



A Study on Behavioural Bias & Investment Decision from Perspective of Indonesia's Cryptocurrency Investors

Sherin Callista Denura¹, Subiako Soekarno²

¹Research Scholar, School of Business and Management, ITB, Bandung

²Assistant Professor, School of Business and Management, ITB, Bandung

ABSTRACT: Cryptocurrency, an innovative asset class that is widely adopted by investors around the world. Indonesia is no exception to this, increasing the investor adoption up to 12 million investors in 2022. This number is very significant compared to Indonesia stock market investors that is only around 7 million investors. Various literatures have covered cryptocurrency in terms of pricing strategy and technicalities, so this paper extends the understanding of cryptocurrency dynamics from a behavioral finance perspective that is still less developed in Indonesia. This paper aims to explore the relationship between financial literacy, behavioral bias as well as its implication on the investment decision making process and investment performance from the perspective of investors based on Indonesia's cryptocurrency investors at online communities. This paper used Structural Equation Modeling (SEM) to predict the relation between variables. Our results show that financial literacy has an impact on each behavioral bias. While the behavioral biases that investigate in this study have different result in term of impact on decision-making process and the investment performance. Overconfidence, herding and anchoring are the biases that significantly influence investor's decision making in scope of cryptocurrency market in Indonesia. This study outcome may help investors understand and increase the awareness of investor's investment behavior and decision-making process, and parallel to that the regulators and other stakeholders may use the insight to improve investor's protection.

KEYWORDS: Behavioral Bias, Cryptocurrency, Financial Literacy, Investment Decision, Investment Performance

INTRODUCTION

Cryptocurrency is one of the top rising investment asset classes in recent years spread across the world, where each transaction is encrypted on the public ledger called blockchain. According to Investing.com [1], by 2022 there're more than 20.000 cryptocurrency circulating around the world with 9314 active cryptocurrencies. After the first iteration of Bitcoin in 2009, people's increasing interest in cryptocurrency and blockchain technology has led to more new crypto assets and asset classes. Currently cryptocurrency is divided into three subclasses; Crypto Coins such as Bitcoin, Ethereum, Ripple; Stable Coins that correlated to some currencies such as Tether and BUSD; and Tokens that used to explain a crypto currency that is related to specific application or ICO such as VeChain, Lyfe and DIGIX; and many more [2]. Cryptocurrencies are viewed as one of the most significant new alternative investments also in Indonesia despite its growth is falling under suspicions of irrational behavior of investors, low information availability, and the sense of missing out the opportunity of profit making activities that push people to invest massively. According to Coindesk [3], The number of cryptocurrency transactions in Indonesia reached US\$55 billion in 2021, compared to the previous year that was only around US\$4 billion. Referring to a study by Crypto Global Report [4], Indonesia had one of the highest ownership rates compared to the global average. Another insight from Finder Singapore [5] states that around 12M Indonesians or around 4.5% of Indonesia total population own crypto. Bitcoin, Ethereum, Dogecoin, Cardano are the most famous among Indonesia's investors. A notion spread that crypto is an inflation hedge and the future of money, that can operate as digital gold that its value increases over time. Many driving factors that make the growth and adoption of crypto in Indonesia becomes very significant, such the regulatory supports from Indonesia Commodity Futures Trading Regulatory Bureau (Bappebti) that allow investors to legally trade cryptocurrency as commodities since 2019. Also cryptocurrency investment in Indonesia is only charged for 0.1% from the capital gain and a value-added tax (VAT), lower than other conventional financial products available on the market.

On the other hand, there's a contra argument from Indonesia Islamic Bureau (MUI) has stated that Crypto is Haram or forbidden to be used as a payment option, but it does not decrease the investor's interest in cryptocurrency. Also, the warning from Otoritas Jasa



Keuangan (Indonesia Financial Services Authority) prohibiting financial service institutions to facilitate cryptocurrencies. The prohibition includes using, marketing and or facilitating the trading of crypto assets. But, the growth of crypto investors in Indonesia is still tremendous as data said. The impressive growth of cryptocurrency is deemed to be highly influenced by investor's interaction on online communities and social media. R. C. Philips and D. Gorse [6] even found that social media data can be used as the predictions of cryptocurrency price bubbles. Crypto investors and enthusiasts are known for being active on social networks such as Telegram, Discord, Reddit, Quora, and other platforms [7]. This current study picked Telegram communities to be observed due to its accessibility and familiarity in the Indonesian environment.

Nowadays investors are facing more complex financial decisions, overcoming many different types of investment products. Investment preferences are often influenced by someone's level of financial literacy [9]. A higher level of financial literacy facilitates the ability of individual to manage risk and make wise investment decisions [10]. Due to the characteristics of the free market, cryptocurrency made it also very crucial for each investor to really understand and have vivid knowledge about fundamental financing and the investing process of cryptocurrency itself. Thus, to understand the current phenomenon, this study includes the analysis of financial literacy correlation with investment decisions in the field of cryptocurrency investment and extends the understanding to correlation investment performance as the outcome.

As known from previous research, financial literacy can have important implications for behavioral finance of individual. We can find numerous studies about financial literacy and behavioral finance for various conventional financial assets around the world, yet the cryptocurrency field still has gap to be developed. The cryptocurrency market is unique, it provides us the opportunity to analyze how investor's behavior can influence the investment decision making within speculative conditions. The concept of cryptocurrency as a decentralized financial system, allows the market to become unregulated, highly speculative, and hard-to-value [11][12]. Moreover, cryptocurrencies performance is not directly related to cash flow, unlike conventional financial assets [13]; [14]. The aforementioned facts about the cryptocurrency markets make it well suited to behavioral theories that can highlight the irrationality of investors. The explosive growth of cryptocurrencies and the gap within the literature body encourages the authors to learn more about this subject. The analysis of behavioral and financial literacy factors that influence the investment choices and investment performance of cryptocurrency investors is proposed in this study. This study is one of the preliminary in the field of behavioral finance which targets cryptocurrency investors in Indonesia market.

Therefore, this study raises the following research questions: RQ.1: How does financial literacy relate to behavioral biases among cryptocurrency investors?; RQ.2: How do behavioral biases relate to investment decisions among cryptocurrency investors?; RQ.3: What are the links between investment decision making process and the investment performance on cryptocurrency market?

And, these are the key objectives of the study that was conducted: RO.1: To explore how financial literacy relate to behavioral biases among cryptocurrency investors; RO.2: To explore how behavioral biases relate to investment decision among cryptocurrency investors; RO.3: To explore the relation between investment decision and investment performance aspects on among cryptocurrency investors in Indonesia.

LITERATURE REVIEW

A. *Cryptocurrency*

Cryptocurrency is an asset class in form of digital currency, where the usage is not limited to specific geographical location or nations, and no tied to specific fiat currency [15]. A disruption of the traditional financial system, cryptocurrency, has become one of the most pressing topics. According to Investing.com, by 2022 there're more than 20.000 cryptocurrency circulating around the world with 9314 active cryptocurrencies. The number is even doubled from last year. The market capitalization of cryptocurrency is majority hold by Bitcoin. Previous studies mentioned that Bitcoin itself has no fundamental value and potentially become speculative bubbles [16]; [17]. Theoretically, an asset with no intrinsic value should not have high demand and price, but the existence of cryptocurrency has spoken differently. A behavioral perspective is seen as an appropriate way to understand this phenomenon where speculation and anomalies happened. Baur et al [18] proved that bitcoin and cryptocurrency in general has no correlation with common assets such as stock, bonds, golds, and also currencies [19]. Previous literature on cryptocurrency mostly covered topics related to pricing dynamic, cyber safety, diversification, and underlying technology [8]. There are previous researches on cryptocurrency from the behavioral perspective specifically on herding behavior [20]; [21]; [22], [23]; and regarding confirmation bias [24]. The uniqueness of this current study is by connecting more bias proxies and adding variable investment



decision and performance, that the subject of the study is investors on a highly active market like Indonesia. This study wants to fill the research gap and enriches the body of financial behavioral studies on specific cryptocurrency matters especially in developing countries, in this case Indonesia.

B. Financial Literacy & Behavioral Bias

Simply, financial literacy is someone's ability to manage money and make effective decisions to use that money [25] where the financial literacy level can also be an indication how likely an individual participates in investment activities [26]. An extensive literature has suggested that financial literacy or financial knowledge is crucial to improve someone's financial behavior related to financial products and services [27] [28] [29] and to avoid the behavioral bias [30]. In the field of cryptocurrency, a recent study in Japan found that there are positive and negative impacts of financial literacy on cryptocurrency ownership [31]. Thus, these hypothesis are formed for this current study:

H.1 Financial literacy is affecting herding bias in cryptocurrency market

H.2 Financial literacy is affecting to overconfidence bias in cryptocurrency market

H.3 Financial literacy is affecting to loss aversion bias in cryptocurrency market

H.4 Financial literacy is affecting to gambler's fallacy in cryptocurrency market

H.5 Financial literacy is affecting to anchoring in cryptocurrency market

C. Behavioral Bias & Investment Decisions

The area of behavioral finance is the critique to the traditional economic theory of rational investors, known as Efficient Market Hypothesis (EMH) where the theory believes that investors act rationally and process new information correctly [35]. Hence, more empirical research found that investors are not always rational and able to process all information correctly [36]. Thus, the existence of the behavioral finance field is to cover the understanding of how investors can act irrationally and make mistakes. Behavioral factor models are often associated with the investor's decision-making process [37]; [38]; [39]. The study from an online German Bank found that characteristics of cryptocurrency investor increase their exposure to investment biases and risky investment portfolios [12]. It is aligned with the other literature that mentioned about how men investors in cryptocurrency are tend to be more speculative investors [40]. This current study focuses on five behavioral biases.

Herding Bias

According to literatures, herding is defined as a decision-making process that is characterized by copying majority's judgements and actions [41]. Lack of knowledge about the cryptocurrency itself [42] made many investors imitate other people's transactions that led to extreme price movements. The study of herding behavior in the digital currency market using cross sectional absolute deviation method to market data from 2013-2018 [21] established that herding behavior exists. O'Bryan Poyser [23] revealed that crypto market price formations mechanism indicates the herding behavior, as seen on the momentum occurrence on positive sentiments that make the price and demand increase significantly. A study on the pandemic era also found the existence of herding behavior during normal periods in the cryptocurrency market [43]

H.6 Herding bias significantly influence investor's decision making in cryptocurrency market

Overconfidence Bias

Overconfidence bias is described as a tendency to overestimate, highly self-credit success and tendency to blame external factors when failure happens [44]; [45]. Literature explained that high levels of overconfidence bias in investors, push them to spend more resources in new information and invest in a huge amount to achieve abnormal return [46] despite the high-risk investment [44]. Overconfidence also correlates with investor's tendency to over diversify their investments [47] that often lead to harmful financial conditions and mislead the investment decision. The irrationality drives investors to make excessive trading & investment.

H.7 Overconfidence bias significantly influence investor's decision making in cryptocurrency market

Anchoring

Individual's tendency to value uncertain events by using initial value of that events and adjusting it to achieve final judgment; defined as anchoring [48]; [49]. Younger investors tend to measure upcoming investment return using prior performance returns [50]. The anchoring bias has been studied by previous researchers on the scope of real estate investment [51], loan and credit market [52], also on cryptocurrency market [7]; [53].

H.8 Anchoring bias significantly influence investor's decision making in cryptocurrency market



Loss Aversion Bias

Loss aversion bias is a behavior where investors are more sensitive to losses than to equivalently sized gains [48]. The loss aversion bias has been studied on the previous literature on the various scope, such as on the correlation between loss aversion and anchoring bias [51] and also in spectrum of cryptocurrency market [53].

H.9 Loss aversion bias significantly influence investor's decision making in cryptocurrency market

Gambler's fallacy

The gambler's fallacy defined as mechanism of using a prior series of occurrences, to predict the probability of future events. By doing this, investors tend to have over positive prediction that exposes them to bigger risk and possibility of loss. As previous literature found experienced investor is more likely prone to gambler's fallacy [54]. In line with this, Zielonka [55] found financial analysts are liable to several behavioral biases including Gambler's Fallacy. Investors that are prone to gambler's fallacy have characteristics such as waiting to invest once the market becomes positive, sell the investment once it becomes negative, tendency to buy winning products, while selling losing one [29]. Also, investors with gambler's fallacy character, have belief that they can mitigate the final rate of return during upstream and downstream of capital market [56]. Gambler's fallacy is established on respondents from stock market areas [57]. Overall, both theoretically and empirically, the gambler's fallacy is widely demonstrated. However, the cryptocurrency and gambler's fallacy evidence, still has potential to be observed.

H.10 Gambler's fallacy bias significantly influence investor's decision making in cryptocurrency market

D. Investment Decision & Performance

In the case of financial investment, there are plenty of investment options such as stock, bonds, real estate, and the new one is cryptocurrency. The combinations of investment choices build an investment portfolio that aim to generate return or usually called as investment performance. There are numerous factors that drive an investor's decision, whether it is based on their knowledge, the financial analysis or personal experience that gives output on the investment performance. In field of behavioral finance, found that investment decision are frequently irrational due to imperfect information [61], anomalies [62], psychological bias [63] and also behavioral bias [54]. These aforementioned items play an important role in the decision-making process.

H.11 Investor's decision making in cryptocurrency market influence the investment performance

E. Conceptual Framework

Heuristic biases, investment choices, and investment performance have been studied in numerous researches. However, the field of cryptocurrency market is less studied in developing countries compare to developed countries. But studies done in western countries most likely cannot be applied to Asian countries because culturally irrelevant [65] and may not be applicable in the Indonesia setting. The findings of this study offer important empirical evidence of how individual crypto investors behave in developing financial markets. The study focused on this topic mainly to provide more understanding on the relationship between financial literacy, emotional bias, investment decisions, and investment performance particularly in cryptocurrency. In order to get additional insight into the impact of behavioral and financial literacy characteristics on investment decisions & performances, this study is a step toward developing a model that links such aspects with cryptocurrency investment decisions using PLS-SEM. Our paper advances the body of knowledge in a fresh way.

METHODOLOGY

The conceptual framework that is designed for this research has a purpose to understand the relationship between financial literacy, emotional bias and investment decision and investment performance among cryptocurrency investors in Indonesia.

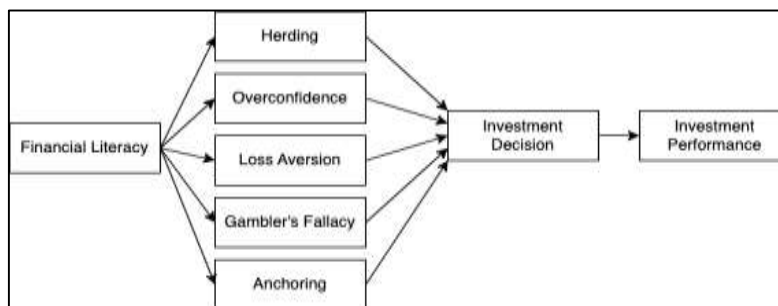


Figure 1. Conceptual Model

The construct that is used in this research is based on previous literature with some modifications to adjust with the specific area. This research used SEM - PLS to estimate the model and analyze the causal relationship of each aforementioned item. In this research, the sample has been drawn from Indonesia. A questionnaire is distributed to several crypto communities online to target directly to people that invest in crypto. The target respondent is a total of 207 respondents, mainly from age 25 - 35 years old living in Indonesia and has been using cryptocurrency for transactional or investment purposes. Before the questionnaire is distributed, it's reviewed and reworked to avoid confusing questions. The respondents got a structured questionnaire with 5-point Likert scale which 5 is representative of strongly agree and 1 is strongly disagree. The questionnaire itself is divided into 4 sections, the first one covers demographic aspects, the second one covers financial literacy, the third one is behavioral factors/ emotional biases, and the last one covers the investment decision & investment performance. The questionnaire consists of 47 questions, 7 questions about demographic, 5 questions about financial literacy, 24 questions about behavioral factors/ emotional biases, and 10 questions about investment decision making and investment performance. Table 1 below showed the demographic profile of the respondents. Majority of the respondents are male, aged between 25-35 years old, had a bachelor degree working in the private sector with annual income above IDR 120 million.

Table 1. Demographic Profile of the Respondents (n=257)

<i>Variables</i>	<i>Category</i>	<i>Frequency</i>	<i>Percentage</i>
Gender	Male	185	71.98
	Female	72	28.02
Age (in Years Old)	<25	30	11.67
	25-35	162	63.03
	36-45	47	18.28
	>45	18	7.00
Marital Status	Married	124	48.24
	Unmarried	133	51.76
Education	<High school	3	1.16
	Highschool	17	6.61
	Bachelor	203	78.98
	Master	33	12.84
	Doctoral	1	0.38
Occupation	Private Sectors	157	61.08
	Civil Servant	45	17.50
	Entrepreneur	50	19.45
	Others	5	1.94
Annual Income (in IDR)	>120.000.000	188	73.15
	60.000.000-120.000.000	69	26.85
	36.000.000-59.000.000	0	0
	<36.000.000	0	0



DATA ANALYSIS

This study employed structural equation modeling (SEM) with partial least squares (PLS) using software smartPLS. SEM is proven to be the powerful technique to handle complexities in a model and understand causal relationship among variables [76]. The initial step that the author did on the SEM data analysis is to evaluate that all the constructs in this study are valid and reliable. To make sure that each indicator reflects the right variable, we employed convergent and discriminant validity tests [77]. On a convergent validity test we observed the factor loadings, composite reliability, and the average variance extracted (AVE) and performed the Fornell-Larcker test and Heterotrait-Monotrait (HTMT) to confirm the discriminant validity test. On Table 2 we provide the details of each indicator and variable for the reliability test and Table 3 for the result of discriminant validity test.

Table 2. Result of Measurement Model

<i>Constructs</i>	<i>Items</i>	<i>Factor Loading</i>	<i>Cronbach's Alpha</i>	<i>Composite Reliability</i>	<i>Average Variance Extracted (AVE)</i>
Financial Literacy	FL1	0.782	0.834	0.838	0.604
	FL2	0.828			
	FL3	0.827			
	FL4	0.675			
	FL5	0.765			
Herding	HR1	0.721	0.790	0.811	0.614
	HR2	0.812			
	HR3	0.723			
	HR4	0.870			
Overconfidence	OC1	0.854	0.854	0.897	0.632
	OC2	0.652			
	OC3	0.770			
	OC4	0.863			
	OC5	0.818			
Loss Aversion	LA1	0.834	0.860	0.864	0.641
	LA2	0.773			
	LA3	0.817			
	LA4	0.783			
	LA5	0.795			
Gambler's Fallacy	GF1	0.809	0.849	0.903	0.605
	GF2	0.846			
	GF3	0.702			
	GF4	0.791			
	GF5	0.733			
Anchoring	AN1	0.732	0.867	0.876	0.655
	AN2	0.837			
	AN3	0.802			
	AN4	0.900			
	AN5	0.767			
Investment Decision	ID1	0.782	0.839	0.854	0.608
	ID2	0.690			
	ID3	0.800			
	ID4	0.796			



	ID5	0.825			
Investment Performance	IP1	0.762	0.839	0.905	0.664
	IP2	0.761			
	IP3	0.861			
	IP4	0.868			

Table 3. Fornell-Larcker Criterion & Heterotrait-Monotrait (HTMT)

<i>Fornell-Larcker Criterion</i>								
	<i>AN</i>	<i>FL</i>	<i>GF</i>	<i>HR</i>	<i>ID</i>	<i>IP</i>	<i>LA</i>	<i>OC</i>
<i>AN</i>	0,810							
<i>FL</i>	0,336	0,777						
<i>GF</i>	0,196	0,280	0,778					
<i>HR</i>	0,312	0,421	0,121	0,784				
<i>ID</i>	0,435	0,447	0,056	0,439	0,780			
<i>IP</i>	0,328	0,205	0,157	0,241	0,325	0,815		
<i>LA</i>	0,206	0,289	0,207	0,406	0,312	0,208	0,801	
<i>OC</i>	0,496	0,251	0,016	0,256	0,440	0,191	0,415	0,795

<i>Heterotrait-Monotrait (HTMT)</i>								
	<i>AN</i>	<i>FL</i>	<i>GF</i>	<i>HR</i>	<i>ID</i>	<i>IP</i>	<i>LA</i>	<i>OC</i>
<i>AN</i>								
<i>FL</i>	0,389							
<i>GF</i>	0,242	0,299						
<i>HR</i>	0,375	0,515	0,159					
<i>ID</i>	0,499	0,528	0,079	0,522				
<i>IP</i>	0,364	0,227	0,169	0,282	0,343			
<i>LA</i>	0,238	0,335	0,229	0,493	0,369	0,228		
<i>OC</i>	0,582	0,283	0,071	0,295	0,492	0,208	0,473	

(Notes: AN=Anchoring, FL=Financial Literacy, GF=Gambler’s Fallacy, HR=Herding, ID=Investment Decision, IP=Investment Performance, LA=Loss Aversion, OC=Overconfidence)

As seen on the table 2, all the item factor loading has values that are greater than recommended value of 0.6 [78]; also all variables have composite reliability ranging from 0.811 to 0.905 that has exceeded the recommended values of 0.7 [79] Also the Average Variance Extracted (AVE) on the measurement model passed the minimum point of 0.5 [77]. Further on the discriminant validity test the author performed the Fornell-Larcker test and Heterotrait-Monotrait (HTMT). First, for Fornell-Larcker criterion, the author checked if all the variables having greater value of square root AVE compare to the correlation with other variables as shown on Table 3. In addition, the author also checked the Heterotrait-Monotrait (HTMT) of which values should be no greater than 0.9 [79]. The results of the measurement model shows that all reliability and validity criteria are fulfilled. Therefore, constructs that are used on this model would be used to test the structural model and hypothesis testing.

Table 4 VIF Value (Inner Model)

	<i>AN</i>	<i>FL</i>	<i>GF</i>	<i>HR</i>	<i>ID</i>	<i>IP</i>	<i>LA</i>	<i>OC</i>
<i>AN</i>					1,472			
<i>FL</i>	1,000		1,000	1,000			1,000	1,000
<i>GF</i>					1,106			



<i>HR</i>	1,282	
<i>ID</i>		1,000
<i>IP</i>		
<i>LA</i>	1,442	
<i>OC</i>	1,582	

Table 5. VIF Value (Outer Model)

<i>AN1</i>	<i>AN2</i>	<i>AN3</i>	<i>AN4</i>	<i>AN5</i>	<i>FL1</i>	<i>FL2</i>	<i>FL3</i>	<i>FL4</i>	<i>FL5</i>
1,634	2,232	1,896	3,563	2,255	1,787	2,220	2,158	1,362	1,622
<i>LA1</i>	<i>LA2</i>	<i>LA3</i>	<i>LA4</i>	<i>LA5</i>	<i>OC1</i>	<i>OC2</i>	<i>OC3</i>	<i>OC4</i>	<i>OC5</i>
2,044	1,743	2,054	1,826	1,792	1,988	1,424	1,810	3,013	2,655
<i>GF1</i>	<i>GF2</i>	<i>GF3</i>	<i>GF4</i>	<i>GF5</i>	<i>HR1</i>	<i>HR2</i>	<i>HR3</i>	<i>HR4</i>	
1,665	1,823	2,575	1,995	2,975	1,459	1,584	1,514	2,133	
<i>ID1</i>	<i>ID2</i>	<i>ID3</i>	<i>ID4</i>	<i>ID5</i>	<i>IP1</i>	<i>IP2</i>	<i>IP3</i>	<i>IP4</i>	
1,753	1,519	1,878	2,055	2,101	1,870	1,885	1,905	1,883	

(Notes: AN=Anchoring, FL=Financial Literacy, GF=Gambler’s Fallacy, HR=Herding, ID=Investment Decision, IP= Investment Performance, LA=Loss Aversion, OC=Overconfidence)

Further, table 4 and table 5 presented the inner and outer Variance Inflation Factor (VIF) value to make sure that there was no multicollinearity in the model. The maximum value must be 5, to be considered as no multicollinearity [80]. As presented on the table all values are under 5 means, the inner and outer model is safe from multicollinearity.

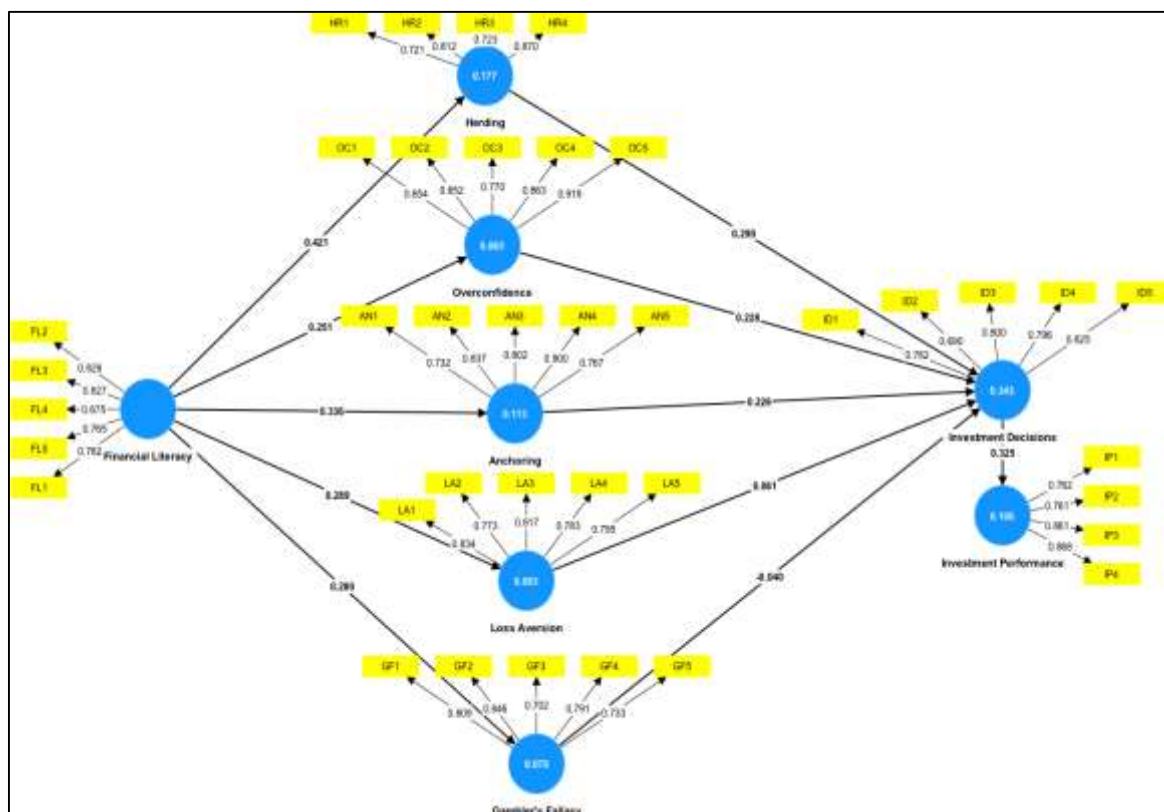


Figure 2. Structural Models Results



Table 6. Path Coefficients

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
Financial Literacy -> Herding	0,421	0,429	0,046	9,135	0,000
Financial Literacy -> Overconfidence	0,251	0,258	0,059	4,233	0,000
Financial Literacy -> Loss Aversion	0,289	0,297	0,060	4,845	0,000
Financial Literacy -> Gambler's Fallacy	0,280	0,290	0,056	4,987	0,000
Financial Literacy -> Anchoring	0,336	0,343	0,052	6,461	0,000
Herding -> Investment Decisions	0,290	0,297	0,061	4,736	0,000
Overconfidence -> Investment Decisions	0,228	0,231	0,063	3,629	0,000
Anchoring -> Investment Decisions	0,226	0,225	0,062	3,669	0,000
Loss Aversion -> Investment Decisions	0,061	0,060	0,057	1,069	0,285
Gambler's Fallacy -> Investment Decisions	-0,040	-0,038	0,060	0,663	0,507
Investment Decisions -> Investment Performance	0,325	0,336	0,070	4,655	0,000

As presented on table 6, the path coefficient analysis is also employed on this current study. In the models found that within area of cryptocurrency in Indonesia, financial literacy has significant impact on herding behavior as β -value was 0.421, with t-statistics value was 9.135 corresponding to p-value ≤ 0.01 . Thus, financial literacy influences herding behavior on hypothesis H1. (Table 8) is proved and accepted. Also checking on the table 6 that financial literacy has significant impact on overconfidence as β -value was 0.251, with t-statistics value was 4.233 corresponding to p-value ≤ 0.01 . Thus, financial literacy influences overconfidence bias within the area of cryptocurrency in Indonesia as stated on hypothesis H.2 (Table 8) is proved and accepted. Continue on the next path, in the models found that within area of cryptocurrency in Indonesia, financial literacy has significant impact on loss aversion as β -value was 0.289, with t-statistics value was 4.845 corresponding to p-value ≤ 0.01 . Thus, financial literacy influences loss aversion behavior on hypothesis H.3 (Table 8) is proved and accepted. Result also found that financial literacy has significant impact on gambler's fallacy among Indonesia's cryptocurrency investor as β -value was 0.280, with t-statistics value was 4.987 corresponding to p-value ≤ 0.01 . Thus, financial literacy influences gambler's fallacy on hypothesis H.4 (Table 8) is proved and accepted. Last part of financial literacy and behavioral bias among Indonesia's cryptocurrency investor ,the models shown that financial literacy has significant impact on anchoring as β -value was 0.336, with t-statistics value was 6.461 corresponding to p-value ≤ 0.01 . Thus, financial literacy influences anchoring behavior on hypothesis H.5 (Table 8) is proved and accepted. The result is consistent with previous research that showed significant influence of financial literacy to behavioral bias of investors [81]; [27]. This model also tested how each behavioral bias variable influences investment decision making among Indonesia's cryptocurrency investors. The sixth hypothesis (H6) is also confirmed and accepted, showing that herding behavior influences investor decision making with β -value was 0.290, with t-statistics value was 4.736 corresponding to p-value ≤ 0.01 . The finding is aligned with previous research [82]; [83] that reflect collective information is highly influenced investors in making investment decisions. Next, the seventh hypothesis (H7) is also confirmed and accepted, showing that overconfidence influences investor decision making with β -value was 0.228, with t-statistics value was 3.629 corresponding to p-value ≤ 0.01 . Related previous research also found that overconfident investors increase their investment ambitiously [84]. After that, the eighth hypothesis (H8) is also confirmed and accepted, showing that anchoring influences investor decision making with β -value was 0.226, with t-statistics value was 3.669 corresponding to p-value ≤ 0.01 . The result is consistent with a study by Chen et al [85] that conducted research on several biases to determine the influence on the decision-making process, and found that anchoring is one of the most significant ones. Also aligned with recent study by Wang [53].

Then on hypothesis 9 (H9) the result found that loss aversion is not significantly influences investor decision making with β -value was 0.061, with t-statistics value was 1.069 and p-value is 0.2857 that is bigger than 0.01. Past literature shows that loss aversion less likely to be happened on short to medium term investment type. Loss aversion is often associated with investors with long term investment (Hayat & Anwar, 2016) while cryptocurrency fluctuation make their investors tend to have short to medium term investment. Another previous study also found that loss aversion is less likely to appear on high qualification investors and highly



educated degree [28]; [83]. As for gambler’s fallacy also found to be not significantly influences investor decision making with β -value was -0.040, with t-statistics value was 0.663 and p-value is 0.507, thus hypothesis 10 (H10) is rejected. The similar finding also revealed by Aziz & Khan [86], that found gambler’s fallacy as insignificant to influence investor decision making stock market. Lastly, the result found that investment decision making is significantly influence investment performance among Indonesia’s cryptocurrency investor, with β -value was 0.325, with t-statistics value was 4.655 corresponding to p-value ≤ 0.01 . Thus, investment decisions significantly influence investment performance on hypothesis H.11 (Table 8) is proved and accepted.

Table 7. R² and R² Adjusted

	<i>R-square</i>	<i>R-square adjusted</i>
Anchoring	0,113	0,109
Gambler’s Fallacy	0,078	0,075
Herding	0,177	0,174
Investment Decisions	0,373	0,370
Investment Performance	0,106	0,102
Loss Aversion	0,083	0,080
Overconfidence	0,063	0,059

As known from previous study, that R-squared value is divided into 3 categories; value above 0.67 is considered as high, value between 0.33 to 0.67 is considered as moderate, value between 0.19 to 0.33 is considered as weak, and below 0.19 is unacceptable or no effect [87]. As seen on table 7, in this current model the result show that the R-squared for investment decision is 0.343 that means herding bias, overconfidence bias, anchoring bias, loss aversion and gambler’s fallacy factors moderately explained 34.3% of the variation of investment decision among Indonesia’s cryptocurrency investors.

Table 8. Acceptance and Rejection Hypothesis

<i>Hypothesis</i>	<i>Status</i>
H.1 Financial literacy is affecting herding bias in cryptocurrency market	Accepted
H.2 Financial literacy is affecting to overconfidence bias in cryptocurrency market	Accepted
H.3 Financial literacy is affecting to loss aversion bias in cryptocurrency market	Accepted
H.4 Financial literacy is affecting to gambler’s fallacy in cryptocurrency market	Accepted
H.5 Financial literacy is affecting to anchoring in cryptocurrency market	Accepted
H.6 Herding bias significantly influence investor’s decision making in cryptocurrency market	Accepted
H.7 Overconfidence bias significantly influence investor’s decision making in cryptocurrency market	Accepted
H.8 Anchoring bias significantly influence investor’s decision making in cryptocurrency market	Accepted
H.9 Loss Aversion bias significantly influence investor’s decision making in cryptocurrency market	Rejected
H.10 Gambler’s Fallacy bias significantly influence investor’s decision making in cryptocurrency market	Rejected
H.11 Investor’s decision making in cryptocurrency market influence the investment performance	Accepted

CONCLUSION

This study has been conducted on Indonesia’s cryptocurrency investors that gathered from various online communities. The questionnaire is used to gather investor’s perspective that cover all variables to investigate the Indonesian crypto investors perspective on how financial literacy could influence the existence of behavioral bias and extend to investigate the influence of those on investment decision as well as investment performance. Financial literacy shows a significant and positive influence on all of these behavioral biases as found on their t-statistics in the PLS-SEM model. As many previous studies has also found the correlation between financial literacy and behavioral bias with extend on the investment decision and performance [88]. In case of Indonesia cryptocurrency investors, the study revealed herding, overconfidence and anchoring behavior have significant influence on investment decision making, while loss aversion and gambler’s fallacy show no significant influence on investment decision.



The result may vary from one to other markets but clearly proved that correlation is exist between these variables. Based on the R-Squared and adjusted R-squared show moderate effect from these behavioral biases to investment decision as it is valued for 0.373 and 0.370. According to the result of this study, the author recommends cryptocurrency investors to try to identify types of biases that exist in their behavior. Furthermore, investors should avoid investing activities that are heuristic or emotional. To achieve the objective of their investment; to do a proper analysis and an investigation towards the investment opportunities is surely a priority.

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