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APP-BASED INVESTMENT PLATFORM AND INVESTMENT DECISION MAKING: A STUDY OF RETAIL INVESTOR BEHAVIOR IN INDONESIA

Annisa Nuraini Tahir, Dwi Nastiti Danarsari
Faculty of Economics and Business, Universitas Indonesia, Indonesia
Email: annisa.nuraini11@ui.ac.id, dwi.nastiti@ui.ac.id

ABSTRACT

The significant growth of retail investors in Indonesia between 2020 and 2022 is partly attributable to technological advancements that have made it easier to access investments through a variety of applications. Previous studies in developing nations like Indonesia, India, and Pakistan suggested that perception biases have influence on retail investor decision making. However, given the capabilities of current investing applications like the display of historical stock/mutual fund price data, retail investors should ideally be able to make more rational investment decisions. This study aims to study the effect of overconfidence, representativeness and loss aversion biases on rational investment decision making made by retail investors in Indonesia who utilize app-based investment platform. This study employs partial least square structural equation modeling (PLS-SEM) to examine the role of overconfidence, representativeness, and loss aversion biases that affect rational investment decision making. As an application feature, historical price data serves as the moderating variable of the interaction between them. The result of this study indicates that overconfidence influences rational investment decision making in a positive and significant manner, while representativeness and loss aversion do not have a significant effect. Price historical data as application feature also does not have significant effect in moderating the relationship between them.

KEYWORDS *behavioral finance; retail investor; investment app; perception bias; overconfidence; representativeness; loss aversion*

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INTRODUCTION

The number of retail investors in Indonesia has increased significantly in the 2020-2022 period. In 2020, the Indonesian Central Securities Depository (KSEI) recorded that the number of individual investors (single investor identification/SID) in the capital market still amounted to 1.69 million. At the end of 2021, this number has increased rapidly to 3.4 million, and at the end of June 2022, KSEI recorded individual investors reaching 4 million with a total asset value of 1029 trillion rupiah.

Individual investors, also known as retail investors, have experienced a rapid increase in numbers due to advances in technology, where retail investments can be accessed easily through various websites and applications. According to Indonesian Financial Services Authority, there were 92 online investment transaction portals in 2022, including both applications and other types of portals. Indonesia Central Securities Depository (KSEI) reported 4.8 million transactions of mutual fund investments were made in April 2022. In that particular month, 92% of all mutual fund transactions were conducted using the application, while the remaining 5% is made through bank sales agents, and 3% through non-bank sales agents (KSEI, 2022). Mobile-based applications have changed the capital market, which was previously exclusive to institutional investors or investors with large assets, to become more open to the general public. Dynamics of stock trading have also altered (Chaudhry & Kulkarni, 2021). What was once conventional, subject to high fees and has barriers to entry, has become easier and lower costs. The number of investors has increased as a result of this transformation, particularly retail investors who utilize their own funds and do not have professional experience in investing.

Research on behavioral aspects of finance for developing countries is still limited (Kumar & Goyal, 2015). Previous research in Indonesia indicated that retail investors in the capital market behaved irrationally in making investment decisions (Sumani et al., 2013). Goodwin, Nelson and Jonathan (2019) assume rational decision making as a decision based on an analysis of all available information to maximize the utility of each choice. However, human behavior cannot be completely free from errors used in decision making (Shleifer, 2000). In making investment decisions, investors are not always consistent with the perception of the risks they face. Errors in decision making or what are called biases are increasingly relevant in a volatile market (Banerji et al., 2020). Bias in decision making is caused by cognitive limitations in conditions of uncertainty, so that someone is forced to use heuristics in making decisions (Kahneman and Tversky, 1979).

Numerous perception biases have been found to exist when making investment decisions in prior studies. Santoso, Farida and Wijayanto (2022) in their research on retail investor behavior in Indonesian capital market during the Covid-19 pandemic concluded that overconfidence and representativeness biases significantly affect investment decision making in retail investors, while herding behavior does not. The cause of the emergence of these two biases is uncertainty in market conditions due to the influence of Covid-19 pandemic. Research in Malaysia (Jaiyeoba et al., 2020) regarding the perception bias that appears in retail and institutional investors, states that both type of investors are influenced by overconfidence, representativeness and anchoring biases. The disposition effect,

herding, and overconfidence are three perception biases that have been studied in Pakistan and have significant impact on investment decisions . Overconfidence, anchoring and representativeness are three biases characterized by psychological biases that are present in retail investors in Indian capital market when making investment decisions (Raut et al., 2020).

Brown, Stice and Rice (2015) argue that the role of investment applications in channeling investment news and media response to financial information can be beneficial for retail investors. New technologies can also play a role in reducing bias in informed decision making. With the latest information received by investors through its application-based investment platform, ideally retail investors can make more rational investment decisions. However, research in Germany obtained the opposite result (Kalda et al., 2021). After using investment applications, retail investors' decisions are more biased, favoring risky, high-volatility stocks as well as those with historically high yields, which are consistent with loss aversion and representativeness bias.

The behavioral aspect of finance (behavioral finance) is a financial market model that emphasizes the potential implications of psychological factors influencing investor behavior. Theories regarding the behavioral aspects of finance develop because of differences from traditional finance where the actors are rational people. Behavioral finance emphasizes that financial actors can be irrational (Statman, 2014). Based on the limited rationality framework, retail investors are trying to make rational decisions, but they often lack important information about problem definitions, relevant criteria, and so on (Lin, 2011). In general, people's judgments are limited in their rationality, so they will abandon the best solution for an acceptable or reasonable solution according to their "satisfaction". There are many previous studies where investors will rely on simplification strategies (heuristics) in making decisions. Although heuristics are very helpful in investment decisions, they can cause errors, or are called bias (Lin, 2011). Therefore, even though investment decisions are in accordance with each stage of the rational decision-making process, perception bias will still exist on the part of investors.

Overconfidence is a bias that arises when a person is too confident in his knowledge and abilities, thus ignoring investment risks. Burton and Shah (2013) gave the term "illusion" for this bias. There are 4 illusions that describe overconfidence, namely the illusion of talent, illusion of skill, illusion of superiority, and illusion of validity. Illusion of talent is an illusion that arises as a result of giving too much attention to individual talent, and ignoring external factors that affect the results at that time. Illusion of skill is the tendency for people to think they have the ability to carry out a certain task when evidence shows that they are no better than random chance. Illusion of superiority is a person's tendency to associate positive attributes with him/her far greater than negative attributes, so that he will label himself "above average", even though he/she is not. This trend has major implications for the financial markets, where they are considered victorious only on the basis of their slightly above average performance. Not infrequently, the result is a big loss. Illusion of validity is a person's tendency to believe that the results of his observations obtained from a narrow period of time have high validity.

There are many effects of the overconfidence bias. First, because investors are overly confident that they are choosing stocks that can earn higher returns than the market, they will tend to trade more frequently. In contrast, the stock these people sell generally outperforms the stock they buy in exchange. Second, due to inaccurate evaluations, the investment portfolio is also inefficient so that it has a real economic impact.

Representativeness is a bias that arises when investors base their decisions on existing stereotypes (Raut et al., 2020). Investors draw conclusions from company characteristics such as extraordinary past performance (e.g increased sales and interesting explanations about the company's products and management) to be a valuable investment. Investors also consider the nearest future yield as a representation of their expectations of future returns (Raut et al., 2020). Conversely, investors will think that the recent decline in prices will reflect poor performance in the future. The impact of the representativeness bias is that investors tend to buy shares that have just experienced an increase, thereby reducing the efficiency of the investor's portfolio.

Kahneman and Tversky (1979) developed Prospect Theory as an alternative to Utility Theory. From the experiments conducted, it was found that a person considers losses to be twice as big as gains even though they are nominally the same. The impact that is felt from this loss can be a real loss, or a result that is below one's expectations. If the expected returns do not match reality, the person experiences a loss of utility (Kőszegi & Rabin, 2006).

Technological developments also influence the behavior of retail investors and their investment decisions. The existence of technology makes the exchange of information easier. On the one hand, technology removes barriers for people to access information about the investment and financial world, but on the other hand technology can increase the dissemination of biased or unconfirmed information. Lukas (2019) through his research in England on social platforms for investors exchanging information can improve the quality of investment decisions by reducing the disposition effect, namely the tendency to sell loss-making stocks too slowly and profitable stocks too quickly. However, Zhang, et al. (2022) in his research in China states that social media rumors weaken investor confidence and cause volatility in the Chinese stock market. The development of applications for investing in the stock market and its derivatives also influences the behavior of retail investors. Chaudry and Kulkarni (2021) in their research on the design of Robinhood and public investment applications in the United States, these two applications do not follow a design pattern that encourages healthy investment behavior.

A spokesperson for Robinhood stated that the notification feature was designed to keep investors aware of the latest news, returns received, and price movements (Derousseau, 2018). Brown, Stice and Rice (2015) argue that the role of investment applications in channeling investment news and media response to financial information can be beneficial for retail investors. With the latest information received by investors through its application-based investment platform, ideally retail investors can make more rational investment decisions. New technologies can also play a role in reducing bias in informed decision making.

Robo-advisors, one of the features on application-based investment platforms, can be a solution to increase portfolio efficiency (D'Acunto et al., 2019).

However, research in Germany (Kalda et al., 2021) obtained the opposite result. Decision making by retail investors after using investment applications has more bias, namely loss aversion by selecting stocks with high volatility and risk, and representativeness, namely choosing stocks with high yields in the past.

Based on previous theory and research, the model adopted for the study is depicted below.

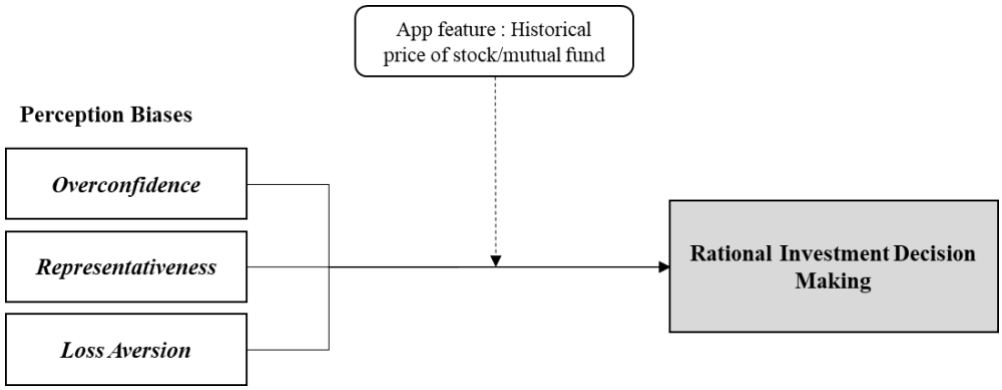

Figure 1. Model of Study

Hypotheses of this study are as follows :

H1: There is a positive and significant influence between the perception bias of overconfidence and rational investment decision making

H2 : There is a positive and significant influence between the perception of representativeness bias and rational investment decision making

H3: There is a positive and significant influence between the perception bias of loss aversion and rational investment decision making

H4 : There is a negative and significant influence between application features and rational decision making

H5 : Application features positively and significantly moderate the effect between the perception bias of overconfidence and rational investment decision making

H6: Application features positively and significantly moderate the influence between the representativeness perception bias and rational investment decision making

H7 : Application features positively and significantly moderate the effect of loss aversion perception bias and rational investment decision making

Based on the above presented notions, this study aims to study the effect of overconfidence, representativeness and loss aversion biases on rational investment decision making made by retail investors in Indonesia who utilize app-based investment platform.

RESEARCH METHOD

The samples who were used as respondents in this study were retail investors in Indonesian region who utilize part or all of their own money to invest. The age range is limited to 18-64 years. Samples are required to have an account or previously had an account on application-based investment platform registered to Indonesian Financial Services Authority. Samples are also required to have experience in conducting a buy/sell transaction at least 1 time during the last year. The investment applications used are limited to capital market investments and portfolios/ mutual funds. Both types of investment have uncertain returns, so investment decision making is considered risky (Jaiyeoba et al., 2020; Kahneman & Tversky, 1979). Samples are self-declared retail investors, which are validated through questions in the questionnaire.

There are five parts of questionnaire, namely screening questions, samples demography, application feature usage, rational investment decision making and perception biases. Questionnaires are developed using 5-point Likert scale with 1 represents "strongly disagree" and 5 represents "strongly agree". Pilot study is conducted to 31 samples to assess validity and reliability of latent variables measured.

After assessing validity and reliability of latent variables measured, questionnaires are distributed online via Google Form and Tsurvey, and Indonesian questionnaire distribution platform specializes in mobile application users. Targeted number of samples are 200, which is 10 times the number of latent variables analyzed (Hair, et.al, 2021). There are 251 recorded responses, in which 18 responses are eliminated due to no variation in the response pattern and discrepancy in investment type.

RESULT AND DISCUSSION

Results

Measure

Survey instrument included several statements designed to measure the participants' decision-making process under the influence of perception biases. A self-administered questionnaire was developed and distributed through online questionnaire (Google Form). The questionnaire consisted of 3 main sections with a total of 30 questions. First section is questions about demography of respondents. Second section consists of 3 questions regarding investment decision making. Third section consists of questions related to research variables. Each survey item related to the research variables are measured on a 5-point scale ranging from (1) which is strongly disagree to (5) which is strongly agree.

Table 1. Questionnaire Reference

Latent Variable	Reference
Overconfidence	Ullah et.al (2020), Lin (2011)
Representativeness	Jain, Walia and Gupta (2019); Raut, Das and Mishra (2018)
Loss Aversion	Gupta and Shrivastava (2022); Jain, Walia and Gupta (2019)
Rational Investment Decision Making	Lin (2011); Kumar and Goyal (2017)
App feature : historical price of stock/mutual fund	Derousseau (2018)

Data Analysis

All the valid data are analyzed using descriptive and inferential statistics. Descriptive statistics are conducted to collect information about demographic profile of samples collected, utilizing Microsoft Excel. Table 2 reports the demographic profile of the samples collected.

Table 2. Demographic Profile

Demographic Variable	Category	Frequency	Percentage
Age	18-30 years	145	62%
	31-40 years	67	29%
	41-50 years	18	8%
	51-64 years	3	1%
Gender	Male	140	60%
	Female	93	40%
Education	Middle-High School	80	34%
	Academy	16	7%
	University	137	59%
Occupation	Private sector/ Public sector Employees	155	66.5%
	Entrepreneur	27	11.6%
	Students	27	11.6%
	Household	10	4.3%
Average Transaction Amount	< IDR 1 million	135	58%
	IDR 1-5 million	61	26%
	IDR 5-10 million	20	9%
	IDR 10-20 million	7	3%
	> IDR 20 million	10	4%
Investment Type	Mutual fund only	95	41%
	Stock market only	78	33%
	Both	60	26%
Domicile	West Java	55	24%
	Jakarta	45	20%
	Central Java	20	8.7%
	East Java	19	8.3%
	Others	90	38%

Measurement Model Assessment

All the valid data collected are analyzed using partial least square structural equation modelling (PLS-SEM). This method is able to simultaneously model and estimate complex relationships among multiple dependent and independent variables, in which the concepts under consideration are typically unobservable and measured indirectly by multiple indicators (Hair Jr et al., 2021). SmartPLS 4.0.9.3 software is employed to conduct the analysis. To ensure data validity and reliability, measurement model assessment is conducted using the model below.

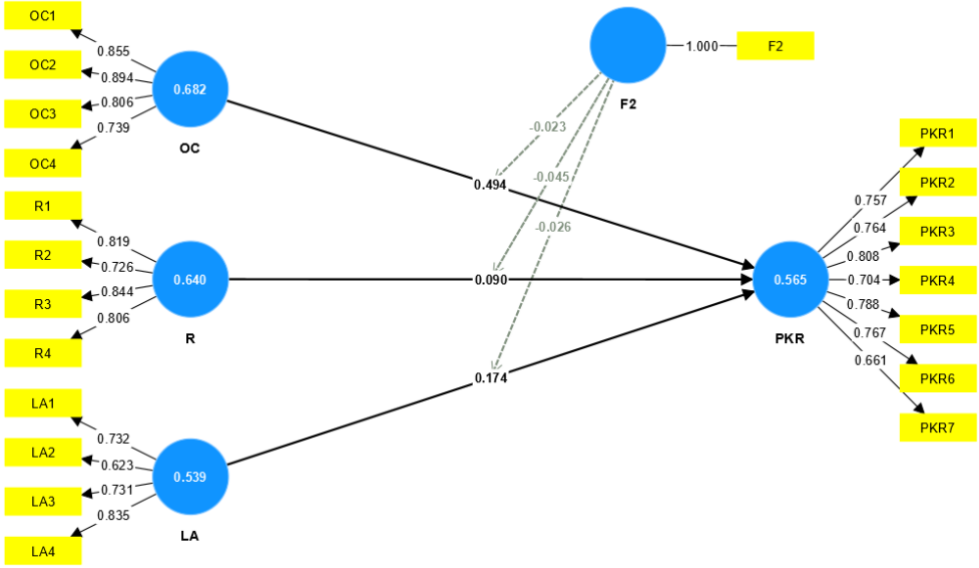

Figure 2. Measurement Model Assessment Result

Factor loading value of more 0.708 is an indicator of good reliability and AVE (average variance extracted) value of more than 0.5 indicates good convergent validity (Hair Jr et al., 2021). Indicator LA2 and PKR 7 are excluded from further analysis due to insufficient factor loading value. Internal consistency reliability is measured by Cronbach's Alpha, composite reliability ρ_a and ρ_c . Table 2 below depicts the value of mentioned measures.

Table 3. Measurement Model Assessment Result

Construct	Indicator	Code	Factor Loading	Cronbach's Alpha	ρ_a	ρ_c	AVE
Over-confidence	I am sure that I made the right investment decision	OC1	0.855	0.843	0.852	0.895	0.682
	I am sure that I can master the future market trend for my investment	OC2	0.894				
	Market trends are often	OC3	0.806				

Construct	Indicator	Code	Factor Loading	Cronbach's Alpha	ρ_a	ρ_c	AVE
	consistent with my perspective						
	I've always seen profit as a parameter of a successful investment strategy	OC4	0.735				
Represent-ativeness	I believe that stocks/mutual funds that have performed well in the past will continue to perform well in the future	R1	0.819	0.812	0.822	0.876	0.640
	I know stocks/mutual funds to avoid because they have not performed well in the past	R2	0.726				
	I invest in stocks/mutual funds whose names I often hear	R3	0.844				
	I rely on past performance to buy stocks/mutual funds because I believe the good/bad performance will continue	R4	0.806				
Loss Aversion	I tend not to sell stocks/mutual funds whose value has decreased	LA1	0.732	0.717	0.763	0.822	0.539
	After experiencing a loss, I increasingly avoid risk in investing	LA2	0.623				

Construct	Indicator	Code	Factor Loading	Cronbach's Alpha	ρ_a	ρ_c	AVE
	I tend to sell stocks/mutual funds whose value has increased	LA3	0.731				
	I am wary of stocks/mutual funds that exhibit sudden changes in trading volume/price changes	LA4	0.835				
Rational Investment Decision Making	Investing in stocks/ mutual funds can help me develop passion and find fulfillment	PKR1	0.757	0.871	0.874	0.900	0.565
	Investing in stocks/ mutual funds is a better way to increase my wealth	PKR2	0.764				
	I invest in stocks/mutual funds to maintain my money's worth	PKR3	0.808				
	In my opinion, exchanging information with friends and relatives is important to understand investing in stocks/ mutual funds	PKR4	0.704[1] 0.696				
	I often collect and reference investment information from news channels, social media,	PKR5	0.788				

[1] Indicator PKR4 is not included in the final calculation and model because the second measurement model assessment produced indicator PKR4 to be 0.696 after omitting indicators LA2 and PKR7.

Construct	Indicator	Code	Factor Loading	Cronbach's Alpha	ρ_a	ρ_c	AVE
	or other relevant public information sources						
	Before selecting stocks/ mutual funds, I consider the future growth of the economy and related industries	PKR6	0.767				
	When I buy/sell stocks/ mutual funds, I pay attention to the transaction costs involved	PKR7	0.661				

Structural Model Assessment

After measurement constructs are confirmed to be valid and reliable, the next step is to examine the model for potential collinearity. High collinearity will impact to high standard error (Hair Jr et al., 2021). SmartPLS 4.0.9.3 is employed to measure Variance Inflation Factor (VIF) value. Value higher than 5 indicates the existence of collinearity issues. Table 4 reports the collinearity assessment result

Table 4. Collinearity Results

	F2	**LA1**	**LA3**	**LA4**	**OC1**	**OC2**	**OC3**	**OC4**
	1.000	1.308	1.397	1.424	2.096	2.973	2.134	1.490
VIF	**R1**	**R2**	**R3**	**R4**	**F2 x LA**	**F2 x R**	**F2 x OC**	
	1.882	1.339	1.800	1.813	1.000	1.000	1.000	
	PKR1	**PKR2**	**PKR3**	**PKR5**	**PKR6**			
	2.060	2.181	2.044	1.921	1.898			

Significance and relevance of the structural model relationships is conducted to test the hypothesis. After omitting indicator LA2, PKR 7, and PKR 4 following is the result of bootstrap calculation depicted in the model.

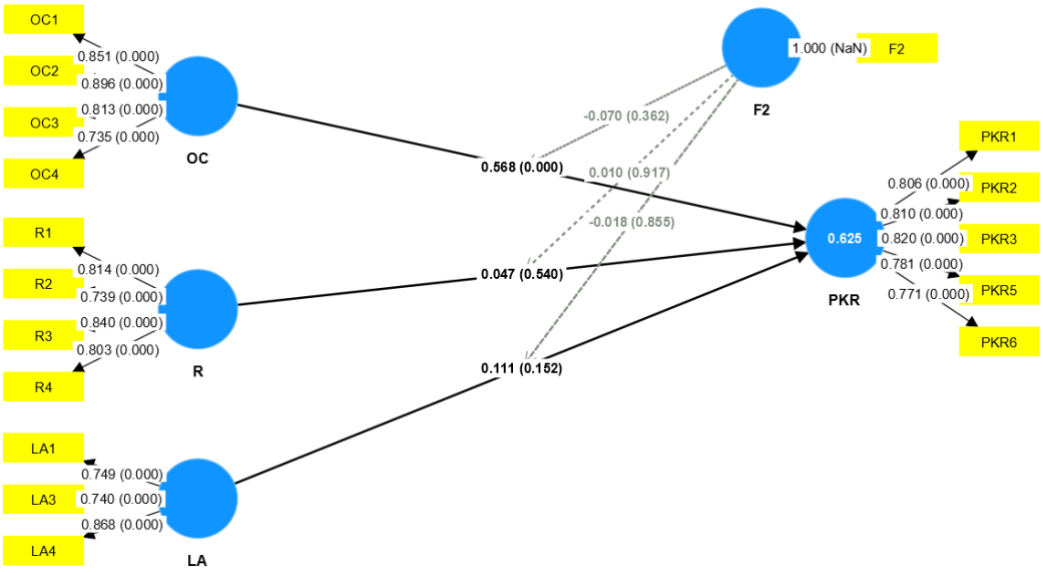

Figure 3. Final Structural Model Assessment Result

It is hypothesized that overconfidence, representativeness, and loss aversion bias have positive and significant effect to rational decision making. Table 5 summarizes the structural model assessment result of this study. Based on the calculation, overconfidence (β 0.568, p-value 0.00) have positive and significant effect to rational decision making, consistent with studies of retail investor behavior in emerging market countries (Gupta & Shrivastava, 2022; Raut et al., 2020; Santoso et al., 2022; Ullah & Elahi, 2014). Surprisingly, representativeness bias (β 0.047, p-value 0.540) and loss aversion bias (β 0.111, p-value 0.152) do not significantly affect rational decision making, though they are positively related. This finding is in contrast with previous studies (Gupta & Shrivastava, 2022; Raut et al., 2020; Santoso et al., 2022).

Education background can be argued to have contributed in lessening the representativeness bias in this study. According to Baker et al. (2019), respondents with higher education have lower tendency on exhibiting representativeness bias in investment decision making. In this study, 59% of samples have university-level education, therefore it is possible that representativeness bias does not significantly affect rational investment decision making, though further study is needed to confirm this notion.

Engaging in buying and selling activities in response to price changes is one indicator of latent variable loss aversion. According to Adrianto and Hamidi (2020), retail investors in Indonesia's stock market, particularly those who are young, only engage in buying and selling activities five times at most per year. As a result, it is presumed that respondents do not engage in buying or selling activities based on increases or decreases in value, which accounts for the lower in loss aversion score.

It is also hypothesized that application feature which provides historical data of stock/mutual funds have negative and significant effect to rational investment decision making. The findings of this study display positive relationship between them. This finding is consistent with research done by Brown, Stice and Rice

(2015), despite being contrary to the researcher's hypothesis, which is based on Kalda, et al. (2021). Brown, Stice and Rice (2015) argued that innovation in technology helps investor make a more rational decision.

In contrast with the hypothesis, historical data of stock/mutual funds does not significantly moderate the relationship between biases and rational investment decision making. It is argued that historical data feature of stock/mutual fund prices is not a significant factor in decision making due to the low selling/buying activity engaged in by respondents.

Table 5. Structural Model Assessment Result

Relationship	Code	β	p-value
Overconfidence >< Rational Investment Decision Making	OC >< PKR	0.568	0.00
Representativeness >< Rational Investment Decision Making	R >< PKR	0.047	0.540
Loss Aversion >< Rational Investment Decision Making	LA >< PKR	0.111	0.152
Feature >< Rational Investment Decision Making	F2 >< PKR	0.224	0.00
Feature as a moderating variable between overconfidence and rational investment decision making	F2 X OC >< PKR	-0.070	0.362
Feature as a moderating variable between representativeness and rational investment decision making	F2 X R >< PKR	-0.018	0.855
Feature as a moderating variable between loss aversion and rational investment decision making	F2 X LA >< PKR	0.010	0.917

Discussion

This study aims to prove that there is a positive and significant relationship between perception bias and rational decision making in retail investors, with the historical data feature of stock/mutual fund prices as a variable that moderates the relationship between them. It is shown that overconfidence has positive and significant effect to rational decision making, consistent with previous studies conducted in emerging market countries. Surprisingly, representativeness and loss aversion do not have significant effect to rational decision making, though the relationship is positive. According to Baker et al. (2019), respondents with higher education have lower tendency on exhibiting representativeness bias in investment decision making. In this study, 59% of the samples are educated in university level. It can be argued that it is a contributing factor in lessening representativeness bias in this study. Low frequency in buying/ selling is argued as a contributing factor in the insignificance of loss aversion bias. This argument is also argued as a contributing factor in the insignificance application feature in moderating the relationship between the biases and rational investment decision making. Price historical data as an application feature, has positive and significant effect on rational decision making. This is consistent with research by Brown, Stice and Rice (2015), where the role of investment applications can be beneficial for retail investors.

CONCLUSION

There are certain sample size restrictions in this study, and only one application feature is examined. This study also omits financial literacy as a contributing factor. Future researchers can consider expanding the number of samples, type of application features and analyze demography and financial literacy as contributing factors in studying biases in retail investors.

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