

# Determinants of Public Investment Decision in Forex Robots Trading: Evidence from Indonesia

Uus Ahmad Husaeni\*, Dwidja Priyatno, Saptaning Ruju Paminto and Hasbu Naim Syaddad

## ABSTRACT

**Manuscript type:** Research paper

**Research aims:** This study aims to analyse the factors that influence investment decisions on forex trading robot users in Indonesia by using four factors that influence investment decisions: financial literacy, investment knowledge, financial behaviour, and risk tolerance.

**Design/Methodology/Approach:** The method used in this research is quantitative with a survey approach. The data analysis technique used Structural Equation Modeling (SEM) through the Partial Least Square (PLS) approach. The data collection technique was carried out by distributing questionnaires with a Google form on the WA Forex robot trading user group. In the end, 200 users filled out the questionnaire.

**Research findings:** This study shows that financial literacy and investment knowledge significantly influence public decisions. Meanwhile, financial behaviour and risk tolerance do not significantly affect people's investment decisions in forex robot trading. This shows that forex trading robot users have good financial literacy and investment knowledge in deciding to invest. However, trading robot users have financial behaviour that tends to be wrong, so they are tempted to profit that is promised by 10-60 percent every month by forex trading robot companies without paying attention to the risk tolerance of the amount of property they invest. As a result, if the return from investment encounters obstacles, forex trading robot users will experience financial difficulties.

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\* Corresponding author: Uus Ahmad Husaeni is a lecturer in the Faculty of Islamic Economics and Business, Universitas Suryakencana, Cianjur, Indonesia. Email: [uusahmadhusaeni@unsur.ac.id](mailto:uusahmadhusaeni@unsur.ac.id).

Dwidja Priyatno is a professor of law (corporate law) at Bandung Law School, Bandung, Indonesia. Email: [priyatnodwidja@gmail.com](mailto:priyatnodwidja@gmail.com).

Saptaning Ruju Paminto is an associate professor of law (cybercrime) in the Faculty of Law, Universitas Suryakencana, Cianjur, Indonesia. Email: [saptaning@unsur.ac.id](mailto:saptaning@unsur.ac.id).

Hasbu Naim Syaddad is a lecturer in the Faculty of Engineering, at Universitas Suryakencana, Cianjur, Indonesia. Email: [hasbunaimsyaddad@unsur.ac.id](mailto:hasbunaimsyaddad@unsur.ac.id).

**Theoretical contribution/Originality:** This study provides information that can help potential investors be careful and understand the risks when investing using forex trading robots. Research on investment decisions on forex trading robots in Indonesia is the first research that has been conducted due to the proliferation of companies offering forex trading robots that have led to Scams or Ponzi Schemes so that investors are harmed.

**Practitioner/Policy implication:** The government of the Republic of Indonesia is to immediately pass the Law on the Use of Trading Robots in Indonesia so that it becomes the basis for the legality of trading using robots. Meanwhile, for the investment community using trading robots, even though trading robots promise large profits, they have weaknesses that allow the public to experience financial losses.

**Research limitations/Implications:** Future research can consider the UTAUT model in measuring investment decisions in trading robots in Indonesia. Research regarding trading robots needs to be carried out continuously as public literacy material to avoid investment models that end in Ponzi schemes—also using a legal approach to be able to explain the criteria for trading robot providers that are close to or by the legislation in Indonesia which is currently being drafted.

**Keywords:** Forex, Investment, Risk, Trading Robots.

**JEL Classification:** D71, G11, G41

## 1. Introduction

Investment is an exciting topic. According to Mittal (2022), the definition of *investment* is the accumulation of a form of an asset with the hope of obtaining profits in the future. There are various types of investments, one of which is forex. Forex is an abbreviation of foreign exchange or foreign exchange (forex) or activity that trades the value of a country's currency with the value of another country's currency, intending to make a profit through the difference between buying and selling the money (Humala et al., 2015).

Forex trading is one of the most attractive forms of investment, and can even be a reliable job as a source of livelihood, if practiced skillfully. This makes forex trading a viable solution to Indonesia's increasing unemployment rate, as it can serve as an alternative source of income. Forex investment is lucrative because of its propensity to achieve high profit levels. Nevertheless, this opportunity for high profit is also accompanied by very high risk, which categorises forex trading as a high-risk, high-return investment (Ibrahim, 2014).

In the forex market, money circulation reaches a daily rate of 3.8 trillion USD. Fluctuating price movements and high levels of liquidity make forex investment one of the commodities with great potential

to earn large and fast profits. However, like the promised profit, this business also contains the same significant risk as the promised profit (Abdul-Rahim et al., 2022). This considerable risk can be minimised by analysing the market. The analysis is the activity of taking into account, weighing, and measuring past and present events or data to predict the direction of price movements in the future. Two types of analysis are known in the trading world: technical and fundamental. Fundamental analysis is based on global economic, political, and security situations and conditions, while technical research focuses more on market movements (Caporale & Plastun, 2021).

It is common for many beginner traders to make trading mistakes which incur losses. This can happen due to many factors, such as emotional and psychological factors. Because they need to understand what they do well, it could be because traders are still relatively new and inexperienced in their field (Omar & Jones, 2015). Psychological preparation is essential when a trader wants stable and good results. Beginner traders who have just started the trading process often think of forex as something easy to learn when it requires very high patience and thoroughness in making market entry decisions. During the first days of trading, one can start to analyse the trading strategy carried out, and there are situations of unpreparedness and lack of confidence. Every trader requires self-discipline, control over emotions, and the ability to make good decisions; trading conditions are essential (Humala & Rodriguez, 2013).

With the increasing number of forex brokers (foreign exchange market brokers) competing in the foreign exchange (forex) market, many offer specific services to traders to make it easier for traders to earn profits. One of them provides services using forex trading robots or Expert Advisors (EA) as one of the broker's efforts to attract consumers and provide convenience in trading automatically (Ibrahim, 2014). The robot will make transactions automatically when executed. As a result, many companies affiliated with one of the brokers have issued trading robot products in Indonesia. Through these trading robots, investors get sizable profits on average, reaching 10-60 percent per month. Thus, the decision of the public community to invest in forex by using trading robot services has increased rapidly. The following is a picture of the development of trading robots and the profits generated in Indonesia:

Figure 1: Development of Trading Robots in Indonesia

PROFIT RECAPITULATION OCTOBER 2021																			
PRODUCT	SMARTY	PHIBRE	EUREKA	DINA PRO	FAHRENHEIT	MAKAI	WEST ROBOT	ATG	CLASS VIP	EVOTRABE	SA COPEI	SA 50	SHIGERU	SMARTOYO	YUJOD	ISM	SUNTON OIL		
VERSION	SMALLBULL	SMARTOYO FX	USA TRADE	ALFA SUCCESS	LOTUS GOLD		ELITE	LEGIS MARKET	HANDU MARKET	UNIKORN FX	USA NGL	SANTARI FX	ISMAIL	BETHE ASTER	IBO MARKETS	SM	SUNTON CAPITAL		
October 1, 2021	0.46%	0.88%	1.02%	0%	1.00%	1.41%	1.95%	0.71%	0.68%	0.58%	1.58%	1.02%	1.0%	1.13%					
October 2, 2021					2.8%	2.4%	2.1%												
October 3, 2021					0.9%	1.4%	2.2%												
October 4, 2021	1.0%	1.4%	0.8%	1.0%	1.0%	1.3%	2.0%	0.8%	0.9%	0.9%	0.7%	1.7%	0.7%	FLOATING	1.8%	-0.8%	3.6%		
October 5, 2021	0.9%	0.9%	0.8%	1.3%	0.9%	1.4%	2.4%	0.9%	1.0%	1.4%	0.6%	0.4%	0.4%	MAINTENANCE	2.4%	2.3%	2.6%	4.6%	
October 6, 2021	1.0%	0.8%	0.8%	1.0%	1.1%	1.4%	2.3%	0.6%	0.9%	0.8%	1.3%	0.7%	0.7%	MAINTENANCE	2.3%	2.4%	3.7%	14.4%	
October 7, 2021	0.9%	0.4%	0.7%	1.2%	0.8%	1.4%	1.0%	0.8%	0.7%	0.8%	1.0%	0.1%	1.3%	0.5%	0.5%	2.2%	-0.6%	15.7%	
October 8, 2021	0.9%	-0.8%	0.8%	0.4%	0.8%	1.3%	2.4%	0.4%	1.1%	1.0%	0%	1.0%	1.0%	FLOATING	1.4%	2.6%	15.9%		
October 9, 2021					0.9%	1.5%	1.9%												
October 10, 2021					0.8%	1.1%	2.0%												
October 11, 2021	1.1%	0.5%	0.7%	1.3%	1.0%	1.3%	1.9%	0.3%	0.5%	0.5%	1.2%	0.5%	2.0%	FLOATING	1.2%	1.4%	0.7%		
October 12, 2021	1.3%	0.9%	0.8%	1.1%	0%	1.4%	2.5%	0.6%	0.7%	1.0%	1.1%	1.5%	1.7%	1.9%	2.4%	2.6%	15.2%		
October 13, 2021																			
October 14, 2021																			
October 15, 2021																			
October 16, 2021																			
October 17, 2021																			
October 18, 2021																			
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October 30, 2021																			
October 31, 2021																			
<b>TOTAL</b>	<b>3.67%</b>	<b>4.26%</b>	<b>0.72%</b>	<b>7.54%</b>	<b>10.61%</b>	<b>16.91%</b>	<b>38.38%</b>	<b>4.90%</b>	<b>6.80%</b>	<b>7.33%</b>	<b>7.57%</b>	<b>6.96%</b>	<b>9.27%</b>	<b>10.33%</b>	<b>13.22%</b>	<b>18.22%</b>	<b>82.61%</b>		
<b>JUNE 2021</b>	5.83%	17.26%	10.40%	21.9%	38.6%			11.70%	15.77%	18.3%	14.8%	41.8%	46.4%				31.70%		
<b>JULY 2021</b>	8.88%	14.46%	13.8%	21.7%	30.6%	48.8%		15.6%	15.8%	18.3%	17.7%	22.7%	40.3%				22.8%	45.05%	
<b>AUGUST 2021</b>	9.86%	12.67%	14.0%	22.8%	27.96%	48.54%		17.0%	20.4%	20.1%	13.8%	10.3%	23.0%	3.7%	6.0%	14.0%	48.94%		
<b>SEPTEMBER 2021</b>	12.24%	11.19%	18.1%	23.2%	26.4%	41.0%	47.6%	16.7%	17.7%	22.0%	18.1%	35.8%	47.3%	17.6%	-4.0%	1.4%	27.2%		

Source: Telegram Group Robot Trading Indonesia Raya, October 2021

There has yet to be any actual data on the number of trading robots in Indonesia because there are no regulations so far governing the use of trading robots here. The data above is a product of a trading robot that registers on the @RobotTradingIndonesiaRaya account on the instant messaging app Telegram. Based on the data as of 12 October 2021 (meaning trading time is only 12 days with holidays), the total profit generated by trading robots ranges from 3.67-82.61 percent, with the most profitable trading robot being Sunton Oil at 82.61 percent and the lowest is Net89 with 3.67 percent. Meanwhile, in September 2021, the total profit generated ranged from 5.49 percent (ISM Trading Robot) to 67.59 percent (9527 Trading Robot).

The usage of trading robots may be profitable, as well as making investment decisions easy for their users. However, the decision to employ a robot to make your investment decisions is not without its disadvantages. Along with time development, problems arise when the trading robot makes a wrong decision (decision-making error), which cause traders to experience losses. Of course, it is not unheard of for robots to make mistakes which adversely impact their human users. The trading robot's decision-making error is due to the robot using a "less appropriate" technique for current market conditions, a setting which was made during the robot's creation process (Ibrahim, 2014). There are many algorithmic techniques that a

forex robot programmer can use to create a forex robot and influence its decision-making capabilities, namely the martingale technique, hold technique, and techniques based on the economic calendar (Fornés & Cardoza, 2009). These mistakes in investment decision-making techniques result in losses for traders using the Forex robot's services. Alternatively, even a trading robot service provider company has been known to carry out Ponzi schemes and makes fake forex trades causing a good number of Indonesians to be victims of forex investment fraud. The value of community losses due to trading robots is no trivial matter. Based on a report received by the Directorate of Special Economic Crimes, the Criminal Investigation Agency at the National Police Headquarters, as of March 2023, the total value of the victims' losses due to the fraudulent trading robot Ponzi scheme reached trillions of rupiah. Here are five trading robots with the most significant losses in Indonesia:

**Table 1: Five Trading Robots with the Largest Investor Losses in Indonesia**

Trading Robot Name	Number of Investors	Total Loss (Billion)
Auto Trade Gold 5.0	25.000	9.000
Fahrenheit	1.419	555
Net 89	4.000	3.000
DNA Pro	3.621	551.7
Viral Blast	20.000	1.500

Source: katadata.co.id, 2023

Based on the data in Table 1, the trading robot with the most significant rate of investor losses is ATG 5.0, with a total loss of up to 9 trillion rupiahs with a total of 25,000 investors. Net 89 is in second place with a total loss of investors reaching 3 trillion rupiahs with a total of 4,000 investors. In third place is Viral Blast, with a comprehensive investor loss of up to 1.5 trillion rupiahs with a total of 20,000 investors. In fourth and fifth place are Fahrenheit (1,419 investors), with total investor losses reaching 555 billion rupiahs, and DNA Pro (3,621 investors), with real investors running at 551.7 billion rupiahs.

The reasons for these investors' choice of trading robot in Table 1 are beyond the scope of this research, however it is certain that potential investors need to have basic investing knowledge because it is intended to prevent unreasonable investment practices, fraud, and the risk of loss that will be faced. Research on the investment

decisions of public communities using trading robots on forex has not been found much. Based on this, research is needed to determine what factors influence public communities' investment decisions in forex trading using trading robots. Through this research, it is hoped that it can minimise fraud cases caused by trading robots in Indonesia. For this reason, this study aims to analyse how financial literacy, investment knowledge, financial behaviour, and risk tolerance influence the investment decisions of public communities in forex trading using trading robots.

## **2. Literature Review**

### **2.1 Foreign Exchange (Forex)**

Forex is an abbreviation of foreign exchange, which is an activity that trades the value of one country's currency for the value of another country's currency to make a profit through the difference between buying and selling the currency. Forex investment is a lucrative business area because the profit level is very high (Ayitey Junior et al., 2023). These very high profits are of course accompanied by very high risks so forex trading is often referred to as a high-risk, high-return investment. In the Indonesia context, such a profitable investment option could be a possible solution to the growing employment rate by being an alternative source of personal income, given that the investor is financially literate.

According to Akram et al., (2020), currencies traded in forex trading are always in pairs. A pair consists of two different currency quotes. The currency located in front is called the base currency and the currency located behind is called the quote currency or counter currency. An example is the GBP/USD pair with an exchange rate of 1.9800, so what is called the base currency is GBP, and what is called the quote currency is USD and this means that 1 GBP is worth 1.9800 USD. Not all countries' currencies are traded, only currencies of countries whose economies are developed and stable are traded on the forex market, such as USD (US Dollar), GBP (British Pound Sterling), EUR (European Union), AUD (Australian Dollar), JPY (Japanese Yen), and CHF (Swiss Franc).

### **2.2 Expert Advisor (EA) or Trading Robot**

An Expert Advisor (EA), also called a forex robot is an additional software or script in an application, which can later function as a trading machine that can carry out forex trading automatically. EA is programmed using the MetaQuote Language 4 (MQL4)/MetaQuote

Language 5 (MQL5) programming language. This robot is designed to carry out forex trading on the MetaTrader 4 or MetaTrader 5 platform. Expert Advisors have various levels of automation in trading (Pongsena et al., 2018).

EA can be programmed to take the following actions in trading:

- 1) Open Position;
- 2) Close Position;
- 3) Modifying an ongoing trade;
- 4) Change the Stop Loss (SL) and Take Profit (TP) of an ongoing trade;
- 5) Analyse a pair-based on; internal indicators (where traders can edit the indicators themselves according to the trader's wishes);
- 6) Sending alerts: voice, email, application programming interface (integration into other applications);
- 7) Analyse the trader's account financial management, balance, margin, etc;
- 8) With the ability to integrate with other applications, development is unlimited (Satibi et al., 2018).

The advantages of EA include:

- 1) It doesn't take up too much time. Just spend a little time, for example, every week, to search for and analyse a trading system;
- 2) No need to carry out in-depth and manual forex analysis, because what a trader analyses is the performance of the system/trader or individual.

However, general knowledge about forex and analysis is very important. It's best to continue exploring analysis in your free time. With the advantages offered, of course, there are weaknesses in using this EA, namely:

- 1) It is less flexible, a trader cannot decide when to open a transaction. So just follow along. However, there are several systems, such as in Zulutrade, which can decide to stop or close a transaction if it does not match the current trading. Apart from that, you can decide to stop/hold the signal provider you are currently following;
- 2) More expensive training costs, due to the commission/part that must be paid for the signal provider/system unless you use a personal trading robot (Pongsena et al., 2018).

### 2.3 *Financial Literacy and Investment Decision*

A main factor which influences the decision to invest in forex using trading robots is financial literacy. According to Fan (2022) and Zhao & Zhang (2021), financial literacy significantly influences people's investment decisions. *Financial literacy* is a process that determines the extent to which an individual can know and understand financial concepts, apply and manage finances well, and then invest (Asari & Kurnianingsih, 2022). The 2019 financial literacy index carried out by the "Financial Services Authority (OJK)" was recorded at 38.03%, higher than the survey in 2016, which was 29.7%. Good financial literacy can motivate to invest in several instruments so that these individuals will make investment plans (Asari & Kurnianingsih, 2022). Based on financial literacy, individuals can rationally use financial products and services based on their needs. They are not easily deceived by criminals who exploit their financial ignorance for personal gain. The role of financial literacy is to help improve the quality of financial services and contribute to a country's economic growth (Raut, 2020).

*H<sub>1</sub>: Financial literacy significantly affects public investment decisions in forex robot trading.*

### 2.4 *Investment Knowledge and Investment Decisions*

Investment knowledge can influence investment decisions, based on the results of research by Zhao & Zhang (2021) and Fan (2022), stating that investment knowledge significantly affects investment decisions. Investment knowledge is information on how to use half of the funds you have to make a profit in the future. Data can be obtained from learning received from any literary source and absorbed in memory (Aryani, 2018). Individuals need an understanding of investment to start investing and know the type of investment, the benefits obtained, and the risks when investing to decide whether to invest (Oktaryani & Abdul Manan, 2020). Zhao & Zhang (2021) state that knowledge makes it easier for individuals to make investment decisions because knowledge is the basis for shaping individuals to do what they want. Every individual who wants to become an investor must have basic knowledge about investing and how to learn about financial management properly and correctly for the future.

*H<sub>2</sub>: Investment knowledge significantly affects public investment decisions in forex robot trading.*

## 2.5 *Financial Behaviour and Investment Decisions*

One factor that may influence investment decisions is financial behaviour. Based on research by Khawaja & Alharbi (2021) and Pandey & Jessica (2019), financial behaviour has a significant positive effect on investment decisions. Behavioural finance is an approach to how individuals invest or engage in economic activities affected by psychological factors (Ahmad et al., 2017). Financial behaviour is a state of mind, opinion, and judgment regarding finance (Zahera & Bansal, 2018). The financial behaviour variable includes behaviour that uses cash, credit, and savings. Without reasonable knowledge of financial concepts, financial behaviour cannot develop properly, leading to practical financial applications in the future (Kaur & Kaushik, 2016). Behavioural finance relates to how individuals can manage and use their financial resources. Individuals responsible for financial behaviour can manage their money more effectively by creating a budget that includes expenses, investments, and timely payment of obligations. After understanding this basis, individuals will know it is necessary to consider everything before acting (Oktaryani & Abdul Manan, 2020).

*H<sub>3</sub>: Financial behaviour significantly affects public investment decisions in forex robot trading.*

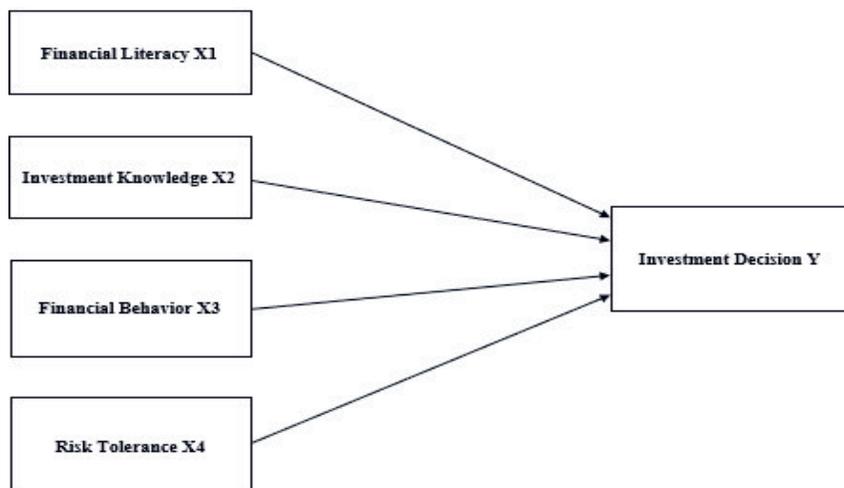
## 2.6 *Risk Tolerance and Investment Decisions*

Risk tolerance is thought to influence investment decisions, based on the research results of Khan et al. (2020); and Pak & Mahmood (2015), which stated that risk tolerance significantly affects investment decisions. Risk is uncertainty about the results received in the future, or the results obtained may differ from expectations (Muktadir-Al-Mukit, 2022). Risk tolerance measures whether an investor can accept the uncertainty of the return received when investing (Saivasan, 2022). Beginner investors must know and take the risks of the chosen investment. Every investor will consider supporting it because of the profits obtained and some risks. The investment that will be selected and the amount of capital invested will affect investors' risk tolerance. Knowing the several types of investors, each individual has a different decision in choosing the type of investment. Provide risk tolerance for differences due to age, education, socioeconomic status, income, and wealth (Veerasingam & Teoh, 2022).

*H<sub>4</sub>: Risk tolerance has a significant effect on public investment decisions in forex robot trading.*

Based on the literature review, the fundamental difference between this research and previous research is that it is found in the research object where research on public decisions to invest in trading robots is rarely done. This research may be the first to do so because the use of trading robots in Indonesia is still developing.

**Figure 2: Conceptual Framework**



### **3. Methodology**

The method used in this research is quantitative with a survey approach. The data collection technique was done by distributing questionnaires to the forex traders in Indonesia who use forex robots in their investing. The questionnaire was created using a Google form and sent to multiple WhatsApp groups with members who are forex trading users who use trading robots. The questionnaire uses a Likert scale of 18 indicators with details of four indicators for these variables: financial literacy, investment knowledge, and financial behaviour. Meanwhile, the risk tolerance and investment decision variables total three indicators. The minimum sample size, as suggested by Hair et al., (2017), was based on the power of analysis according to the complexity of the research model. According to Green's (1991) table, the minimum sample size of this study is 76 (three predictors with medium effect size), as suggested by (Mansor et al., 2022; and Phang et al., 2022). For population, the researcher refers to data from the top five trading robot providers in Indonesia: trading robot ATG 5.0 (Auto Trade Gold 5.0), DNA Pro, Fahrenheit,

Viral Blast, and Mark AI. The questionnaires were distributed from 1 June to 21 June 2022. 200 members from five different Whatsaspp groups filled out the questionnaire. Therefore, the respondents in this study met the minimum sample size requirements for testing the research model. The data analysis technique in this study used Structural Equation Modeling (SEM) through the Partial Least Square (PLS) v3.0 approach. PLS-SEM is used to predict and develop theory. Two models have been formed in structural equation modeling: a measurement model (outer model) and a structural model (inner model). The measurement model describes the proportion of variance for each manifest variable (indicator) that can be explained in the latent variable. The measurement model will determine which indicators are the domain in forming latent variables.

## 4. Data Analysis and Results

### 4.1 Descriptive Statistics

Table 2 shows that the majority of respondents were male, 81.5%, the most dominant age was in the range of 26-32 years or 29%, and most of the respondents were from Java, at 38.5%. The majority of respondents were married, 63%, and the highest level of education of respondents was high school level or equivalent at 39%. Meanwhile, 71% of respondents were already working, and 51.5% of respondents' monthly income was in the range of IDR 6-10 million.

**Table 2: Profile of the Respondents**

Variables	Categories	Frequency	Percentage (%)
Gender	Male	163	81.5
	Female	37	18.5
Age	Between 19-25 years old	48	24
	Between 26-32 years old	58	29
	Between 33-39 years old	39	19.5
	Between 40-46 years old	28	14
	Between 47-53 years old	17	8.5
	Between 54-60 years old	8	4
	Between 61-67 years old	2	1

Variables	Categories	Frequency	Percentage (%)
Domicile	Sumatera	35	17.5
	Java	77	38.5
	Bali and Nusa Tenggara	47	23.5
	Kalimantan	11	5.5
	Sulawesi	21	10.5
	Papua	9	4.5
Marital status	Single	53	26.5
	Married	126	63
	Divorced	21	10.5
Education Status	High school or equivalent	78	39
	Diploma	31	15.5
	Bachelor's degree	66	33
	Master's degree	18	9
	Doctoral degree	7	3.5
Employment Status	Employed	142	71
	Unemployed	17	8.5
	Entrepreneur	41	20.5
Monthly income	IDR 1 million until 5 million	55	27.5
	IDR 6 million until 10 million	103	51.5
	IDR 11 million until 15 million	27	13.5
	IDR 16 million until 20 million	8	4
	IDR 21 million until 25 million	5	2.5
	More than IDR 26 million	2	1

#### 4.2 Convergent Validity

Convergent validity relates to the principle that the manifest variables of a construct should be highly correlated. The convergent validity test with PLS software can be seen from the loading factor value for each construct indicator. As for assessing convergent validity, the loading factor value must be greater than 0.7, and the Average Variance Extracted (AVE) value must be greater than 0.5, with the results as follows:

**Table 3: Convergent Validity Test**

Latent Variable	Indicator Items	Loading Factor	CR	AVE
Financial Literacy	FiLi 1	0.849	0.916	0.720
	FiLi 2	0.845		
	FiLi 3	0.860		
	FiLi 4	0.756		
Investment Knowledge	InKn 1	0.735	0.872	0.592
	InKn 2	0.817		
	InKn 3	0.721		
	InKn 4	0.794		
Financial Behaviour	FiBe 1	0.769	0.867	0.587
	FiBe 2	0.743		
	FiBe 3	0.831		
	FiBe 4	0.753		
Risk Tolerance	RiT 1	0.708	0.802	0.509
	RiT 2	0.712		
	RiT 3	0.707		
Investment Decision	InDe 1	0.869	0.935	0.745
	InDe 2	0.832		
	InDe 3	0.882		

Table 3 shows that each manifest variable in the latent variable has a loading factor / outer loading value of more than 0.7 and each AVE value > 0.5, so all manifest variables are declared to have met the convergent validity requirements. So that all indicators are declared to have high validity in explaining the latent variables, and the use of the manifest variables is declared to have been able to measure the variables correctly.

### 4.3 Discriminant Validity

Discriminant validity is seen by measuring the cross-loading factor and comparing AVE with the correlation between variables in a study. Discriminant validity can represent the extent to which a construct empirically differs from other constructs. If this is interpreted statistically, then the AVE of each latent variable must be greater than the highest  $r^2$  value with the value of other latent variables. The second criterion for discriminant validity is that the "loading" for each indicator is expected to be higher than its "cross-loading." If the former lacker assesses discriminant validity at the

construct level (latent variable), then “cross-loading” is possible at the indicator level. The following is a cross-loading validity test.

**Table 4: Cross Loading Factor Test Results**

Indicator	Financial Literacy	Investment Knowledge	Financial Behaviour	Risk Tolerance	Investment Decision	Conclusion
FiLi 1	<b>0.849</b>	0.525	0.477	0.556	0.671	Valid
FiLi 2	<b>0.845</b>	0.433	0.366	0.469	0.597	Valid
FiLi 3	<b>0.860</b>	0.671	0.641	0.701	0.632	Valid
FiLi 4	<b>0.756</b>	0.645	0.612	0.705	0.592	Valid
InKn 1	0.561	<b>0.735</b>	0.687	0.696	0.711	Valid
InKn 2	0.525	<b>0.817</b>	0.686	0.698	0.663	Valid
InKn 3	0.536	<b>0.721</b>	0.653	0.603	0.683	Valid
InKn 4	0.551	<b>0.794</b>	0.660	0.692	0.612	Valid
FiBe 1	0.542	0.705	<b>0.769</b>	0.618	0.687	Valid
FiBe 2	0.534	0.666	<b>0.743</b>	0.651	0.661	Valid
FiBe 3	0.611	0.719	<b>0.831</b>	0.635	0.625	Valid
FiBe 4	0.606	0.664	<b>0.753</b>	0.697	0.673	Valid
RiT 1	0.583	0.711	0.703	<b>0.708</b>	0.752	Valid
RiT 2	0.542	0.667	0.667	<b>0.712</b>	0.731	Valid
RiT 3	0.500	0.572	0.581	<b>0.707</b>	0.753	Valid
InDe 1	0.663	0.720	0.682	0.665	<b>0.869</b>	Valid
InDe 2	0.683	0.705	0.705	0.669	<b>0.832</b>	Valid
InDe 3	0.670	0.652	0.616	0.621	<b>0.882</b>	Valid

Based on the data in Table 4, it can be seen that the value of the cross-loading factor on each indicator is higher than the value of the other constructs. Therefore, it can be said that the indicators used to measure the latent variables have met the requirements. In addition to using a cross-loading factor, discriminant validity can be tested by comparing the AVE root with its correlation. The following is a validity test using the Fornell Lacker Criterion test.

**Table 5: Fornell Lacker Criterion Test Results**

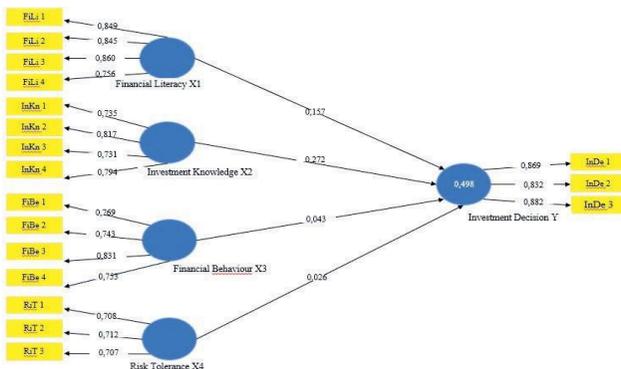
Latent Variable	Financial Literacy	Investment Knowledge	Financial Behaviour	Risk Tolerance	Investment Decision
<b>Financial Literacy</b>	<b>0.820</b>				
<b>Investment Knowledge</b>	<b>0.691</b>	<b>0.719</b>			
Financial Behaviour	0.635	0.694	<b>0.704</b>		
Risk Tolerance	0.736	0.710	0.686	<b>0.677</b>	
Investment Decision	0.562	0.687	0.670	0.633	<b>0.844</b>

From Table 5, it can be seen that the AVE root value of each latent variable has a higher value than the correlation value with other variables, so it can be concluded that the model has good discriminant validity. Based on the results of the two validity tests carried out previously, namely convergent validity and discriminant validity, it can be concluded that 18 manifest variables can be used as research indicators in their respective latent variables.

#### 4.4 Structural Model Testing (Inner Model)

The test of the structural model (inner model) can be seen from the value of the coefficient of determination (R-Square), Predictive Relevance (Q<sup>2</sup>), and Goodness of Fit Index (GoF) for each endogenous variable as the predictive power of the structural model. Changes in the value of R-Square can be used to explain the effect of certain exogenous latent variables on endogenous latent variables.

**Figure 3: Output PLS-SEM**



**Table 6: Value of Path Coefficient and Structural Equation**

Variable	Path Coefficient	T Statistics ( O/STERR )
Financial Literacy → Investment Decision	0.214	4.310
Investment Knowledge → Investment Decision	0.336	5.009
Financial Behaviour → Investment Decision	0.112	1.942
Risk Tolerance → Investment Decision	0.076	1.911

Based on Table 6, the coefficient value of the Financial Literacy structural path to the Investment Decision is 0.214, for the Investment Knowledge structural path coefficient to the Investment Decision is 0.336, and for the Financial Behaviour, the structural path coefficient to the Investment Decision is 0.112. Moreover, the coefficient of the structural path of Risk Tolerance to Investment Decision is 0.076. Thus, the structural equation model is obtained as follows:

$$Y = 0.214 + 0.336 + 0.112 + 0.076 + \zeta$$

#### 4.5 Coefficient of Determination (R-Square)

The value of the R square is the coefficient of determination on the endogenous construct. The value of R-Square is the coefficient of determination on the endogenous construct. The higher the R-Square value, the better the prediction model of the proposed research model, along with the reliability test results:

**Table 7: Analysis of the Coefficient of Determination (R-Square)**

Variable	Path Coefficient	Correlation	Influence (%)
Financial Literacy → Investment Decision	0,214	0,736	15,7%
Investment Knowledge → Investment Decision	0,336	0,811	27,2%
Financial Behaviour → Investment Decision	0,112	0,387	4,3%
Risk Tolerance → Investment Decision	0,076	0,347	2,6%
<b>Total Influence (R<sup>2</sup>)</b>			<b>49,8%</b>

Based on Table 7, the value of the coefficient of determination is obtained by multiplying the value of the path coefficient by the respective correlation values. The table shows that the influence of financial literacy on investment decisions is 15.7%, from investment knowledge on investment decisions it is 27.2%, and from financial behaviour to investment decisions it is 4.3%. Moreover, the risk tolerance for investment decisions is 2.6%. Overall, the simultaneous effect of the four exogenous latent variables on the endogenous variables is 49.8% which is dominated by investment knowledge, while the remaining 50.2% is the influence of other factors not investigated ( $\zeta$ ).

#### 4.6 Hypothesis test

The t-test is a hypothesis test. The significant values used (two-tailed) t-values were 1.64 (significant level 10%), 1.95 (level significance 5%), and 2.57 (level significance 1%). In this study, researchers used an alpha level of 5% (a two-way test). So the t table used is 1.95. To assess the significance of the predictive model in testing the structural model, it can be seen from the t-statistic value between exogenous variables to endogenous variables in the path coefficient table in the following SmartPLS v3.0 output:

**Table 8: Hypothesis Testing**

Variable	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
Financial Literacy → Investment Decision	0.254	0.260	0.074	4.310	0.000
Investment Knowledge → Investment Decision	0.356	0.357	0.067	5.009	0.000
Financial Behaviour → Investment Decision	0.175	0.195	0.053	1.942	0.057
Risk Tolerance → Investment Decision	0.112	0.210	0.047	1.911	0.089

Based on the t-statistic and *p*-value in the table above, the test results for each hypothesis are as follows:

##### 4.6.1 Hypothesis 1

Financial literacy has a significant effect on investment decisions. The test results are presented in the following table:

**Table 9: Hypothesis Testing 1**

Latent Variable	Path Coefficient	t-statistic	t-table	p-value	H <sub>1</sub>
Financial Literacy → Investment Decision	0.214	4.310	1.95	0.000	Accepted

From Table 9, the path coefficient value of the financial literacy on investment decisions has a positive value of 0.214 with a t-statistic value of 4.310. The t-statistic value is greater than the t-table ( $4.310 > 1.95$ ) and the *p*-value ( $0.000 < 0.05$ ) with a significant positive result. So it can be concluded that  $H_0$  is rejected and  $H_1$  is accepted, meaning that financial literacy has a significant effect on investment decisions, where a better investment decision will follow better financial literacy so the proposed research hypothesis is accepted.

#### 4.6.2 Hypothesis 2

Investment knowledge has a significant effect on investment decisions. The test results are presented in the following table:

**Table 10: Hypothesis Testing 2**

Latent Variable	Path Coefficient	t-statistic	t-table	p-value	H <sub>2</sub>
Investment Knowledge → Investment Decision	0.336	5.009	1.95	0.000	Accepted

From Table 10, the path coefficient value of the investment knowledge variable for creative cities is positive at 0.336, with a t-statistic value of 5.009. The t-statistic value is greater than the t-table ( $5.009 > 1.95$ ) and the *p*-value ( $0.000 < 0.05$ ) with a significant positive result. So it can be concluded that  $H_0$  is rejected and  $H_1$  is accepted, meaning that investment knowledge significantly affects investment decisions. The better the investment knowledge, the better the investment decision, so the proposed research hypothesis is accepted.

#### 4.6.3 Hypothesis 3

Financial behaviour has a significant effect on investment decisions. The test results are presented in the following table:

**Table 11: Hypothesis Testing 3**

Latent Variable	Path Coefficient	t-statistic	t-table	p-value	H <sub>3</sub>
Financial Behaviour → Investment Decision	0.112	1.942	1.95	0.057	Rejected

From Table 11, the path coefficient value of the financial behaviour variable on investment decisions is positive at 0.112, with a t-statistic value of 1.942. The t-statistic value is smaller than the t-table ( $1.942 > 1.95$ ) and the p-value ( $0.057 > 0.05$ ) with a positive result that is not significant. So it can be concluded that  $H_1$  is rejected and  $H_0$  is accepted, meaning that financial behaviour has no significant effect on investment decisions, where the better the financial behaviour, the better the investment decision, so the proposed research hypothesis is rejected.

#### 4.6.4 Hypothesis 4

Risk tolerance has a significant effect on investment decisions. The test results are presented in the following table:

**Table 12: Hypothesis Testing 4**

Latent Variable	Path Coefficient	t-statistic	t-table	p-value	H <sub>4</sub>
Risk Tolerance → Investment Decision	0.076	1.911	1.95	0.089	Rejected

From Table 12, the path coefficient value of the Risk Tolerance variable on Investment Decisions is positive at 0.112, with a t-statistic value of 1.911. The t-statistic value is smaller than the t-table ( $1.911 > 1.95$ ) and the p-value ( $0.089 > 0.05$ ) with a positive result that is not significant. So it can be concluded that  $H_1$  is rejected and  $H_0$  is accepted, meaning that Risk Tolerance has no significant effect on the Investment Decision, where the better the Risk Tolerance, the better the Investment Decision, so the proposed research hypothesis is rejected.

## 5. Discussion

The test results show a statistical t-value of  $4.310 > t$  table 1.95, a p-value of  $0.000 < 0.05$ , and the regression results are positive so that financial literacy has a positive and significant impact on investment decisions with an effect of 15.75 percent. This means that if the level

of financial literacy is high, it will increase the decision to invest in forex using trading robots. Financial literacy can prevent individuals from potential losses. A person's level of financial literacy can motivate them to start investing (Raut, 2020). From this research, it can be seen that forex trading robot users already know sound financial management and decide to invest. This is very useful for future interests because it understands the investment's importance. The results of this study are in line with research conducted by Raut (2020), Sivaramakrishnan, Srivastava, and Rastogi (2017), Zhao and Zhang (2021), and Fan (2022), which state that financial literacy has a strong and positive influence on investment decisions in cryptocurrencies, mobile investment technology, and capital markets. Meanwhile, this study's results differ from those of research conducted by Jain et al., (2022) which concluded that financial literacy has no significant effect on the investment decisions of capital market investors in India.

The test results show a t-statistical value of  $5.009 > 1.95$ , a *p*-value of  $0.000 < 0.05$ , and the regression results are positive so investment knowledge has a positive and significant impact on investment decisions with an effect of 27.24 percent. This means that high levels of investment knowledge will improve the decision to invest in forex using trading robots. Before learning how to invest, most individuals only kept money in savings, but with the development of the economy and technology, as it is today, people have used some of their money to invest, such as forex trading, buying stocks, bonds, or mutual funds that offer future benefits (Asari & Kurnianingsih, 2022). So the role of investment knowledge is significant for these activities. This study's results align with research conducted by Zhao and Zhang (2021); this study found that although investment knowledge and experience were positively related to investment decisions in cryptocurrencies, investment experience was more influential in cryptocurrency investments. The findings also show that investment experience, especially ownership of risky assets, significantly mediates between subjective financial knowledge and cryptocurrency investment behaviour. The research conducted by Fan (2022); states that objective and subjective investment knowledge, experience using mobile banking for payments and money transfers, and specific ownership of investment vehicles (such as life insurance policies) are significant determinants of investment decision-making. On the other hand, personal investment literacy, risk tolerance, familiarity with mobile financial services, portfolio value, and particular investment vehicles are significantly related to mobile investment trading.

The test results show a t-statistical value of  $1.942 < 1.95$ , a  $p$ -value of  $0.057 > 0.05$ , and the regression results are positive, so financial behaviour has no significant effect on investment decisions with a practical value of only 4.33 percent. If people have good financial behaviour, they will likely not invest in forex trading. This means that users of trading robots tend to have bad financial behaviour, so they are tempted to profit promised by forex trading companies with trading robots where the promised profit is 10-60 percent every month. Users of trading robots tend to think short-term in their investment decisions because high returns tempt them. So users of trading robots, even though they have high incomes, will face financial problems due to irresponsible financial behaviour. This study follows research conducted by Khawaja and Alharbi (2021) their results show that factors such as past stock performance, financial statements, company status in the industry, company reputation, and expected company profits have a significant influence on investor's decision to invest. However, financial behaviour was not significantly influenced by gender or age; but significantly influenced by educational qualifications, professional experience, and investment volume on capital market investment decisions in Saudi Arabia. The research conducted by Raut (2020), the results shows that there is a significant effect of all predictive variables. However, financial behaviour does not significantly influence investors' decisions to invest in the capital market in India. This study's results differ from what was concluded by Nair, Shiva, and Yadav (2022); the study shows that financial behaviour is the primary determinant of investment decisions to use mobile applications by retail investors for electronic applications trading. Moreover, this study reveals that perceived risk is not an essential aspect for retail investors compared to perceived returns. Then, Pandey and Jessica (2019) researched how financial behaviour influences investment decisions in India's real estate market.

The test results show a t-statistical value of  $1.911 < 1.95$ , a  $p$ -value of  $0.089 > 0.05$ , and the regression results are positive, so risk tolerance has no significant effect on investment decisions with a practical value of only 2.63 percent. This means that the higher the risk tolerance of the trading robot user, the lower the decision to invest in forex using a trading robot because it has a significant risk. Risk is one of the things that can prevent individuals from making a decision. Once investors understand the various risks in investing, investors tend to make more informed decisions based on objectives. Because each individual has a different risk tolerance, this study's

results align with research conducted by Kaur and Kaushik (2016); the study results show that investment behaviour can be explained by the awareness, perception, and socio-economic characteristics of individual investors. Better awareness regarding various aspects of mutual funds will positively impact mutual fund investment. Contrary to belief, the perception of mutual fund risk does not affect investment decisions. Furthermore, investors' socioeconomic characteristics such as age, gender, occupation, income, and education impact their awareness about mutual funds. Then the research conducted by Sivaramakrishnan, Srivastava, and Rastogi (2017) concluded that risk tolerance does not affect investment decisions in the capital market in India. Meanwhile, this study is different from what was done by Veerasingam and Teoh (2022); the results of the study show that attitudes toward risk and perceived behavioural control significantly positively influence investors' investment decisions in cryptocurrencies. Furthermore, Pak and Mahmood's (2015), research reveals that personality traits impact individual risk tolerance behaviour. This, in turn, influences investment decisions about stocks, securities, and bonds. The results of this study imply that investment advisors should take into account the personal characteristics and risk tolerance of individuals, among other things, when providing investment advice to private investors. Then, Fan (2022) and Saivasan (2022) conducted research, which concluded that risk tolerance influences investment decisions on mobile investment trading in India.

## **6. Conclusion**

Based on the data processed in this study, financial literacy, and investment knowledge significantly influence the Indonesian people's investment decisions. Meanwhile, financial behaviour and risk tolerance do not significantly affect people's investment decisions in forex robot trading. Investment knowledge has the most significant influence on investment decisions, which is 27.24 percent, followed by financial literacy at 15.75 percent, financial behaviour at 4.33 percent, and risk tolerance at 2.63 percent. The results of this conclusion indicate that having qualified investment knowledge will help the investor be more careful in making investment decisions in forex trading robots. The authors of this study hope that with the current development of economic and technological transactions, the people of Indonesia will be able to invest some of their money for future profits. Financial literacy can prevent individual investors from potential losses. From the results of this study, users of forex

trading robots already know about good financial literacy and have decided to invest. This is very useful for future purposes. Forex trading robot users tend to have bad financial behaviour, so they are tempted to profit promised by companies with 10-60 percent profit every month. Users of forex trading robots tend to think short-term in investment decisions because they are tempted by high returns, which can result in financial problems if they experience losses or delay their investment returns. The higher the risk tolerance for trading robot users, the lower or more careful they are in making forex investment decisions using trading robots because they know they have a significant risk of loss followed by a significant potential profit. Investors must understand the various risks in investing so that they can make more informed decisions based on their investment objectives.

The suggestion that can be given from the results of this research to the government of the Republic of Indonesia is to immediately pass the Law on the Use of Trading Robots in Indonesia so that it becomes the basis for the legality of trading using robots. Meanwhile, for the investment community using trading robots, even though trading robots promise large profits, they have weaknesses that allow the public to experience financial losses, including:

- 1) technical problems often appear in trading robots which can be detrimental and endanger people's investments;
- 2) Investors must monitor and check market conditions, even though the trading robot system works automatically, but not everything can be done in real-time;
- 3) Investors must be careful in choosing trading robots because many of them use Ponzi schemes which are very detrimental to investors.

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