EMOTIONLESS DECISION. A COIN FLIP INVESTMENT DECISION, IS THAT WORTHED?

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Abstract- This article tries to test whether emotionless decisions (a coin flip) in investment decision-making could outperform human judgment due to superiority in avoiding behaviour bias caused by emotion. However, research about a coin flip in the investment decision is rarely can be found due to a lack of a solid foundation. Research problem in this article: Would the coin flip in investment decisions outperform human judgment in terms of investment wealth under the short-term trading range? The originality of this research is no prior research has been interested in checking the superiority of coin flip decisions in real investment due to the risk of uncertainty. This research finds a suitable environment (stock market competition) as the place to check the validity of the idea. This research uses a simple coin flip experiment to decide whether to sell or hold the investment asset during the stock competition. The result of investment wealth from the coin flip will be compared with the rest of the participants. A standard normal distribution (z) and (t) is used to check whether the coin flip wealth consistently falls into the top 5% or 1% of the right tail. Before that, the Kolmogorov-Smirnoff test is conducted to ensure the distribution follows the normal distribution shape. Using a coin flip for investment decisions is not outperform human judgment and winning the competition. Investment decision-making is an art between handling complex rational thinking about risk and managing the emotion in the process.

Keywords: Coin Flip Decision; Investment Decision; Stock Competition; Emotionless Decision

1. INTRODUCTION

Investment decision-making is a process in which individual or professional investors select and manage their investment assets; therefore, it could maximize their wealth in the future. From the work of (Markowitz, 1952), fund managers conduct their fiduciary duty based on the portfolio theory and assess the risk based on the volatility of asset return. Later, the asset pricing theory, which was derived (Sharpe, 1964), proposed the linear relationship between asset return with market return, which was later known as the capital asset pricing model. It evolved into a multifactor pricing model such as APT (Ross, 1976), and under the assumption of rationality, the efficient market hypothesis was also introduced (Fama, 1970). The foundation of classical investment study was based on these theories and is still used in modern portfolio management. Further extension of this theory is linked with time and momentum (Fahmy, 2020) and Wright's Law or learning curve theory (Way et al., 2019).

However, the investment is not without emotion in the process. Fear and aversion to the risk could cause some disturbance and might change the decision. Prospect theory (Kahneman & Tversky, 1979) states that people feel more pain in the domain of loss. Under the riskier situation, most people choose to be risk seekers rather than risk averse. Therefore, human is not entirely rational as "homo economicus" as proposed by rational theory in classical finance.

Some behaviour biases were documented, such as the disposition effect (Weber & Camerer, 1998), status quo bias (Kahneman et al., 1990), and framing effect (Tversky & Kahneman, 1981). These researches give another perspective to see investment decisions not only from the rational view but also emotional view, which is also called irrational investment decision.

This article's main objective is to investigate whether an emotionless method (coin flip) in making investment decisions regarding selling and holding an asset could outperform human judgment in stock competition. For the author, the exciting point of this research is whether the coin flip could help reduce the emotional bias so that the investment result could be higher than investors affected by the bias. The problem addressed in this article is, does the final wealth from the coin flip decision fall into the top 5% or 1% of normal distribution? This research offers a novelty in conducting coin flip in investment decision-making and its relation with the final wealth of the investors.

1.2 Literature Review

1.2.1 Coin Flip in Decision Making

Based on the pieces of literature search, the application of coin flip in decision making can vary from life-changing decision to college to pick. Although the coin flip offered randomization and fairness in judgment, people strongly avoid resolving the dilemma using this method (Keren & Teigen, 2010). The impact of coin flip decisions in life-changing decisions was observed by (Levitt, 2016). The result found that people were happier for the coin that suggested a change in later months than the coin purposed to maintain the status quo. Other scholars also showed people aversed their responsibility in university application, tossing a coin to help randomize their decision (Dwenger et al., 2018). Coin flip can be seen as an external decision aid. However, when people did not need to stick to the coin result, they chose their initial beliefs rather than follow the coin guidance (Douneva et al., 2019).

Finding research that discussed coin flip applications in decision-making, especially in investment, is very difficult. No study investigated the coin flip decision for investment activities from the previous finding. This research is interested in the result of the randomization of the coin flip to help investment decisions. A coin flip will help the subject to determine whether to sell or hold a particular stock regardless of the complex feeling and emotions about the stock or the information. If the strong market form in the efficient market hypothesis (Fama, 1970) was assumed for the Indonesian Stock Market and Random Walk was held, the final assets result from short-term investment should be followed the normal distribution. The empirical data was collected based on our team's participation in two stock trading simulation competitions with the same rule and initial wealth. Some of our students tested the reliability of coin flips to sell or hold an asset in these competitions.

1.2.2 Hypothesis Development

The idea for this research came from the efficient market hypothesis and the random walk hypothesis. A strong form market would be very efficient in absorbing the information (Fama, 1970). According to the random walk hypothesis, the result would make the price move randomly. Therefore, the investors' final wealth would not vary from the normal distribution. A coin flip will be a tool for randomising selling and holding decisions. If the stock price were random within a short period (less than a month), the final wealth result from the coin flip would fall within the 95% or 99% confidence interval of normal distribution. Therefore, the author expects the result of the coin flip decision beyond the 95% or 99% confidence interval of the Z or t distribution to outperform the rest of the competition participants. The hypothesis

of this research is the investors' wealth from the coin flip decision is higher than investors who did not use the coin flip in their decision.

2. METHODOLOGY AND DATA ANALYSIS

The data were collected from the stock trading competition participated by our students. This research chooses to use stock trading competition as a research object because it helps minimize the risk of losing the asset. If this research was conducted using the actual asset, it could cause significant asset loss if the result was against the hypothesis. Some students perform a coin flip before selling or holding their assets. The summary of all participants' wealth will be used to calculate and analyze this research's Z and t distribution. There are two stock trading competitions: SEKOIN and UNTRAC. SEKOIN was held by the capital market community of Polines in 2021. UNTRAC was held by the capital market community of Semarang State University in 2021. Both competitions provide similar rules and the same initial asset for each participant, which is 1 billion rupiahs. SEKOIN competition has a shorter length of time, five days of trading and UNTRAC has longer, three weeks of trading. Participants' wealth was reported twice in SEKOIN competition and three times in UNTRAC. This data will be used to confirm our hypothesis of whether coin flip could outperform human judgment. The detail of the research methodology can be seen in the diagram below.

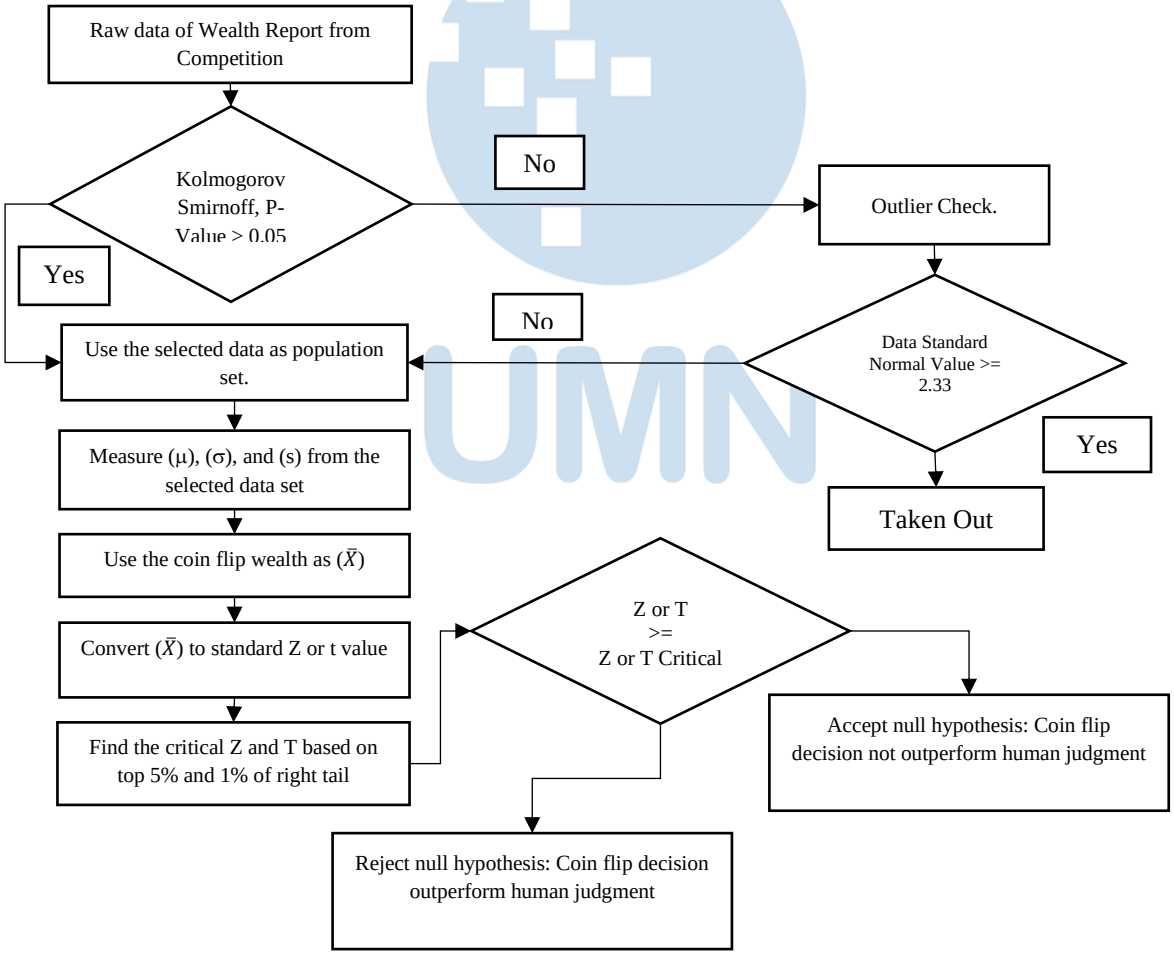

Figure 1. Research Framework and Method

3. RESULT AND DISCUSSION

3.1. Descriptive Statistic

Table 1. Description Of Competition (Raw)

Competition	SEKOIN	UNTRAC
Participant	32	123
Coin Flip Participant	1	2
Wealth Report	2	3
Means (Final Wealth)	990.671.519	707.455.515
Standard Deviation (Final Wealth)	45.381.682	421.228.607

Table 2. Description Of Wealth Report (Raw)

Wealth Rep	S-3(*)	S-5	UN-W1 (#)	UN-W2	UN-W3
Mean	997.947.248	990.671.519	1.001.641.805	1.001.209.167	707.455.515
St. Deviation	21.432.657	45.381.682	17.051.429	25.790.393	421.228.607
Count	31	31	123	123	123
Max	1.032.508.500	1.046.198.500	1.070.000.000	1.091.500.000	1.129.500.000
Min	927.200.000	817.500.000	937.342.000	929.675.000	1.400

* S-3 is for SEKOIN Wealth Report Day 3 of Trading
# UN-W1 is for UNTRAC Wealth Report Week 1 of Trading

3.2. Statistical Test & Result

This research will use the normal distribution as the statistical tool. Therefore, the raw data is analyzed using the Kolmogorov-Smirnoff test to determine whether it follows a normal distribution. The first test of the Kolmogorov-Smirnoff test can be seen in the table below:

Table 3. First Run of Kolmogorov-Smirnoff Test

Wealth Rep	S-3	S-5	UN-W1	UN-W2	UN-W3
N	31	31	123	123	123
Test Stats	0.232	0.200	0.154	0.151	0.340
Sig	0.000*	0.003*	0.000*	0.000*	0.000*

The first run of the Kolmogorov-Smirnoff test showed that the data did not fit the normal distribution. P-values of the test are below 0.05, and the conclusion is the data is not the same as the normal distribution. Therefore, the outlier of the data was checked and taken out from the data. For the outlier check, the z-value from the data that is more than 2.33 will be detected as an outlier and taken out from the sample. The process of eliminating outliers proceeds until the data fits the normal distribution according to the Kolmogorov-Smirnoff test. At the end of the process, the second run of the Kolmogorov-Smirnoff has cleared the outlier from SEKOIN data. However, there was seven times the diagnosis running for UNTRAC data before it fit with normal distribution. The final result of the normal distribution test will be shown in table 4.

Table 4. Seventh Run of Kolmogorov-Smirnoff Test

Wealth Rep	S-3	S-5	UN-W1	UN-W2	UN-W3
N	29	29	111	102	62
Outliers	2	2	12	21	61
Test Stats	0.134	0.089	0.084	0.084	0.104
Sig	0.195	0.200	0.051	0.076	0.093

The wealth report from UN-W3 showed a significant outlier from the data. It is because some of the competition participants violated the game's rules, so some deduction is applied to their wealth based on the frequency of the violation.

Table 5. Normally Distributed Wealth Data

Wealth Rep	S-3	S-5	UN-W1	UN-W2	UN-W3
Mean (μ)	1.002.265.334	1.000.724.728	1.002.874.581	1.000.808.414	996.124.663
Std Dv (σ)	14.052.178	24.149.872	10.284.580	13.089.545	15.923.131
Std Dv (S)	14.300.909	24.577.337	10.331.222	13.154.185	16.053.118
Count	29	29	111	102	62
Max	1.032.508.500	1.046.198.500	1.029.537.500	1.033.730.000	1.029.678.400
Min	970.548.300	951.664.300	975.700.000	967.550.000	960.864.000

The result of coin flip wealth is summarized in table 6.

Table 6. Wealth Report of Coin Flip Group

Wealth Rep	S-3	S-5	UN-W1	UN-W2	UN-W3
Team 1	1.009.735.100	1.000.061.700	994.040.000	1.012.310.000	1.009.555.000
Team 2	-	-	991.707.808	978.944.800	946.306.100

Suppose we assumed the data as population and σ is known, then the z distribution can be used to check whether the coin flip decision result falls under the higher 5% of the population. If it is not assumed as population, then the t distribution will be used to check the hypothesis. The formulation for the Z and t-test will be:

$Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}}$	$t = \frac{\bar{X} - \mu}{s/\sqrt{n}}$
Z test, if the σ is known	t-test, if the σ is unknown

In the next step, the wealth from the coin flip is converted into standard normal value (in Z or t) using the formula above.

Table 7. Standard Normal Value of Coin Flip Wealth Result

Sample	Z Value	T Value
S-3	2.863(*)	2.813(*)
S-5	-0.148	-0.145
UN-W1 - 1	-9.050(#)	-9.009(#)
UN-W1 - 2	-11.440(#)	-11.388(#)
UN-W2 - 1	8.874(*)	8.831(*)
UN-W2 - 2	-16.869(#)	-16.786(#)
UN-W3 - 1	6.641(*)	6.588(*)
UN-W3 - 2	-24.635(#)	-24.436(#)

(*) Significant at 1% level right tail
(#) Significant at 1% level but left tail

Table 8. Critical Z and T Value

	Z Critical	T Critical
Top 5%, right tail	1.65	1.701 (df = 28) or 1.660 (df = 100)
Top 1%, right tail	2.33	2.467 (df = 28) or 2.364 (df = 100)

3.3. Discussion

Based on the finding, the wealth results from the coin-flip decision are inconsistent over the top of the 5% right tail region. Only three samples (SEKOIN day-3, UNTRAC week-2 by team 1, UNTRACT week-3 by team 1) showed the top 5% and 1% of normal distribution right tail (outperforming human judgment). On the other hand, four samples (UNTRACT week-1 by team 1, UNTRACT week-1 by team 2, UNTRACT week-2 by team 2, and UNTRACT week-3 by team 2) indicated bad decision results, which fall to the left tail of the normal distribution. This preliminary finding might point out that using a coin flip as a decision aid for investment is a terrible idea. It seems that the portfolio selection in the early process of managing the asset play a very pivotal role in the result of the investment, and this research suspect the students are not competent enough to pick a choice of their asset. If the investors poorly execute it, the outcomes from the coin flip will be even worse.

Secondly, although the three samples' wealth result is the top 1% of normal distribution, the champion for this competition is even more than that. The winner of the SEKOIN competition obtained a total wealth of 1.046.198.500, which could be converted into standard normal value (z) = 10.14 (using the same formula). This z value could be converted again into a p-value equal to the top of 2.81×10^{-9}. The number is even smaller for the UNTRAC winner, which is the top of 1.45×10^{-23} (Final wealth: 1.129.500.000). In other words, trusting your decision to the coin flip cannot yield a victory in asset management.

This research pointed out that the emotional aspect is also crucial in the investment decision. Without emotion (a coin flip), the decision maker could be blind to the potential danger (risk) that awaits from the early asset selection. Teaching this emotional aspect also can be tricky and challenging due to the lack of learning competencies to avoid behaviour bias (Kiky, 2022).

4. CONCLUSION

This article concluded that an emotionless decision (a coin flip decision) would not give a good result without any good stock selection at the beginning of the process. The winner of the stock game competition must commit their time to observe, monitor, and evaluate their portfolio investment. Throughout the process, emotion still matters a lot in the evaluation step. Although some observations yield above the top 5% and 1% of the normal distribution right tail, the winners are clearly beyond that range. In concluding remark, a coin flip has not proven to be better than human judgment in this case.

5. IMPLICATION, LIMITATION AND FUTURE RESEARCH

The limitation of this research is the lack of a longer duration of the competition. Perhaps, there are more competitions ahead with the same rule and initial assets to be tested. Therefore it could increase the robustness of the result. A dynamic environment from the stock market is a fascinating place to conduct future research regarding investment decision-making, such as asset selection, buying timing, holding and selling decisions. During the process, there are a lot of behavioural biases can be found. A complex causal relationship between internal and external factors of investors can be promised field to be explored.

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