



## An Acceptance of The Financial Instruments Trading by Artificial Intelligence: AI

Jarturon Atcharanuwat and Tanpat Kraiwanit\*

Faculty of Economics, Rangsit University, Thailand

\*Correspondence author, E-mail: tanpat.k@rsu.ac.th

### Abstract

The purpose of this research is to study financial instrument trading by artificial intelligence (AI) among 684 respondents who are familiar with the topic. An online questionnaire was developed and composed of 3 sections as follow: 1) general information on the respondents, such as gender, age, educational level, occupation, and salary 2) investment behavior, such as monthly savings and investment budgets, and 3) investment literacy and background. A binary logistic regression analysis was introduced for the hypothesis testing in this study. The result shows that 8 variables are statistically significant: gender, age, educational level, occupation, salary, monthly savings, investment budgets, and investment literacy and background. In addition, men are more open to AI trading than women. Elderly persons accept AI trading more than younger ones. Persons with a higher educational level show greater acceptance of AI trading. The adoption of AI trading varies among occupations, and individuals who earn a high salary and have high savings, high investment budgets, and high investment literacy tend to be more amenable to AI trading.

**Keywords:** *Artificial intelligence: AI, Robo-advisor*

### 1. Introduction

Technology has changed rapidly over the last few decades. Now we are entering an era in which technology has thoroughly seeped into our daily lives and gradually changed our lifestyle, business activities, and economy. Since 2018, many financial companies have been using a robo-advisor platform or artificial intelligence (AI) for managing capital (Denwithayan, 2017). An AI robot or quant trading uses a computer program or artificial intelligence in stock trading instead of human decisions. The robo-advisors, a technology that was developed from AI, are currently considered to be one of the hot Fintechs. The robo-advisors provide advice on investment through advanced analysis software in which the system collects financial data from online questionnaires and performs an evaluation. Then, it provides an investment design through an asset allocation that is suitable for acceptable risks and the investors' expected outcome.

Nowadays, aside from foreign investors trading stocks using AI robots or quant trading to cut the cost of hiring humans to carry out the trading, almost all the brokers in Thailand have started to provide AI robot or quant trading services for interested retail investors and have already undertaken wide advertising and public relations. The program has been tested and has provided great returns (Sak, 2018). Trading using a robot and AI systems is the technological trend in this age. The robot system is able to work automatically following the orders that were input into the computer by the administrator, while AI was created by humans who intended the robots to be intelligent and able to analyze rationally and accurately like the human brain (Bizbug Admin2, 2018).

Besides, people using robots for stock trading need to be concerned with the safety of investment policy. In the case that someone knows the pattern, the buy-sell spread of the program, they might buy or sell to block and cause damage to the investors that use this system. Thus, the users of a trading robot must be confident that the formula is effective and conform to a stable working system.

Furthermore, in Thailand, High-Frequency Unintentionally Trader adopted AI and has just emerged with its high speed of signaling market orders in seconds. Its AI would block the offers to buy and for sale in less than no time. There is a real sample trading of a DW, within 4 seconds, 38 orders have been completed. No one would be able to do that. Another remarkable issue, it is like fake trading, trapping ones especially the retail investors. Importantly, it is one of the causes that make Thai's stock market to be more fluctuated than in history. Some company has gone to the bottom with unusual trading. (AI-DW-block



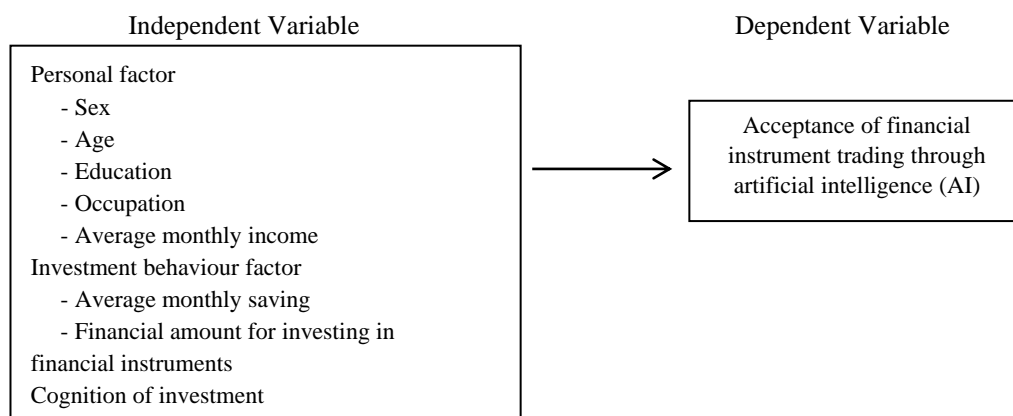
trade, 2018) Moreover, machine learning was used in developing AI for testing the precision in market trend prediction. From the example, just basic indicators that are needed for testing the precision of support vector machine. Some of the Thai' stock such as BH (Bumrungrad Hospital Public Company Limited) has a high precision of 87% and BDMS (Bangkok Dusit Medical Services Public Company Limited) has a high precision of 78%. (Tharadhol, 2017)

Thus, the researcher would like to study the views of investors in the Bangkok Metropolitan Region about robots' or AI's participation in investments instead of humans, whether it affects investors' or finance professionals' careers and how it affects the overview of the economy.

## 2. Objectives

To study opinions on financial instrument trading through artificial intelligence and the factors affecting those opinions.

### 2.1 Conceptual framework



**Figure 1** Conceptual framework

### 2.2 Definitions of specific terms

In the field of computer science, artificial intelligence (AI) involves providing computers with abilities similar to or the same as those of humans, especially the capability to think by themselves, in other words, to have intelligence. This intelligence was given by humans, so we call it artificial intelligence.

Financial instruments are financial pieces of evidence or documents that show ownership and rights of a claim that the issuers sell to obtain funding from investors and might register them to be traded on the stock exchange (Secondary Market). Financial instruments are classified into three large groups, which are equity instruments, debt instruments, and derivative instruments. In this study, I will refer to equity instruments, which are those that are for trading on the Stock Exchange of Thailand (SET) and the Market for Alternative Investment (MAI), like common stocks, preferred stocks, warrants and Non-Voting Depository Receipts (NVDRs).

Accepting artificial intelligence for financial instrument trading means that it works instead of human brains. The functioning patterns in decision making as a replacement for humans have begun to ease the burden of labor ("AI Robot", 2018). The amount and quality of AI products can also be controlled to conform to the standard.

### 2.3 Scope of the study

1. The scope of the population. The population in this study consists of the participants in the survey, who own and trade financial instruments: altogether 684 samples.

2. The scope of the content. The study gauges the views of participants regarding the acceptance of artificial intelligence for financial instrument trading.



3. The scope of time. The duration of this study is 6 months, from August 2018 to February 2019.

#### 2.4 Study hypothesis

Most investors presume that financial instrument trading through AI can provide more returns from investment, taking into account the risk or the chance of erroneous trades.

### 3. Materials and Methods

The approach of this study is quantitative. Data were collected through surveys conducted randomly with 684 samples. The analysis and evaluation of the data were carried out with ready-made software, and the relationship between the variables was tested using logistic regression analysis (Binary Logistic Regression).

### 4. Results and Discussion

The factors affecting the views on financial instrument trading through AI were analyzed using the questionnaire participants' general information, investment behavior and cognition of investment as independent variables and the views concerning financial instrument trading through AI as dependent variables. They were analyzed in relation to common factors, including sex, age, education, occupation, average monthly income, average monthly savings, a financial amount for investing in financial instruments and cognition of investment. The data were analyzed using ready-made software and converted into quantitative data first by obtaining the Pearson chi-square of each variable and then by analyzing the relationship between the variables and excluding the ones that were not significant. Scores were then determined for each variable before evaluating them using multivariate analysis techniques and logistic regression analysis (binary logistic regression).

Case 1: All the independent variables

Case 2: Only statistically significant variables

The results from the Pearson chi-square test for each variable are shown in Table 1 as follow:

**Table 1** Pearson chi-square for each variable

No.	Variables	Pearson Chi-Square	Asymp. Sig. (2-Sided)
1	Gender	47.601	.000
2	Age	214.289	.000
3	Educational Level	48.926	.000
4	Occupation	101.819	.000
5	Monthly Salary	196.365	.000
6	Monthly Savings	248.004	.000
7	Investment Budget	385.112	.000
8	Investment Knowledge and Background	296.961	.000

Table 1 shows the Pearson chi-square values of the statistically significant variables, which will be used for weighting (gender, age, educational level, occupation, monthly salary, monthly savings, and investment budget) as follow:

**Table 2** Scores according to significance levels and reweighting to 100%

No.	Variables	Pearson Chi-Square	Weight
1	Gender	47.601	3.83%
2	Age	214.389	17.26%
3	Educational Level	48.926	3.94%
4	Occupation	101.819	8.20%
5	Monthly Salary	196.365	15.81%
6	Monthly Savings	248.004	19.96%
7	Investment Budget	385.112	31.00%
	Total	1242.216	100.00%

The study next defined scores for each choice on each variable using the proportion of respondents who accept AI multiplied by the maximum score. The results are described in Table 3 as follows:

**Table 3** Weighting of each choice on each variable

Variable	Score
Gender	(3.83)
Male	2.75
Female	1.08
Age (Full Score)	(17.26)
Under 20 Years Old	0.00
20–30 Years Old	2.25
31–40 Years Old	13.80
Over 40 Years Old	1.21
Educational Level	(3.94)
Middle School	0.02
Undergraduate	3.07
Graduate	0.84
Other	0.00
Occupation	(8.20)
Investor	7.13
Financial and Banking	0.76
Student	0.31
Other	0.00
Monthly Salary	(15.18)
Below 15,000 THB	0.15
15,001–20,000 THB	0.36
20,001–30,000 THB	1.67
30,001–40,000 THB	8.82
40,001 THB or More	4.17
Monthly Savings (Full Score)	(19.96)
1,000–4,000 THB	0.44
4,001–8,000 THB	9.96
8,001–12,000 THB	4.24
12,001–16,000 THB	3.44
16,001–20,000 THB	0.08
20,001 THB or More	1.80
Investment Budget (Full Score)	(31.00)
10,000–30,000 THB	0.87
30,001–60,000 THB	0.43
60,001–90,000 THB	0.19
90,001–120,000 THB	0.19
120,001–160,000 THB	0.00
160,001 THB or More	29.32

The score was substituted into the database, as described above, and analyzed using multiple-variable analysis with logistic regression analysis: the binary logit model.



All the independent variables were analyzed individually (gender, age, educational level, occupation, monthly salary, monthly savings, investment budget, and investment knowledge and background). The results are shown below.

**Table 4** Results of the multiple-variable analysis (method=enter) (including all the variables)

Variable	Symbol	Coefficient	Sig.	Exp(B)
Constant	-	-5.712	.000	.003
Gender	X <sub>1</sub>	.248	.203	1.281
Age	X <sub>2</sub>	.124	.000	1.132
Educational Level	X <sub>3</sub>	.537	.000	1.711
Occupation	X <sub>4</sub>	-.105	.074	.900
Monthly Salary	X <sub>5</sub>	.121	.061	1.129
Monthly Savings	X <sub>6</sub>	.163	.000	1.177
Investment Budget	X <sub>7</sub>	.102	.000	1.107
Investment Knowledge and Background	X <sub>8</sub>	.184	.016	1.203

According to the model, the educational level is the most important factor because it has the highest coefficient (0.537). The second one is investment knowledge and background (0.184). However, gender and occupation show no statistical significance.

The analysis was repeated but considering only the statistically significant variables (age, educational level, monthly savings, investment budget, and investment knowledge and background). The results are shown below:

**Table 5** The multiple analysis

Variable	Symbol	Coefficient	Sig.	Exp(B)
Constant	-	-5.410	.000	.004
Age	X <sub>2</sub>	.133	.000	1.142
Educational Level	X <sub>3</sub>	.556	.000	1.743
Monthly Savings	X <sub>6</sub>	.166	.000	1.180
Investment Budget	X <sub>7</sub>	.104	.000	1.109
Investment Knowledge and Background	X <sub>8</sub>	.187	.012	1.205

The model is formalized as  $P = \frac{1}{1 + e^{-Z}}$ , in which P is the probability that the respondents will accept the concept of AI trading, where  $Z = -5.410 + 0.133(X_2) + 0.556(X_3) + 0.166(X_6) + 0.104(X_7) + 0.187(X_8)$ .

The model shows that the educational level has the highest coefficient value of 0.556, which implies that it is the most important factor. The second most important factor is investment knowledge, with a coefficient value of 0.187, and the least important factor is investment budgets, with a coefficient value of 0.104.

When considering the value of Exp (B), when the independent variables change, the respondents will be more accepting of the concept of AI trading when they are older (1.142 times), they have a higher educational level (1.743 times), they have higher monthly savings (1.180 times), they have higher investment budgets (1.109 times), they have better investment knowledge and background (1.205 times).

**Table 6** shows the results of the appropriateness of the model

Step	-2 Log Likelihood	Cox & Snell R-Square	Nagelkerke R-Square
1	342.526	.487	.706

The table shows that the -2 log likelihood (deviance) and pseudo-R-square (Cox & Snell R-square, Nagelkerke R-square) are 342.526, 0.487 and 0.706, respectively.

Back-Testing



To test the accuracy of the model, the forecasted results from the model are compared with the empirical ones. The cut-off value for different levels (scale from 0 to 1) reflects the different levels of acceptance of the concept of AI trading. For example, if the forecasted value is less than the cut-off value, it implies that the respondents do not accept the concept of AI trading and vice versa.

**Table 7** Results from back-testing

Cut-Off Value	Forecast Actual	Accept	Do Not Accept	% Accuracy	Total
0.50	Do Not Accept	151	34	81.6%	684
	Accept	27	472	94.6%	91.1%
0.55	Do Not Accept	156	29	84.3%	684
	Accept	28	471	94.4%	91.7%
0.60	Do Not Accept	159	26	85.9%	684
	Accept	30	469	94.0%	91.8%
0.65	Do Not Accept	162	23	87.6%	684
	Accept	32	467	93.6%	92.0%
0.70	Do Not Accept	167	18	90.3%	684
	Accept	35	464	93.0%	92.3%

The results from the back-testing show that the most influential factor for AI trading yields a cut-off value of 0.70. As shown in the table, the model is able to calculate the probability that the respondents will accept the concept of AI trading with 92.3% accuracy. Moreover, when considering only the accuracy of acceptance, the model can predict with 93% accuracy. In addition, when incorporating the variables in case 1.2 into the model, a score above 0.5 means that there is a 93% chance that the respondents will accept the concept of AI.

## 5. Conclusion

The results of the study will be discussed together with the theory and previous studies. Concerning the factor of personal information, questionnaire participants who are different in age have different chances of accepting AI, which is in line with the research by Rajitpinyolert (2017), who studied the big picture of robot funds and found that they are not popular amongst young investors, as the share that they hold is more like the value type than the growth type. Most of them still stick to the 60/40 proportion of their portfolios, which is quite defensive. Thus, this study shows that participants who are below 31 years old tend to be less accepting of AI and that different financial amounts for investing in financial instruments cause different probabilities of accepting AI, which conforms to this study's suggestion that it is quite hard to evaluate the success of a robot fund. Credit rating agencies have not paid much attention to this kind of funding, as the market is not wide enough for it to be worthwhile placing business in this segment, which requires harder funding decisions in this system.

Furthermore, different cognitions of investment cause different chances of accepting AI, which is in line with the study by Borovykh, Bohte, and Oosterlee (2017), who conducted a test with a conditional time series and concluded that it is more efficient than various multivariate time series, the autoregressive model and long short-term memory networks (LSTM), because it does not need many retrospective data. It also provides greater returns than the method of Bjerknes and Vukovic (2017), who studied advice in managing investing ports by robots and concluded that, on three out of four occasions, the advice from robots could provide greater returns than the index in the Norwegian market when the risks were adjusted. Moreover, Hodge, Mendoza, and Sinha (2018), who studied the effect from robots acting like humans in providing advice on investment, found that investors would lose trust in the investment when the first piece of advice is not right. The first method that would support the investors' trust is to let robots engage in self-learning and let humans invest in their own way. The second method is to allow robots to follow the form programmed by humans and let humans follow the human form. We can say that the investors who have higher cognition of investment would understand more about the investment system of AI and achieve greater returns.



Now that technology has taken on a greater role in trading in the capital market, anyone who can understand and adapt more quickly to the changed investing state will be the winner in this game. When mentioning robot and investment, many people imagine hi-tech, modern and complicated supercomputers that can deliver a purchase order within a quarter of a second, but, if we examine the topic in depth, we find that systematic thinking, involving patterns and obvious steps, is the key to efficient trading by robots (Supakwong, 2017). Thus, in the present investment environment in which technology is taking part, including easier access to essential information for investment and new investors who aim for profits, robot or AI trading offers another shortcut to the peak of investment.

For anyone who is interested in gaining information on the advantages and disadvantages of the system and the risks that could arise, for supporting decisions, increasing the rate of utilization and expanding the ways of obtaining information through social media, there should be free trials of AI in financial instrument trading to provide a better understanding of the process.

## 6. Acknowledgement

I would like to show my gratitude to Kraiwanit, research advisor, for providing advice, concepts and solutions to problems throughout the writing of this article.

## 7. References

- AI-DW-block trade (2018, Oct). *Efinancethai*. Retrieved from <https://www.efinancethai.com/HotTopic/HotTopicMain.aspx?id=ZUhSVFc2MHhSSUU9>
- AI Robot is really prepared to be a labor premium? (2018, May1). *Matichon Online*. Retrieved from [https://www.matichon.co.th/news-monitor/news\\_937291](https://www.matichon.co.th/news-monitor/news_937291)
- Bizbug Admin2. (2018). Trade stocks through ROBOT-A.I should study advantages – disadvantages before using the service. Retrieved July 1, 2018, from <https://bit.ly/2FAAUVR>
- Bjerknes, L. & Vukovic, A.(2017). *Automated Advice: A Portfolio Management Perspective on Robo-Advisors*. A thesis for the degree of Master of Industrial Economics and Technology Management. Norwegian University of Science and Technology.
- Borovykh, A., Bohte, S., & Oosterlee, C. W. (2017). Conditional Time Series Forecasting with Convolutional Neural Networks. *Lecture Notes in Computer Science/Lecture Notes in Artificial Intelligence*, 729–730.
- Denwiththayanan, K. (2017). Robot Advisor Investment Management Assistant. Retrieved January 20, 2018, from <https://www.pwc.com/th/en/pwc-thailand-blogs/blog-20170131.html>
- Hodge, F. D., Mendoza, K. I., & Sinha, R. K. (2018). The Effect of Humanizing Robo-Advisors on Investor Judgments. *SSRN Electronic Journal*. (in press).
- Rajitpinyolert, B. (2017). Robot Fund Overview. *Bangkokbiznews*. Retrieved from <http://www.bangkokbiznews.com/blog/detail/642511>
- Sak. (2018). AI, Robot or Quant Trading can it works? Retrieved January 25, 2018, from <https://www.stock2morrow.com/discuss/room/1/topic/9859>
- Supakwong, S. (2017). Think ALGO, trading in a new era let's robots make money instead. Bangkok: Stock2morrow.
- Tharadhol (2018, November). Development of AI with machine learning for Thai stock trading. Retrieved from <https://www.tharadhol.com/svm-thai-stock>