2024)

Structural Model Testing (Inner Model)

Based on the inner model analysis results processed through SmartPLS 4.0, various vital pieces of information are obtained for model interpretation. The tests include R-Square (coefficient of determination) and bootstrapping, which aim to confirm the strength of the relationships between exogenous (independent) and endogenous (dependent) variables, as well as assess the significance of the proposed hypotheses.



Source: Processed by the Researcher (2024)

Figure 2. Inner Model (Structural Model)

R-Square

Table 5. R-Square Value

Variable	R-Square	R-Square Adjusted
Investment Decision (ID)	0,759	0,756
Risk Perception (RP)	0,882	0,881

Source: Processed by the Researcher (2024)

The determination coefficient (R^2) test is conducted to assess the extent to which the exogenous (independent) variables in the construct can explain the endogenous (dependent) variables. The R^2 value for the investment decision variable is 0.759, indicating that the model can explain 75.9% of the variability in investment decisions, which is influenced by the risk perception variable. In comparison, other variables outside the model influence the remaining 24.1%. Additionally, the risk perception variable has an R^2 value of 0.882, showing that the model can explain 88.2% of the variability in risk perception through the Overconfidence, herding behavior, and loss aversion variables, with the remaining 11.8% explained by other variables outside the model.

Hypothesis Testing

In determining hypothesis testing, particularly for direct relationships, the evaluation is based on the alignment of path coefficient values (original sample), t-statistics, and p-values. A hypothesis is accepted if the t-statistic exceeds the threshold of 1.645 and the p-value is less than 0.05, indicating a statistically significant relationship. Additionally, the proposed direction of the relationship in the hypothesis must be consistent with the coefficient obtained from the analysis, providing further validity to the results.

From Table 7, it can be concluded that:

1. The hypothesis that overconfidence negatively affects investment decisions in Generation Z has been rejected. This is due to the path coefficient value of 0.301, which indicates inconsistency with the negative direction of the hypothesis. However, the t-statistics value meets the criteria, i.e., 3.093 > 1.645, and the p-value is 0.002 < 0.05.
2. The hypothesis that Overconfidence negatively affects Risk Perception in Generation Z is rejected. This is due to the path coefficient value of 0.404, which indicates inconsistency with the negative direction of the hypothesis. However, the t-statistics value meets the criteria, i.e., 7.229 > 1.645, and the p-value is 0.000 < 0.05.
3. The hypothesis that Herding Behavior positively affects Investment Decisions in Generation Z is accepted. This is due to the path coefficient value of 0.435, which indicates consistency with the positive direction of the hypothesis. The t-statistics value meets the criteria, i.e., 4.412 > 1.645, and the p-value is 0.000 < 0.05.
4. The hypothesis that Herding Behavior positively affects Risk Perception in Generation Z is accepted. This is due to the path coefficient value of 0.358, which indicates consistency with the positive direction of the hypothesis. The t-statistics value meets the criteria, i.e., 5.355 > 1.645, and the p-value is 0.000 < 0.05.
5. The hypothesis that Loss Aversion negatively affects Investment Decisions in Generation Z is rejected. This is due to the path coefficient value of -0.098, which indicates consistency with the negative direction of the hypothesis. However, the t-statistics value does not meet the criteria, i.e., 1.098 < 1.645, and the p-value is 0.272 > 0.05.
6. The hypothesis that Loss Aversion positively affects Risk Perception in Generation Z is accepted. This is due to the path coefficient value of 0.207, which indicates consistency with the positive direction of the hypothesis. The t-statistics value meets the criteria, i.e., 3.952 > 1.645, and the p-value is 0.000 < 0.05.
7. The hypothesis that Risk Perception positively affects Investment Decisions in Generation Z is accepted. This is due to the path coefficient value of 0.254, which indicates consistency with the positive direction of the hypothesis. The t-statistics value meets the criteria, i.e., 2.745 > 1.645, and the p-value is 0.006 < 0.05.

Table 6. Hypothesis Testing (Direct Effect)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
OC -> ID	0,301	0,305	0,097	3,093	0,002
OC -> RP	0,404	0,405	0,056	7,229	0,000
LA -> ID	-0,098	-0,094	0,090	1,098	0,272
LA -> RP	0,207	0,209	0,052	3,952	0,000
HB -> ID	0,435	0,430	0,099	4,412	0,000
HB -> RP	0,358	0,356	0,067	5,355	0,000
RP -> ID	0,254	0,251	0,092	2,745	0.006

Source: Processed by the Researcher (2024)

Table 7. Hypothesis Testing (Indirect Effect)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
OC -> RP -> ID	0,103	0,101	0,040	2,507	0,010
HB -> RP -> ID	0,091	0,090	0,039	2,336	0,020
LA -> RP -> ID	0,052	0,052	0,023	2,314	0,021

Source: Processed by the Researcher (2024)

The evaluation of indirect relationships, particularly mediation, is based on the t-statistics and p-values. A mediation hypothesis is accepted if the t-statistics value exceeds the threshold of 1.645 with p-values less than 0.05, indicating a statistically significant relationship. Based on Table 8, it can be concluded that:

8. The hypothesis that Risk Perception mediates the relationship between Overconfidence and Investment Decision is accepted, as the t-statistics value meets the criteria, i.e., 2.507 > 1.645, and the p-value is 0.010 < 0.05.
9. The hypothesis that Risk Perception mediates the relationship between Herding Behavior and Investment Decision is accepted, as the t-statistics value meets the criteria, i.e., 2.336 > 1.645, and the p-value is 0.020 < 0.05.
10. The hypothesis that Risk Perception mediates the relationship between Loss Aversion and Investment Decision is accepted, as the t-statistics value meets the criteria, i.e., 2.314 > 1.645, and the p-value is 0.020 < 0.05.

Table 8. Results of the Mediation Test Criteria

Hypothesis	Effect		Result	Conclusion
H8	Direct	OC -> ID	Insignificant	*Full Mediation (Indirect Only)*
	Indirect	OC -> RP -> ID	Significant	
H9	Direct	HB -> ID	Significant	*Partial Mediation (Complementary)*
	Indirect	HB -> RP -> ID	Significant	
H10	Direct	LA -> ID	Insignificant	*Full Mediation (Indirect Only)*
	Indirect	LA -> RP -> ID	Significant	

Source: Processed by the Researcher (2024)

Based on Table 9, it can be concluded that:

1. Hypothesis 8 tests the role of Risk Perception as a mediator in the relationship between Overconfidence and Investment Decisions, showing a result of complete mediation. The interpretation of this result is that the Overconfidence variable does not directly affect Investment Decisions without the mediation of Risk Perception. In other words, Risk Perception fully mediates the effect of Overconfidence on Investment Decisions.
2. Hypothesis 9 tests the role of Risk Perception as a mediator in the relationship between Herding Behavior and Investment Decision, showing a result of partial mediation. The interpretation of this result is that the Herding Behavior variable still directly affects Investment Decisions. However, part of its effect is mediated through the Risk Perception variable. Thus, Risk Perception acts as a mediator that strengthens but does not entirely replace the effect of herd behavior on Investment Decisions.
3. Hypothesis 10 tests the role of Risk Perception as a mediator in the relationship between Loss Aversion and Investment Decision, showing a result of complete mediation. The interpretation of this result is that the Loss Aversion variable does not directly affect Investment Decisions without the mediation of Risk Perception. In other words, Risk Perception fully mediates the effect of Loss Aversion on Investment Decisions.

CONCLUSION

The conclusions from this study indicate that Overconfidence, herding behavior, and loss aversion have varying effects on investment decision-making. The overconfidence variable has no significant influence on investment decisions. This finding aligns with the research of Afriani and Halmawati (2019), which suggests that an individual's level of Overconfidence does not affect their investment decisions. This indicates that transactional experience does not necessarily correlate with the ability to make rational and data-driven investment decisions. The overconfidence variable also shows no significant effect on risk perception, consistent with the study by Almansour et al. (2023). This is because respondents tend to base decisions on objective data analysis and are influenced by more vital external factors despite having high confidence in their abilities. The herding behavior variable has a positive and significant effect on investment decisions. This result is consistent with Purwidianti et al. (2023), who state that herding behavior can encourage investors to follow the majority trend, potentially enhancing investment decisions. Herding behavior also has a positive and significant effect on risk perception. In line with Ahmed et al. (2022), herding behavior arises when individuals attempt to mitigate risk by following others. This behavior increases investor risk perception, as they worry about potential losses if they do not align with the majority's decisions. The loss aversion variable has no significant effect on investment decisions, which aligns with the findings of Nur Aini and Lutfi (2019), which indicate that an individual's loss aversion level does not impact their investment decisions. However, loss aversion positively and significantly affects risk perception, consistent with Hasan and Mustafa (2023). Loss aversion occurs because investors focus more on potential losses than on gains, causing the perceived risk to feel more significant than it is. The risk perception variable has a positive and significant effect on investment decisions. This result is supported by Purwidianti et al. (2023), who found that a well-developed risk perception promotes more prudent and rational decision-making.

Furthermore, risk perception fully mediates the relationship between Overconfidence and investment decisions, consistent with Almansour et al. (2023). Risk perception helps investors affected by Overconfidence to become more cautious and better consider risks, thereby promoting more accurate investment decisions. Risk perception partially mediates the relationship between herding behavior and investment decisions. It is also consistent with Almansour et al. (2023), indicating that risk perception assists investors influenced by herding behavior in more carefully considering the investment decisions they follow. Lastly, risk perception fully mediates the relationship between loss aversion and investment decisions, which is in line with Budiman and Jasika (2018). Loss aversion causes investors to focus more on potential losses than gains, increasing their sensitivity to risk. As a result, risk perception rises and can influence investment decisions by prompting investors to avoid risky choices, even when there are substantial opportunities for gains (Hasan & Mustafa, 2023).

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