

Determining the Effectiveness of Ichimoku Cloud Strategy in Cryptocurrency

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Abstract

Ichimoku cloud strategy, a technical indicator developed by Goichi Hosoda, is often used to predict future pricing movements. Not only predicting how much the price will rise, but it also determines and predicts the time period of increase or decrease. However, since the cryptocurrency market is volatile and often unexpected, the usefulness of the Ichimoku cloud strategy is questionable. This report aims to determine the effectiveness of Ichimoku cloud strategy in cryptocurrency, and evaluate these methods by comparing it to the buy and hold. As a result, it was determined that the safest method is using the Ichimoku cloud strategy since it made the least maximum drawdown each year, although having the lowest total profit. If an investor is willing to create the highest profit regardless of the risk cryptocurrency has, a buy and hold is recommended. However, if an investor wants to balance between stability and profit, the conversion line and base line method is most suitable for investment.

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1. Introduction

1.1. Cryptocurrency

Cryptocurrency is a type of payment that can be exchanged online for goods and services¹. Due to the immediate ownership transfer and strong security system, the cryptocurrency market has been recognized and gained popularity since 2009². Its market size also increased rapidly, exceeding the market capital of \$3 trillion³. Investors started to join the trade of coins in order to maximize their profit.

However, the value of cryptocurrency is much more volatile than regular stocks⁴. Its unpredictable fluctuation is severe and critical to the investors, making it difficult to predict future pricing movements. Thus, the effectiveness of technical indicators and trading strategies remain questionable.

1.2. Ichimoku Cloud Strategy

Ichimoku cloud strategy is a technical indicator system that may indicate future pricing movements of stocks⁵. The strategy was developed by Goichi Hosoda, a Japanese journalist in the late 1960s. Not only predicting the amount of rise in price, but it also determines and predicts the time period of increase or decrease. Since Ichimoku cloud strategy essentially combines three different indicators into one single chart, traders are allowed to test the strategies in multiple ways⁶.

There are five important lines in the Ichimoku cloud strategy:

1.2.1. Conversion line

Conversion line is the midpoint of candlesticks in the last 9 days. The formula for conversion line is:

¹ Frankenfield, J. (Aug 2021). *Cryptocurrency*. Retrieved from <https://www.investopedia.com/terms/c/cryptocurrency.asp>

² Royal, J. (Oct 2021). What is cryptocurrency? Here's what you should know. Retrieved from <https://www.nerdwallet.com/article/investing/cryptocurrency-7-things-to-know>

³ Lau, Y. (Nov, 2021). *Cryptocurrencies hit market cap of \$3 trillion for the first time as Bitcoin and Ether reach record highs*. Retrieved from <https://fortune.com/2021/11/09/cryptocurrency-market-cap-3-trillion-bitcoin-ether-shiba-inu/>

⁴ Reiff, N. (Jun 2020). *Why Bitcoin has a volatile value*. Retrieved from <https://www.investopedia.com/articles/investing/052014/why-bitcoins-value-so-volatile.asp>

⁵ Mitchell, C. (April 2021). Ichimoku cloud definition and uses. Retrieved from <https://www.investopedia.com/terms/i/ichimoku-cloud.asp>

⁶ Echleon 1. (2021). *How to trade with Ichimoku cloud*. Retrieved from <https://echelon-1.com/how-to-trade-with-ichimoku-cloud/>

$$CL = \frac{9-PH + 9-PL}{2}$$

where:

PH: Period High

PL: Period Low

1.2.2. Base line

Base line is the midpoint of candlesticks in the last 26 days. The formula for base line is:

$$BL = \frac{26-PH + 26-PL}{2}$$

1.2.3. Leading span A

Leading span A is the midpoint between the conversion line and the base line. The value is plotted 26 periods into the future, and it acts as one of the two cloud boundaries.

$$\text{Leading span A} = \frac{CL + BL}{2} \text{ (plotted 26 days forward)}$$

1.2.4. Leading span B

Leading span B is the midpoint of the last 52 price bars. The value is plotted 52 days into the future, and it acts as slower cloud boundaries.

$$\text{Leading span B} = \frac{52-PH + 52-PL}{2} \text{ (plotted 52 days forward)}$$

1.2.5 Lagging Span

Lagging span is a line that prices are plotted 26 days backward.

1.3. Objective

This research report aims to determine the effectiveness of Ichimoku cloud strategy in cryptocurrency, and evaluate these methods by comparing it to the buy and hold.

2. Methodology

2.1. Data Collection and Analysis

In this study, the prices of Bitcoin and Ethereum were collected to evaluate the effectiveness of the Ichimoku cloud strategy in cryptocurrency. These two currencies were selected since they are the most popular and largest digital tokens in the cryptocurrency market.

All historical prices of Bitcoin and Ethereum were gathered from Yahoo Finance in US dollars. The data were retrieved on a daily basis, which includes open, highest, lowest, close, adjusted close, and volume of the currency. The daily close price was used as the price for selling and purchasing the tokens.

The time period of two cryptocurrencies was collected from the earliest date that remains in the historical data up to the time when data were collected. In the case of Bitcoin, the data was gathered from September 17, 2014, up to October 31, 2021. For Ethereum, the data was retrieved from August 07, 2015, to October 31, 2021.

2.2. Initial Capitals and Parameters

The initial capital in the study is 100,000 USD. It is assumed that trading commissions remain zero throughout the whole trading.

In backtesting, a person should buy before selling the coins, which means that the initial action of the person must be buying. Moreover, when there is a signal for buying, the person should use all cash that one owns to buy coins. On the other hand, in the selling signal, the person should trade all the shares into cash.

2.3. Trading Strategies

In this research, two Ichimoku trading strategies were implemented in order to evaluate the effectiveness of the Ichimoku cloud strategy in cryptocurrency. The first method is using a conversion line and base line. The second method is using leading span A and B, also known as Ichimoku clouds. These two strategies were compared with the buy-and-hold.

The implementation of the Ichimoku cloud strategy was double-checked in the tradingview to ensure its accuracy.

2.3.1. Conversion line and Base line

The first trading strategy is using the intersection of conversion line and base line as the trading signals. When the conversion line exceeds the base line, it suggests that the price momentum of the short-term is increasing. On the other hand, if the conversion line gets lower than the base line, it signals price momentum has shifted downward. Therefore, it is a buy signal if the conversion line crosses over the base line, and a sell signal when the conversion line gets lower than the base line.

2.3.2. Ichimoku Cloud

The second trading strategy is using the intersection of two leading spans, leading span A and leading span B. Since two leading spans form an Ichimoku cloud, the color change of the Ichimoku cloud acts as a signal for trading. If leading span A is rising higher than leading span A, the time cloud changes into blue from red, which implies the uptrend of the prices. Oppositely, if the leading span A is below the leading span B, which cloud turns red from blue, it helps confirm the price downtrend. Thus, it is time to buy stocks, when leading span A becomes higher than B, and a person would sell the tokens if the leading span A gets lower than the leading span B.

2.3.3. Buy and Hold

Buy and hold refers to a passive strategy that a person buys stocks and holds them for a long time regardless of the market fluctuation⁷. In this research, a person buys tokens on the first day and sells them on the last day.

2.4. Result Analysis

To determine and analyze the result of the strategies, following indicators were selected.

2.4.1. Total Profit

The total profit is the financial gain after the whole process of trading. It is calculated by the following formula:

⁷ Beers, B. (May 2020). *Buy and hold definition*. Retrieved from <https://www.investopedia.com/terms/b/buyandhold.asp>

$$\text{Total Profit} = \frac{V_{final} - V_{beginning}}{V_{beginning}} * 100$$

where:

V_{final} = final price

$V_{beginning}$ = initial capital

For the buy and hold, the beginning value is the initial capital of the investor, and the final value is the closing price at the last day of trading multiplied by the amount of bitcoin the investor bought on the first day. The same formula is applied to calculate the total profit.

2.4.2. Compound Annual Growth Rate (CAGR)

The compound annual growth rate, abbreviated as CAGR, provides a constant rate of return over the time period. High CAGR indicates a high return on investment. The formula of CAGR is:

$$\text{CAGR} = \left(\frac{V_{final}}{V_{beginning}} \right)^{1/t} - 1$$

where:

V_{final} = final price

$V_{beginning}$ = initial capital

t = time in year

For the buy and hold, the beginning value is the initial capital of the investor, and the final value is the closing price at the last day of trading multiplied by the amount of bitcoin the investor bought on the first day. The same formula is applied to calculate the CAGR.

2.4.3. Sharpe Ratio

The Sharpe ratio is the average return earned while considering the volatility and total risk of the market. It helps investors to know about the past and expected future performance of the excess risk. A higher Sharpe ratio is preferred since it elicits either high returns or lower risks in the portfolio. The Sharpe ratio is calculated by:

$$\text{Sharpe Ratio} = \frac{R_p - R_f}{\sigma_p}$$

where:

R_p = portfolio return

R_f = risk-free rate

σ_p = standard deviation of the portfolio's excess return

2.4.4. Maximum Drawdown

The maximum drawdown is the maximum observed loss during the trade. The low maximum drawdown suggests a lower risk during investment. The maximum drawdown is calculated by:

$$\text{Maximum drawdown} = (V_p - V_T) / V_p$$

where:

V_p = peak value

V_T = trough value

3. Strategy Testing: Bitcoin (BTC-USD)

3.1. Financial Analysis

Before backtesting, financial analysis of Bitcoin was done to gain further insight into the currency. The cumulative daily return and volatility of Bitcoin were calculated.

3.1.1. Cumulative Daily Return

The cumulative daily return is the total change in the investment over a time period, but independent of the amount of time involved. A good cumulative return is about 7% each year.

The cumulative daily return of Bitcoin is:

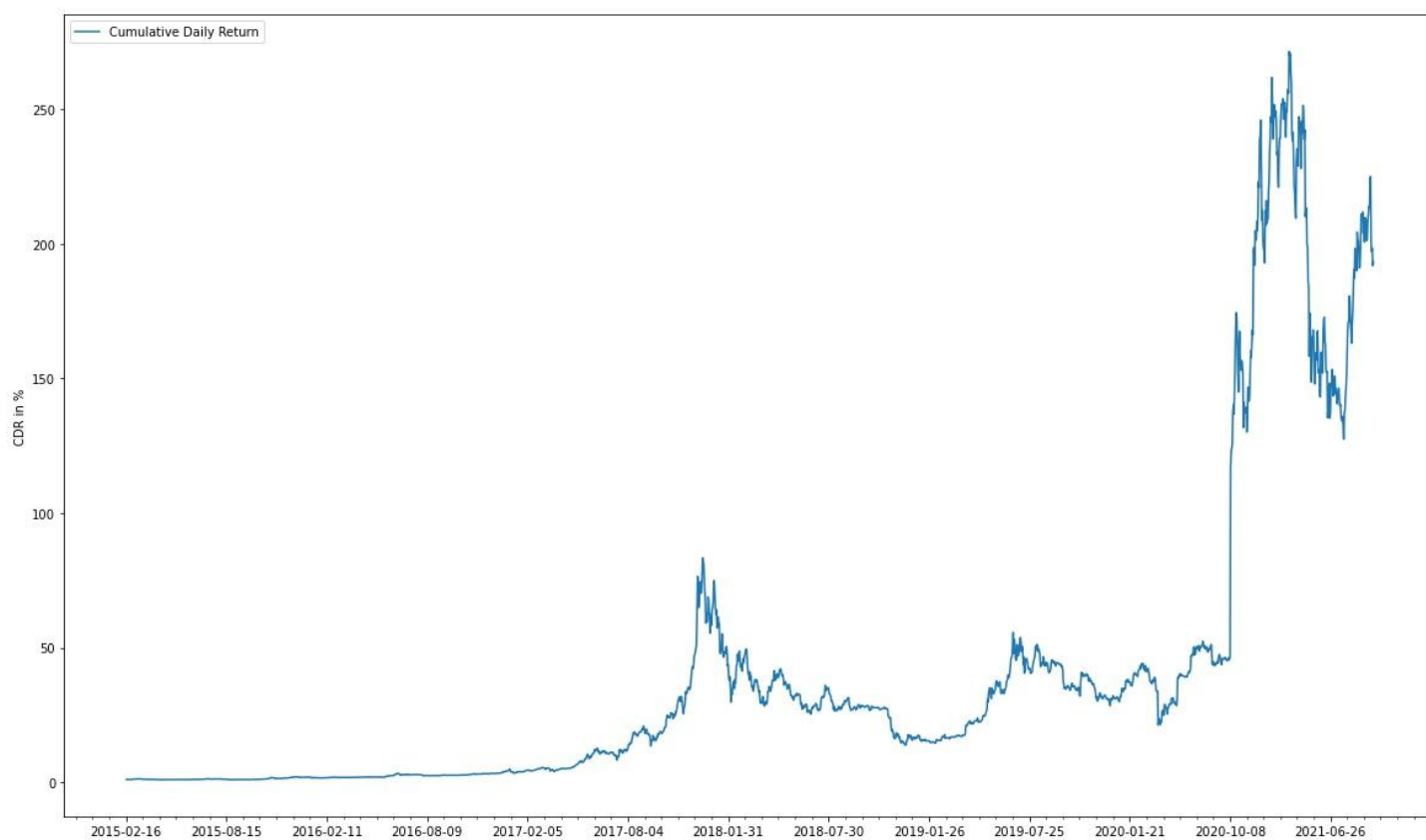


Figure 1. Cumulative Daily Return of Bitcoin

The maximum cumulative daily return of bitcoin was 271.6%, while the cumulative daily return at the end of the time period was 193.3%. The high cumulative return of Bitcoin conveys that the price of Bitcoin is increasing rapidly as time passes by.

3.1.2. Volatility

Volatility is a level of variation in trading prices over a period of time. It represents the fluctuation of an asset's price relative to the mean price. In this report, volatility was measured as the standard deviation of returns during the preceding 30 days.

The volatility of Bitcoin is illustrated in the following figure:

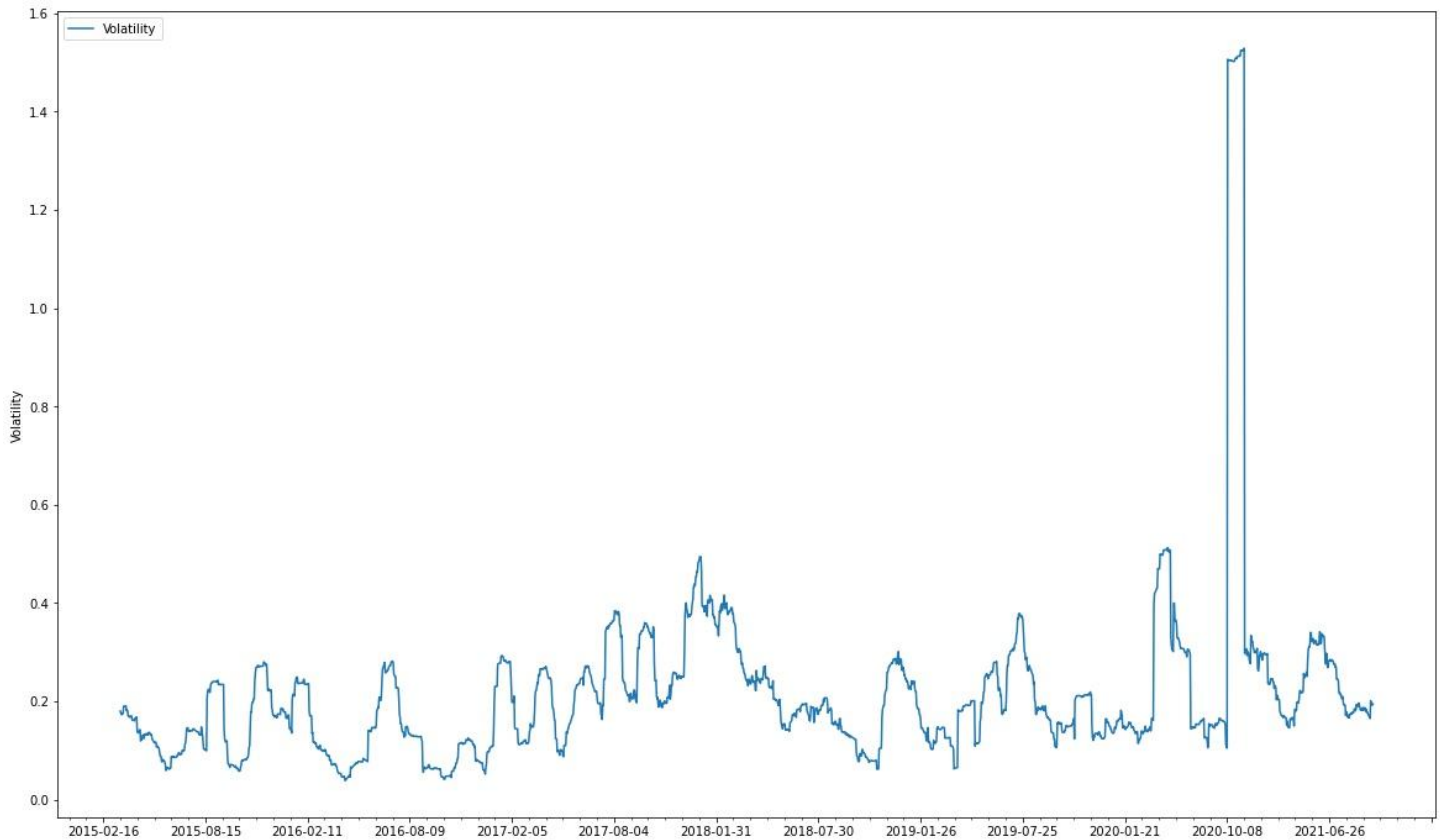


Figure 2. The volatility of Bitcoin

The maximum volatility of Bitcoin is 152.9%, which elicits that Bitcoin price is highly volatile.

3.2. Data Representation

Following Figures 3 and 4 represent the Ichimoku cloud strategy applied to Bitcoin. The first figure depicts Ichimoku cloud strategy in the whole period of Bitcoin, while the second figure gives closer insight by illustrating only a year.

The thick blue line indicates the daily closing price. The green line is for the conversion line, while the orange line points to the base line. The purple line and the brown line show leading spans A and B, respectively. The red line indicates the lagging span.

Figure 3. Ichimoku Cloud Strategy in the whole period of Bitcoin



Figure 4. A closer view: Bitcoin in a period of 2020-08-27 to 2021-08-27

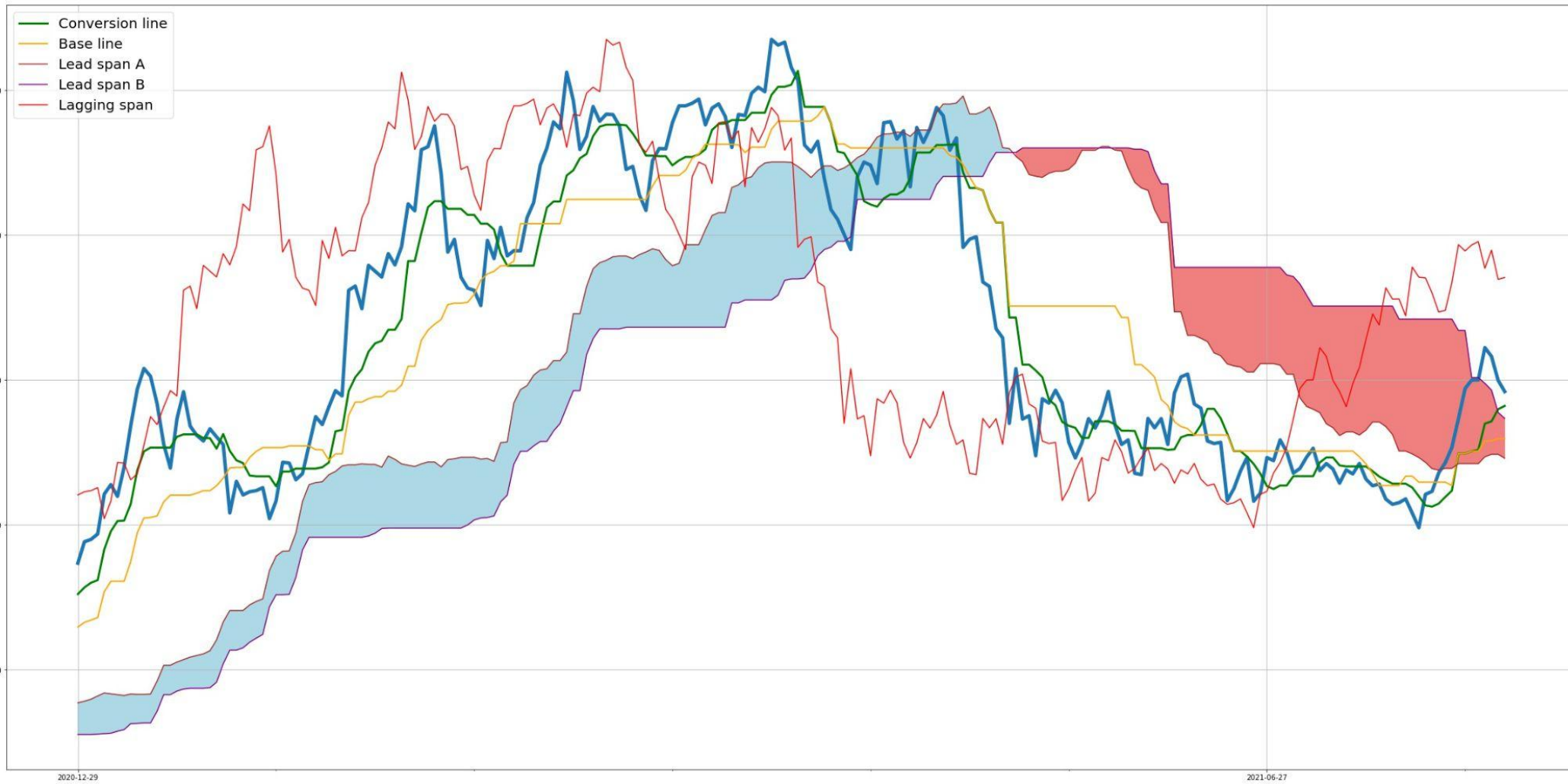


Figure 5. The buy and selling signal of Bitcoin: conversion line and base line



During the backtesting, there were a total of 101 trading signals: 51 buying signals and 50 selling signals.

Figure 6. *The buy and selling signal of Bitcoin: leading span A and B*



During the backtesting, there were a total of 63 trading signals: 32 buying signals and 31 selling signals.

The best number of each column is highlighted **boldly** in the following tables.

Table 1. Summary table of Bitcoin

	Total Profit	CAGR	Sharpe Ratio	Maximum Drawdown
Method 1: Conversion line and Base line	13,820.4%	111.7%	3.10	-67.8%
Method 2: Ichimoku Cloud	6,375.0%	97.4%	2.77	-64.3%
Method 3: Buy and Hold	19,229.8%	136.0%	3.17	-83.4%

Table 2. The annual growth rate of Bitcoin in each year

	2014	2015	2016	2017	2018	2019	2020	2021
Method 1	0.0%	992.2%	46.8%	1082.8%	-30.6%	75.7%	64.1%	-14.4%
Method 2	9.7%	39.4%	56.5%	621.6%	26.93%	1.1%	8.0%	9.7%
Method 3	-1.7%	1,154.6%	81.7%	1,367.6%	-57.2%	87.2%	109.0%	-4.3%

Figure 7. Graphical representation of annual growth rate of Bitcoin

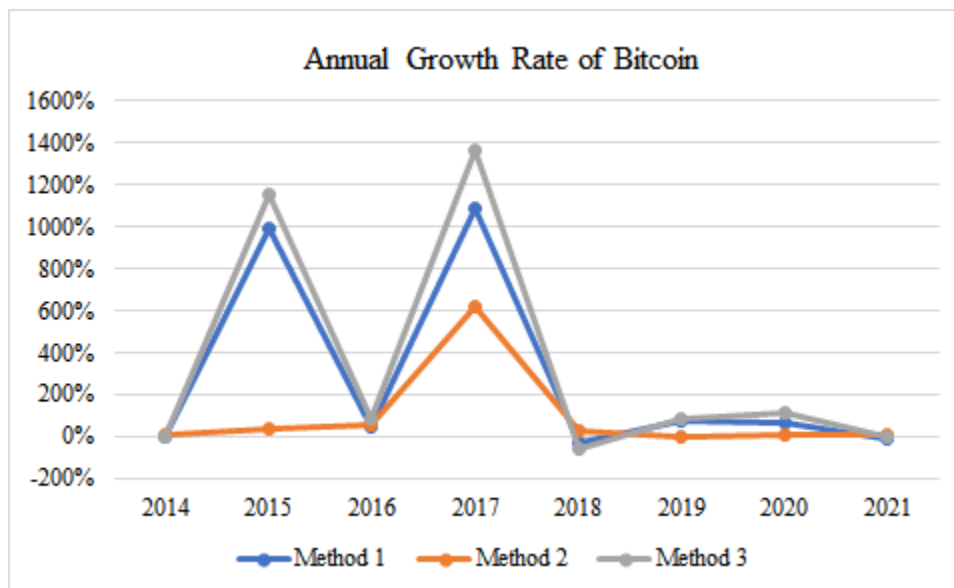
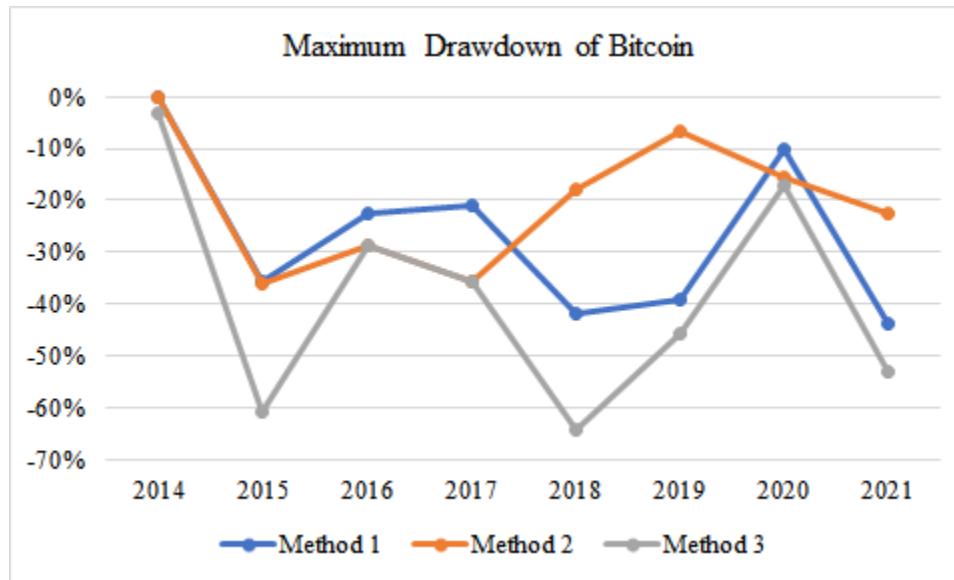


Table 3. *The maximum drawdown of Bitcoin in each year*

	2014	2015	2016	2017	2018	2019	2020	2021
Method 1	0.0%	-35.7%	-22.4%	-20.8%	-42.0%	-39.3%	-10.0%	-43.8%
Method 2	0.0%	-36.0%	-28.6%	-35.5%	-17.8%	-6.6%	-15.4%	-22.7%
Method 3	-3.1%	-60.8%	-28.6%	-35.5%	-64.3%	-45.9%	-17.3%	-53.1%

Figure 8. *Graphical representation of maximum drawdown of Bitcoin*

3.3. Data Analysis

All trading methods have generated profit. Considering the situation of the rapid increase in Bitcoin price, the buy and hold has made the highest profit of 19,229.8%, compared to using two other methods of Ichimoku cloud strategies. Using the conversion line and the base line has made a profit of 13,820.4%, followed by the Ichimoku cloud method, 6,375.0%.

The compound annual growth rate was highest in the buy and hold by having an average of 136.0%. The sharpe ratio of buy and hold also reached 3.17, which is considered to be excellent. However, the maximum drawdown of buy and hold was also the highest among the three methods in the report, having -83.4%.

The total profit and compound annual growth rate of the first Ichimoku trading strategy, using conversion and base line, ranked second. However, the sharpe ratio of this method also exceeded 3.0,

by having 3.10, which interprets that return was high relative to the risk it has taken. The maximum drawdown was -67.8%, which is significantly lower than the buy and hold, suggesting that people would feel less anxious when trading by using this strategy.

The second Ichimoku strategy, using Ichimoku cloud, made the least profit and compound annual growth rate among the three trading strategies. However, its annual growth rate shows that there was less fluctuation in price compared to other methods. Moreover, it had the lowest maximum drawdown of -64.3%, considered to be the safest method among all.

The safest method is using the Ichimoku cloud strategy since it makes the most stable profit each year, although having low total profit and compound annual growth rate. However, if a person wants to make the highest profit regardless of the risk, a buy and hold is recommended. If a person wants to balance between stability and profit, the conversion line and base line method is suitable for investment.

4. Strategy Testing: Ethereum (ETH-USD)

4.1. Financial Analysis

Before backtesting, financial analysis on Ethereum was done to gain further insight into the currency. The cumulative daily return and volatility of Ethereum were calculated.

4.1.1. Cumulative Daily Return

The cumulative daily return of Ethereum is:

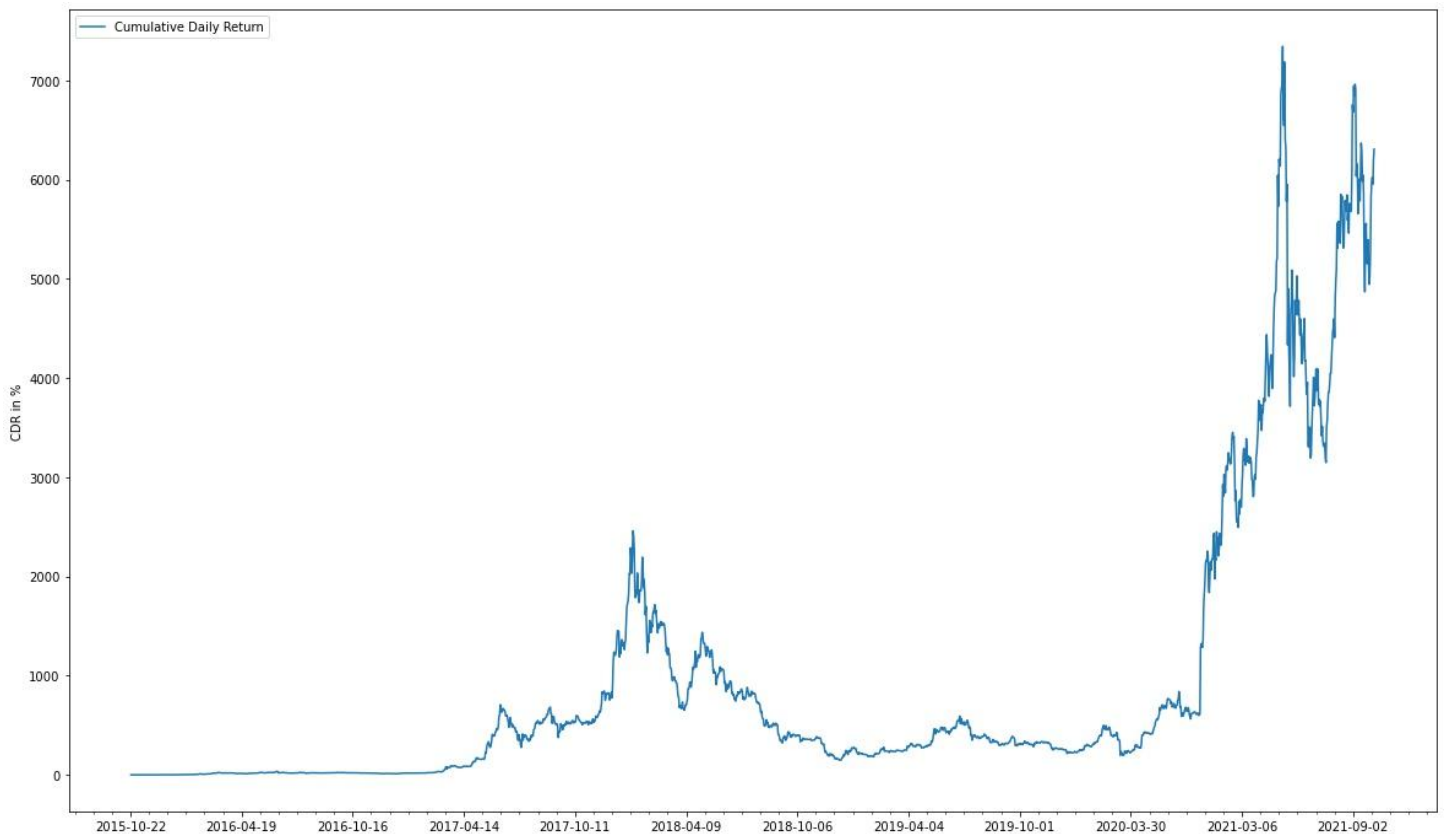


Figure 9. Cumulative Daily Return of Ethereum

The maximum cumulative daily return of Ethereum was 7343.1%, while the cumulative daily return at the end of the time period was 6307.1%. The very high cumulative return indicates that the price of Ethereum has increased rapidly compared to the initial price.

4.2.2. Volatility

The volatility of Ethereum is calculated in the following figure:

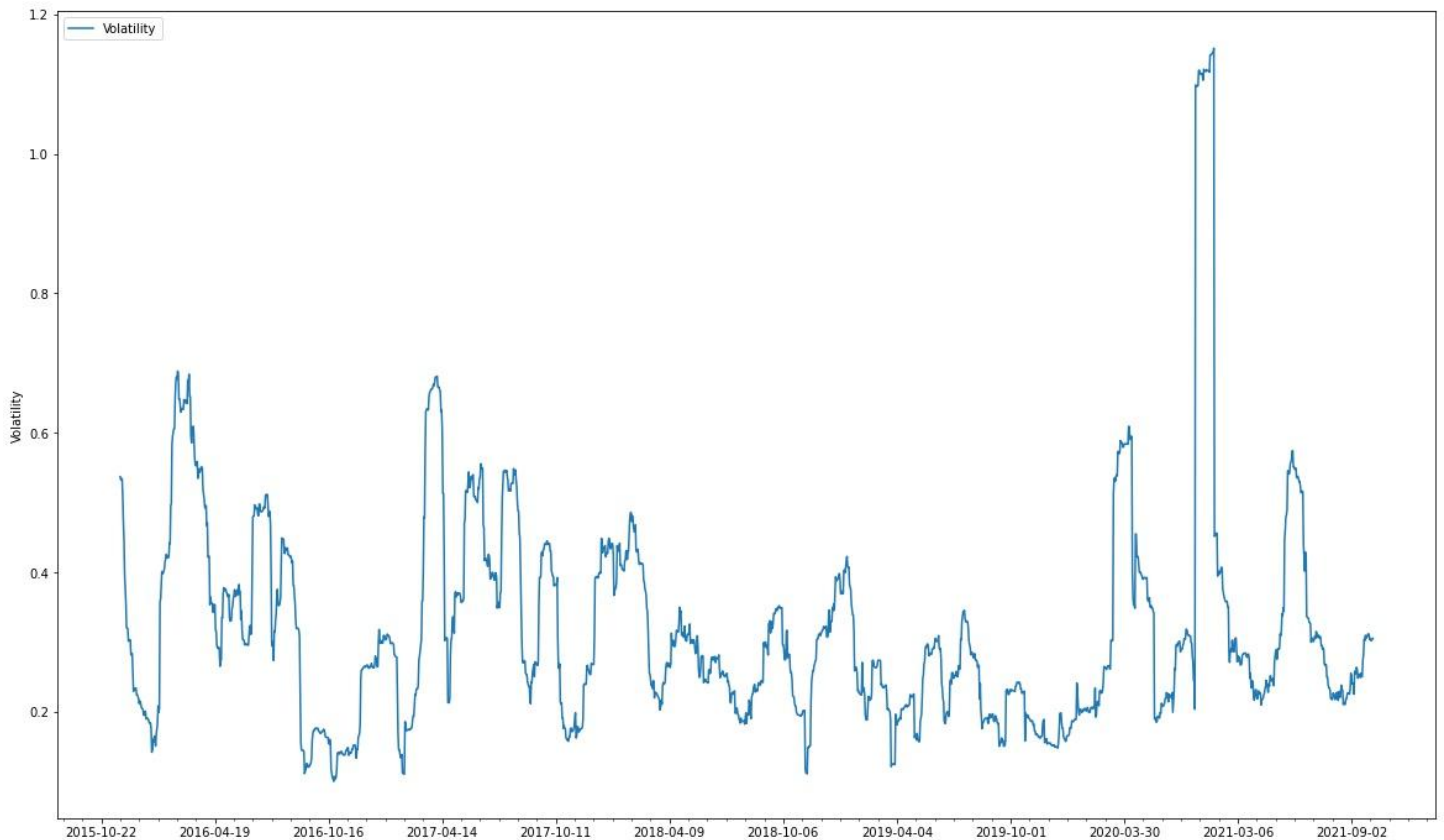


Figure 10. The volatility of Ethereum

The maximum volatility of Ethereum is 115.2%, which interprets that the Ethereum price swings heavily around the mean price.

4.2. Data Representation

The following figures 11 and 12 represent the Ichimoku cloud strategy applied to Ethereum. The first figure depicts the Ichimoku cloud strategy in the whole period of Ethereum, while the second figure gives closer insight by illustrating only a year.

The thick blue line indicates the daily closing price. The green line is for the conversion line, while the orange line points to the base line. The purple line and the brown line show leading spans A and B, respectively. The red line indicates the lagging span.

Figure 11. Ichimoku Cloud Strategy for the whole period of Ethereum



Figure 12. A closer view: Ethereum in a period of 2020-08-27 to 2021-08-27

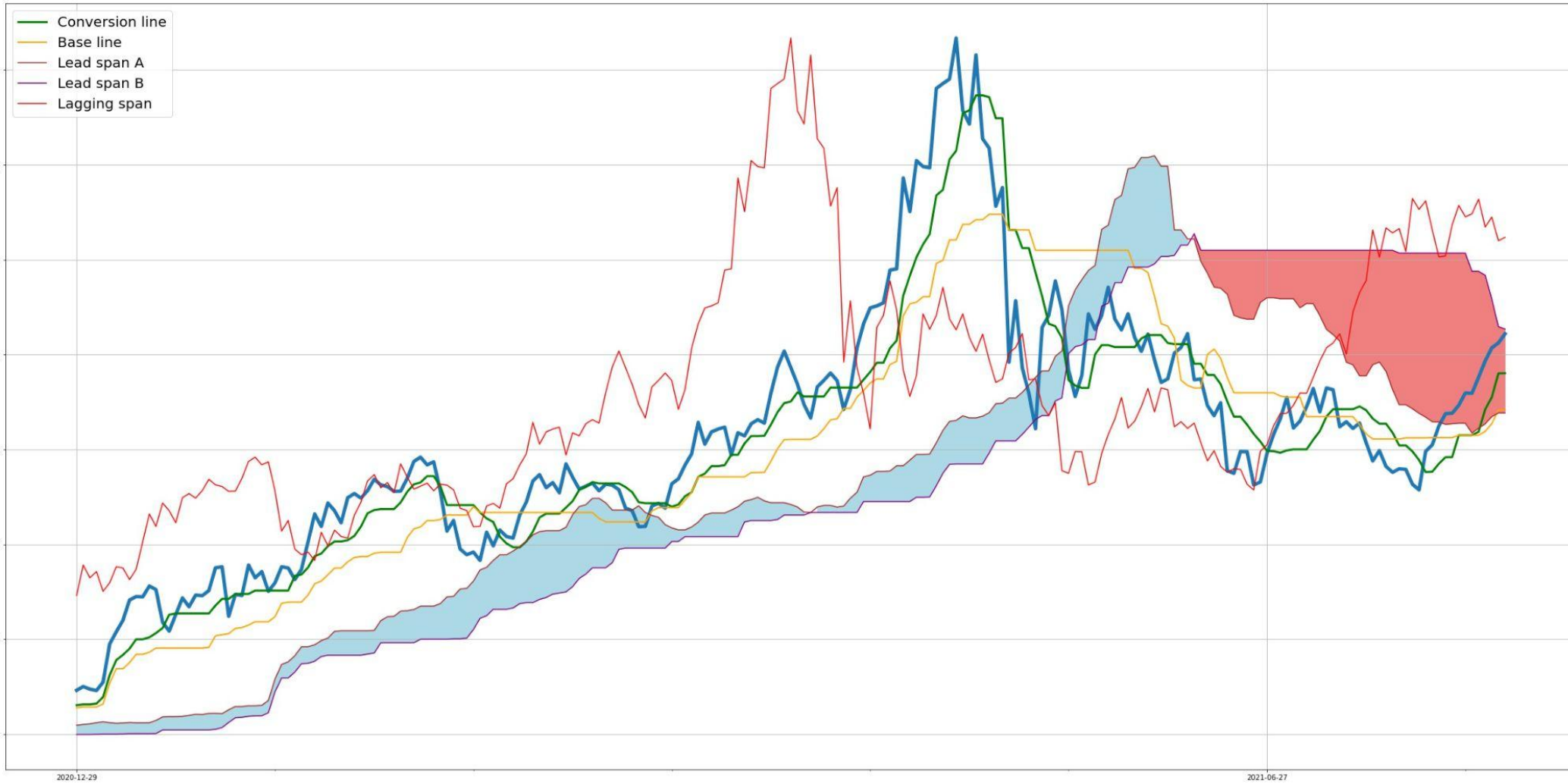
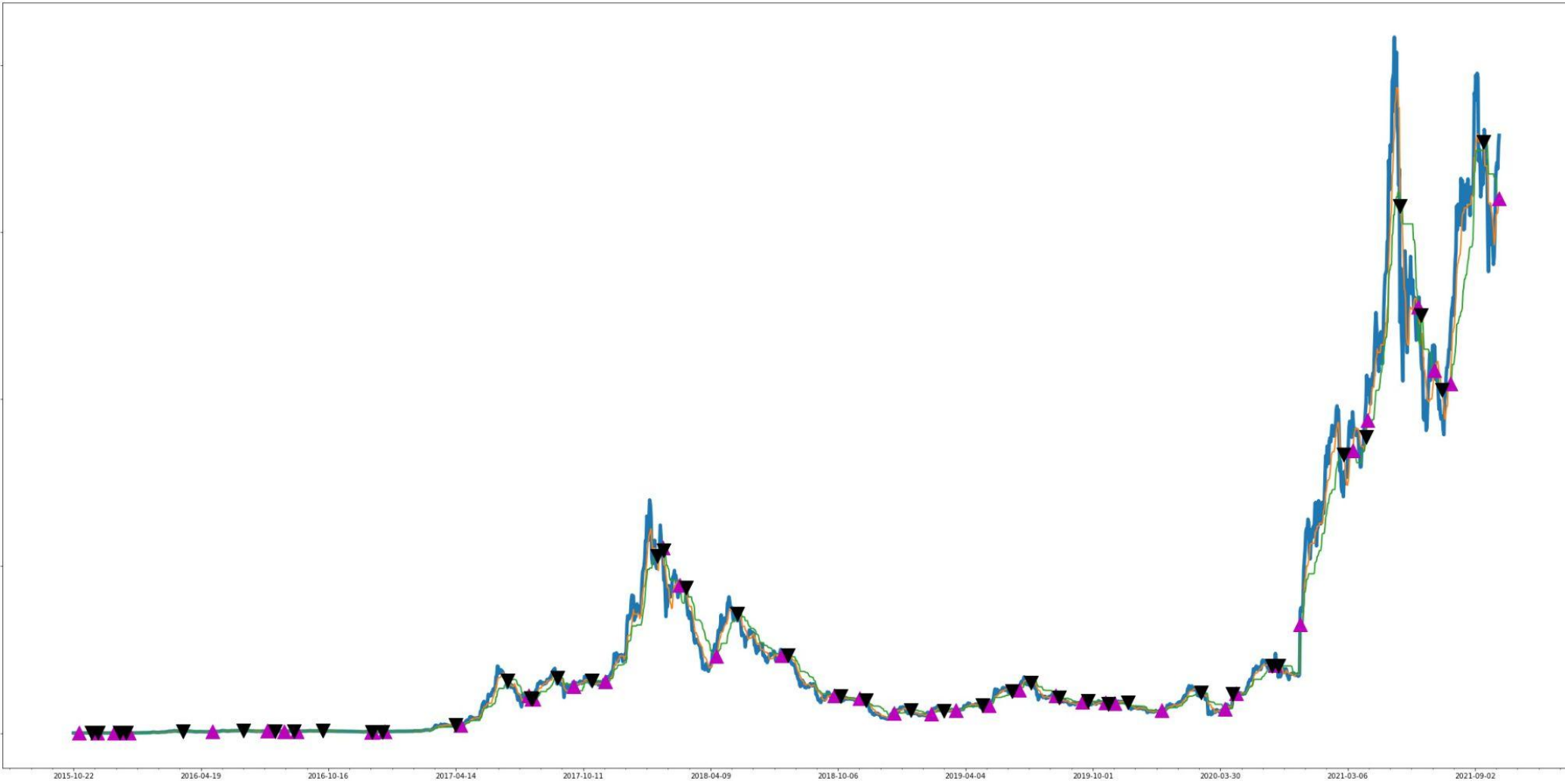
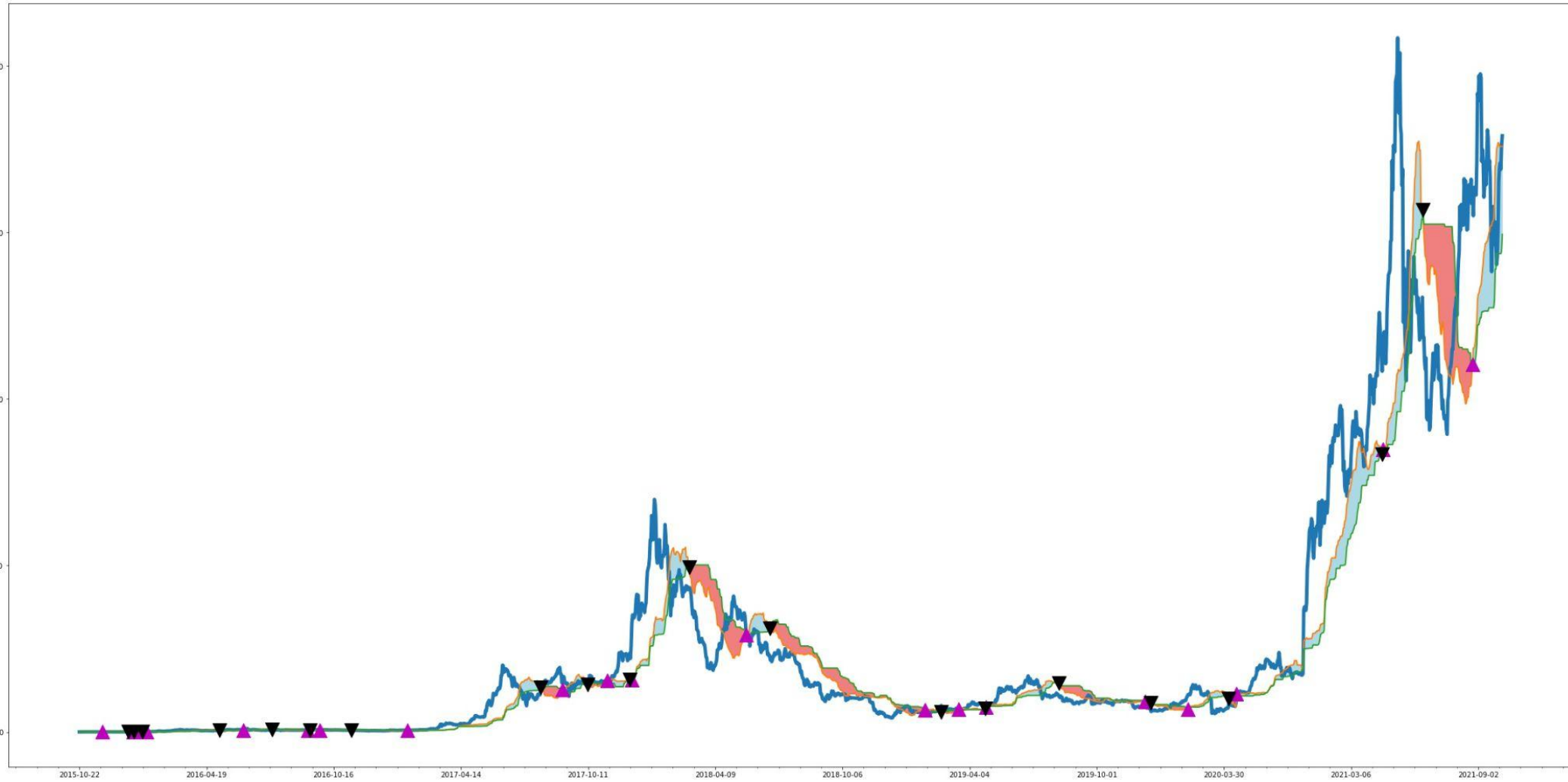


Figure 13. The buying and selling signal of Ethereum: conversion line and base line



During the backtesting, there were a total of 87 trading signals: 44 buying signals and 43 selling signals.

Figure 14. The buy and selling signal of Bitcoin: leading span A and B



During the backtesting, there were a total of 39 trading signals: 20 buying signals and 19 selling signals.

The best number of each column is highlighted **boldly** in the following tables.

Table 4. Summary table of Ethereum

	Total Profit	CAGR	Sharpe Ratio	Maximum Drawdown
Method 1: Conversion line and Base line	553,531.3%	376.5%	5.05	-70.7%
Method 2: Ichimoku Cloud	202,459.9%	297.1%	4.18	-70.6%
Method 3: Buy and Hold	630,611.5%	387.9%	4.34	-94.0%

Table 5. The annual growth rate of Ethereum in each year

	2015	2016	2017	2018	2019	2020	2021
Method 1	-0.9%	-31.1%	992.2%	6.2%	13.9%	59.3%	25.5%
Method 2	-7.2%	-23.8%	39.4%	-25.8%	55.0%	55.9%	12.8%
Method 3	47.2%	-29.0%	1154.6%	-83.0%	7.0%	208.4%	100.8%

Figure 15. Graphical representation of annual growth rate of Ethereum

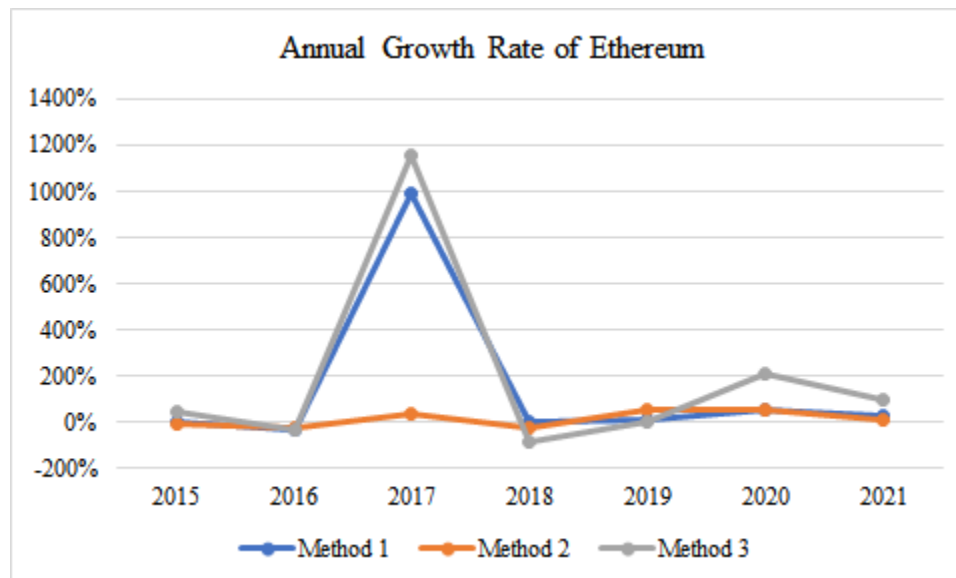
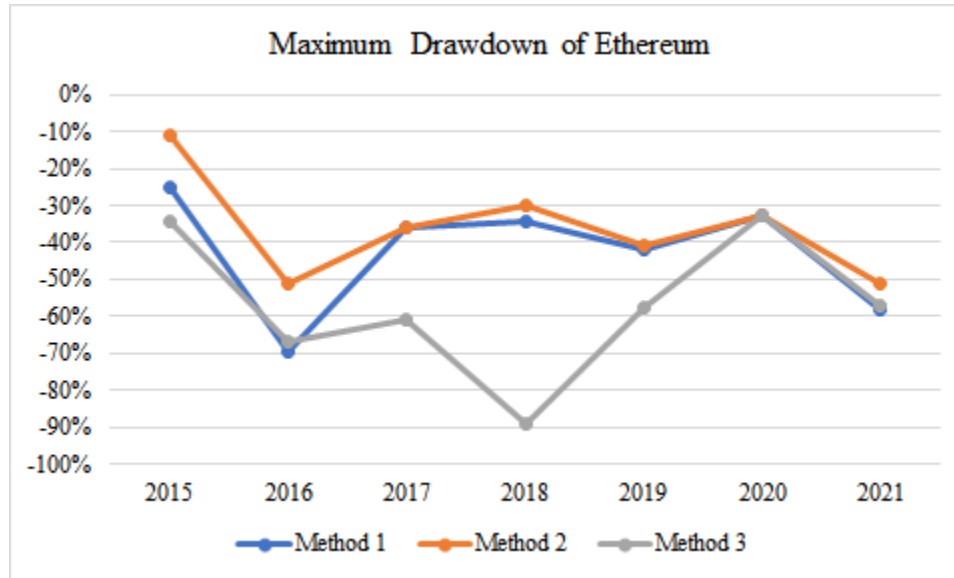


Table 6. *The maximum drawdown of Ethereum in each year*

	2015	2016	2017	2018	2019	2020	2021
Method 1	-25.0%	-69.5%	-35.7%	-34.6%	-42.1%	-32.6%	-58.0%
Method 2	-11.3%	-50.9%	-36.0%	-30.0%	-40.9%	-32.8%	-51.3%
Method 3	-34.4%	-66.9%	-60.8%	-88.8%	-57.6%	-32.8%	-57.1%

Figure 16. *Graphical representation of maximum drawdown of Ethereum*

4.3. Data Analysis

All trading strategies have created profit. The buy and hold have yielded the highest profit of 630,611.5%, followed by the first method, using conversion line and base line, making 553,531.3%. The Ichimoku cloud method has only created 202,459.9% of the profit.

The compound annual growth rate was highest in buy and hold since there was 387.9% growth. The Sharpe ratio is 4.14, which suggests that the return was high relative to the risk it has taken. However, the maximum drawdown of this method is -94.0%, which is a significant degree of decrease. The very high maximum drawdown implicitly shows that people would feel much anxious when keeping the money without any trading.

The first Ichimoku strategy, using conversion line and base line, ranked second in terms of compound annual growth rate and maximum drawdown. However, the Sharpe ratio of this method is the highest, and the difference of maximum drawdown with the lowest maximum drawdown is only 0.01%.

The second strategy, using Ichimoku cloud, made the least profit among the three trading strategies. However, the maximum drawdown of the second method is the lowest, making investors feel stable.

The safest method is using the Ichimoku cloud strategy since it makes the least maximum drawdown each year, although having a low total profit. If a person wants to make the highest profit regardless of the risk, a buy and hold are recommended. If a person wants to balance between stability and profit, the conversion line and base line method is suitable for investment.

5. Conclusion

Throughout the backtesting of Bitcoin and Ethereum, it was discovered that all trading strategies have yielded profits. Although the total profit of two Ichimoku cloud strategies were lower than the profit of buy and hold, their maximum drawdowns were also significantly lower than buy and hold. It can be concluded that the safest method is using the Ichimoku cloud strategy since it made the least maximum drawdown each year, although having the lowest total profit. If an investor is willing to create the highest profit regardless of the risk cryptocurrency has, a buy and hold is recommended. However, if an investor wants to balance between stability and profit, the conversion line and base line method is most suitable for investment. Depending on the priority or main focus of the investors, different methods may be applied.