

Understanding Factors Affecting Investment Decision-Making During Pandemic

Evelyn and Jossenia Leonora Widyanto

Finance Program, Accounting Department, School of Accounting,
Bina Nusantara University
Jakarta, Indonesia 11480
evelyn008@binus.ac.id, jossenia.widyanto@binus.ac.id

Setiani Putri Hendratno

Accounting Department, School of Accounting,
Bina Nusantara University
Jakarta, Indonesia 11480
shendratno@binus.edu

Abstract

Investment decision-making is a complex process and play's vital role in achieving investor goals. The current COVID-19 pandemic didn't mitigate investors' enthusiasm for investing in Indonesian stock market. The growth of investors in Indonesia has hits a new record. By the end of 2021, number of single investor identification will have surpassed 7.5 million. This study objectives to investigate factors that affect individual's Indonesian investor in investment decision-making during the pandemic. Four factors such as herding behavior, technology advancement, financial literacy, and firm knowledge were explored. To investigate these variables, questionnaire was designed utilizing the purposive sample method and the Likert scaling methodology. A sample of 338 Indonesian investors who started investing during the COVID 19 pandemic were collected and their data was analyzed using SmartPLS application. The findings of this study demonstrated that herding behavior, technology advancements, financial literacy, and firm knowledge all had a positive and significant impact on Indonesian investors' investment decisions. However, the results show that technological advances are the most important factor influencing investors' investment decisions. The outcomes of this study will boost investor confidence and broaden investor knowledge in weighing decisions for developing better investment activities.

Keywords

Herding, Technology Advancement, Financial Literacy, Firm Knowledge and Investment Decision-making.

1. Introduction

COVID-19 pandemic evoked the most dramatic stock market crash in history. As the result of limited economic activity, this outbreak had a significant economic impact. On January 31, 2020 IDX left level 6,000 and closed at 5,940. Index was practically in free fall and closed at 3,937 or drop 37.50% by March 24, 2020, compared to the end of 2019. This is caused by a steady drop in share prices as investors worry about the distribution of the coronavirus and government reactions that implement some policies. As stock markets worldwide average declined, investor immediately responded by engaging in panic selling on shares owned. Fortunately, the change of trading halt policy obtains a positive respond from the market because they assume that stock price will not experience the same dramatically crash (Rahim et al. 2021). From the third week of May 2020 to early June 2020, an increase in the stock prices of the stock trade was beginning to show improvement. PT Bursa Efek Indonesia (BEI) reports that the growth of retail investors in the capital market has set a new record in the history of the capital market. The number of single investor identification (SID) Friday (31/12) has reached 7,489,337 SID. PT Kustodian Sentral Efek Indonesia (KSEI) also noted that young people or the millennial generation investors still dominating in Indonesia's capital market.

Investment decisions are affected by a variety of factors. Setiyono et al. (2013) found that there is a pattern of herding behavior among Indonesian capital market investors. The phenomenon of herding behavior often appeared and found

in market of emerging economies and mainly seen during market stress. Most Indonesian investors tend to adopt herd behavior when making investment decisions. The situation where market require fast decision-making provoke the hesitant investor to follow another investor who are more sophisticated (Rahayu et al. 2021). Asymmetry information and noise traders also mark the presence of herding. Chinese investor showed that after liberalization, there was significant decline in herding intensity. These indicate that quantity and quality of information available influences the investor herding behavior (Alhaj-Yaseen and Rao 2019). Herding behavior will affect and increase the volatility of market (Bikhchandani and Sharma 2001). Madaan and Singh (2019) research claims that herd behavior has a strong influence on investor investment decisions-making. Herding occurs when the information is not fully available and it leads with risk and uncertainty. A different opinion was given by Rahman and Gan (2020) where the research explains that herding does not significantly influencing investment decisions.

Technology expands and is aided by rapid internet advances, digital financial services have opened up to make it easier for the public to carry out transactions and financing. Lee and Shin (2018) claims that the advancement of technology is the trend and became the leading player in the financial world. As a result of activity restrictions during the pandemic, the use of technology is increasing. The increase and growth in the number of investors was driven by the ease of investment that can be done online (Fernando et al. 2021). Previously, investors had limited information to make decisions, but with technological advances, they could easily obtain a huge stack of information to make decisions (Qasim et al. 2019). Nowadays, investors can invest their funds in the stock market by online through some applications that are run by the securities company and connected to the stock market activities. Investment app, made primarily millennials and new investors to trade up their securities through mobile phones (Fan 2021). Due to new generation of digital technology, traditional services have been replaced by Robo-advisor, a based artificial intelligence technology that helps investors to make more effective investment decisions (Shanmuganathan 2020). On the contrary, the results of the research done by Wahyudi et al. (2020) states that financial technology does not affect investment decisions.

Indonesia's technological advancement has not been accompanied by an understanding of the world of investment. Based on the National survey of 2019 issued by Indonesia Financial Services Authority (OJK) at the end of the year shows that Indonesian peoples have a low financially literate level, which only around 38.03%. According to Alaraj and Bakri (2020), having good financial literacy will lead investors to a most profitable decision when they invest their money. Quality of information, awareness level, and rationality to make investment decision based by investor's capability and needs reflect the investor financial literacy. Klapper et al. (2013) argue that investor with high level of financial literacy is less likely to experience negative income shocks during the macroeconomic crisis. The ability to understand financial knowledge will help investor to make a good financial decision. Financial literacy will increase investors' knowledge of rightly investing and assimilate such irrational behavior (Suresh 2021). While Arif (2015) suggests financial literacy has significant negative impact with investment decision-making. Instead, the most affecting factor in making investment decision-making is the condition of financial statements and Firm status in the industry.

Having knowledge of the company that will be invested is important to investors. Corporate performance is often associated with an investor's perception of company success. The assessment of the company's financial information will strengthen the decision-making process (Linciano et al. 2018). The study from Fallatah (2018) conclude that knowledge shown from the performance of the firm through their financial condition. In Indonesia, blue-chip shares are the type that is most attractive to investors in investing their money because this blue-chip share comes from a company that has a good reputation and performance so that its movements tend to be steady and safe. Rababah et al. (2020) research found that the COVID-19 had a serious impact on the financial performance of both small and medium enterprises. Better performance indicators will increase the investment traction of both domestic and foreign investors as these increase investors' trust to be more optimistic about future financial performance (Munisi 2019). Blessing and Onoja (2015) research stated that some significant ways to assess the performance from financial statements are profitability, assets, liabilities, and equity. These are useful to investors in investment decision-making. Investors tend to make investment decisions based on the company financial statements and industry status (Arif 2015).

This research is critical in determining the elements that influence Indonesian investors' investment decisions during a pandemic. The increasing number of Indonesian investors that set a new record in the midst of a pandemic, whereas previously in Rahim et al. (2021) discovered that the presence of the pandemic had caused investors panic, until they sell their own shares, caught the interest of researchers in knowing what factors could cause the number of Indonesian investors to soar during the pandemic. The motivation for conducting this research is to discover information that will

benefit many parties and encourage the growth of investment in Indonesia. This study tries to fill in the research gaps left by prior studies, focusing on herding behavior, technological advancements, financial literacy, firm knowledge, and individual investment decision behavior. There was a chasm between those studies. Some researchers discovered that these characteristics had a considerable impact on investment decision making, while others discovered that they had no significant impact on investment decision making. On the other hand, we make certain adjustments because one of the drawbacks of prior research was relying just on behavioral biases components (Madaan and Singh 2019; Rahman and Gan 2020). The presence of COVID-19 affects market stability. Therefore, some previous research could be outdated or not relevant with current situations. The other parts of this research are organized as follows. Section 2 reviews the relevant literature, theoretical foundations and proposes the hypotheses along with the research model. Section 3 describes the research methodology followed by Section 4 data collection. Section 5 deals with reporting the results and discussion. Last, section 6 state the conclusion.

1.1 Objectives

Based on this description, the research significance of the paper is to see more clearly the factor that most influenced the interest in investing during the pandemic. The research question underlying this study:

- Does the behavior of herding affect the interest of Indonesian investors to invest during the pandemic?
- Does the technology advancement affect the interest of Indonesian investors to invest during the pandemic?
- Does the financial literacy of investors affect the interest of Indonesian investors to invest during the pandemic?
- Does firm knowledge affect the interest of Indonesian investors to invest during the pandemic?

Moreover, the specific objectives of this paper are:

- To give empirical result about the effect of herding behavior to investment decision-making during pandemic
- To give empirical result about the effect of technology advancement to investment decision-making during pandemic
- To give empirical result about the effect of financial literacy to investment decision-making during pandemic
- To give empirical result about the effect of firm knowledge to investment decision-making during pandemic

2. Literature Review

2.1 Investment Decision-Making

Understanding the decision-making process in the market has always been a challenging task for academics and practitioners. Several theories and assumptions have been put forward by known scholars to explain factors affecting investment decisions. Investing is the activity of placing several funds in an instrument with the aim of increasing its value over a specific period of time and generating profits in the future (Fernando et al. 2021). The covid-19 pandemic that emerged triggered a massive movement in the financial market. The rapid incidence of sprawl and mortality has left an economic impact that significantly affected human psychology and continues to influence investors toward stock market investment decisions (Naseem et al. 2021). Behavioral finance theory argues that investor sociology behavior, physiological behavior, and irrational behavior as well as biases influence individual investment decision-making. Studies have shown that investor behavior is based on psychological principles that can be used to explain why people buy or sell stock (Madaan and Singh 2019). According to Rahman and Gan (2020), the investment decision refers to the decisions made by the investors toward the assets they have in which the funds will be invested. Investors defined as individuals who put their money into investment products to get the expected return, and investor's main goal is to maximize their return and minimize risk. To get the greatest incentive from the investment decision, investors need to be fully and accurately adapted for potential opportunities. The standard of classification investment options should be made to make sure investors make good decisions (Alaaraj and Bakri 2020). There are basically two types of investors: individual and institutional investors. Investment decision-making is not always done rationally.

2.2 Herding Behavior

Herding's behavior is an economic theory that is defined as an act by an investor to reduce risk investment by imitating the other investors behavior (Mertzanis and Allam 2018). A study found that herding is the most common behavioral bias that happens when they fear of loss or in a period of market distress so they think irrationally. In the markets

where herd behavior is present, the main element that forms investment decisions is not a compilation of personal information or a personal assessment of investors, but the decision of other investors (Başarir and Yilmaz 2019). The researcher claims the main reason investors do the herding is they think that other investors have more knowledge about financial products, see themselves as inadequate in information evaluations, and act in harmony with the goals of the majority. In most cases, herding appears because habits of investors who like to imitate for avoiding extra efforts. Studied found that investor is influenced by herding and there was a significant impact of behavioral finance such as herding on individual investors' investment decision-making (Raut et al. 2020). In line with the study, Abul (2019) confirms that psychological factors, like herd behavior, do affect investors' investment decisions making. Investor investment decisions are made according to the market trends (other investors). The study also found that psychological factors play an important role in making investment decisions for individual investors. Madaan and Singh (2019) discovered that individual behavior and market phenomena are combined in behavioral biases, which are considered as a part of behavioral finance. Furthermore, they found that herding behavior has significant and positive effects on investor sentiments. Contrary, Adil et al. (2021) research stated that herding behavior of investors on investment decisions was negative and statistically significant for both male and female investors. Hence, the first hypothesis is as follows:

H1. Herding behavior positively significant to the investors' investment decision-making

2.3 Technology Advancement

Technology advancement here discuss about the development of a new scientific things that could facilitate human activities. Markets worldwide were profoundly influenced by the advancement in technology. Technological advances triggered by the Internet revolution that led to changes in traditional financial services to electronic-based financial development (Lee and Shin 2018). Online stock trading is an example of a technological advancement product where investors can trade, seek investment advice and make investment decisions through their mobile phones. Fernando et al. (2021) argue that online or digital-based applications will help investors in investing. Online stock trading is a booming technology product because it provides facilities with lower transaction costs and ease of access. Technological adoption of investment are important considerations in the financial and industrial economies. The uncertainty in the market and technology (arrival of the new technology) has a significant impact on investment decision-making (Fan et al. 2019). Fan (2021) indicates that the new technology era is characterized by the use of mobile devices for investment transactions and the use of Robo-advisor as investment advice. The existence of mobile investment will make investors more effective in portfolios decisions, conducting investment transactions, also researching and monitoring securities and markets. Based on research done by Shanmuganathan (2020), Robo-advisor is considered because it helps investors make decisions more effectively, cheaper, and less emotional. Current technological development leads investors to expect considerable expectations because these developments can help investors to improve their investment activities (Solanki et al. 2019). Hence, the second hypothesis is as follows:

H2. Technology advancement positively significant to the investors' investment decision-making

2.4 Financial Literacy

The investors' financial literacy talks about awareness and understanding associated with ideas and investment information, which aims to ensure the ability to make informed, safe, and effective investment decisions (Suresh 2021). Financial literacy will help minimize irrational behavior to achieve the desired benefits. Income level, education level, and workplace activity affected financial literacy (Al-Tamimi and Kalli 2009). Rasool and Ullah (2020) concludes that there is a negative association between financial literacy and behavioral bias for individual investors, and increasing financial literacy will reduce the likelihood of investor facing behavioral biases. In obtaining optimum investments, investors require to be financially literate because the financial product is a complex instrument. Adil et al. (2021) stated that based on the cross-sectional research design method find that financial literacy has significant impact on investment decisions amongst both female and male investors. Along with the study, some previous studies also found that there is a significant link between financial literacy and investment decisions (Al-Tamimi and Kalli 2009; Jariwala 2015; Prasad et al. 2021; Suresh 2021). Jariwala (2015) found that financial literacy will increase financial information and financial knowledge of an investor to make their confidence in making investment decisions and generate better financial behavior. Investor financial literacy is one of the most important aspects that help investors to maximize investment return and revenue (Prasad et al. 2021). Studies also explain that accounting statistics, market data information, broad overview, and technical understanding are closely related factors with the financial industry. Hence, the third hypothesis is as follows:

H3. Financial literacy positively significant to the investors' investment decision-making

2.5 Firm Knowledge

Firm knowledge in this research means the capability of a firm in running their business to achieve their goals. Every investor needs assurance about what these organizations are and how efficiently and effectively they are through the information disclosed by the organization before investing to get the most potential. When making an investment decision, individuals heavily rely on the record of financial information. Investors believe that reputable companies will create good investment opportunities (Naveed et al. 2020). Transparency of firm information will also build the corporate reputation which would increase investor interest toward the firm (Naveed et al. 2021). Through firm information, investor can discover the performance of the firm. Broad valuable knowledge will show better and more influence firm performance than those that have narrow knowledge. By creating high value of knowledge will increase the chance of generating more revenue and followed by improving firm financial performance (Fallatah 2018). In making investment decisions, accounting information is used as a primary source of information that will help reduce investment inefficiency (Cho and Kang 2019). Financial statement analysis is used by stakeholders to assess a company's value and financial performance. With financial ratios, investors get information on the conditions of the company they will invest in, so they're able to make good decisions. The increasing value of a company will result in a boost in investors' trust in the company and make investors more interested in the capital market (Ichsani et al. 2021). Hence, the fourth hypothesis is as follows:

H4. Firm knowledge positively significant to the investors' investment decision-making

Figure 1 shows the research framework.

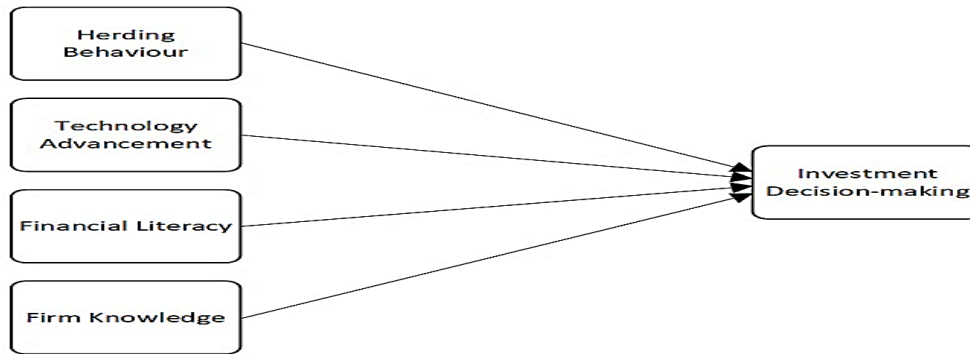


Figure 1. Research framework

3. Methods

In achieving the main goal of doing this research, the method used is quantitative. The research uses primary data which it is the type of original data collected directly from its primary source, a survey. Researchers uses 4 independent variables (exogen's) and 1 dependent variables (endogens). The questionnaire consisted of 6 segments with a total of 26 questions, addressing different aspects of the respondents' personal preference and investment information that required for this study. The primary section of the questionnaire comprises five items in giving respondents personal information. This helps in understanding investor's demographic profiles. The second section consists of four questions following Prasad et al. (2021) and Rahman and Gan (2020) for investment decision. The third segment consists of four questions measuring herding behavior among individual investors (Waweru et al. 2008). The fourth segment of the questionnaire consists of four questions for measuring financial literacy (Montford and Goldsmith 2016; Prasad et al. 2021). Furthermore, the fifth segment of the questionnaire consists of four questions for measuring firm knowledge (Al-Tamimi and Kalli 2009). Last, the sixth segment of this questionnaire consists of four questions measuring technology (Khan et al. 2021). The data were collected, processed and analyzed using SmartPLS. The data with poor quality that including too many missing values or biased ratings, will be cleaned and removed. Statistical techniques in this paper are validity test, reliability test, F^2 , R^2 , Q^2 , Model Fit, and Hypothesis testing.

4. Data Collection

The study is conducted to investigate whether herding behavior, financial literacy, firm performance and technology advancement influences in decision-making of investors with the help of a designed questionnaire. The sampling technique in this study was carried out by using non-probability sampling, namely, the purposive sampling method

where the sample used was determined based on specific criteria. Following the research objectives, only a certain part of the population is relevant to use. The criteria set for taking samples used in this research are;

- Indonesian citizens who start investing during the pandemic

In Indonesia, the covid-19 virus entered March 2020. Questionnaire was distributed on since March 2022. Therefore, the data we are going to use are new investors who have been investing since March 2020 or around the last two years. A sample number of 400 investor arrived using Slovin's 1960 calculation. Questionnaire were distributed to the participants through online with G-Form. We following the previous research which employ Likert scale (Al-Tamimi and Kalli 2009; Prasad et al. 2021; Rahman and Gan 2020). Respondents use a Likert scale from 1 (strongly disagree) to 6 (strongly agree) to select a scale that indicates the level of agreement with each statement. From the total 400 respondents, the data that we used are 338 respondents, 62 data were excluded because of they are not categorized as investors who started investing since the COVID-19 pandemic.

5. Results and Discussion

In Indonesia, the covid-19 virus entered March 2020. Therefore, the data we are going to use are new investors who have been investing since March 2020 or around the last two years. A total of 400 were collected. The study identifies 84.5% or 338 respondents have just started investing two years ago, 10% of have experience in investing for around >2 until 4 years and 5.5% have invested more than four years. This reinforces the evidence that most investors are just starting to invest in the pandemic. So, the number of respondents that meet our criteria was 338 data.

5.1 Numerical Results

Demographic information of the respondent is stated in the first part of questionnaire. Table 1 shows the data and percentage of 338 respondent.

Table 1. The demographic profile of Indonesian investors (n = 338)

Variables	F	%	Variables	F	%
Age			Employment Status		
15 – 25	298	88.17%	Full Time	91	26.92%
26 – 41	31	9.17%	Part-Time	30	8.88%
42 – 57	8	2.37%	Self-employed	28	8.28%
> 57	1	0.30%	Unemployed/ Full-time student/ Retired	189	55.92%
Domicile			Investment Goals		
Java	291	86.09%	Long-term	240	71.01%
Sumatra	21	6.21%	Short-term	98	28.99%
Kalimantan	12	3.55%	Monthly Income (in Rupiah)		
The Lesser Sunda Islands	9	2.66%	< 4.000.000	242	71.60%
Sulawesi	4	1.18%	4.000.000 - 8.000.000	74	21.89%
Maluku Island	0	0.00%	8.000.001 - 12.000.000	15	4.44%
Papua	1	0.30%	> 12.000.000	7	2.07%

*F= Frequency

In terms of age, from 338 respondent, the largest group is between 15-25 years old which consist of 88.17% from the whole sample, followed by aged group 26-41 (9.17%), 42-57 years old about 2.37% and respondents more than 57 years old were the least in number (0.30%). The respondent's domicile is dominated by communities on the Java Island, 86.09%. Followed by Sumatra 6.21%, Kalimantan 3.55%, The Lesser Sunda Islands 2.66%, Sulawesi 1.18%, and Papua 0.30%. For employment status, research found that 91 respondent or 26.92% were full-time employee, 8.88% as part-time, 8.28% as self-employed and 189 respondent or about 55.92% were unemployed/ full-time student/ retired. Again, in the terms of the investment goals, most investors choose long-term investment goals (71.01%). Only 28.99% that have short-term investment goals. Based on monthly income, respondents who have monthly income (in Rupiah) less than 4,000,000 were 242 respondents or 71.60 %. 21.89% respondents earned monthly income around 4,000,000-8,000,000, 4.44% respondents in range 8,000,001-12,000,000 and only 2.07% of respondents earned monthly income more than 12,000,00.

Table 2. Variable mean

	Mean
Herding Behavior	4.431
Technology Advancement	5.384
Financial Literacy	4.556
Firm Knowledge	5.106
Investment Decision-Making	4.998

Table 2 shows the average of each variable that we obtained based on the questionnaire that has been distributed. Each variable consists of four indicators that represent those variables and also have a range from one until six. Number one represent that these variables have minor influence on Indonesian investor investment decision-making. Greater number describe that these variables have stronger effect on Indonesian investor investment decision-making. The average or mean obtained from the total respondents' answers for herding behavior variable was 4.431. This shows that most Indonesian investor still imitating others for their investment decision-making process during the pandemic. The presence of herding behavior in Indonesia during pandemic still can be found. Next, the technology advancement variable mean was 5,384. This number has already gone beyond the center of the scale, which means to prove that the technological advances in finance and investment that occur in Indonesia was the reason of Indonesian investors to invest during pandemic. The mean obtained in financial literacy variable was 4.556 which proves that the average Indonesian investor who invests during the pandemic asses themselves as an investor with a good financial literacy. Likewise, the firm knowledge variable with a mean of 5.106 shows that investors who start investing during the pandemic aware to the company's ability in manage their business. Finally, on the investment decision-making variable, the number obtained was 4,998. This explains that Indonesian investors who invest during the pandemic are able to make suitable investment decisions.

5.2 Graphical Results

The analysis is performed in three stages: outer model analysis, inner model analysis and hypothesis testing. Outer model analysis is useful to see the feasibility and accuracy of the research instrument and used to measure the variables of the objects being studied. The analysis of the outer model from the calculation of convergent validity, discriminant validity and reliability. This outer analysis specifies a relationship between these latent variables and the indications. Starting from convergent validity, was done by viewing average variance extracted (AVE) for each variable in the model.

Table 3. Validity and reliability

	Cronbach's Alpha	Composite Reliability	AVE
Herding Behavior	0.882	0.919	0.738
Technology Advancement	0.850	0.898	0.689
Financial Literacy	0.821	0.883	0.654
Firm Knowledge	0.814	0.878	0.642
Investment Decision	0.700	0.816	0.526

Table 4. Fornell-Larcker Criterion

	Herding Behavior	Technology Advancement	Financial Literacy	Firm Knowledge	Investment Decision
Herding Behavior	0.859				
Technology Advancement	0.097	0.830			
Financial Literacy	0.339	0.245	0.809		
Firm Knowledge	0.253	0.427	0.519	0.801	
Investment Decision	0.349	0.448	0.492	0.535	0.725

Based on the Table 3, from the calculation, the value of the AVE found in each of the variables exceeds the minimum requirement of 0.5. This value represents the adequate convergent validity which means that one latent variable able to explain more than half of the variance of its indicators in the average. In discriminant validity, the Cross Loadings

calculation indicates that the loading value of each indicator on these variables on the construct is greater than the cross-loading value. On Table 4, the Fornell-Larcker Criterion model here prove that this model has excellent discriminant validity because the square root value of AVE for each construct is greater than the correlation value between constructs with other constructs in the model. The analysis of the cross loading and Fornell-Larcker Criterion in this case appears that there was no discriminant validity problem. In the reliability test, all data have composite reliability >0.7 which indicates that the research has high reliability. The reliability test was also strengthened by Cronbach Alpha. Similar with composite reliability, the minimum requirement for Cronbach Alpha is >0.7. Scores generated on the Cronbach Alpha test for herding behavior, technology advancement, financial literacy, firm knowledge and investment decision were 0.882, 0.850, 0.821, 0.814, 0.700 which explained that there was consistency from the gauges or models used.

Table 5. R Square

	R Square	R Square Adjusted
Investment Decision	0.433	0.426

Table 6. f Square, Q Square and Collinearity Statistics (VIF)

	Herding Behavior	Technology Advancement	Financial Literacy	Firm Knowledge	Investment Decision (f²)	Q² (=1-SSE/SSO)	Investment Decision (VIF)
Herding Behavior					0.050		1.141
Technology Advancement					0.100		1.224
Financial Literacy					0.066		1.462
Firm Knowledge					0.073		1.589
Investment Decision						0.220	

Table 7. Fit summary

	Saturated Model	Estimated Model
SRMR	0.071	0.071
d_ ULS	1.054	1.054
d_ G	0.289	0.289
Chi-Square	581.417	581.417
NFI	0.816	0.816

Inner model analysis in the study was used to predict causality relationship between latent variables. Through the coefficient determinations (R^2) in Table 5, the results obtained are 0.426. This suggests that the variability of endogenous (dependent) variables which can be explained by the variability of exogenous (independent) variables is 42.6%. The rest amounts of 57.4% is defined by other variables beyond these variables. Apart from testing the R-Square, we also carried out an examination based on the value of f^2 . This f^2 used to calculate the magnitude of the influence between variables with Effect Size. Through Table 6, the result of f^2 explain herding behavior, technology advancement, financial literacy and firm knowledge has a moderate influence with value of 0.050, 0.100, 0.066 and 0.073 to endogenous variables. Basically, to see if our data is relevant or not, we're using Q^2 . From Table 6, the value obtained was 0.220 so it can conclude that the model that we used have predictive relevance and have a good observation value. Table 6, the multicollinearity test shows the number obtained for each variable were 1.141, 1.224, 1.462, and 1.589. This number is below 5 which means that there is no multicollinearity problem. If there is multicollinearity in the study, it will be very difficult to resist the null hypothesis in a study. Moreover, continued with the model fit test in Table 7 which shows how capable the model developed explains the data. SRMR (Standardized Root Mean Square) result is 0.071 so it can categorize as fit. Normed fit index (NFI) at the range of 0.816 it categorizes as good fit.

5.3 Proposed Improvements

According to this research, the results collected from the respondents some variables are fairly in a good level. However, in this context, improvement is still required. There are still behavioral biases or irrational investor activities in investment decision-making, which could give negative influence. This effect takes place not only by the investors, but also by the economy of the country. According to data provided by respondents, investors who started their investments during the epidemic yet tended to herd on their investment decision-making process. Herding can cause markets more volatile. As a result of these findings, various steps must be done to decrease investor herding behavior. These include improving financial literacy, investment knowledge, and awareness of the risk and consequences of herding. The average investor believes that technological advancement has an impact on Indonesian investors' decisions to invest during the pandemic. This can be used as a benchmarking tool to ensure that investment technology keeps evolving and corporations continue to develop new technologies to support transaction or investment activities, hence increasing the number of Indonesians interested in investing. Despite the fact that the average investor perceives themselves to have strong financial literacy, according to a nationwide survey performed the level of financial literacy in Indonesia is still relatively poor. To address this, seminars on finance and investment can be held, as well as mandated fundamental investment and finance basic classes at a young age and online training programs for the general public. Furthermore, the firm knowledge variable reveals that the average Indonesian investor is well-informed about the company's state before deciding to invest. This must be maintained since, by examining firm knowledge before investing, investors might prevent suffering significant losses as a result of making the wrong investment choice. Making it easy for potential investors to view financial statements as a sign of company performance is one strategy to raise investor awareness of firm information.

5.4 Validation

Hypothesis testing is done by testing T-statistic and P-value through bootstrapping test. The p-value obtained for the herding behavior variable is 0.001, while for technology advancement, financial literacy, and firm knowledge were 0.000, it's proved that these four exogenous variables affect the endogenous variables. P-value indicates that there is a correlation between variables. Original sample describe whether there are positive or negative relationship between those variables. Table 8 shows positive results (0.178, 0.272, 0.231, 0.249) which means that herding behavior, technology advancement, financial literacy, and firm knowledge have a positive influence on investors' investment decision-making. Thus, when herding behavior, technology advancement, financial literacy, and firm knowledge increasing, investment decisions will also increase, and vice versa. T-statistic minimum value used that can be accepted is 1.96 for alpha 5%. In herding behavior variable, the t-statistic value is 3,426. This proves that herding behavior has a significant effect on individual investor's investment decision-making, which was similar with the results of Madaan and Singh 2019; Rahayu et al. 2021; Raut et al. 2020 research, so hypothesis 1 is accepted. Raut et al. (2020) research found that investors are not completely rational and the market is not efficient and herding was the most influencing factor among investors. Contrary, the result of the herding behavior factor in this study does not support the findings of Rahman and Gan (2020). In the context of behavioral factors, this researcher found that herding does not significantly affect the investor's investment decision.

Table 8. Hypothesis test

	Original Sample	T Statistics	P Values
Herding Behavior → Investment Decision	0.178	3.426	0.001
Technology Advancement → Investment Decision	0.272	5.213	0.000
Financial Literacy → Investment Decision	0.231	3.717	0.000
Firm Knowledge → Investment Decision	0.249	4.229	0.000

For technology advancement, the t-statistic value obtained is 5,213. The results revealed that the variable technology advancement also had a significant effect on investment decision-making. This result was similar to the research carried out by Fernando et al. (2021) and Solanki et al. (2019) where Solanki et al. (2019) found that the way of presenting information to reach an investment conclusion before and after digitization changes the way of behavior of individual investors in making investment decision. Moreover, in financial literacy, the t-statistic value shows 3,717, which means the hypothesis 3 is accepted and financial literacy has a significant effect on investment decision-making. This is compatible with research conducted by Suresh (2021) where financial literacy has a positive impact on investment decisions. Researcher also stated that it guides investors to learn more about the investment environment so they can generate profitable investments. Last, firm knowledge variable shows the t-statistic value for 4.229. These

results indicate that firm knowledge has a significant effect on investment decision-making. This was in line with the research conducted by Naveed et al. (2020), who shows that financial information and non-financial information have a significant influence on individual investment decision-making. So, it can be concluded that knowledge of a company, both financial and non-financial will affect investment decisions.

6. Conclusion

As time passes, investors' behaviors in financial investment have become important and several numbers of studies have been performed in this field. But few studies address these aspects of retail investors in a COVID-19 pandemic context. Furthermore, this paper examined firm knowledge factor in investment decision making during pandemic. Four factors were identified as factors that influences investment decision-making such as, herding behavior, technology advancement, financial literacy and firm knowledge. These factors used to explain the overall relationship with the investors' decision-making process. Findings of this study suggest that herding behavior had a positive and significantly relationship with investment decision-making during pandemic. Madaan and Singh (2019) research also emphasized that the presence of herding behavior means that investor in financial market is not rational on their investment decision-making process. Technology advancement also have a positive and significantly relationship with investment decision-making during pandemic. The convenience offered as a form of advancement of technology in investment, encourages the interest of the wider community to participate in investing. In financial literacy and firm knowledge variables, these two variables also have a positive and significantly relationship with investment decision-making during pandemic. Each investor needs to have adequate financial literacy and information on the firm performance before they start investing. This way, could help minimize losses that may be experienced during investment. This current research shows that these variables influence most of Indonesian investors in their investment decision-making process during this pandemic. The most influencing factors that affect investment decision-making in this paper was technological advancement.

This research is useful in the development of scientific studies for academic programs, universities, departments, and faculties, particularly in terms of the factors that influence people's investment decisions. The results of this study will provide new information and insights to future researchers on the concept of investing. On the other hand, findings of this study can help to strengthen the theory that was used as a reference. For practical implications, the research provides valuable insight for investors, governments, fund managers, and any other financial institution. Study uses the most common socio-psychological biases that investors should concerned about while making an investment decision, herding. Understanding and recognizing behavior is very important because irrational investment decisions could bring a dramatic impact that leading to significant instability and, the worst is a financial recession. This also help fund managers to be able to identify and avoid repeating common behavioral errors. Investors can be aware of their behavioral weaknesses and improve their investment decision-making process to achieve greater returns in the future. Nowadays, investment can be done online. Through this research, the results can help the government, financial institutions or online investment application companies in developing services for investment transaction to suit the needs and desires of the community. Next, the study suggests that governments and authorities for taking sufficient steps to improve the financial literacy of Indonesian investors. It will help investors to maximize the value of their investment by conducting educational training program to enhance investors financial literacy. On the other hand, it improves the capability to comprehend and defend against biases which could lead to huge financial losses in the future. Public financial literacy may contribute for economic growth for a country. In the context of firm knowledge, the result of this paper will warn listed companies to concerned about their reputation to attract large number of investors. This study can be used by individual or retail investors in making good investment decisions and avoid irrational decision that can cause huge loss by conducting a technical analysis of the market prior to investment.

Using subjective measures to operationalize the variable was one of the weaknesses of this research. For the future research, objective measure in the form actual trading records could be used to ensure the validity of the research. This research did not provide information about investor trust in mobile technology application. Future research also can analyze other behavioral factors that have not been investigated in this study. We recommend further research to use a larger sample to increase the validity of the research results. Moreover, this study involves only a narrow geographic area. Mainly in Java, Indonesia. Other states are not covered by the target population group. For further research it can be done in other area and more details of population targets which could lead to other factors affecting investment decision in that population. The sample used in this paper is limited to the individual categories of investors. For further research it may use samples from companies that doing some investments to enhance the variety of different kinds of investors. Further research may also draw data from the circumstances or conditions of a country that differ in politics, health, or other conditions that may influence investment decisions. Finally, in the financial

literacy variable, respondents can assess whether they have good financial literacy or not, which allows for bias. Future research could use a questionnaire with a score to determine the true level of financial literacy.

References

- Abul, S. J., Factors influencing individual investor behavior: Evidence from the Kuwait Stock Exchange, *Asian Social Science*, vol. 15, no. 3, pp. 27-39, 2019.
- Adil, M., Singh, Y. and Ansari, M. S., How financial literacy moderate the association between behavior biases and investment decision? *Asian Journal of Accounting Research*, vol. 7, no. 1, pp. 17-30, 2021.
- Alaaraj, H. and Bakri, A., The effect of financial literacy on investment decision making in Southern Lebanon, *International Business and Accounting Research Journal*, vol. 4, no. 1, pp. 37-43, 2020.
- Alhaj-Yaseen, Y. S. and Rao, X., Does asymmetric information drive herding? An empirical analysis, *Journal of Behavioral Finance*, vol. 20, no. 4, pp. 451-470, 2019.
- Al-Tamimi, H. A. H. and Kalli, A. A. B., Financial literacy and investment decisions of UAE investors, *Journal of Risk Finance*, vol. 10, no. 5, pp. 500-516, 2009.
- Arif, K., Financial literacy and other factors influencing individuals' investment decision: Evidence from a developing economy (Pakistan), *Journal of Poverty, Investment and Development*, vol. 12, pp. 74-84, 2015.
- Başarir, Ç. and Yilmaz, Ö., Herd behavior and its effects on the purchasing behavior of investors, *Contemporary Studies in Economic and Financial Analysis*, vol. 101, pp. 215-226, 2019.
- Bikhchandani, S. and Sharma, S., Herd behavior in financial markets, *IMF Staff Papers*, vol. 47, no. 3, pp. 279-310, 2001.
- Blessing, A. and Onoja, E. E., The role of financial statements on investment decision making: A case of United Bank for Africa PLC (2004-2013), *European Journal of Business, Economics and Accountancy*, vol. 3, no. 2, pp. 12-37, 2015.
- Cho, S. M. and Kang, S. A., The effect of accounting information quality and competition on investment inefficiency: Evidence from Korea, *Asia-Pacific Journal of Accounting and Economics*, vol. 26, no. 4, pp. 489-510, 2019.
- Fallatah, M. I., Does value matter? An examination of the impact of knowledge value on firm performance and the moderating role of knowledge breadth, *Journal of Knowledge Management*, vol. 22, no. 3, pp. 678-695, 2018.
- Fan, L., Mobile investment technology adoption among investors, *International Journal of Bank Marketing*, vol. 40, no. 1, pp. 50-67, 2021.
- Fan, Y., Sarkar, S. and Zhang, C., The investment decision with technological and market uncertainties, *European Journal of Finance*, vol. 25, no. 2, pp. 116-138, 2019.
- Fernando, E., Angelia, V., Meiryani and Pradipta, I. A., A propose model analysis of investor factors on interests and decisions of using online investment applications, *Proceedings of 2021 International Conference on Information Management and Technology, ICIMTech 2021*, pp. 240-44, August 19-20, 2021.
- Ichsani, S., Zaenudin, A. I. N. and Damayanti, G. N., The effect of financial ratio on firm value: empirical evidence from listed firms in the IDX30 Index, *Journal of Asian Finance, Economics and Business*, vol. 8, no. 6, pp. 103-112, 2021.
- Jariwala, H. V., Analysis of financial literacy level of retail individual investors of Gujarat State and its effect on investment decision, *Journal of Business and Finance Librarianship*, vol. 20, no. 1-2, pp. 133-158, 2015.
- Khan, S. U., Liu, X. D., Liu, C., Khan, I. U. and Hameed, Z., Understanding uncertainty dimensions and Internet stock trading service in China from a social cognitive perspective, *Information Technology and People*, vol. 34, no. 2, pp. 812-834, 2021.
- Klapper, L., Lusardi, A. and Panos, G. A., Financial literacy and its consequences: Evidence from Russia during the financial crisis, *Journal of Banking and Finance*, vol. 37, no. 10, pp. 3904-3923, 2013.
- Lee, I. and Shin, Y. J., Fintech: Ecosystem, business models, investment decisions, and challenges, *Business Horizons*, vol. 61, no. 1, pp. 35-46, 2018.
- Linciano, N., Lucarelli, C., Gentile, M. and Soccorso, P., How financial information disclosure affects risk perception. Evidence from Italian investors' behaviour, *European Journal of Finance*, vol. 24, no. 15, pp. 1311-1332, 2018.
- Madaan, G. and Singh, S., An analysis of behavioral biases in investment decision-making, *International Journal of Financial Research*, vol. 10, no. 4, pp. 55-67, 2019.
- Mertzanis, C. and Allam, N., Political instability and herding behaviour: Evidence from Egypt's Stock Market, *Journal of Emerging Market Finance*, vol. 17, no. 1, pp. 29-59, 2018.
- Montford, W. and Goldsmith, R. E., How gender and financial self-efficacy influence investment risk taking, *International Journal of Consumer Studies*, vol. 40, no. 1, pp. 101-106, 2016.
- Munisi, G. H., Financial performance of initial public offerings: Companies listed on Dar es Salaam Stock Exchange, *Banking, Economics and Business Research (ICMABEBR-19)*, pp. 20-27, Buenos Aires, Argentina, 2019.

- Naseem, S., Mohsin, M., Hui, W., Liyan, G. and Penglai, K., The investor psychology and stock market behavior during the initial era of COVID-19: A study of China, Japan, and the United States, *Frontiers in Psychology*, vol. 12, pp. 16, 2021.
- Naveed, M., Ali, S., Iqbal, K. and Sohail, M. K., Role of financial and non-financial information in determining individual investor investment decision: A signaling perspective, *South Asian Journal of Business Studies*, vol. 9, no. 2, pp. 261-278, 2020.
- Naveed, M., Farah, M. F. and Hasni, M. J. S., The transformative role of firm information transparency in triggering retail investor's perceived financial well-being, *International Journal of Bank Marketing*, vol. 39, no. 7, pp. 1091-1113, 2021.
- Prasad, S., Kiran, R. and Sharma, R. K., Influence of financial literacy on retail investors' decisions in relation to return, risk and market analysis, *International Journal of Finance and Economics*, vol. 26, no. 2, pp. 2548-2559, 2021.
- Qasim, M., Hussain, R. Y., Mehboob, I. and Arshad, M., Impact of herding behavior and overconfidence bias on investors' decision-making in Pakistan, *Accounting*, vol. 5, no. 2, pp. 81-90, 2019.
- Rababah, A., Al-Haddad, L., Sial, M. S., Chunmei, Z. and Cherian, J., Analyzing the effects of COVID-19 pandemic on the financial performance of Chinese listed companies, *Journal of Public Affairs*, vol. 20, no. 4, 2020.
- Rahayu, S., Rohman, A. and Harto, P., Herding behavior model in investment decision on emerging markets: Experimental in Indonesia, *Journal of Asian Finance, Economics and Business*, vol. 8, no. 1, pp. 53-59, 2021.
- Rahim, R., Sulaiman, D., Husni, T. and Wiranda, N. A., Investor behavior responding to changes in trading halt conditions: Empirical evidence from the Indonesia Stock Exchange, *Journal of Asian Finance, Economics and Business*, vol. 8, no. 4, pp. 135-143, 2021.
- Rahman, M. and Gan, S. S., Generation Y investment decision: An analysis using behavioural factors, *Managerial Finance*, vol. 46, no. 8, pp. 1023-1041, 2020.
- Rasool, N. and Ullah, S., Financial literacy and behavioural biases of individual investors: Empirical evidence of Pakistan stock exchange, *Journal of Economics, Finance and Administrative Science*, vol. 25, no. 50, pp. 261-278, 2020.
- Raut, R. K., Das, N. and Mishra, R., Behaviour of individual investors in stock market trading: Evidence from India, *Global Business Review*, vol. 21, no. 3, pp. 818-833, 2020.
- Setiyono, Tandililin, E., Hartono, J. and Hanafi, M. M., Detecting the existence of herding behavior in intraday data: Evidence from the Indonesia Stock Exchange, *Gadjah Mada International Journal of Business*, vol. 15, no. 1, pp. 27-44, 2013.
- Shanmuganathan, M., Behavioural finance in an era of artificial intelligence: Longitudinal case study of robo-advisors in investment decisions, *Journal of Behavioral and Experimental Finance*, vol. 27, 2020.
- Solanki, S., Wadhwa, S. and Gupta, S., Digital technology: An influential factor in investment decision making, *International Journal of Engineering and Advanced Technology*, vol. 8, no. 6S4, pp. 27-31, 2019.
- Suresh, G., Impact of financial literacy and behavioural biases on investment decision-making, *FIIB Business Review*, 2021.
- Wahyudi, Tukan, B. A. P. and Pinem, D., Analysis of the effect of financial literacy, financial technology, income, and locus of control on lecturer financial behavior, *AFEBI Management and Business Review*, vol. 5, no. 1, pp. 37-46, 2020.
- Waweru, N. M., Munyoki, E. and Uliana, E., The effects of behavioural factors in investment decision-making: A survey of institutional investors operating at the Nairobi Stock Exchange, *International Journal of Business and Emerging Markets*, vol. 1, no. 1, pp. 24-41, 2008.

Biographies

Evelyn '21 comes from Jakarta, Indonesia. Graduated from Dian Kasih senior high school and joined Bina Nusantara University in August 2018 as a finance major student. She served as manager of program division in BINUS Business International Club (BIC) from 2019- 2020. Evelyn is an experienced Treasury with a demonstrated history of working in PT Alam Sutera Realty, Tbk on 2021. Her current research interest includes economics and finance.

Jossen L. Widyanto '21' joined Bina Nusantara University in 2018 as a student majoring in Finance. She was graduated from SMA Tarakanita Gading Serpong. Jossen was experienced as a Vice President of Product and Achievement in BINUS English Club (BNEC) and as Intern at PT Rintis Nabati Raksa.

Proceedings of the 3rd Asia Pacific International Conference on Industrial Engineering and Operations Management, Johor Bahru, Malaysia, September 13-15, 2022

Setiani Putri Hendratno, S.E., M.Ak., joined Bina Nusantara University in 2016 as Accounting Program Lecturer. She teaches Cost Accounting and Managerial Accounting subject. Her current research interest includes financial technology, managerial accounting, sustainability, and metaverse.