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Does The Psychology of Investment Decisions Depend on Risk Perception and Financial Literacy?

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Abstract

This study examines and analyses the effect of overconfidence, herding effect, and disposition effect bias on investment decisions mediated by risk perception and moderated by financial literacy. The sample for this study uses 184 investors from 19 provinces in Indonesia using a purposive sampling technique. Regression partial least squares test the hypothesis with the Warp-PLS application version. The study's results found that overconfidence bias does not affect risk perception. Herding effect bias and disposition bias have positive effects on risk perception. Risk perception has a positive effect on investment decisions. Risk perception fully mediates the relationship between disposition effect bias on investment decisions. However, risk perception does not mediate the relationship between overconfidence bias and herding effect bias on investment decisions. Meanwhile, financial literacy must moderate the relationship between risk perception and investment decisions. The implication of the study is expected to assist the Financial Services Authority in increasing investors' financial literacy in the capital market.

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Introduction

During the last four years, there has been a phenomenon regarding the high interest of the Indonesian people to invest in the capital market which has been observed to have increased significantly (Kustodian Sentral Efek Indonesia, 2022). Especially, interest in investing instock instruments, mutual funds, bonds, or Government Securities. Data from the Indonesian Central Securities Depository (KSEI) reports that as of December 2022, the number of investors registered in single investor identification reached 10.300.069 people (Kustodian Sentral Efek Indonesia, 2022). Based on research Kim et al (2020), the phenomenon of the rising investment in Indonesia tends not to have an idea of the principles of rationality in their decisions, so many investors experience cut losses on their financial instruments. Therefore, the rationality of individual investors in financial markets is doubtful. This paradigm shift is illustrated by two main factors. The first is evidence that describes the existence of psychological influences that determine financial behavior. The second is the lack of a model that can rationally explain investment (Daniel & Hirshleifer, 2015).

In particular, this research discusses emotional bias among overconfidence, herding effect, and disposition effect bias. The behaviors are interesting to study because they can cause unstable market conditions. When investors are exposed to emotional bias, it can have an impact on portfolio losses. In the end, it can indirectly affect the cognitive investors in determining the level of perceived investment risk in the future. Therefore, it is important for investors to properly assess risk perception so that further investment decisions are optimal. There are ways to get around investor perceptions so that they are not biased by understanding financial literacy well (Adil et al., 2022).

Previous studies have carried out effect testing overconfidence, herding, and disposition effect bias to risk perception (Kartika & Iramani, 2013; Hussain & Ali, 2014; Yaowen et al., 2015; Dar et al., 2022; Ahmed et al., 2022; Nareswari et al., 2022). The findings of some of these studies are still inconsistent, so researchers need to confirm. In addition, the study of influence risk perception to investor decision Sindhu and Kumar (2014), Butt et al. (2015), Yaowen et al. (2015), Alquraan et al. (2016), Ademola et al. (2019), Nur Aini and Lutfi (2019), Ahmad and Shah (2020), and Ahmed et al. (2022), there are still inconsistencies in the results, so researchers need to confirm. Although many studies regarding the influence of risk perception on investor decision-making, there are not investigated the moderating effect of this relationship. Therefore, researchers extend previous studies by investigating the role of moderation financial literacy to improve the ability to explain the effect.

The second contribution lies in the methodological gap. Previous studies were only carried out in parts of Indonesia, for example, the research by Nur Aini and Lutfi (2019) and Nareswari et al. (2022) whose population scope was investors in the Surabaya and Jombang areas. Therefore, referring to the study of Ahmed et al. (2022), the respondents are all investors in Indonesia who invest in the capital market, directly or indirectly involved in stock trading on the Indonesian Stock Exchange.

Thus, this study aims to see the effect of emotional bias which is reflected in behavior overconfidence, herding, and disposition effect bias to investment decisions mediated by variables of risk perception and moderated by variables of financial literacy. This study is expected to be a reference for further research and advice so that investors do not prioritize their emotional side. Based on the research results show that financial literacy does not affect making investment decisions because it is not evenly distributed financial literacy in all provinces in Indonesia. The implication of this study is expected to assist the Financial Services Authority to increase investors' financial literacy in the capital market.

Hypothesis Development

Overconfidence Bias and Risk Perception

Overconfidence bias is an unwarranted belief in intuitive reasoning, judgment, and cognitive ability (Arifin & Soleha, 2019). When investors are exposed to overconfidence bias, then their behavior tends to exaggerate their abilities and ignore the possible risks that can occur. As a result, when the decision-making process is one-sided, investors tend to increase their self-confidence based on previous successful investment experiences. However, on the other hand, they only make assumptions based on the information collected so it is difficult to recognize the uncertainty of future investment risks. This condition causes investors to underestimate risk so it can have an impact on the cut loss of their investment (Kahneman & Lovallo, 1993). Based on prospect theory, when individuals decide to reinvest in conditions of future investment risk uncertainty, they will tend to increase their perception of future investment risk. This is due to previous investment cut-loss experience which tends to make individuals loss aversion to avoid uncertain investment risks in the future. Previous studies have been conducted by, Butt et al. (2015), Mallik et al. (2017), Ishfaq et al. (2017) and Nareswari et al. (2022) which state that overconfidence bias positive effect on risk perception. Based on the explanation above, the hypothesis is developed as follows:

H1: *Overconfidence Bias Positive Effect on Risk Perception*

Herding Bias and Risk Perception

Investors who are exposed to herding bias are irrational behaviors by following others when making investment decisions (Kumar & Goyal, 2015). As a result, investors tend to ignore personal information (Baddeley et al., 2010). This decision was unconsciously not supported by fundamentally correct information. In the end, investment decisions have the potential to be biased resulting in a cut loss impact on the investment. Rashid et al. (2019) stated that the impact of behavior herding significant effect on cognitive investors in determining the perception of investment risk in the next portfolio. Based on prospect theory, when individuals decide to reinvest in conditions of future investment risk uncertainty, it will tend to increase the perception of future investment risk. This is due to the experience of cutting losses on previous investments that make individuals tend to be exposed to the axiom of loss aversion to avoid uncertain investment risks in the future. Previous studies have been conducted by Hussain and Ali (2014) and Ahmed et al. (2022) stated that herding effect bias positive effect on risk perception. Based on the explanation above, the hypothesis is developed as follows:

H2: *Herding Effect Bias Positive Effect on Risk Perception*

Disposition Effect Bias and Risk Perception

Disposition effect bias is the tendency of investors to hold stocks lower and sell shares that won earlier (Pelster & Hofmann, 2018). Investors who are too hasty to act with a disposition effect, then their investment decisions have the potential to be biased and have a cut loss impact on their investments. The decision was not supported by fundamentally correct information. Rashid et al. (2019) stated that the impact of behavior disposition effect a significant effect on cognitive investors in determining the level of perceived investment risk in the next portfolio. Based on prospect theory, when individuals decide to reinvest in conditions of future investment risk uncertainty, it will tend to increase the perception of future investment risk. This is due to the experience of cutting losses on previous investments that make individuals tend to be exposed to the axiom of loss aversion to avoid uncertain investment risks in the future. Previous studies have been conducted by Ahmed et al. (2022) which state that disposition effect bias positive effect on risk perception. Based on the explanation above, the hypothesis is developed as follows:

H3: *Disposition Effect Bias positive effect on risk Perception*

Risk Perception and Investment Decision

Perceived risk is a person's perspective of interpreting risk based on information, personal experience, and beliefs they have. Risk perception plays an important role in making investment decisions. This is because cognitively the level of knowledge, experience, and confidence in previous investments shapes

the perspective of perceptions of subsequent investment risk and determines investment decisions (Forlani & Mullins, 2000). The higher the perceived risk of an instrument, the higher the investment proportion in a high-risk asset portfolio. Investors assume, if they invest in a risky asset portfolio, the return gain will be high. However, a rational investor will use prior investment knowledge, experience, and confidence to estimate and manage the portfolio optimally. Based on Markowitz's risk and return portfolio theory, the most optimal way to manage a portfolio is by considering each trade-off between risk and return that will be obtained later. Previous studies have been conducted by Sindhu and Kumar (2014), Butt et al. (2015), Ishfaq et al. (2017), and Ahmad and Shah (2020) which state that risk perception positive effect on investment decisions. Based on the explanation above, the hypothesis is developed as follows:

H4: *Risk Perception Positive Effect on Investment Decision.*

Overconfidence Bias, Risk Perception, and Investment Decision

Risk perception is crucial for investors in making investment decisions because it will determine their behavior in allocating their assets to financial instruments (Forlani & Mullins, 2000). If investors are overconfidence bias, they will obtain a return negative. The behavior tends to increase the perception of risk in the next investment portfolio (Busenitz & Barney, 1997). They make assumptions based on their past investment information, experience, and beliefs. Based on prospect theory, this behavior tends risk-averse or loss aversion to avoid uncertain investment risks in the future. Therefore, the perception of investment risk must be based on the right information, personal experience, and rational beliefs so that investment decisions are optimal. Studi Butt et al. (2015), Yaowen et al. (2015), Ishfaq et al. (2017), Ahmad and Shah (2020), and Dar et al. (2021) explained that the perception of risk mediates the relationship between overconfidence bias on investment decisions. Based on the explanation above, the hypothesis developed is as follows:

H5: *Risk perception mediates the relationship between overconfidence and Bias in Investment Decision*

Herding Bias, Risk Perception and Investment Decision

Risk perception is crucial for investors in making investment decisions because it will determine their behavior in allocating their assets to financial instruments (Forlani & Mullins, 2000). When the market crashes, individuals begin to act irrationally by following the decisions of other investors who are considered to have a high level of inclination toward risk estimates (Busenitz & Barney, 1997). Based on prospect theory, this behavior tends risk-averse or loss aversion to avoid uncertain investment risks in the future. It has the potential to be biased because they are not supported by correct fundamental information (Kumar & Goyal, 2015). In the end, behavior herding impacts stock prices that will deviate from their intrinsic value. Rashid et al. (2019) stated that the impact of behavior herding has a significant effect on cognitive investors in determining the level of perceived investment risk in the next portfolio. Hussain and Ali (2014) explains that perceived risk mediates the relationship between herding effect bias on investment decisions. Based on the explanation above, the hypothesis is developed as follows:

H6: *Risk perception mediates the relationship between herding Effect Bias Investment Decision*

Disposition Effect Bias, Risk Perception, and Investment Decision

Risk perception is crucial for investors in making investment decisions because it will determine their behavior in allocating their assets to financial instruments (Forlani & Mullins, 2000). Based on prospect theory, investors who are exposed to disposition effect bias tend to avoid risks or loss aversion (Genesove & Mayer, 2001). Investors who are too hasty to disposition effect, then the investment decisions are potentially biased. This is because the decision was not supported by correct fundamental information. Rashid et al. (2019) stated that the impact of disposition effect has a significant effect on cognitive investors in determining the level of perceived investment risk in the next portfolio. Ahmed et al. (2022) explained that the perception of risk mediates the relationship between disposition effect bias on investment decisions. Based on the explanation above the hypothesis is developed as follows:

H7: *Risk perception mediates the relationship between Disposition Effect Bias to Investment Decision*

Risk Perception, Investment Decision, and Financial Literacy

Financial literacy is crucial for investors in making investment decisions because it relates to individual knowledge, skills, and beliefs. It can determine future investment risk perceptions. Huston (2010) explains that individuals who have skills financial literacy properly tend to have a rational risk perception in making investment decisions. Therefore, investors need at least a basic understanding of the concept of financial literacy so that the investment obtains optimal benefits.

Sindhu and Kumar (2014) states that risk perception positive effect on investment decision. The higher the investor's perception of risk uncertainty, the higher the investment proportion in high-risk asset portfolios with assumptions of high-risk high return. The problem is the level of individual perception depends on the psychological condition of investors. There are ways to get around investor perceptions so that their investment decisions are not biased by understanding financial literacy well (Rooij et al., 2011). The better the level of financial literacy, the more optimal the investment decision (Ahmad & Shah, 2020). Based on the explanation above, the hypothesis is developed as follows:

H8: *Financial Literacy moderates the relationship between Risk perception to Investment Decisions.*

METHODS

This study uses a quantitative approach. This study uses primary data sources. Data is obtained directly from respondents by collecting them through distributing questionnaires on the website Google Forms. The data obtained is in the form of respondents' answers to several variable measurement instruments through 5-point Likert scale. The population of this study includes all investors in Indonesia who have invested in financial instruments in the capital market. The sample of this research is estimated to be 184 people. The determination of the sample size refers to the study of Malhotra (2014), at least 5 times the number of questionnaire statement items. This study uses a sample based on the technique of purposive sampling by sorting the sample according to the criteria and research objectives. The criteria used in studying the sample are individuals who have securities accounts in the capital market and transact at least once a year.

Tabel 1 Variable Operational Measurement

Variable	Indicator	Source
Investment Decision	1. Investment choice satisfaction 2. Willingness to invest in a stock	S. Ullah (2015)
Overconfidence Bias	1. Success belief 2. Predictive confidence 3. Better than average	Khan et al., (2016)
Herding Effect Bias	1. Choice of stock to trade with other investors. 2. The volume of stock to trade off other investors. 3. Buying and Selling decisions of other investors. 4. Speed of herding.	Kengatharan & Kengatharan, (2014)
Disposition Effect Bias	1. Confidence to sell the winning shares early. 2. Don't want big profits	Pompian (2011)
Risk Perception	1. Perception of risk as a situation that must be faced 2. Willingness to take risks in investment decisions	Ahmed et al. (2022)

Financial Literacy	1. Ability to manage and maintain finances 2. Ability to allocate assets into financial instruments	S. Ullah (2015)

The equation model used in this study is:

ID = α + β1OBRP + β2HERP+ β3DERP+ β4RPID+ β5AbsOBID-RP + β6AbsHEID-RP+ β7AbsDEID-RP +β8AbsRPID-FL + e

Information: ID: Investment Decision, a: N Constant, β: Regression Coefficient, OB: Overconfidence Bias, HE: Herding Effect Bias, DE: Disposition Effect Bias, RP: Risk Perception (mediation), FL: Financial Literacy (moderation), ε: error

Hypothesis testing

Hypothesis testing using the SEM method (Structural Equation Model) with WarpPLS version 8. There is testing of the outer model and inner model. The outer model consists of validity and reliability tests. Validity test consisting of convergent validity and discriminant validity. Convergent validity can be measured from the value of the loading factor. Discriminant validity is measured from the cross-loading value. The validity test parameter must be > 0.7. Meanwhile, the reliability test is measured from the composite reliability value with parameters > 0.7. The inner model consists of the Goodness of Fit Model with the APC, ARS, and AARS index value parameters that must be below 0.05. While the AVIF and AFVIF index values must be <3.3.

RESULTS AND DISCUSSION

Table 2 shows that variable investment decisions, overconfidence bias, herding effect bias, disposition effect bias, risk perception, and financial literacy are valid because of value outer loading factor has met the criteria > 0.7.

Table 2. Convergent Validity Test Results

Variable	Indicator	Loading Factor	Criteria	Decision
Investment Decision (Y)	Y1.2	0,816	>0,7	Valid
	Y1.3	0,792	>0,7	Valid
	Y1.4	0,786	>0,7	Valid
	Y1.5	0,857	>0,7	Valid
	Y1.6	0,74	>0,7	Valid
	Y1.7	0,796	>0,7	Valid
Overconfidence Bias (X1)	X1.2	0,734	>0,7	Valid
	X1.4	0,888	>0,7	Valid
	X1.5	0,932	>0,7	Valid
	X1.6	0,914	>0,7	Valid
	X1.7	0,907	>0,7	Valid
Herding Effect Bias (X2)	X2.1	0,891	>0,7	Valid
	X2.2	0,896	>0,7	Valid
	X2.3	0,907	>0,7	Valid
	X2.4	0,856	>0,7	Valid
Disposition Effect Bias (X3)	X3.3	0,826	>0,7	Valid
	X3.5	0,826	>0,7	Valid
	MED1.2	0,827	>0,7	Valid

Risk Perception (Med)	MED1.3	0,868	>0,7	Valid
	MED1.5	0,835	>0,7	Valid
Financial Literacy (Z)	Z1.2	0,883	>0,7	Valid
	Z1.5	0,883	>0,7	Valid

Table 3. Discriminant Validity Test Results

Indicator	ID	OB	HE	DE	RP	FL
ID	0,799	0,412	0,283	0,060	0,537	0,446
OB	0,412	0,878	0,405	0,341	0,139	0,385
HE	0,283	0,405	0,887	0,459	0,210	0,269
DE	0,060	0,341	0,459	0,826	0,121	0,103
RP	0,537	0,139	0,210	0,121	0,844	0,475
FL	0,446	0,385	0,269	0,103	0,475	0,883

Table 3 shows that the results of the Discriminant Validity test for all indicators have passed the due criteria. each indicator in each construct has the greatest value among the other constructs.

Table 4. Composite Reliability Test Results

Variable	Composite Reliability	Criteria	Decision
Investment Decision	0,913	>0,7	Reliable
Overconfidence Bias	0,944	>0,7	Reliable
Herding Effect Bias	0,937	>0,7	Reliable
Disposition Effect Bias	0,812	>0,7	Reliable
Risk Perception	0,881	>0,7	Reliable
Financial Literacy	0,877	>0,7	Reliable

Table 4 shows that all statement items variable investment decision, overconfidence bias, herding effect bias, disposition effect bias, risk perception, and financial literacy are reliable because the value composite reliability has met the criteria > 0.7.

Table 5. Model Fitment Test Results

Index	P-Value	Criteria	Decision
APC	P< 0,001	P<0,005	Meet the criteria
ARS	P<0,001	P<0,005	Meet the criteria
AARS	P<0,001	P<0,<005	Meet the criteria
AVIF	1,78	<=3,3	Meet the criteria
AFVIF	1,538	<=3,3	Meet the criteria

Table 5 shows that all indices (APC, ARS, and AARS) meet the criteria because their value is <0.05. In addition, the AVIF and AFVIF index values also met the criteria because their values were <3.3.

Table 6 shows that overconfidence bias does not affect risk perception. Herding effect and disposition effect bias positive effect on risk perception. Risk perception positive effect on investment decisions. Risk perception fully mediates the relationship between disposition effect bias to investment decisions, but risk perception does not mediate the relationship between overconfidence and herding effect bias to investment decisions. Temporarily, financial literacy is unable to moderate the relationship between risk perception and investment decisions.

Hypothesis testing

Table 6. Direct Effect Hypothesis Test Results

Hypothesis	B	p-value
H1 (OB-RP)	0,012	0,434
H2 (HE-RP)	0,146	0,021
H3 (DE-RP)	0,291	< 0,001
H4 (RP-ID)	0,498	< 0,001
H5 OB-RP-ID	0,006	0,454
H6 HE-RP-ID	0,073	0,079
H7 DE-RP-ID	0,145	0,002
H8 RP-FL ID	-0,097	0,091

DISCUSSION

Overconfidence Bias and Risk Perception

The findings of this study indicate that overconfidence bias does not affect risk perception. It means, if an individual is overconfident in bias on previous investments, it has no effect on the perception of risk in the next investment. This is because the mindset and risk tolerance of each individual is different. Investors who risk seekers, so their behavior remains aggressive and speculative in viewing investment risk. Meanwhile, investors, who risk averse their behavior remain conservative in viewing investment risk (Hartanto et al., 2023). In addition, the type of investment the respondents of this study are the dominant stock with the highest level of investment risk compared to other types of investment. This finding is consistent with research by Kartika and Iramani (2013) which states that the overconfidence bias effect does not affect risk perception.

Herding Effect Bias and Risk Perception

The findings of this study indicate that herding effect bias positive effect on risk perception. It means, Individuals who herding effect bias and cut loss will tend to be careful and have a higher perception of investment risk in the future (Busenitz & Barney, 1997). The results of this study are consistent with loss aversion in prospect theory which states that individual behavior tends to avoid risk and optimize the probability of return on investment (Combrink & Lew, 2020). This finding is consistent with previous research from Hussain and Ali (2014) and Ahmed et al. (2022) which states that herding effect bias positive effect on risk perception.

Disposition Effect Bias and Risk Perception

The findings of this study indicate that disposition effect bias positive effect on risk perception. Based on the utility function prospect theory that individuals are exposed to disposition effect biased because they tend to be risk-averse in a profit condition by selling the shares immediately to win (Singh, 2016). Therefore, the disposition effect of individuals who are exposed to disposition effect bias, they tend to be careful and have a higher perception of the uncertainty of future investment risk (Busenitz & Barney, 1997). The results of this study are consistent with loss aversion in the prospect theory that individuals tend not to want investment risks that are too high (Ritter, 2003). This finding is consistent with Ahmed et al. (2022) who state that disposition effect bias positive effect on risk perception.

Risk Perception and Investment Decision

The findings of this study indicate that risk perception positive effect on investment decisions. This means that individuals who have a high-risk perception can influence their high propensity to make investment

decisions. Investors assume investing in risky asset portfolios, then the expected return gain is also high. Therefore, investors deal with high-risk portfolios by investing in a diversified manner. Based on Markowitz's risk and return portfolio theory, the most optimal way to manage a portfolio is by considering each trade-off between risk and return that will be obtained later. This finding is consistent with previous research from Sindhu and Kumar (2014), Butt et al. (2015), Ishfaq et al. (2017), and Ahmad and Shah (2020) which state that risk perception has a positive effect on investment decisions.

Overconfidence Bias, Risk Perception and Investment Decision

The findings of this study indicate that risk perception does not mediate the relationship between overconfidence bias to investment decisions. The tendency to be overconfident for each investor is different, which is determined by the mindset and risk tolerance of each individual. Investors who risk seekers, so their behavior remains aggressive and speculative in viewing investment risk. Meanwhile, investors, who risk averse their behavior remain conservative in viewing investment risk. Therefore, the investment experience tends to overconfidence bias unable to determine risk perception and subsequent portfolio investment decisions are more rational. This finding is consistent with the research of Kartika and Iramani (2013) and Mallik et al. (2017) which explains that risk perception does not mediate the relationship between overconfidence bias to investment decision. Investors tend to stick to the concept of high-risk high return, low-risk low return (Rahma et al., 2022).

Herding Effect Bias, Risk Perception, and Investment Decision

The findings of this study indicate that risk perception does not mediate the relationship between herding effect bias to investment decisions. There are differences in the mindset of each individual in investing. Investors tend to be risk seekers, so their behavior remains aggressive and speculative in viewing investment risk. Meanwhile, investors tend to be risk-averse, so their behavior remains conservative in viewing investment risk. This finding is consistent with previous research from Ahmed et al. (2022) which explains that risk perception does not mediate the relationship between herding effect bias to investment decisions.

Disposition Effect Bias, Risk Perception, and Investment Decision

The findings of this study indicate that risk perception mediates the relationship between the disposition effect and bias in investment decisions. These findings support the prospect theory that investors tend to avoid risk uncertainty and optimize the value or return on their investment portfolios. Therefore, the information and past experiences help investors to make efficient investment decisions, behave optimally in certain situations and get better investment returns. This finding is consistent with previous research from Ahmed et al. (2022) which explains that risk perception mediates the relationship between disposition effect bias the investment decision.

Risk Perception, Investment Decision, and Financial Literacy

The findings of this study indicate that financial literacy does not moderate the relationship between risk perception to investment decisions. There are differences in the ability of financial literacy of each respondent. Indonesians also tend to ignore the results of previous investment loss experiences. They assume that investment losses stem from overconfidence and that the herding effect or dispositional bias is a non-systematic risk that must be faced. Most of the respondents in this study tend to be willing to take risks even though their financial literacy skills are low, so changes in risk perception do not affect investment decisions in the capital market. This finding is consistent with previous research from the research results of Tandio and Widanaputra (2016) and Listyani et al. (2019) which explain that perceived risk does not affect investment decisions. Arrow (1971) states that a person tends to ignore risk if the thing at stake is not big.

Conclusions and Recommendations

The results of the study found that overconfidence bias does not affect risk perception. Herding and disposition effect bias have positive effect on risk perception. Risk perception has a positive effect on investment decisions. Risk perception fully mediates the relationship between disposition effect bias to

investment decisions, but risk perception does not mediate the relationship between overconfidence and herding effect bias to investment decisions. Temporarily, financial literacy is unable to moderate the relationship between risk perception and investment decisions.

The implication is that this study is expected to assist the Financial Services Authority in increasing investors' financial literacy in investing in the capital market. The limitation of this research is respondents only from 19 provinces in Indonesia with individual investor respondents. Therefore, further research opportunities are suggested to obtain a complete sample from 34 provinces in Indonesia with respondents who invest more often such as brokers, investment managers, financial institutions, etc. In addition, it is suggested to add the mediating role of the information asymmetry variable as a moderating variable.

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