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MEASURING THE CORRELATION COGNITIVE DISSONANCE BIAS, HIND SIGHT BIAS, OVER CONFIDENCE BIAS AND SELF-CONTROL BIAS TO INVESTMENT DECISION ON STOCK OPTION

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Abstract

Researchers want to know the effects of cognitive dissonance bias, hindsight bias, overconfidence bias, and self-control bias on Stock Option investment decisions. The researcher uses the technical analysis of convergent validity test, discriminant validity test, outer model test, inner model test, rsquare, hypothesis test and Sobel test. The program used is SmartPLS 3 trial version with a sample of 224 respondents with predetermined criteria. The results show that the cognitive dissonance bias variable on Stock Option investment decisions has no significant effect, the hindsight bias variable has no effect on Stock Option investment decisions, overconfidence bias has a positive but not significant effect on Stock Option investment decisions. This is because the T-statistic value is less than 1.97. While the self-control variable can have a positive and significant effect on Stock Option investment decisions.

INTRODUCTION

Nowadays, investment in capital or new forms of investment such as financial assets/securities or what is called financial investment is in demand by the Indonesian people. Financial investment can be done directly or indirectly through investment companies. Investors who do not have large capital can invest in investment companies. Currently, investors do not only invest their funds in the stock market but also in digital investments or trading businesses that are not only used in foreign currencies but also in digital currencies. Trading businesses are called Digital Currency Exchanges or Stock Option Exchanges. Stock Option or crypto currency is a virtual currency that is managed with blockchain technology with a peer-to-peer technology network.

On the site*www.coinmarketcap.com* as one of the sites that monitors Stock Option price movements, it is recorded that there are 6,217 types of Stock Option worldwide with varying dollar conversion values. The number of Stock Option investors in Indonesia in May 2021 was recorded at 6.5 million people. This number has increased since the end of 2020 when Stock Option users were still four million people. The increase in investment activity is closely related to the decision-making process. In making investments, investors will also expect large returns or profits. However, investments do not always generate profits but rather losses. Therefore, investors need to be able to make the right investment decisions.

Investor behavior can be one of the factors influencing investment decision-making.

According to Kapoor and Prosad (2017), decisions taken by investors tend to be irrational and can result in losses for investors. Financial behavior has a combined nature between psychological factors and rational financial considerations in the decision-making process. Financial behavior studies how a person makes decisions both individually and collectively which can be divided into microfinance behavior (Behavioral Finance Micro) which discusses the behavioral bias of individual investors and macrofinance behavior (Behavioral Finance Macro) which discusses the anomalies that occur in the efficient market hypothesis (Pompian, 2012).

Behavioral bias can result in prediction errors and can cause someone to respond incorrectly to a risk that may occur. Pompian (2012) divides behavioral bias into two categories, namely cognitive bias and emotional bias. Cognitive bias is a deviant behavior in the process of understanding, processing, and making decisions on information and existing facts. Meanwhile, emotional bias is a deviant behavior that occurs because it focuses on feelings or emotions and also spontaneity rather than existing information and facts.

*Cognitive dissonance bias*included in cognitive bias which is a behavioral bias that occurs by convincing oneself and avoiding information that

contradicting previous understanding so as not to experience mental discomfort. A person with cognitive dissonance bias behavior will experience mental discomfort caused

by the emergence of new information that contradicts previously obtained information or understanding and tends to avoid new information that appears.

*Hindsight bias*or hindsight bias is past events are used as something that can be predicted and is reasonable to expect again. A person tends to remember good experiences as predictions about the future that are more accurate than they actually are. Good experiences in the past will lead to repeated decision making in the future, and vice versa. A person tends to be interested in investing because of the profits generated from previous investments.

*Overconfidence bias*is a behavioral bias of overconfidence. Someone who has overconfident behavior will be excessive in the knowledge and abilities they have and are confident in estimating greater profits in making investments. Overconfidence bias is one of the most detrimental behaviors because it can underestimate the risk of decline, trade too often, and not diversify the portfolio.

*Self-control bias*is a problem in self-control, where someone fails to achieve their long-term goals because they lack self-discipline or prioritize their short-term goals. Thus, someone with self-control bias behavior can cause investment errors.

Based on the background that has been described, a study can be conducted on "The Influence of Cognitive Dissonance Bias, Hindsight Bias, Overconfidence Bias and Self-Control Bias on Stock Option Investment Decisions", with the novelty of the study lying in the type of investment used, namely Stock Option investment, which rarely conducts research on behavioral bias using SEM-PLS data analysis techniques.

THEORETICAL FRAMEWORK AND HYPOTHESIS

Cognitive Dissonance Bias

*Cognitive dissonance*is a state of discomfort that occurs as a result of obtaining new information that is contrary to previous understanding (Umairoh, 2012). Cognitive dissonance can occur as an effort to reduce feelings of discomfort due to obtaining new information that contradicts previous understanding by convincing oneself. This effort is done by reducing inappropriate cognitions, changing perceptions.

Hindsight Bias

Hindsight bias or hindsight bias is seeing past events as predictable and expected. Someone who suffers from hindsight bias tends to use past evaluations to predict the future (Nosfinger, 2010). When having a good past experience, someone tends to rewrite their memories to depict positive developments as if they were predictable (Pompian, 2006).

Overconfidence Bias

Overconfidence bias or overconfidence bias is an unreasonable belief in one's own intuitive reasoning, judgment and cognitive abilities (Pompian, 2012). Overconfidence is the result of overestimating knowledge, abilities and can underestimate downside risk. Investors will overestimate their ability to evaluate a portfolio as a potential investment, investors do not diversify their portfolio and do not even know that they are accepting more risk.

Self-Control Bias

*Self-control bias*or self-control bias is when someone fails to meet their long-term goals due to a lack of self-discipline caused by fulfilling their short-term gratification. Someone with self-control bias behavior has a tendency to delay saving for the future.

Investment Decisions

Investment is defined as a commitment made to a number of resources with the aim of obtaining profits in the future (Tandelilin, 2010). Achieving investment goals depends on the decision-making that is taken because it has an impact on the results obtained. Investment decisions are actions taken by setting aside part of the income to obtain investment results in the future.

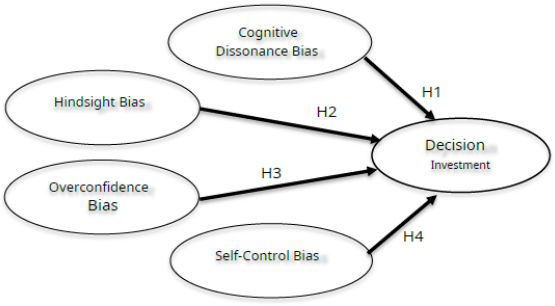

Figure 1. Conceptual Framework

RESEARCH METHODOLOGY

Research Approach

The researcher used quantitative research techniques where the researcher obtained data in the form

of numbers and then analyzed it using statistical analysis. When viewed through the problems reviewed, this research is a causal research, namely analyzing the cause-and-effect relationship between independent variables and dependent variables. The data collection method in this study uses a survey method. The variables underlying this study are four independent variables: Cognitive Dissonance Bias (X1), Hindsight Bias (X2), Overconfidence Bias (X3), Self-Control Bias (X4); and one dependent variable, namely Stock Option Investment Decisions (Y).

Population and Sample

Population is a group of individuals who have similar characteristics. Sample is a portion of the population that represents all data from the

Stock Option. The underlying reason for determining the use of this method is to find out how Stock Option users behave in making decisions.

Measurement of Variables

Measurement of variables in this study used the Smartpls 3 trial ver application, the methods used used convergent validity methods, discriminant validity, reliability measurement, evaluation of measurement models, and hypothesis testing.

DATA ANALYSIS AND DISCUSSION

Demographic Data

population. The researcher used the population in this study were all members who were members of several investment groups found by the researcher. The sample used by the researcher in this study were members of the group who had Stock Option. For research with an unknown population, the number of samples can be determined based on the theory of Hair, et. al. (2010), namely the number of indicators multiplied by 5-10. This study consists of 20 indicators, so that a sample size of 100-200 respondents is obtained.

The sampling technique used in this study is purposive sampling. Purposive sampling is a sampling technique based on certain criteria. This study has predetermined criteria, namely members who have

The amount of personal data collected in this study is age, monthly income.

Validity Test

In convergent validity testing, the indicator statement will be declared valid if the result of the outer loading exceeds 0.5 and the result of the Average Variance Extracted (AVE) value exceeds 0.5 (Mahfud & Ratmono, 2013). While in discriminant validity, the statement will be said to be valid if the cross loading value of each indicator on the variable is greater when compared to other variables. Table 1 is the result of convergent validity testing in the outer loading test.

Table 1. Outer Loading

	X1	X2	X3	X4	Y	Information
X1.1	0.707					Valid
X1.2	0.814					Valid
X1.3	0.854					Valid
X2.1		0.839				Valid
X2.2		0.777				Valid
X2.3		0.830				Valid
X3.1			0.762			Valid
X3.2			0.872			Valid
X3.3			0.886			Valid
X3.4			0.924			Valid
X3.5			0.713			Valid
X4.1				0.954		Valid
X4.2				0.940		Valid
X4.3				0.908		Valid
Y1					0.761	Valid
Y2					0.821	Valid
Y3					0.783	Valid
Y4					0.745	Valid
Y5					0.707	Valid

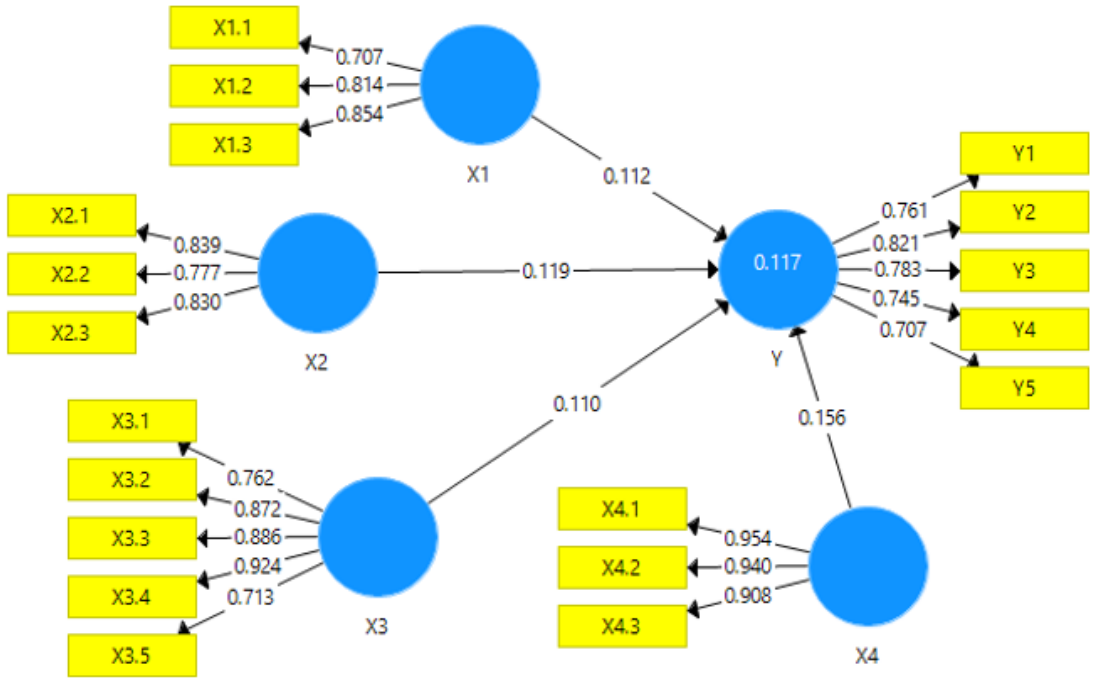

Figure 2. Outer Model Results
Source: Processed Data, Smart PLS 3 Trial Ver (2021)

Table 1 and Figure 2 show that each indicator has met the loading factor value criteria, so the Average Variance Extracted (AVE) value in Table 2 has met the value requirement of >0.5.

Table 2. Average Variance Extracted (AVE)

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	Average Variance Extracted(AVE)
Cognitive Dissonance Bias	0.630
Hindsight Bias	0.666
Overconfidence Bias	0.698
Self-Control Bias	0.873
Cryptocurrency Investment Decisions	0.584

Data Source: Prima

Data (Smart PLS 3 Trial Ver), Processed in 2021

Based on Table 2, the AVE value has met the value requirements which must be more than 0.5. Therefore, all indicators are declared valid to measure the variables used in this study.

Discriminant validity testing uses cross loading values. An indicator can be said to be discriminant if the cross loading value of each indicator on the variable is greater when compared to other variables, in other words, the indicators used in the study must have a higher number of relationships than each existing construct. Table 3 shows the results of discriminant validity testing through cross loading on the indicators in this study.

Table 3. Cross Loading

	X1	X2	X3	X4	Y
X1.1	0.707	0.228	-0.083	-0.079	0.125
X1.2	0.814	0.405	0.162	0.180	0.131
X1.3	0.854	0.405	0.082	0.205	0.195
X2.1	0.327	0.839	0.394	0.521	0.269
X2.2	0.388	0.777	0.088	0.218	0.169
X2.3	0.390	0.830	0.223	0.340	0.218
X3.1	-0.029	0.096	0.762	0.055	0.069
X3.2	0.028	0.299	0.872	0.317	0.153
X3.3	0.077	0.388	0.886	0.364	0.197
X3.4	0.120	0.256	0.924	0.149	0.217
X3.5	-0.005	-0.003	0.713	-0.087	0.033
X4.1	0.139	0.437	0.210	0.954	0.249
X4.2	0.139	0.439	0.263	0.940	0.260
X4.3	0.140	0.434	0.268	0.908	0.205
Y1	0.108	0.256	0.254	0.234	0.761
Y2	0.149	0.292	0.179	0.329	0.821
Y3	0.086	0.133	0.081	0.076	0.783
Y4	0.225	0.111	0.098	0.079	0.745
Y5	0.217	0.134	0.010	0.074	0.707

Data Source: Primary Data (Smart PLS 3 Trial Ver), Processed in 2021

If observed in Table 5, it can be seen that the correlation value between constructs is greater than the correlation value with other

constructs. Therefore, all constructs have good discriminant validity and the indicators in the construct index block are higher than in other blocks.

Composite Reliability Test

Reliability measurement using composite reliability. The measuring instrument will be said to be reliable if the Cronbach's Alpha and Composite Reliability values are more than 0.7. The composite reliability value in this study can be seen in Table 4.

Table 4. Composite Reliability

	Cronbach's Alpha	*Composite Reliability*
Cognitive Dissonance Bias	0.713	0.836
Hindsight Bias	0.755	0.856
Overconfidence Bias	0.903	0.920
Self Control	0.928	0.954
Stock Option Investment Decisions	0.834	0.875

Primary Data Source (Smart PLS 3 Trial Ver), Data Processed in 2021

The results in Table 4 show that each variable in this study showed a Cronbach's Alpha and Composite Reliability value > 0.7 so that the measuring instrument used in the study was declared reliable.

Inner Model Test

The value of the inner model test is obtained by using the T-statistic value. The T-statistic value has a value requirement that must be more than 1.97 or the P value result is more than 0.05.

Table 5. Path Coefficients

	Original Sample (O)	*Sample Mean (M)*	*Standard Deviation (STDEV)*	*T Statistics (|O/STDEV|)*	*P Values*	Information
X1 -> Y	0.112	0.127	0.082	1,365	0.173	Hypothesis first rejected
X2 -> Y	0.119	0.121	0.083	1,431	0.153	Second hypothesis rejected
X3 -> Y	0.110	0.119	0.079	1,397	0.163	The third hypothesis rejected
X4 -> Y	0.156	0.153	0.074	2.105	0.036	Hypothesis fourth accepted

Data Source: Primary Data (Smart PLS 3 Trial Ver), Processed in 2021

H1: Cognitive Dissonance Bias has a significant effect on Investment Decisions

Cryptocurrencies.

The results of the cognitive dissonance variable bias have a positive but insignificant influence on the Stock Option investment decision variable,

this can be proven from the original sample value of 0.112, meaning it has a positive relationship direction. The T-statistic value is 1.365, so it does not meet the requirements exceeding 1.97 and P values with a value of 0.173 which meaning >0.05, and the relationship between cognitive dissonance bias can be stated as having no positive and insignificant influence so that H1 is rejected.

H2: *Hindsight Bias* in a way significant to decision investment

Stock Option.

The hindsight bias variable has a positive but insignificant relationship to Stock Option investment decisions, this can be proven from the original sample value of 0.119, meaning it has a positive relationship direction. The T-statistic value is 1.431 so it does not meet the requirements exceeding 1.97 and P values with a value of 0.153 which means> 0.05, and the hindsight bias relationship can be stated to have a positive but insignificant effect so that H2 is rejected.

H3: Overconfidence Bias has a significant effect on Investment Decisions

Cryptocurrencies.

The overconfidence bias variable has a positive and significant relationship to Stock Option investment decisions, this can be proven from the original sample value of 0.110, meaning it has a positive relationship direction. The T-statistic value is 1.397 so it does not meet the requirements, namely <1.97, and overconfidence bias is stated to have a positive but insignificant effect so that H3 is rejected.

H4: Self-Control Bias has a significant effect on investment decisions.

Stock Option.

The self-control bias variable has a positive and significant influence on Stock Option investment decisions, this can be proven from the original sample value of 0.156, meaning it has a positive relationship direction. The T-statistic value of 2.105 has met the requirements, namely> 1.97, and self-control bias is stated to have a significant effect with a positive relationship direction so that H4 is accepted.

R-Square Test

The R-Square test is used to measure the level of variance of changes in the independent variable on the dependent variable, and to evaluate the inner model by looking at the percentage of variance explained.

Table 6. R-Square Test

	R Square
Stock Option Investment Decisions	0.117

Data Source: Primary Data (Smart PLS 3 Trial Ver), Processed in 2021.

In Table 6, the Stock Option investment decision variable (Y) of 0.117 means that Stock Option investment decisions can be determined by the variables cognitive dissonance bias, hindsight bias, overconfidence bias, and self-control bias as much as 11.7%. The rest is

influenced by other variables outside this study.

Descriptive Statistics

Table 7 shows the characteristics of respondents in this study based on age. The highest percentage is at the age of 21-25 years and the lowest percentage is at the age of >35 years. Thus, the Stock Option users who were respondents in this study were mostly in the age range of 21-25 years.

Table 7. Respondents by Age

Respondent Age (Year)	Amount	Presentation
≤20	37	16%
21-25	165	74%
26-30	13	6%
31-35	5	2%
>35	4	2%
TOTAL	224	100%

Source: Processed Data (2021)

Based on Table 8 shows the characteristics of respondents in this study based on monthly income. The highest percentage in the income range of Rp.
2,500,001 – Rp 3,500,000 per month and the lowest percentage of income of Rp 1,500,001 – Rp 2,500,000 per month, and > Rp 3,500,000 per month. Thus, the majority of Stock Option users who were respondents in this study had an income of Rp 2,500,001 – Rp 3,500,000 per month.

Table 8. Respondents' Monthly Income

Respondents' Income	Amount	Presentation
≤ Rp. 1,500,000	44	20%
Rp. 1,500,001 - Rp. 2,500,000	39	17%
Rp 2,500,001 - Rp 3,500,000	102	46%
> Rp. 3,500,000	39	17%
TOTAL	224	100%

Source: Processed Data (2021)

From the results of the questionnaire distributed, 74% (165 people) were aged 21-25 years, 16% (37 people) were aged ≤20 years, 6% (13 people) were aged 26-30 years, 2% (5 people) were aged

31-35 years old, and 2% (4 people) aged >35 years. Meanwhile, the percentage of income that The results obtained were 46% (102 people) had a monthly income of Rp. 2,500,001 - Rp. 3,500,000, 20% (44 people) have a monthly income of ≤Rp 1,500,000, 17% (39 people) have an income of Rp 1,500,001 – Rp 2,500,000, and 17% (39 people) have an income > Rp
3,500,000. Based on the sampling process, it was found that the age range of 21-25 years was the largest who owned Stock Option and most respondents who owned Stock Option had an income of IDR 2,500,001 - IDR

3,500,000 per month.

Discussion

Cognitive Dissonance Bias on Stock Option Investment Decisions

Based on the results of the T-statistic test, it shows that there is no influence between the cognitive dissonance bias variable on Stock Option investment decisions. This means that the research hypothesis is rejected. This result is not in accordance with the behavioral finance theory which states that decision making is based on psychology and irrational attitudes (Pompian, 2012). The results of the descriptive answers of respondents show the level of cognitive dissonance bias in respondents in the high category with a mean score of 3.62. This means that respondents have cognitive dissonance bias at a high level. Although respondents have high cognitive dissonance bias behavior, this study states that there is no influence between cognitive dissonance bias and Stock Option investment decisions.

The respondents of this study were Stock Option users who were members of Stock Option investment groups so that Stock Option users could help each other in exchanging information even though cognitive dissonance behavior existed within them. This study is supported by research conducted by Umairoh (2012), Setiawan et. al. (2018), and Pradhana (2018) which stated that there was no significant influence between cognitive dissonance bias and investment decisions.

Hindsight Bias on Stock Option Investment Decisions

Based on the results of the T-statistic test, it shows that there is no significant influence between hindsight bias and Stock Option investment decisions, meaning that the research hypothesis is rejected. The results of the descriptive answers of respondents show the level of overconfidence bias in respondents in the high category with a mean score of 3.72, so it can be interpreted that respondents in this study have hindsight bias behavior or in making investment decisions tend to see past experiences as

predictable and can be expected. This study is not in line with the research conducted by Mutawally and Asandimitra (2019) which states that investment experience influences investment decisions.

Overconfidence in Stock Option Investment Decisions

Statistical calculations on the overconfidence bias variable on Stock Option investment decisions do not have a significant effect with a T-statistic value of 1.397 which has a lower value than the value in accordance with the provisions, namely 1.97. The results of the descriptive answers of respondents show the level of overconfidence bias in respondents in the very high category with a mean score of 4.29, so it can be interpreted that respondents have overconfidence behavior. This shows that the high or low overconfidence behavior of respondents does not affect respondents in making investment decisions. The results of this study are supported by Salwah's research (2020) which states that overconfidence bias behavior does not have a significant effect on investment decisions.

Self-Control Bias on Stock Option Investment Decisions

In the fourth hypothesis, self-control bias on Stock Option investment decisions has a positive and significant influence. The T-statistic calculation on the self-control bias variable is 2.105, which has met the requirements of a value of >1.97. It can be concluded that the higher the self-control bias behavior of Stock Option users, the higher the investment decisions taken. This study is supported by research conducted by Harsaputra (2020) which states that self-control bias has a positive and significant effect on investment decisions.

CONCLUSION

From the explanation that has been described, analyzed and tested, the following conclusions can be drawn:

1. The cognitive dissonance bias variable has a positive but insignificant influence on Stock Option investment decisions.
2. The hindsight bias variable has a positive but insignificant influence on Stock Option investment decisions.
3. The overconfidence bias variable has a positive but insignificant influence on Stock Option investment decisions.
4. The self-control bias variable has a positive and significant influence on Stock Option investment decisions.

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