Research Article

The Effect of Overconfidence Bias, Risk Tolerance, and Herding Bias on Stock Investment Decisions with Financial Literacy as a Moderation Variable

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Abstract.
This study aims to analyze the effect of Overconfidence Bias, Risk Tolerance, and Herding Bias on Stock Investment Decisions with Financial Literacy as a Moderating Variable. The subjects in this study were: (1) Students aged >17 years to 27 years, (2) having financial assets in the stock sector, (3) had done trading, and (4) domiciled in DIY, (5) or joined KSPM (Capital Market Study Group). KSPM members were chosen as research subject because they are considered as individuals who understand more about stocks and follow the development of the capital market. In this study, the sample amounted to 120 respondents selected using purposive sampling analysis technique, then the data was processed using the SPSS 25 software. Data were collected through a survey by distributing questionnaires online via Google Form to various social media platforms such as WhatsApp, line, telegram, Instagram, and twitter (now X). Based on the analysis that has been done, the results show that Overconfidence Bias, Risk Tolerance, and Herding Bias have a positive and significant effect on stock investment decisions, while Financial Literacy moderates a negative and significant effect on the influence of Overconfidence Bias, Risk Tolerance, and Herding Bias on stock investment decisions.

Keywords: Overconfidence Bias, Risk Tolerance, Herding Bias, Financial Literacy, Investment Decisions

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1. Introduction

Currently the government is trying to restore economic growth affected by the Covid-19 pandemic. The realization of Indonesia's economic growth reached -5.32% in the second quarter and was predicted by Finance Minister Sri Mulyani that economic growth would increase by -2.9% to -1% (BPS, 2020). Based on these statistics, it shows that economic growth in Indonesia is still at a minus level, which can lead to a recession. Economic growth in Indonesia is targeted at 5% by the government and is predicted to be achieved in 2021. On this occasion, the Indonesian government is trying to take advantage of

opportunities to recover economic growth in 2021 as a result of the Covid-19 pandemic which has caused the global economy to experience conditions of uncertainty. In order for the Indonesian economy to grow rapidly, the Indonesian government must take advantage of the various potentials that exist, one of which is the investment sector. The investment sector is one of the sectors that is the main driver of the economy so that it plays an important role in economic growth in Indonesia. According to Sari (2017), the government also targets an investment ratio of 8% to gross domestic to be achieved.

In recent years, stock investment has been in the spotlight and is considered quite attractive by the public in this modernization era. In addition, the capital market is also an index of a country's economic development.
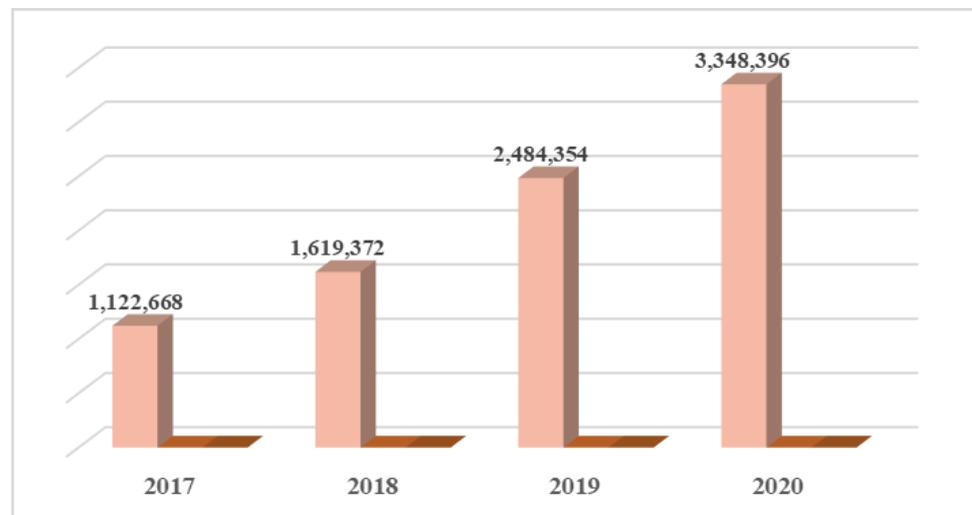
Figure 1: Number of Capital Market Investors in Indonesia 2017-2020. Source: (PT Kustodian Sentral Efek Indonesia, 2020).

Based on the graph above, it shows that there has been a significant growth in the number of investors starting from 2017-2020 in Indonesia, this indicates that the Indonesian people have a high interest in investing.

Based on data reported by KSEI (2020) young investors (aged <=30 years) significantly dominated the Indonesian capital market during 2019 and 2020. In 2019 young investors contributed around 44.65% and in 2020 amounted to 54.79% of existing investors. This proves how fast young investors are growing in the Indonesian Capital Market.

Even though in the midst of the pressure of the Covid-19 pandemic it has not made the people of the Special Region of Yogyakarta (DIY) less interested in investing in the capital market. This is evidenced by the entry of DIY into the top 10 in 7th Province with the highest number of SID shares in 2020.

TABLE 1: List of the Top-10 Provinces with the most SID shares in Indonesia for December 2020.

No.	Province	Number of SID (Single Investor Identification)
1.	DKI Jakarta	350.369
2.	West Java	278.679
3.	Central Java	176.694
4.	Banten	110.086
5.	North Sumatra	85.267
6.	Bali	38.697
7.	In Yogyakarta	37.523
8.	South Sumatra	33.412
9.	Riau	31.590
10.	South Sulawesi	29.624

Source: (Financial Services Authority, 2020)

The table shows that DIY is one of the cities with a large number of SID shares compared to cities in other regions such as South Sumatra, Riau, and South Sulawesi. Single Investor Identification (SID) is linguistically defined as Single Investor Identity Number. SID is obtained when a person becomes an investor in the Indonesian capital market. This code is used by customers, investors, and or other parties based on applicable regulations to carry out activities related to securities transactions. In addition, even though amidst the pressure of the Covid-19 pandemic it has not reduced the interest of the people of the Special Region of Yogyakarta (DIY) to invest in the capital market. Based on data obtained from the Financial Services Authority (OJK), it is known that the number of Single Investor Identification (SID) until the second quarter of 2020 has increased compared to last year in the same period. The climate for stock market investors during the pandemic is still relatively normal. It was recorded that in the second quarter of 2020 the achievements of investors in DIY were 51,999 accounts, whereas in the previous year in the same period it was smaller, namely 45,728 accounts (OJK, 2020).

Investors' choices when it comes to investments are impacted by their individual characteristics or traits. Some investors tend to be cautious, while others are more moderate, and still, others exhibit a more aggressive approach. These distinctions in investor temperament or traits stem from psychological factors that play a role in shaping their investment decisions. Hermalin and Isen (2000) argue that emotional engagement is a factor in the decision-making process for investors, potentially leading to irrational choices. This perspective aligns with research conducted by Theressa and Armansyah

(2022), which highlights that investors' irrational behavior often manifests as biased decision-making. Consequently, it is plausible that young investors may also allow their emotions to influence their investment decisions, underscoring the importance of emotional maturity in this context.

Overconfidence bias which is an unwarranted overconfidence in judgment, cognitive ability, rational reasoning, and intellect so that a person overestimates the predictive ability and accuracy of the information presented (Pompian, 2012). A high level of confidence by an investor can make him overconfident in his knowledge and tend to underestimate the risks that might occur and also exercise excessive control over a phenomenon. In addition, overconfidence bias can make investors do overtrading which causes portfolio returns to be low so that the risks they bear are even greater.

The selection of the type of investment and the amount of funds invested are also strongly influenced by the investor's tolerance for risk, which is then referred to as risk tolerance. Salvatore (2020) explains that risk tolerance is behavior towards risks faced regarding whether the investor likes risk (risk seeker) or the type that avoids risk (risk averter) or also ignores risk (risk neutral). Different types of investors allow for differences in terms of making investment decisions, besides that it is also influenced by the size of the allocation of funds held for investment.

The definition of herding bias according to Salvatore (2020) is a bias in which the behavior of investors in making investments tends to follow the behavior of other investors. It found 8.4% of herding behavior on the Indonesia Stock Exchange (IDX) in a study conducted by Setiyono et.al, (2013). Therefore, it is possible that there is a tendency for herding bias in investment decisions on the Indonesia Stock Exchange (IDX).

In previous studies there were differences in results (reseach gap) between one study and another. Research by Vitmiasih et al (2021); Pranyoto et al (2020); And Puspawati & Yohanda (2022) states that Herding Bias has no significant effect on rational investment decision making while research by Afriani & Halmawanti (2019); Madaan & Singh (2019); Novianggie & Asandimitra (2019); Akinkoye & Bankole (2020) stated differences in research results which stated that herding bias had a significant effect on investment decisions. Research by Setiawan et al (2018); Addinpujoartanto & Darmawan (2020); Baihaqqy et al (2020); Arik & Sri (2021); Novianggie & Asandimitra (2019) states that overconfidence bias has a positive effect on stock investment decisions while research by Ahmad & Shah (2020); Bakar & Yi (2016); And Park et al (2012) states that overconfidence has no significant effect on investment decisions. Research by Salvatore (2020); Pranyoto et al (2020); And Kusumaningrum et al (2019) revealed that risk

tolerance has no positive effect on investors' investment decision making, while different results are shown by research Wardani & Lutfi (2019); Masruroh & Sari (2021); And Budiarto (2017) states that risk tolerance has a positive effect on investment decisions. Based on previous research, it shows that there are inconsistencies in the results of research between one researcher and another researcher so that it is suspected that there are other factors or variables that can affect both of them, one of which is by adding a moderating variable, namely Financial Literacy. In addition, based on the previous studies mentioned above, it is known that the research samples are different, where the samples are not categorized as young or mature and professional or non-professional investors. The sample they used included only individual investors located in their respective regional areas.

Therefore, this research is a research development from Vitmiasih et al (2021) which uses representative bias, herding effect, and rational investment decisions variables. The results of research conducted by Vitmiasih et al (2021) state that there is a significant negative effect between representative bias behavior and rational investment decision making. Meanwhile, the herding effect has no significant effect on rational investment decision making. In addition, this research is also a reference to the research of Mutawally & Haryono (2019), in which the object and research area are Surabaya students, while in this study, students in the Special Region of Yogyakarta. As it is known that DIY is synonymous with the term "Student City/Education City". Based on data obtained from the official website of the Region V Yogyakarta Higher Education Institution (LLDKTI) In 2022 there will be 102 tertiary institutions which have several categories including academic, polytechnic, high school, institute and university. The number of registered students in 2020 in the DIY Province was recorded at 402,883 (PDDikti, 2020). The growth of universities and the rising student population in Yogyakarta has led IDX DIY to actively encourage investment among young individuals, including students. This is evidenced by the increasing number of Investment Galleries in several Yogyakarta Universities. According to data reported by the IDX official website, IDX as of December 31, 2019, 36 universities in Yogyakarta have Investment Galleries. Therefore, this research was conducted in DIY to test whether there are differences in research results between the City of DIY and other cities like Surabaya Pradikasari & Isbanah (2019) show that the variables overconfidence and risk tolerance effecton investment decisions; meanwhile investors in Semarang city Sukmasari (2021) show that overconfidence has a positive and significant effect on investment decisions, herding bias has a positive and significant effect on investment decisions, loss aversion has a significant negative effect on investment decisions.

In previous studies, there are differences in results (reseach gap) between one study and another. Research by Vitmiasih et al (2021); Pranyoto et al (2020); and Puspawati & Yohanda (2022) states that herding bias has no significant effect on rational investment decision making, while research by Afriani & Halmawanti (2019); Madaan & Singh (2019); Novianggie & Asandimitra (2019); Akinkoye & Bankole (2020) states different research results which state that herding bias has a significant effect on investment decisions. Research by Setiawan et al (2018); Addinpujoartanto & Darmawan (2020); Baihaqqy et al (2020); Arik & Sri (2021); Novianggie & Asandimitra (2019) states that overconfidence bias has a positive effect on stock investment decisions while research by Ahmad & Shah (2020); Bakar & Yi (2016); and Park et al (2012) states that overconfidence has no significant effect on investment decisions. Research by Salvatore (2020); Pranyoto et al (2020); and Kusumaningrum et al (2019) revealed that risk tolerance does not have a positive effect on investor investment decision making, while different results were shown by Wardani & Lutfi's research (2019); Masruroh & Sari (2021); and Budiarto (2017) stated that risk tolerance has a positive effect on investment decisions. Research by Adil et al., (2021) states that financial literacy moderates the relationship between overconfidence and investment decisions of female and male investors. From the results of his research, financial literacy is considered the most significant factor in reducing overconfidence bias. He also mentioned that financial literacy statistically and significantly moderates the relationship between herding bias and investment decisions among female investors but is not significant among male investors.

This study builds upon the research conducted by Vitmiasih et al (2021), which incorporated representative bias, the herding effect, and rational investment decision variables. What sets this investigation apart from prior studies is the inclusion of two new independent variables: overconfidence bias and risk tolerance, as well as the intro-duction of a moderating variable called financial literacy. Based on previous research, it shows that there are inconsistencies in the results of research between one researcher and another, so it is suspected that there are other factors or variables that can influence both, one of which is by adding moderating variables, namely financial literacy. In addition, based on the previous studies mentioned above, it is known that the research sample is different, where the sample is not categorized at a young or established age and professional or non-professional investors. The samples they used only included individual investors in their respective regional areas. Therefore, the three variable effects need to be tested again because there is a possibility of sample differences from previous studies. This research is expected to contribute to the understanding

and knowledge of the community, especially young investors (students) so as not to be rash and consider carefully in making investment decisions.

2. Literature Review and Hypotheses

2.1. Prospect Theory

This theory was introduced by Kahneman & Tversky (1979) regarding the theory of decision-making carried out by humans whose results are uncertain in some situations. This theory explains and introduces the cognitive basis of errors or *bias* done by humans. *Prospect theory* asserts that one does not always act rationally, one adds psychological factors such as emotional aspects and erratic behavior to rational choices. Emotional involvement, preferences, traits, and various kinds of things that are inherent in humans often cause humans to not always behave rationally in making decisions (Kahneman & Tversky, 1979). This theory emphasizes that there is a continuous bias caused by psychological factors that affect individual choices in conditions of uncertainty.

2.2. Behavioral Finance

This theory delineates the fusion of classical economic theory and finance with psychology and the science of decision-making, as articulated (Pompian, 2012). More specifically, behavioral finance endeavors to explore the questions of "what," "why," and "how" in the realm of finance and investment through a human-centric lens. Its primary objective is to comprehend and forecast the systemic implications of financial markets from a psychological standpoint. Barberis & Thaler (2003) highlighted that the fundamental premise of behavioral finance rests on cognitive psychology and is constrained to the domain of arbitrage. Psychological literature has uncovered that individuals tend to commit systematic cognitive errors, driven by overconfidence in their abilities or expertise and an excessive reliance on past experiences (Ritter, 2003). The concept of limited arbitrage seeks to elucidate the causes of stock price deviations that elude rational investors' observations. Irrational decisions can arise when investors succumb to belief biases, especially in situations marked by uncertainty (in accordance with heuristic theory) and specific risks (as postulated by prospect theory).

2.3. Overconfidence Bias

Overconfidence bias is one of the implications of prospect theory which shows that a person can behave biased or irrational caused by individual psychological factors. Overconfidence causes investors to really believe that their analytical skills are accurate even though this attitude is only an illusion and can result in investment losses (Sari & Damingun, 2021). An excessive level of confidence by investors can make them overconfidence in their knowledge, underestimate risks, and over control over the phenomena that occur. Overtrading is one of the consequences of irrational behavior with overconfidence bias which causes low portfolio returns so that the risks borne are greater.

The results of previous research conducted by Setiawan et al (2018); Addinpujoartanto & Darmawan, (2020); Baihaqqy et al (2020); Arik & Sri 2021); Novianggie & Asandimitra (2019) states that overconfidence bias has a positive and significant effect on investment decisions. This means that the higher the individual's overconfidence behavior, the more irrational the investment decision. Based on the statement above and previous studies, the authors formulate a hypothesis for student stock investment decisions, namely as follows:

H1: Overconfidence bias has positive effect on stock investment decisions

2.4. Risk Tolerance

Risk tolerance is the maximum amount of uncertainty that a person can accept when making decisions (Putra et al., 2016). The level of competence that is acceptable in taking an investing risk is referred to as risk tolerance. Every investor has a different level of risk tolerance. Risk is divided into three if associated with investor preferences, namely (1) the type of investor who likes to take risks (risk seeker), (2) the type of investor who avoids risk (risk averter), (3) the type of investor who is neutral to risk (risk neutral). The relationship between risk tolerance and prospect theory is that when the investor is a type of risk seeker, he will boldly make investment decisions and does not rule out the possibility that he makes these decisions without being based on available information so that it is feared that he will behave irrationally in making investment decisions and take risks. loss. While the type of risk averter investor, he will tend to avoid investments that are considered high risk, so he prefers to invest in assets that have a small risk. While the type of risk neutral investors they tend to ask for an increase in return in accordance with the increase in risk. Age, career status, socioeconomic standing, income, wealth,

and the time of income prospects can all influence risk tolerance. Because of these differences, it can be said that risk tolerance has an influence on investment decision making.

Results of previous research conducted Wardani & Lutfi (2019); Masruroh & Sari (2021); Esra & Salvatore (2020); And Budiarto (2017) states that risk tolerance has a positive and significant effect on investment decisions. This shows that the higher the risk tolerance in a person, they will tend to be braver in making investments compared to other people and are more willing to bear losses from the investments they take. Based on previous statements and studies, the authors formulate a hypothesis for student stock investment decisions, namely as follows:

H2: Risk tolerance has positive effect on stock investment decisions

2.5. Herding Bias

Herding bias is the tendency of investors' financial behavior to follow the behavior of other investors (Addinpujoartanto & Darmawan, 2020). Setiawan et al. (2018) defined herding bias as the tendency of investors to copy other investors in investing without first conducting fundamental analysis, resulting in an inefficient market. Investors believe that other investors have greater competence when making investment judgments, therefore they will mimic the investor's investing conduct. Herding conduct enables investors to act impulsively and react fast to changes in the decisions of other investors without taking into account the hazards that may develop (Madaan & Singh, 2019). Herding bias occurs when private knowledge concerning group or individual decisions is overshadowed by the influence of public information (Areiqat et al., 2019).

Results previous research conducted Afriani & Halmawanti (2019); Madaan & Singh (2019); Novianggie & Asandimitra (2019); Akinkoye & Bankole (2020) states that herding bias has a positive and significant effect on stock investment decisions. The findings from this research suggest that as an investor's inclination toward herding behavior increases, so does the likelihood of making irrational investment decisions. This is in line with the research conducted Madaan & Singh (2019) and Yi & Xiugang (2019) which states that herding bias will increase irrationality in making the resulting investment decisions. Based on previous research and statements, the authors formulate a hypothesis for student stock investment decisions, namely as follows:

H3: Herding bias has positive effect on stock investment decision making.

2.6. Overconfidence Bias, Financial Literacy, and Investment Decision

Someone who is indicated to have an overconfidence bias tends to exaggerate the ability, knowledge, and accuracy of the information he has, but ignores publicly available information and is able to make decisions unconsciously. (Wendy, 2021) Overconfidence bias behavior can make investors make reckless decisions and can result in losses. Financial literacy is an important factor that must be considered when making investment decisions. Financial literacy contributes to minimizing the possibility of biased financial decision making (Schmeiser & Seligman, 2013). Takeda et al (2013) who found that individuals with high financial literacy tend not to be overconfident. Before making an investment decision, an investor with high literacy will consider several aspects such as the types of stocks chosen to the risks that may occur in the future.

Several previous studies conducted by Setiawan et al (2018); Addinpujoartanto & Darmawan, (2020); Baihaqqy et al (2020); And Arik & Sri (2021) discovered a significant positive relationship between overconfidence bias and investment decision-makings. Different results are shown by Ahmad & Shah (2020); Bakar & Yi (2016); And Park et al (2012) states that overconfidence has no significant effect on investment decisions. Based on the inconsistency of the results of previous research, this raises the allegation that there are other variables that are able to influence both by adding a moderating variable, namely Financial Literacy. Based on previous research and statements, the authors formulate a hypothesis for student investment decisions, namely as follows:

H4: Financial literacy weaken the effect of overconfidence bias on stock investment decisions.

2.7. Risk Tolerance, Financial Literacy, and Investment Decision

According to Hallman & Rosenbloom (1987) investor risk tolerance is subjective rather than objective, and it is difficult to quantify because investor risk tolerance refers to how well an investor is able to deal with stock price volatility, as well as how well he is able to control attitudes and emotional tolerance in dealing with risk. Subjective behavior and emotional involvement in investment decisions are irrational actions, according to prospect theory, which states "Sometimes, individuals don't consistently make rational decisions." due to psychological factors such as emotional involvement, traits, preferences, and other things that are inherent in a person, resulting in irrational decision making (Kahneman & Tversky, 1979). As a result, proper financial literacy for

investors is required to control this illogical behavior. Individuals with high financial literacy are more risk-tolerant than those with low financial literacy (Hermansson & Jonsson, 2021). Financial literacy helps to make effective financial decisions (Samsuri et al., 2019).

Based on previous research conducted by Wardani & Lutfi (2019); Masruroh & Sari (2021); And Budiarto (2017) found a significant positive effect between risk tolerance and investment decisions. Different results are shown by Salvatore's research (2020); Pranyoto et al (2020); And Kusumaningrum et al (2019) revealed that Risk Tolerance has no positive effect on investors' investment decision making. Based on the inconsistency of the results of previous research, this raises the allegation that there are other variables that are able to influence both by adding a moderating variable, namely Financial Literacy. Based on previous research and statements, the authors formulate a hypothesis for student investment decisions, namely as follows:

H5: Financial literacy weaken the effect of risk tolerance on stock investment decisions.

2.8. Herding Bias, Financial Literacy, and Investment Decision

Herding bias refers to the inclination of an investor to base their investment decisions on the choices made by fellow investors (Novianggie & Asandimitra, 2019). Investors with herding tendencies overlook existing information (basic analysis) and instead mimic the behavior of other investors while making investing decisions. Financial literacy plays a role in minimizing the possibility of making biased financial decisions or in other words assisting investors in making rational decisions (Schmeiser & Seligman, 2013). Financial literacy helps investors to refute irrelevant information, gives investors the ability to analyze financial products before choosing what type of investment to take, and keeps investors away from herding behavior (Sabir et al., 2019). Meanwhile, investors with low financial literacy in making their decisions are influenced by the advice given by their brokers, friends and family so there is an opportunity for biased decisions to occur.

Results of previous research by Afriani & Halmawanti (2019); Madaan & Singh (2019); Novianggie & Asandimitra (2019); Akinkoye & Bankole (2020) found a significant positive effect between herding bias and investment decisions. Different results were shown by Vitmiasih et al (2021); Pranyoto et al (2020); And Puspawati & Yohanda (2022) states that Herding Bias has no significant effect on rational investment decision making. Based on the inconsistency of the results of previous research, this raises the notion that there

are other variables that are able to influence both by adding a moderating variable, namely financial literacy.

H6: Financial literacy weaken the effect of herding bias on stock investment decisions.

3. Research Methodology

3.1. Types of Research

This research method uses a quantitative approach using a questionnaire survey. In this research method, the research uses a causality conclusive research design method. Malhotra (2009) defines causality research as a form of approach that aims to prove the existence of a causal relationship and the effect that will arise from the independent variables.

3.2. Population, Sample, and Sampling Technique

The population in this study were students from various universities in DIY that have investment galleries. While the samples in this study were (1) young investors who are domiciled in DIY, (2) aged > 17 years to 27 years, (3) have financial assets in stocks, (4) have traded, and (5) or incorporated in KSPM (Capital Market Study Group). The sampling technique used purposive sampling. The purposive sampling technique was used to select respondents such as meeting the age criteria, length of investment, and also the type of investment the respondent had.

3.3. Data Collection Technique

In this study, data collection techniques were carried out by distributing questionnaires or questionnaires. In this research primary data was used, therefore this data collection technique was carried out by distributing questionnaires to get respondents online (spread gform links via social media) such as: whatsapp, instagram, line, telegram, and twitter.

3.4. Operational Definition

1. Independent Variable

Independent variables are variables that affect or cause changes in the dependent variable. The independent variables in this study include Overconfidence Bias, Risk Tolerance, and Herding Bias.

2. Dependent Variable

The dependent variable is the variable that is influenced by the independent variables, the dependent variable in this study is stock investment decisions.

3. Moderation Variable

Moderating variables are predictor variables that affect the direction and/or the strength of the relationship between independent and dependent variables, or between predictor and outcome variables (Creswell, 2018). The moderating variable in this study is financial literacy.

4. Result

Respondents who were sampled in this study were students from various universities in DIY. The number of distribution and collection of questionnaires can be summarized in the following table:

The description of the research respondents is as follows:

4.1. Descriptive Statistics

Descriptive statistical analysis consists of the number of samples, minimum value, maximum value, mean (mean) and standard deviation of each variable.

Based on the table of descriptive statistical test results above, it can be concluded that the respondent data amounted to 120 respondents with a minimum value, maximum value, mean, and standard deviation respectively. Then all variables show that the variables taken as samples are good, while the standard deviation value for each variable is away from the number 0, it can be stated that the data spread is quite diverse.

4.2. Validity Test

To see the validity of each questionnaire item, corrected item-total correlation was used. The results of r count are compared with r table, where r table = 0.1793 with a one-way

TABLE 2: Operational definition.

Variable Type	Variable Definitions	Indicator	Grain Statement
Overconfidence Bias (X1)	*Overconfidence bias* is unreasonably excessive belief in judgment, cognitive abilities, rational reasoning, and intellect so that a person overestimates the predictive ability and accuracy of the information presented (Pompian, 2012).	Confidence in the success of a plan. The ability and accuracy of predicting stocks. Level of skills, experience, and knowledge of stock investment (Pompian, 2012)	1-6
Risk Tolerance (X2)	The highest level of uncertainty a person may take when making a decision is defined as *risk tolerance* (Putra et al., 2016).	The level of courage to face risk. The level of courage to make stock investment decisions. (Esra & Salvatore, 2020)	1-4
Herding bias (X3)	The phenomenon where investors tend to mimic the actions of fellow investors in their financial decisions is referred to as the *herding bias* (Addinpujoartanto & Darmawan, 2020).	The comfort level of having the same stock investment as other investors. The degree of dependence on other investors in making decisions. Reaction to decisions of other investors. (Vijaya, 2014)	1-4
Financial Literacy (X4)	*Financial literacy* is a measure to assess how far a person's knowledge of financial concepts, the ability to manage their finances through appropriate planning and strategies before making financial decisions taking into account the economic conditions that occur (Remund, 2010).	Knowledge of interest rates Knowledge of inflation Knowledge of the time value of money Knowledge of investment Knowledge of risk diversification (Knoll & Houts, 2012)	1-6
Stock Investment Decision (Y)	Investment decision is a process of selecting certain alternatives from several existing stock investment options (Afriani & Halmawati, 2019).	Confidence in inner feelings and reactions when making investment decisions. Involvement of instinct in investment decision making Belief in one's intuition Belief in the accuracy of investment decisions made. (Scott & Bruce, 1995)	1-4

TABLE 3: Sample and Rate of Return Questionnaire.

Information	Amount	Percentage
Returned questionnaire	125	100%
Questionnaires that cannot be processed	5	4%
Questionnaires that can be processed	120	96%

significance test (df = N-2 ; 120-2 = 118 at a significance level of α = 0.05). If r count > r table (at a significance level of 5%) then it can be said to be valid and vice versa. The following are the results of the validity test in the research that has been done:

TABLE 4: Respondent Characteristics.

No	Category	Sub-Category	Frequency	Percentage
1	Gender	Man	59	49.2%
		Woman	61	50.8%
2	Age	18	6	5%
		19	16	13.3%
		20	23	19.2%
		>20	75	62.5%
3	University	Yogyakarta Muhammadiyah University	63	52.5%
		Gadjah Mada University	10	8.3%
		Yogyakarta State University	4	3.3%
		University of Technology Yogyakarta	12	10%
		Indonesian Islamic University	7	5.8%
		Yogyakarta Atma Jaya University	4	3.3%
		Ahmad Dahlan University	2	1.7%
		University of Mercu Buana Yogyakarta	2	1.7%
		Yogyakarta PGRI University	1	0.8%
		UPN Veteran Yogyakarta	3	2.5%
		UIN Sunan Kalijaga, Yogyakarta	4	3.3%
		STIE YKPN Yogyakarta	2	1.7%
		STIE YKP Yogyakarta	3	2.5%
		STIM YKPN Yogyakarta	3	2.5%
4	Faculty	Economics and Business	95	79.2%
		Business & Humanities	6	5%
		Informatics	1	0.8%
		Islam	2	1.7%
		FHISIP	1	0.8%
		Agriculture	1	0.8%
		Science & Technology	4	3.3%
		Vocational School	9	7.5%
		Language and Art	1	0.8%

Source: Processed primary data, 2023

TABLE 5: Research Variable Descriptive Statistics.

Descriptive Statistics							
	N	Range	Minimum	Maximum	Means	std. Deviation	Variances
Overconfidence Bias	120	24	6	30	20.20	4,188	17,539
Risk Tolerance	120	14	6	20	14.97	2,795	7,814
Herding bias	120	16	4	20	14.13	2,789	7,780
Financial Literacy	120	23	7	30	23.22	4,204	17,672
Investment decision	120	20	5	25	18.42	3,497	12,230
Valid N (listwise)	120						

4.3. Reliability Test

The test was carried out by looking at the Cronbach's alpha value where if the Cronbach's alpha value was > 1 or equal to 0.70, the research was declared reliable. The following are the results of the reliability test in the research that has been done:

Based on the table above, it shows that the research instrument is said to be reliable in measuring research variables with a Cronbach's alpha value > 0.7. This means that the data obtained is reliable and can be trusted as a variable measuring tool for further data testing.

4.4. Normality Test

The normality test technique in this study used the Kolmogorov Smirnov sample test. The data will be said to be normally distributed if sig > 0.05. The normality test results can be seen in table 4.9 as follows:

It can be seen from the table above, the data significance level is 0.200 which means it is greater than the sig value of 0.05.

4.5. Multicollinearity Test

This test is carried out by looking at the Variance Inflation factors (VIF) values. If the VIF value < 10 and the Tolerance value > 0.10 then there is no multicollinearity between the independent variables and vice versa. The results of the multicollinearity test can be seen in table 4.10 as follows:

Based on the table above it can be seen that the VIF and Tolerance values indicate no multicollinearity where the VIF value < 10 and the Tolerance value > 0.10.

_{TABLE} 6: Validity Test Results.

Variable	Statement Items	R	Sig.	Information
Overconfidence Bias (X1)	Item 1	0.829	0.000	Valid
	Item 2	0.792	0.000	Valid
	Item 3	0.776	0.000	Valid
	Item 4	0.780	0.000	Valid
	Item 5	0.789	0.000	Valid
	Item 6	0.793	0.000	Valid
Risk Tolerance (X2)	Item 1	0.816	0.000	Valid
	Item 2	0.884	0.000	Valid
	Item 3	0.849	0.000	Valid
	Item 4	0.741	0.000	Valid
Herding bias (X3)	Item 1	0.878	0.000	Valid
	Item 2	0.856	0.000	Valid
	Item 3	0.857	0.000	Valid
	Item 4	0.840	0.000	Valid
Financial Literacy (X4)	Item 1	0.761	0.000	Valid
	Item 2	0.893	0.000	Valid
	Item 3	0.779	0.000	Valid
	Item 4	0.777	0.000	Valid
	Item 5	0.736	0.000	Valid
	Item 6	0.683	0.000	Valid
Investment Decision (Y)	Item 1	0.880	0.000	Valid
	Item 2	0.788	0.000	Valid
	Item 3	0.871	0.000	Valid
	Item 4	0.811	0.000	Valid
	Item 5	0.822	0.000	Valid

Source: Processed primary data, 2023

4.6. Heteroscedasticity Test

The heteroscedasticity test uses the Glajser test, if sig > 0.05 then there are no symptoms of heteroscedasticity. The results of the heteroscedasticity test are in table 4.11 as follows:

Based on table 4.11 it shows that the significance value of all variables is > 0.05 meaning that there is no heteroscedasticity.

TABLE 7: Reliability Test Results.

No	Variable	Cronbach's Alpha	Information
1.	*Overconfidence Bias*(X1)	0.890	Reliable
2.	*Risk Tolerance*(X2)	0.840	Reliable
3.	*Herding bias*(X3)	0.888	Reliable
4.	*Financial Literacy*(X4)	0.881	Reliable
5.	Investment Decision (Y)	0.872	Reliable

Source: Processed primary data, 2023

TABLE 8: Normality Test Results *One-Sample Kolmogorov-Smirnov Test*.

		Unstandardized Residuals
N		120
Normal Parameters, b	Means	.0000000
	std. Deviation	2.19217321
Most Extreme Differences	absolute	.070
	Positive	.070
	Negative	-.065
Test Statistics		.070
asymp. Sig. (2-tailed)		.200c,d
a. Test distribution is Normal.		
b. Calculated from data.		
c. Lilliefors Significance Correction.		
d. This is a lower bound of the true significance.		

Source: processed primary data, 2023

TABLE 9: Multicollinearity Test Results.

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	std. Error	Betas			*Tolerance*	VIF
1	(Constant)	1,803	1,273		1,416	.160		
	Overconfidence Bias	.186	063	.223	2,937	.004	.589	1698
	Risk Tolerance	.568	.103	.454	5,535	.000	.504	1985
	Herding bias	.309	086	.246	3,578	001	.714	1,400
a. Dependent Variable: KPI								

TABLE 10: Heteroscedasticity Test Results.

Coefficients^a					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	std. Error	Betas		
1 (Constant)	2.107	.767		2,746	007
Overconfidence Bias	051	038	.161	1,349	.180
Risk Tolerance	-.031	062	-.065	-.507	.613
Herding bias	-.067	052	-.140	-1,291	.199
a. Dependent Variable: ABS_RES					

Source: Processed primary data, 2023

4.7. Multiple Linear Regression Analysis

TABLE 11: Test Results for the Coefficient of Determination (Adjusted R2).

Summary Model^b				
Model	R	R Square	Adjusted R Square	std. Error of the Estimate
1	.779a	.607	.597	2,220
a. Predictors: (Constant), HR, OV, RT				
b. Dependent Variable: KPI				

Source: Processed primary data, 2023

Based on the table above, the Adjusted R Square (R2) value is 0.597. This shows that 59.7% of the stock investment decision variables can be explained by 3 (three) independent variables, namely Overconfidence Bias, Risk Tolerance, and Herding Bias. The remaining 40.3% is explained by other variables outside of the research model.

TABLE 12: Model Test Results (F Statistical Test).

ANOVA^a					
Model	Sum of Squares	Df	MeanSquare	F	Sig.
1 Regression	883,456	3	294,485	59,734	.000b
residual	571,869	116	4,930		
Total	1455325	119			
a. Dependent Variable: KPI					
b. Predictors: (Constant), HR, OV, RT					

Source: Processed primary data, 2023

Based on the table above, the results of the F Statistical Test show a significant value of less than 0.05 and the calculated f value is greater than f table (2.68) so that it can

be concluded that the Overconfidence Bias (X1), Risk Tolerance (X2), and Herding Bias (X3) has a simultaneous effect on the Stock Investment Decision variable (Y).

TABLE 13: T test results.

Coefficients*a*					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	std. Error	Betas		
1 (Constant)	1,803	1,273		1,416	.160
Overconfidence Bias	.186	063	.223	2,937	.004
Risk Tolerance	.568	.103	.454	5,535	.000
Herding bias	.309	086	.246	3,578	001
a. Dependent Variable: KPI					

Source: Processed primary data, 2023

Based on the table above, the independent variables each have a significance <0.05, so the hypothesis is accepted. This means that each independent variable has a significant influence on the dependent variable.

4.8. Moderated Regression Analysis

1. Hypothesis 4:

TABLE 14: Results for the Coefficient of Determination (Adjusted R2).

Summary Model*b*				
Model	R	R Square	Adjusted R Square	std. Error of the Estimate
1	.732a	.536	.524	2,413
a. Predictors: (Constant), MODERATE_1, FL, OV				
b. Dependent Variable: KPI				

Source: Processed primary data, 2023

Based on the table above, the results of the test for the coefficient of determination can be seen from the Adjusted R Square (R2) value of 0.524. This shows that the Overconfidence Bias variable which is moderated by Financial Literacy is able to influence the Stock Investment Decision variable by 52.4%. The remaining 47.6% is explained by other variables outside of the research model.

Based on the table above, the results of the F Statistical Test show a significant value of less than 0.05 and the calculated f value is greater than f table (2.68) so that it can

TABLE 15: Model Test Results (F Statistical Test).

ANOVA^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	779,711	3	259,904	44,624	.000b
	residual	675,614	116	5,824		
	Total	1455325	119			
a. Dependent Variable: KPI						
b. Predictors: (Constant), MODERATE_1, FL, OV						

Source: Processed primary data, 2023

be concluded that the Overconfidence Bias variable which is moderated by Financial Literacy simultaneously influences Stock Investment Decisions.

TABLE 16: T test results.

Coefficients^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	std. Error	Betas		
1	(Constant)	-4,971	3,310		-1,502	.136
	OV	.856	.210	1025	4,077	.000
	FL	.819	.159	.985	5.141	.000
	MODERATE_1	-.027	.009	-1,135	-3,003	003
a. Dependent Variable: KPI						

Source: Processed primary data, 2023

Based on the table above, the results of the t test show that the regression coefficient value of the Financial Literacy variable is 0.985 is positive so that it can be said that the Overconfidence Bias variable has a positive effect on Stock Investment Decisions. Then the regression analysis obtained a significance value of 0.000 <0.05. Meanwhile, the interaction variables Overconfidence Bias and Financial Literacy -1.135 have a negative value and a significance value of 0.003 <0.05. So it can be concluded that Financial Literacy is a moderating variable that weakens the positive effect of Overconfidence Bias on Stock Investment Decisions, so that H4 is accepted.

2. Hypothesis 5:

Based on the table above, the results of the test for the coefficient of determination can be seen from the Adjusted R Square (R2) value of 0.605. This shows that Risk Tolerance which is moderated by Financial Literacy is able to influence the Stock

TABLE 17: Test Results for the Coefficient of Determination (Adjusted R2).

Summary Model[b]				
Model	R	R Square	Adjusted R Square	std. Error of the Estimate
1	.784a	.615	.605	2,197
a. Predictors: (Constant), MODERATE_2, FL, RT				
b. Dependent Variable: KPI				

Source: Processed primary data, 2023

Investment Decision variable by 60.5%. The remaining 39.5% is explained by other variables outside of the research model.

TABLE 18: Model Test Results (F Statistical Test).

ANOVA[a]					
Model	Sum of Squares	Df	MeanSquare	F	Sig.
1 Regression	895,620	3	298,540	61,873	.000b
residual	559,705	116	4,825		
Total	1455325	119			
a. Dependent Variable: KPI					
b. Predictors: (Constant), MODERATE_2, FL, RT					

Source: Processed primary data, 2023

Based on the table above, the results of the F Statistical Test show a significant value of less than 0.05 and the calculated f value is greater than f table (2.68) so that it can be concluded that the Risk Tolerance variable which is moderated by Financial Literacy simultaneously influences Stock Investment Decisions.

TABLE 19: T test results.

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	std. Error	Betas		
1 (Constant)	-6,854	3,304		-2,074	040
RT	1,426	.272	1,140	5,236	.000
FL	.736	.164	.884	4,478	.000
MODERATE_2	-.037	012	-1,107	-3.103	002
a. Dependent Variable: KPI					

Source: Processed primary data, 2023

Based on the table above, the results of the t test show that the regression coefficient value of the Financial Literacy variable is 4,478 is positive so that it can be said that

the Risk Tolerance variable has a positive effect on Stock Investment Decisions. Then the regression analysis obtained a significance value of 0.000 <0.05. Meanwhile, the interaction variable Risk Tolerance and Financial Literacy -3.103 has a negative value and a significance value of 0.002 <0.05. So it can be concluded that Financial Literacy is a moderating variable that weakens the positive effect of Risk Tolerance on Stock Investment Decisions, so that H5 is accepted.

3. Hypotheses 6:

TABLE 20: Test Results for the Coefficient of Determination (Adjusted R2).

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.736[a]	.542	.530	2.397
a. Predictors: (Constant), MODERAT_3, FL, HR				
b. Dependent Variable: KPI				

Source: Processed primary data, 2023

Based on the table above, the results of the test for the coefficient of determination can be seen from the Adjusted R Square (R2) value of 0.530. This shows that Herding Bias which is moderated by Financial Literacy is able to influence the Stock Investment Decision variable by 53%. The remaining 47% is explained by other variables outside of the research model.

TABLE 21: Model Test Results (F Statistical Test).

ANOVA[a]						
	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	788.879	3	262.960	45.770	.000[b]
	Residual	666.446	116	5.745		
	Total	1455.325	119			
a. Dependent Variable: KPI						
b. Predictors: (Constant), MODERAT_3, FL, HR						

Source: Processed primary data, 2023

Based on the table above, the results of the F Statistical Test show a significant value of less than 0.05 and the calculated f value is greater than f table (2.68) so that it can be concluded that the Herding Bias variable which is moderated by Financial Literacy simultaneously influences Stock Investment Decisions.

Based on the table above, the results of the t test show that the regression coefficient value of the Financial Literacy variable 4.805 is positive so that it can be said

TABLE 22: T test results.

Coefficients^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.887	3.521		-1.388	.168
	HR	1.111	.305	.886	3.644	.000
	FL	.793	.165	.953	4.805	.000
	MODERAT_3	-.032	.013	-.897	-2.440	.016
a. Dependent Variable: KPI						

Source: Processed primary data, 2023

that the Herding Bias variable has a positive effect on Stock Investment Decisions. Then the regression analysis obtained a significance value of 0.000 <0.05. While the interaction variable Herding Bias and Financial Literacy -2.440 has a negative value and a significance value of 0.002 <0.05. So it can be concluded that Financial Literacy is a moderating variable that weakens the positive effect of Herding Bias on Stock Investment Decisions, so that H6 is accepted.

5. Discussion

5.1. The Effect of Overconfidence Bias on Stock Investment Decisions

Based on the results of multiple regression coefficient tests, it is stated that overconfidence bias has a positive effect on stock investment decisions. This is evidenced by the acquisition of a significance value of 0.004 with a positive coefficient of 0.186. Therefore, it can be inferred that the first hypothesis (H1) positing that overconfidence bias has a positive effect on stock investment decisions is acceptable. From the results of testing the research hypothesis, it is found that investors who have overconfidence behavior will make irrational decisions, will make excessive stock purchases, overestimate their ability to invest and believe that investment performance will exceed market performance.

High or low levels of investor overconfidence can affect investment decision making. The greater the level of overconfidence bias, the more certain investors are that their investment strategies will succeed because they believe they can anticipate and discover stocks that will be profitable in the future. Supported by the belief that they have greater investment abilities and experience than the average other investor, which does not necessarily imply that they do. This overwhelming sentiment can affect

investors' money since overconfidence bias can induce investors to make incorrect predictions, resulting in poor/irrational investment decisions. The phenomenon that occurred was uncontrollable. Overtrading is one example of irrational activity that leads to overconfidence bias returns portfolio is low, therefore risk is larger. The findings of this research align with studies carried out by Setiawan et al (2018); Addinpujoartanto & Darmawan, (2020); Baihaqqy et al (2020); Arik & Sri 2021); Novianggie & Asandimitra (2019).

5.2. The Effect of Risk Tolerance on Stock Investment Decisions

Based on the results of the multiple regression coefficient test, it is stated that risk tolerance has a positive effect on stock investment decisions. This is evidenced by the acquisition of a significance value of 0.000 with a positive coefficient of 0.568. So it can be concluded that the first hypothesis (H2) which explains that risk tolerance has a positive effect on stock investment decisions is acceptable.

The findings of this research align with the principles of behavioral finance theory where a person's psychology is influential in making investment decisions. Risk tolerance is a person's ability or courage to accept risk in investment. The influence of risk tolerance on stock investment decisions can be very significant. However, sometimes, if not managed properly, low or high risk tolerance can lead to irrational investment decisions. This is due to the respondent's level of ability to take investment risks according to their characteristics high risk high returns. Judging from the type of investor, respondents have a type risk seekers, where respondents dare to take big risks to get big returns too. This shows that respondents have a high level of risk tolerance, so they are more willing to face risks or are willing to bear losses in making investment decisions. investors who have a higher risk tolerance are willing to bear the loss of an investment as long as the investment provides an opportunity to get a higher return or profit. As a result, when someone has a high level of risk tolerance, it does not rule out the possibility that when he makes investment decisions without being based on available information, it is feared that he will behave irrationally and risk experiencing losses. In this condition, it is possible that when investors make investment decisions without being based on available information, they are worried that they will behave irrationally and risk experiencing losses. Investors with high risk tolerance may become overconfident and take excessive risks in stock investments. They may ignore or underestimate potential losses. Barber and Odean (2001) found that overconfident investors tend to overtrade and result in poorer investment performance. The results

of this study are in line with research conducted by Wardani & Lutfi (2019); Masruroh & Sari (2021); Esra & Salvatore (2020); and Budiarto (2017).

5.3. The Effect of Herding Bias on Stock Investment Decisions

Based on the results of the multiple regression coefficient test, it is stated that herding bias has a positive effect on stock investment decisions. This is evidenced by the acquisition of a significance value of 0.001 with a positive coefficient of 0.309. So it can be concluded that the first hypothesis (H3) which explains that herding bias has a positive effect on stock investment decisions is acceptable.

The results of this study indicate that herding bias has a major influence on investors who tend to be easily influenced when receiving recommendations, or the influence of the reflection of other investors. Herding bias has an influence on investment decisions where when the level *biased herding* the higher the investment decision made the more irrational (Madaan & Singh, 2019). This statement is conducted by research conducted by Yi & Xiugang (2019) which suggests that herding behavior will increase irrationality in the resulting investment decision making. This proves that there is a link between rationality and emotion in the decision-making process and that psychological factors may be in accordance with the optimization of investors' actions. The findings of this study align with the research carried out by Afriani & Halmawanti (2019); Madaan & Singh (2019); Novianggie & Asandimitra (2019); Akinkoye & Bankole (2020).

5.4. Financial Literacy Moderates the Effect of Overconfidence Bias on Stock Investment Decisions

Based on the MRA interaction test, it is known that the variable overconfidence bias and financial literacy -1.135 has a negative value and a significance value of 0.003 <0.05. So it can be concluded that Financial Literacy is a moderating variable that weakens the positive effect of overconfidence bias on stock investment decisions, so that H4 is accepted.

This study shows that respondents who indicated overconfidence bias tended to produce investment decisions that were less rational (irrational), one of which was due to a lack of understanding of financial literacy. The results of this study prove the role of financial literacy in weakening the overconfidence bias relationship with stock investment decisions, while at the same time accepting the results of research conducted by Adil et al (2021)showing the role of financial literacy in moderating the relationship

between financial behavioral biases and investment decisions, it was revealed that financial literacy is able to moderate the relationship between overconfidence bias and investment decisions by female and male investors. In line with research by Novianggie & Asandimitra (2019) and Hayat (2016) which states that an investor with high financial literacy skills is able to reduce overconfidence bias. So it can be concluded that there are clear indications that increasing financial literacy can help investors make logical/rational decisions after analyzing market conditions, and conducting company analysis that inhibits investors from engaging in overconfidence.

5.5. Financial Literacy Moderates the Effect of Risk Tolerance on Stock Investment Decisions

Based on the MRA interaction test, it is known that the Risk Tolerance and Financial Literacy variables are -3.103 with a negative value and a significance value of 0.002 <0.05. So it can be concluded that Financial Literacy is a moderating variable that weakens the positive effect of Risk Tolerance on Stock Investment Decisions, so that H5 is accepted.

The results of this study indicate that the majority of respondents have good financial literacy. They are able to understand the concepts of finance, financial management, savings and loans, insurance and investment. Financial literacy is closely related to risk perception and investment decisions (Aren & Aydemir, 2015). Good financial literacy will be a solid foundation for them to build a bridge that connects their level of risk tolerance with investment decisions. The stronger the foundation, the better the investment decisions it will make.

The results of this study prove the role of financial literacy in weakening the relationship between Risk Tolerance and stock investment decisions while at the same time accepting the results of research conducted by (Khurram et al., 2020) which shows that there is a role of financial literacy in moderating the relationship between risk tendencies and investment diversification. In addition, this research is also in line with the research conducted Aren & Aydemir (2015)which states that financial literacy plays a role in moderating the relationship between overall risk aversion and risky investment intensity. The existence of financial literacy makes investors more courageous in taking risks so that the investment decisions they make will be more and better over time.

5.6. Financial Literacy Moderates the Effect of Herding Bias on Stock Investment Decisions

Based on the MRA interaction test, it is known that the variable Herding Bias and Financial Literacy -2.440 has a negative value and a significance value of 0.002 <0.05. So it can be concluded that Financial Literacy is a moderating variable that weakens the positive effect of Risk Herding Bias on Stock Investment Decisions, so that H6 is accepted.

The results of this study are in line with research conducted by Adil et al (2021) which states Financial literacy has been shown through statistical analysis to have a significant moderating effect on the relationship between herding bias and investment choices. Individuals with strong financial literacy are capable of setting investment objectives and analyzing market conditions prior to making investment decisions. In contrast, those with limited financial literacy tend to emulate the decisions of other investors, lacking the ability to gauge potential returns and risk tolerance for potential losses. According to Lusardi and Mitchell's research in 2006, financial literacy has the capacity to mitigate the impact of cognitive biases and positively influence investment decisions, leading investors to make more rational and objective choices. The findings of this study indicate a negative beta value, indicating that financial literacy plays a role in mitigating herding bias, thereby reducing the occurrence of irrational investment decisions.From the results of this study it can be concluded that there are clear indications that increasing financial literacy can help investors to make decisions logically/rationally after analyzing market conditions, and analyzing companies that hinder investors from engaging in herding behavior (bandwagon).

6. Conclusions

This study aims to test and empirically prove overconfidence bias, risk tolerance, and herding bias towards stock investment decisions with financial literacy as a moderation variable (empirical study on students in DIY). Based on the analysis that has been done, the results show that overconfidence bias, risk tolerance, and herding bias have a positive and significant effect on stock investment decisions, while financial literacy moderates a negative and significant effect on the influence of overconfidence bias, risk tolerance, and herding bias on irrational stock investment decisions.

The results of this research have implications for investing businesses, policymakers, and academics. The findings of this study can be used by investment firms to better

understand investors' decision-making processes and build strategies based on the criteria highlighted in this study. They can guide investors and provide superior investment advice. This can aid in growing investment volume, increasing earnings, and decreasing losses. This research can also help regulators and policymakers. Investment policies based on the findings of this study may be more effective in reaching their goals. Because of the impact of this oddity, the market operates inefficiently. Moreover, this study shows that student investors in DIY rely more on personal information compared to other information or alternatives. This result indicates that student investors in DIY need to be more careful and thorough in analyzing the information they have and the information they get from close relatives or friends. Investors who cannot analyze more carefully will make less optimal investment decisions with lower returns and higher risks than expected. Investors will also not get the same level of satisfaction from their investment decisions. By conducting better analysis, it is expected that investors will make more optimal and better investment decisions. The results of this study indicate that financial literacy is an important factor in investing. Therefore, it is hoped that this research can increase public awareness of the importance of financial literacy in investing in order to avoid financial behavioral biases and irrational decisions.

References

[1] Addinpujoartanto NA, Darmawan S. Pengaruh Overconfidence, Regret Aversion, Loss Aversion, Dan Herding Bias Terhadap Keputusan Investasi Di Indonesia. Jurnal Riset Ekonomi dan Bisnis. 2020;13(3):175–187.

[2] Afriani D, Halmawati H. Pengaruh Cognitive Dissonance Bias, Overconfidence Bias Dan Herding Bias Terhadap Pengambilan Keputusan Investasi. Jurnal Eksplorasi Akuntansi. 2019;1(4):1650–65.

[3] Ahmad M, Shah SZA. Overconfidence heuristic-driven Bias in investment decision-making and performance: Mediating effects of risk perception and moderating effects of Financial Literacy. Journal of Economic and Administrative Sciences. 2020.

[4] Akinkoye EY, Bankole OE. Effect of emotional biases on investor's decision making in Nigeria. International Journal of Business and Management Future. 2020;4(1):33–9.

[5] Al-Tamimi HA, Kalli AN. Financial Literacy and investment decisions of UAE investors. J Risk Finance. 2009.

[6] Areiqat AY, Abu-Rumman A, Al-Alani YS, Alhorani A. Impact of behavioral finance on stock investment decisions applied study on a sample of investors at Amman stock exchange. Academy of Accounting and Financial Studies Journal. 2019;23(2):1–17.

[7] Aren S, Aydemir SD. The moderation of Financial Literacy on the relationship between individual factors and risky investment intention. Int Bus Res. 2015;8(6):17.

[8] Arik SNLK, Sri ALG. The effect of overconfidence and optimism bias on stock investment decisions with financial literature as moderating variable. Eurasia: Economics & Business. 12(54).

[9] Baihaqqy MR. Disman, Nugraha, Sari, M., & Ikhsan, S. The effect of financial literacy on the investment decision. Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences. 2020;3:3073–3083. https://doi.org/https://doi.org/10.33258/birci.v3i4.1333

[10] Bakar S, Yi ANC. The impact of psychological factors on investors' decision making in malaysian stock market: A case of Klang Valley and Pahang. Procedia Economics and Finance. 2016;35(October 2015), 319–328. https://doi.org/10.1016/S2212-5671(16)00040-X

[11] Barberis N, Thaler R. A survey of behavioral finance. Handbook of the Economics of Finance. 2003;1:1053-1128.

[12] Barber BM, Odean T. Boys will be boys: Gender, overconfidence, and common stock investment. Q J Econ. 2001;116(1):261–92.

[13] Statistik BP. Ekonomi Indonesia Triwulan II 2020 Turun 5,32 Persen. https://www.bps.go.id/pressrelease/2020/08/05/1737/-ekonomi-indonesia-triwulan-ii-2020-turun-5-32-persen.html. accessed on May 18, 2023.

[14] Budiarto A, Susanti. Pengaruh Financial Literacy, Overconfidence, Regret Aversion Bias, dan Risk Tolerance terhadap Ke[utusan INvestasi (Studi pada investor PT. Sucorinvest Central Gani Galeri Investasi BEI Universitas Negeri Surabaya). Jurnal Ilmu Manajemen (JIM). 2017;5(2).

[15] Creswell JW. Research design: Qualitative, quantitative, and mixed methods approaches. United Kingdom: SAGE Publications Ltd.; 2018.

[16] Esra MA, Salvatore T. TOLERANCE TERHADAP PENGAMBILAN KEPUTUSAN INVESTASI INVESTOR Kata. Jurnal Manajemen. 2020;10(1).

[17] Grable JE. Financial risk tolerance. In: Xiao IJ, editor. Advances in Consumer Financial Behavior Research. New York: Springer; 2016. pp. 1–20.

[18] Giesler M, Veresiu E. Creating the responsible consumer: Moralistic governance regimes and consumer subjectivity. J Consum Res. 2014;41(3):840–57.

[19] Hallman GV, Rosenbloom JS. Personal financial planning. 4th ed. New York: McGraw-Hill; 1987.

[20] Hayat A. Impact of behavioral biases on investment decision; Moderating role of financial literacy. SSRN Electronic Journal. 2016:1–14. https://doi.org/10.2139/ssrn.2842502

[21] Hermalina BE, Isen AM. The effect of economic and strategic decision making. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.200295.

[22] Hermansson C, Jonsson S. The impact of financial literacy and financial interest on risk tolerance. J Behav Exp Finance. 2021;29:100450.

[23] Hirshleifer D, Teoh S. Herd behaviour and cascading in capital markets: A review and synthesis. Eur Financ Manag. 2003;9(1):25–66.

[24] Kahneman D, Tversky A. Prospect theory: An analysis of decision under risk. Econometrica. 1979;47(2):263–92.

[25] Komalasari PT, Asri M, Purwanto BM, Setiyono B. Herding behaviour in the capital market: What do we know and what is next? Management Review Quarterly. 2022;72(3):745–87.

[26] Niazi MK, Malik QA. Socio-demographics, risk propensity, and investment diversity moderating role of financial literacy. International Transaction Journal of Engineering Management & Applied Sciences & Technologies. 2020;11(1):1–15.

[27] Knoll MA, Houts CR. The Financial Knowledge Scale: An application of item response theory to the assessment of financial literacy. J Consum Aff. 2012;46(3):381–410.

[28] Kusumaningrum TM, Isbanah Y, Paramita RA. Factors affecting investment decisions: Studies on young investors. International Journal of Academic Research in Accounting, Finance and Management Sciences. 2019;9(3):10–6.

[29] Lusardi A, Mitchell O. 2006, Financial literacy and planning: Implications for retirement wellbeing, Pension Research Council Working Paper 1, The Wharton School.

[30] Madaan G, Singh S. An analysis of behavioral Biases in investment decision-making. International Journal of Financial Research. 2019;10(4):55–67.

[31] Malhotra NK. Riset Pemasaran Pendekatan Terapan. Edisi Keempat Jilid Satu. Jakarta: Indeks; 2009.

[32] Masruroh D, Sari RP. Pengaruh risk tolerance terhadap keputusan mahasiswa surabaya berinvestasi dengan financial literacy sebagai variabel moderasi. Jurnal Akuntansi Dan Ekonomi. 2021;6(3):32–9.

[33] Mutawally FW, Haryono NA. The influence of financial literacy, risk perception, behavioral finance and investment experience on investment decisions of Surabaya students [JIM]. Jurnal Ilmu Manajemen. 2019;7(4):942–53.

[34] Novianggie V, Asandimitra N. The influence of behavioral bias, cognitive bias, and emotional bias on investment decision for college students with financial literacy as the moderating variable. International Journal of Academic Research in Accounting, Finance and Management Sciences. 2019;9(2):92–107.

[35] Otoritas Jasa Keuangan. (2017). Laporan Strategi Nasional Literasi Keuangan Indonesia. Retrieved Maret 05, 2022, from OJK. Website: http://www.ojk.go.id/id/berita-dankegiatan/publikasi/Pages/StrategiNasional-Literasi-KeuanganIndonesia-(Revisit-2017)-.aspx

[36] Otoritas Jasa Keuangan. (2020). Statistik Pasar Modal April, Mei, dan Juni 2020.

[37] Otoritas Jasa Keuangan. (2020). Statistik Pasar Modal Desember 2020.

[38] Park J, Konana P, Gu B, Kumar A, Raghunathan R. (2012). Confirmation bias, overconfidence, and investment performance: evidence from stock message boards. SSRN Electronic Journal (Issue October). https://doi.org/10.2139/ssrn.1639470.

[39] PDDikti. (2020). Statistik Pendidikan Tinggi 2020.

[40] Pompian MM. Behavioral finance and investor types: Managing behavior to make better investment decisions. John Wiley & Sons; 2012. https://doi.org/10.1002/9781119202417.

[41] Pradikasari E, Isbanah Y. Pengaruh Financial Literacy, Illusion Of Control, Overconfidence, Risk Tolerance, Dan Risk Perception Terhadap Keputusan Investasi Pada Mahasiswa Di Kota Surabaya. Jurnal Ilmu Manajemen (JIM). 2018;6(4).

[42] Pranyoto E. Susanti, & Septiyani Herding Behavior, Experienced Regret Dan Keputusan Investasi Pada Bitcoin. Jurnal Bisnis Darmajaya. 2020;6(1):29–43. https://jurnal.darmajaya.ac.id/index.php/JurnalBisnis/article/view/1928{%}

[43] Kustodian Sentral Efek Indonesia PT. Rapat Umum Pemegang Saham Luar Biasa. https://www.ksei.co.id/files/uploads/press_releases/press_file/id-id/190_berita_pers_rupslb_ksei_tahun_2020_pembangunan_infrastruktur_dominasi_rencana_investasi_aset_ksei_di_tahun_2021_20210113125334.pdf, diakses pada 06 Februari 2022.

[44] Putra IP, Ananingtiyas H, Sari DR, Dewi AS, Silvy M. Pengaruh tingkat literasi keuangan, experienced regret, dan Risk Tolerance pada pemilihan jenis investasi. Journal of Business and Banking. 2016;5(2):271–82.

[45] Puspawati D, Yohanda AR. Bias Perilaku Pada Keputusan Investasi Generasi Muda. Ejournal.Unsri.Ac.Id. 2022;16(1), 41–60. https://ejournal.unsri.ac.id/index.php/ja/article/view/15724

[46] Remund DL. Financial literacy explicated: The case for a clearer definition in an increasingly complex economy. J Consum Aff. 2010;44(2):276–95.

[47] Ritter JR. Behavioral finance. Pac Basin Finance J. 2003;11(4):429–37.

[48] Sabir SA, Mohammad H, Shahar HB. The role of overconfidence and past investment experience in herding behaviour with a moderating effect of financial literacy: Evidence from pakistan stock exchange. Asian Econ Financ Rev. 2019;9(4):480–90.

[49] Salvatore T. (2020). Pengaruh Over Confidence, Herding, Regret Aversion, Dan Risk Tolerance Terhadap Pengambilan Keputusan Investasi Investor/Timothy Salvatore/27160445/.

[50] Samsuri A. Fitri Ismiyanti, I Made Narsa. (2019). Effects of Risk Tolerance and Financial Literacy to Investment Intentions. International Journal of Innovation, Creativity and Change. 2019;10(9):40–54. www.ijicc.net

[51] Sari TR. Pengaruh Kualitas Laporan Keuangan, Kepemilikan Asing, Frekuensi Pertemuan Komite Audit, Umur Perusahaan, Dan Arus Kas Terhadap Efisiensi Investasi Perusahaan (Studi Empiris Pada Perusahaan Yang Terdaftar di BEI Periode Tahun 2011-2015). Semarang: Universitas Katolik Soegijapranata; 2017.

[52] Sari RN, Damingun D. Pengaruh Bias Overconfidence Terhadap Keputusan Investasi di Pasar Modal [BSR]. Borneo Student Research. 2021;2(3):2072–81.

[53] Schmeiser MD, Seligman JS. Using the right yardstick: Assessing Financial Literacy measures by way of financial well-being. J Consum Aff. 2013;47(2):243–62.

[54] Setiawan YC, Atahau AD, Robiyanto R. Cognitive Dissonance Bias, Overconfidence Bias dan Herding Bias dalam Pengambilan Keputusan Investasi Saham [Accounting and Financial Review]. AFRE. 2018;1(1):17–25.

[55] Sugiyono. (2017). Metode Penelitian Kuantitatif, Kualitatif, dan R&D. Bandung: CV.

[56] Subash R. Role of behavioral finance in portofolio investment (Decisions: Evidence from India) [thesis]. Faculty of Society Sciences. Charles University in Prague; 2012.

[57] Sukmasari F, Puryandani S. PENGARUH OVERCONFIDENCE, HERDING BIAS DAN LOSS AVERSION TERHADAP KEPUTUSAN INVESTASI SAHAM (Studi Pada Masyarakat Di Kota Semarang) (Doctoral dissertation, STIE Bank BPD Jateng); 2021.

[58] Takeda K, Takemura T, Kozu T. Investment Literacy and Individual Investor Biases: Survey Evidence in the Japanese Stock Market. Rev Socionetwork Strateg. 2013;7(1):31–42.

[59] Theressa TD, Armansyah RF. Peran herding, overconfdence, dan endowment bias pada keputusan investasi investor pasar modal. Journal of Business & Banking. 2022;12(1):35–50.

[60] Vijaya E. An empirical analysis of influential factors on investment behaviuor of retail investors' in Indian Stock Market. International Journal in Management and Sosial Science. 2014;2(12):296–308.

[61] Vitmiasih V, Maharani SN, Narullia D. Pengaruh Perilaku Representativeness Bias Dan Herding Effect Terhadap Pengambilan Keputusan Investasi Rasional. Jati: Jurnal Akuntansi Terapan Indonesia. 2021;4(1).

[62] Wardani AK, Lutfi L. (2019). Pengaruh literasi keuangan, experienced regret, risk tolerance, dan motivasi pada keputusan investasi keluarga dalam perspektif masyarakat Bali. Journal of Business & Banking. 2019. https://doi.org/10.14414/jbb.v6i2.996.

[63] Wendy W. Efek Interaksi Literasi Keuangan Dalam Keputusan Investasi: Pengujian Bias-Bias Psikologi. Jurnal Ekonomi Bisnis Dan Kewirausahaan. 2021;10(1):36.

[64] Yi H, Xiugang Y. Managers' overconfidence, risk preference, herd behavior and non-efficient investment. Indep J Manag Prod. 2019;10(1):56–75.