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HOW DOES ONLINE TRADING TECHNOLOGY AFFECT RISK-TAKING BEHAVIOR IN INVESTORS?

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Abstract
Most of the existing research on the impact of technological innovation is aimed at finding out how individuals accept certain technologies and their effects on performance. Meanwhile, research that correlates the existence of technology with economic behavior is still limited. One of the economic activities with a high intensity of technology use is investing in the stock market. With the high intensity of technology use in the stock trading process, economic behavior influenced by technology's existence will naturally be formed. Therefore, this study aims to reveal the effect of technology, especially online trading technology, on the risk-taking behavior of individual investors. The data is analyzed using a statistical method, Structural Equation Modeling (SEM). Empirical results suggest that using online trading technology makes investors' risk-taking behavior more aggressive.
Keywords : risk-taking behavior, online trading

1. Introduction

It is common knowledge that the trading mechanism in the stock market is loaded with technological infrastructure. Investors interact with technology features, including technology used to access and process information and stock trading. Technological developments and innovations used in the stock market are given conditions that investors must address. The technology is used in their investment activities to become part of their behavior. Economic behavior that is closely related to stock investment activities is risk-taking behavior. Risk-taking behavior is defined as an individual's action that contains or carries a significant level of risk (Injodey & Alex, 2011).

The topic that is often studied related to the presence of technology is a behavior related to acceptance and intention to use the technology, as in the research conducted by Lee (2009), Venkatesh (2000), and Konana & Balasubramanian (2005). After the acceptance and intention phases, individuals use certain technologies, becoming a habit that forms one of the individual's behaviors. Based on this empirical gap, this study aims to prove online trading technology's effect on stock investors' risk-taking behavior.

In the practice of stock investing, online technology and information technology become the infrastructure of the stock trading process. The technology synergy provides the information and information processing needed to make investment decisions. Therefore, this technology's existence must be adapted by investors as a consequence to get the opportunity to get a return from stock investment.

Most research on the use of online trading technology by investors is carried out in the corridor of adaptation of investors to the use of online trading technology (Fang Liu, Shia Huang, & Hsiu Chiou, 2012) (Lee, 2009) (Gopi & Ramayah, 2007). This research uses various modifications to the Technology Acceptance Model (TAM) approach. Meanwhile, Konana & Balasubramanian (2005) provides an alternative approach to adapting investors to online trading technology using the Social-Economic-Psychological (SEP) approach. This study seeks to prove the effect of investors' perceptions of technology on economic behavior, especially risk-taking behavior, to develop a discussion of the factors that influence individual acceptance of technology. The facts about the high consumption of technology in stock trading activities and the role of technology in providing information flow are the reasons for the importance of proving technology's effect on investors' behavior.

1.3 Literature Review

In a broad sense, risk is the probability of a loss occurring due to a decision. Thus, investment risk is the probability of financial loss due to investment decisions. In investment theory, it is assumed that investors rationally make a logical trade-off between the expected return and the investment portfolio's risk.

Individual risk preferences are influenced by risk capacity and risk aversion (Klement, 2017). Risk capacity is the ability of an investor to take financial risks. Moreover, risk aversion is a combination of psychological dimensions and emotional responses that determine investors' willingness to take financial risks and psychological burdens when faced with financial losses. Investors choose a type of investment only if the risk is within the limits of the investor's risk capacity and risk-averse. In some studies, risk aversion is termed risk tolerance, although with the exact definition. Risk tolerance plays a role in shaping individual risk-taking behavior. In general, risk tolerance can be conceptualized as an individual's willingness to engage in activities with the desired goal of containing uncertainty and the possibility of loss (Grable, 2016). Risk-averse or risk tolerance which describes investor behavior toward risk can be identified from the choice of portfolio asset allocation and cash allocation (Cavezzali & Rigoni, 2012).

Based on individual investors as decision-makers and how much investment risk can be tolerated, all quantitative risk calculations will form investor perceptions and preferences about risk. In the phase after forming perceptions and preferences about risk in investors, actions are related to the chosen investment activity. Individual actions containing or carrying a significant risk level are termed risk-taking behavior. Risk-taking behavior by individuals, in this case, investors, is reflected through portfolio diversification decisions, allocation of funds in the portfolio, stock turnover in the portfolio, and the average trading value.

The technology acceptance model (TAM) was initially designed to explain the behavior of individual computer use. The perception of usefulness and the perception of convenience are considered the two predecessor variables that influence attitudes toward technology (Lee, 2009). Furthermore, attitudes towards this technology affect behavior in using technology. Perceptions of usefulness indicate the level of individual belief that using a technology system will improve performance. Meanwhile, the perception of ease shows individual confidence that using certain

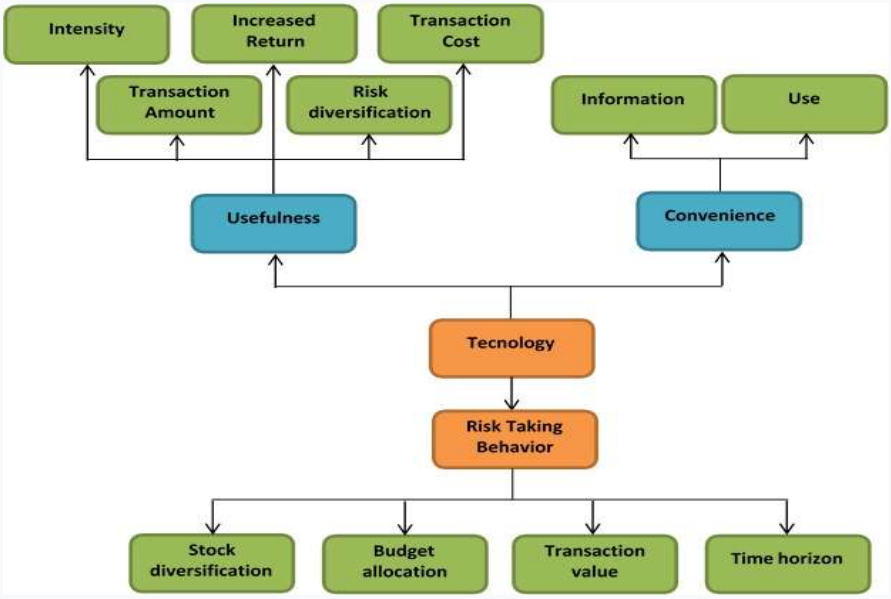
technologies does not require serious effort. According to TAM, perceived usefulness is also influenced by perceived ease of use because the easier the system is to use, the more useful it will be.

Research conducted by Venkatesh (Science, 2000) added a social dimension to TAM, later named TAM2. TAM2 describes the influence of three interrelated social forces, subjective norms, volunteerism, and image, on individuals who face opportunities to adopt or reject the new system. Meanwhile, Konana & Balasubramanian (2005) include socio-economic and psychological dimensions (SEP Model) to determine investors' acceptance of online trading technology.

In this study, the TAM (Technology Acceptance Model) is used to prove the influence of perceptions of specific technologies on economic behavior. The advantages of online trading technology in finding and processing information give individual investors the ability to react and make corrections quickly and more precisely. This ability increases investor confidence to trade more often and be more aggressive in stock trading decisions. This logic is in line with Huberman's (2001) findings, which state that investors with superior information have a higher trading frequency. It does not stop discussing the factors influencing individual acceptance of technology. This study tries to prove the effect of investors' perceptions of technology on economic behavior, namely risk-taking behavior.

This research is part of the primary research on a larger scale with more complex variables. The main study's chart of the relationship between variables is presented in the following conceptual framework chart. Meanwhile, this study particularly discusses the relationship between technology perception variables and risk-taking behavior.

Conceptual Framework



The hypothesis in this study was built based on the conceptual framework shown in the figure, which states that investors' perception of the use of online trading technology affects risk-taking behavior.

2. Methods

2.1 Data Types, Population, and Sample

The data required in this study is primary data collected using the survey method with the help of questionnaires. These questionnaires aim to obtain data related to the perception of the use of online trading technology and risk-taking behavior variables observed in individual stock investors in the Jakarta Stock Exchange. The number of respondents is 154 investors who fit the sample criteria.

On the other hand, this study also employed the purposive sampling method, with the following criteria: the investors are individual actors with an investment fund of less than 1 billion Indonesian Rupiahs, having been an investor for more than three years, and actively undertaking transactions.

2.2 Analysis Methods

The method adopted to analyze the data are the structural equation model (SEM). SEM is based on the forms of correlations among the researched variables and the nature of the research variables. This paper will discuss only two variables: the online technology perception variable and the risk-taking behavior variable.

Referring to the nature of the research variables, where each variable cannot be directly measured through a single indicator but utilizing several indicators, the use of SEM as the method for data analysis is deemed suitable.

2.3 Variable Definition

Variable	Definition
Risk-taking behavior	Investor's behavior when allocating risks in the owned stock portfolio. Risk-taking behavior is measured using these indicators: stock diversification in the portfolio, average transaction values, investment time horizon, and fund allocation.
Perception of technology	Investors' perception of online trading technology on stock investment activities.
Perception of usefulness	Investors' confidence that using online trading technology will improve their performance as an investor and their stock portfolio performance
Perception of convenience	Investors' confidence that they can independently use online trading technology to improve their stock portfolio investment activities.

3. Results

The results of the measurement of variables, including online technology perception variables and risk-taking behavior variables, are summarized in the following table.

Table 3.1 Technology Perception Variable Measurement Model (X1)

Indicator	Loading Factor	P-value	Sub Indicator	Loading Factor	P-value
Perception of usefulness (X1.1)	0.908	0.000	X1.1.1	0.830	0.000
			X1.1.2	0.862	0.000
			X1.1.3	0.601	0.000
			X1.1.4	0.667	0.000
			X1.1.5	0.619	0.000
Perception of convenience (X1.2)	0.894	0.000	X1.2.1	0.914	0.000
			X1.2.2	0.921	0.000

Source: Analysed Primary Data, 2020

From the results of statistical tests, it can be concluded that all indicators are significant as a measure of the usefulness variable (X1.1) and the convenience variable (X1.2). Furthermore, based on the loading factor and p-value of the usefulness and convenience variables, it can be concluded that these two variables are significant as a measure of the online technology perception variable (X1). From the magnitude of the coefficient of the highest loading factor, it is obtained that the benefit (X1.1) is the strongest measure of the technology perception variable (X1).

Table 3.2 Measurement of Risk-taking Behavior Variable Measurement Model (Y4)

Indicator	Loading Factor	P-value	Information
Y4.1	0.808	0.000	Significant
Y4.2	0.545	0.001	Significant
Y4.3	0.699	0.000	Significant

Source: Analysed Primary Data, 2020

Based on the statistical test results summarized in table 3.2, it can be concluded that all indicators of the risk-taking behavior variable (Y4) are significant as a measure of the risk-taking behavior variable (Y4).

Table 3.3 Structural Model SEM: Direct Effect

Correlation	Coefficient	P-value	Conclusion
Technology Perception (X1) on Risk-taking Behavior (Y4)	0.361*	0.000	Significant

Source: Analysed Primary Data, 2020

From the test results of the effect of the technology perception variable (X1) on risk-taking behavior (Y4), the structural coefficient is 0.361, and the P-value is 0.000. P-value <0.05, and the coefficient is positive, indicating that there is a significant and positive influence between technology perception (X1) on risk-taking behavior (Y4). That is, the higher the perception of technology (X1), the higher the risk-taking behavior (Y4).

4. Discussion

Effect of Perceived Online Trading Technology on Risk-Taking Behavior

The online technology perception variable in this study is defined as the investor's perception of applying online trading technology in stock investment activities. Statistical tests have confirmed that stock investors' perceptions of usefulness and convenience are valid indicators of online technology perception variables. In the respondents' answers, there are findings that the existence of online trading technology provides benefits and convenience for investors in buying and selling shares. Respondent investors perceive that online trading technology provides benefits, including increased trading intensity, stock transaction value, returns, and stock variations. On the other hand, there was a decrease in transaction costs in the form of deposits at securities institutions that provide online trading services. In addition, investors also perceive that using online trading technology provides convenience, especially regarding information access. The findings regarding the perceived usefulness and perceived convenience by investors of online trading technology are summarized in table 4.1 and table 4.2

Table 4.1 Result of The Perception of Usefulness Indicator

Perception of Usefulness Indicator (X1.1)	Question	% Answer Agree	% Answer Disagree	% Neutral
Intensity	Since using online trading, transactions are becoming more frequent	80	5	15
Transaction value	Since using online trading, the nominal amount of the transaction has increased	75	8	17
Increased return	Since using online trading more often get capital gains	50	10	40
Stock Variation	Since using online trading, the types of shares bought/sold are increasingly varied	70	9	21
Transaction fee	Stock transaction fees in the form of deposits at securities institutions that	76	4	20

Perception of Usefulness Indicator (X1.1)	Question	% Answer Agree	% Answer Disagree	% Neutral
	provide online trading services, the nominal amount is relatively affordable			

Source: Analysed Primary Data, 2020

The conclusions from tables 4.1 and 4.2 states that most investors positively perceive the benefits and ease of use of online trading technology.

Table 4.2 Result of The Perception of Convenience Indicator

Convenience Perception Indicators	Question	% Answer Agree	% Answer Disagree	% Neutral
Information	The online trading system makes it easy to find information that determines stock choices	80	1	19
	I find it easier to monitor the value of the stocks I own because it can be done at any time	88	2	10
Use	The features of the online trading system are easy to operate	82	1	17
	Online trading makes it easier to ascertain whether I have acquired the stock I want to buy or whether the stock I am selling has sold	89	1	10

Source: Analysed Primary Data, 2020

Furthermore, it will be discussed how positive perceptions from investors on the use of online trading technology lead to an increase in risk-taking behavior by investors. Starting with the presentation of the facts on the respondents' answers are presented in table 4.3 as follows.

Table 4.3 Results of Risk-Taking Behavior Indicators

Risk-taking Behavior indicators	Question	% Answer Agree	% Answer Disagree	% Neutral
Allocation of stocks	I tend to choose stocks that give high return expectations even though the risks involved are also high	57	16	27
Investment horizon	I bought stocks as a short-term investment (not kept for more than one year)	49	29	22

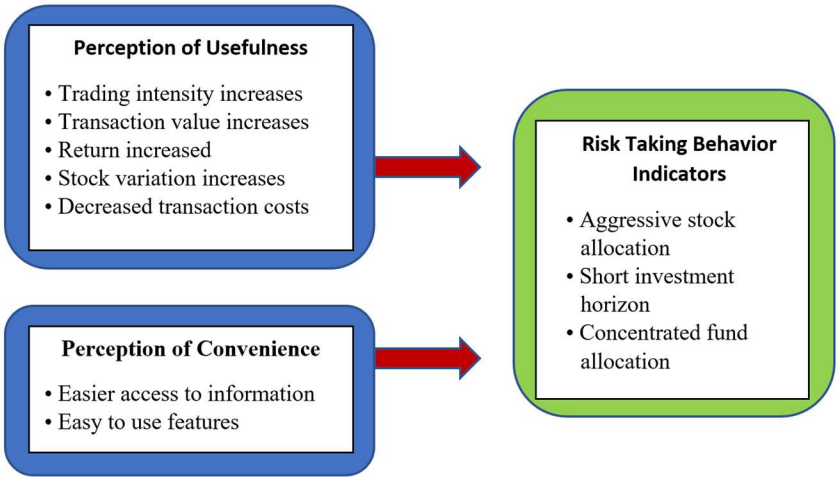
Risk-taking Behavior indicators	Question	% Answer Agree	% Answer Disagree	% Neutral
Fund allocation	The proportion of stock investment value in my portfolio is not evenly distributed but concentrated on the stock that gives the highest expected return	74	9	17

Source: Analysed Primary Data, 2020

Respondent's answers to the stock allocation indicator can be interpreted that the majority of investors choosing the consequences of dealing with high risks to get high returns. The respondents' answers to the investment horizon indicator also confirmed the willingness to accept this high risk. Most investors choose stocks as short-term investments or less than one year. This choice indicates that investors prefer stocks that are in an uptrend in the short term to provide high returns but are at high risk to be held in the long term. Furthermore, investors' risk-taking behavior is examined through fund allocation indicators. Most investors do not diversify risk but focus on allocating funds to stocks that provide high returns. Based on the facts of the respondent's answers, a picture of investors' risk-taking behavior can be obtained. There are three points of findings regarding risk-taking behavior by investors, namely: aggressive stock allocation, short investment horizon, and concentrated allocation of funds.

Furthermore, investors' perceptions of the usefulness and convenience use of online trading technology will be presented, which are linked to facts regarding risk-taking behavior by investors. The presentation is intended to obtain an overview of how increasing investor perceptions of the usefulness and convenience of online trading technology can lead to increased risk-taking behavior of individual investors.

Chart 1. The Correlation between Investors' Perceptions of the Use of Technology and Indicators of Risk-Taking Behavior



The finding that increasing the use of online trading technology will increase risk-taking behavior by investors will be discussed with an emphasis on the role of information channels. The online trading system is integrated with information technology so that it will affect the flow of information received by investors. The flow of information provided by this technology allows investors to quickly access information from various sources about stocks that can affect stock investment expectations. This information availability becomes the basis for investors to determine which stocks to buy or sell, how much is the value of buying and selling, and how often the frequency of buying and selling. When investors feel they can rely on the sources of information they have, it will increase investor confidence to buy and sell stocks more often. In the opposite situation, when investors feel less informed, they rarely do stock trading activities and keep fewer stocks in their portfolios. This argument is in line with Huberman's (2001) research results, which conclude that investors with superior information will feel better than other investors, so the frequency of trading is high. Reliable information and quick execution of trades allow investors to react quickly to catch up with the momentum of price changes in the market. Investors become more confident to invest aggressively because they can make corrections quickly in case of market changes with the support of online trading technology. The support for the usefulness and convenience of the technology encourages investors to be more confident in increasing risk tolerance for their stock investments. Increased risk tolerance impacts increasing risk-taking behavior by investors in buying and selling shares. Increased risk-taking behavior by investors aims to increase the expected return on the investment made. The risk-taking behavior is manifested in 3 ways: stock allocation, investment horizon, and fund allocation in the portfolio.

From chart 4.4, it can be seen that the increase in investor perception of the benefits and convenience of online trading technology is manifested in 3 things: an increase in buying and selling intensity, an increase in transaction value, and an increase in stock variations. Investors do these three things in the corridor of increasing risk-taking behavior: aggressive stock allocation, short investment horizon, and allocation of funds concentrated on stocks with high return, high-risk character. In summary, it can be concluded that when investors positively perceive the usefulness and ease of use of online trading technology to increase the value of their transactions, the proportion of their investment value will be concentrated in stocks that provide high return expectations with high-risk consequences.

5. Conclusion

From the empirical results, it can be concluded that the higher the intensity of online trading technology usage, the more aggressive the risk-taking behavior of investors. Furthermore, increased investor perception of the usefulness and convenience of online trading technology is manifested in 3 ways: an increase in buying and selling intensity, an increase in transaction value, and an increase in stock variations. Investors do these three things in the corridor of increasing risk-taking behavior: aggressive stock allocation, short investment horizon, and allocation of funds concentrated on stocks with high return, high-risk character.

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