

TECHNICAL ANALYSIS OF BOLLINGER BANDS INDICATORS AND RELATIVE STRENGTH INDEX IN DETERMINING SELL AND BUY SIGNALS OF BITCOIN CRYPTOCURRENCY COMMUNITIES

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ABSTRACT

This research aims to analyze the accuracy of the Bollinger Bands and Relative Strength Index (RSI) technical indicators in determining buy and sell signals on Cryptocurrency, especially Bitcoin. Based on data from 2021 to 2023, there has been a significant increase in the number of Cryptocurrency investors in Indonesia. Bollinger Bands measure volatility and help determine the right time to enter or exit the market, while RSI helps identify overbought or oversold conditions. The research results show that of the total of 15 signals identified using the daily timeframe, Bollinger Bands succeeded in providing accurate predictions 10 times with an accuracy rate of 66.7%. The RSI indicator shows an accuracy rate of 60%, with 3 out of 5 signals successful. Bollinger Bands tend to provide more signals because they base their predictions on price movements against their own band lines, RSI focuses more on overbought and oversold conditions, providing sharper and more accurate signals, but the limitations of both indicators are seen in bullish market conditions, where they do not there is a buy signal that is generated when the price of Bitcoin experiences a significant increase. This research concludes that although both indicators have their respective advantages and disadvantages, traders can use them accurately to identify trading opportunities on Bitcoin.

Keywords: Bollinger Bands, Relative Strength Index, Cryptocurrency, sell signal, buy signal, Bitcoin, technical analysis.

INTRODUCTION

Cryptocurrency investment is a popular investment instrument in Indonesia, as can be seen from the rapid growth in the number of investors in recent years. The following is an increase in the number of Cryptocurrency investors in Indonesia from 2021-2023.

Table 1. Number of Investors Cryptocurrencies in Indonesia

Year	Number of Cryptocurrency Investors
2021	11.2 Million
2022	16.1 Million
2023	18.51 Million

Source:(BAPPEBTI, 2023)

Based on data from the Commodity Futures Trading Supervisory Agency (Bappebti), the number of Cryptocurrency investors in Indonesia will increase 63% from 2021 to 2023. The number of Cryptocurrency investors in Indonesia will reach 18.51 million people in 2023. This is different from investment in the capital market, according to the data Indonesian Central Securities Depository (KSEI), the number of capital market investors in Indonesia in 2023 will be 12.13 million people. The capital market is a financial instrument over a long period of time that can be transacted in the form of debt or ownership rights to assets issued by the government, public authorities or private companies.(Mayangsari & Wiagustini, 2022). The following is data on the growth of capital market investors in Indonesia.

Table1. Number of Capital Market Investors in Indonesia

Year	Number of Capital Market Investors
2021	7.49 Million
2022	10.31 Million
2023	12.13 Million

Source:(KSEI, 2023)

The increase in Cryptocurrency prices, especially Bitcoin, is one of the main factors driving the growth in the number of Cryptocurrency investors in Indonesia. High returns make many people interested in investing in Cryptocurrency because of its high profit potential. The following are the top five Cryptocurrencies (Coinmarketcap; 2023).

Table2. Top Five Cryptocurrencies as of December 25, 2023

Cryptocurrencies	Price	Market Cap	Volume (30D)
Bitcoin (BTC)	\$43,246	\$846,789,619,046	\$533,291,052,324
Ethereum (ETH)	\$2,282	\$274,309,699,671	\$225,165,767,311
Tether (USDT)	\$1	\$91,301,635,914	\$1,284,246,908,469
Solana (SOL)	\$113	\$48,407,327,371	\$133,233,376,205
Binance (BNB)	\$265	\$40,297,488,445	\$25,139,840,241

Source: <https://coinmarketcap.com/>

Based on this information, Bitcoin is the type of coin that is most frequently traded. It is known in Table 3 that in the last 30 days Bitcoin was the top one in Cryptocurrency trading volume. According to Harooni & Alvan, (2023) Bitcoin is the first cryptocurrency in world history introduced in 2008 by an identity operating anonymously by the name of Satoshi Nakamoto. Bitcoin was developed with a decentralized payment system that utilizes the underlying blockchain technology and is supported by open source software. Satoshi Nakamoto attempted to create a coin that relied on cryptographic proof rather than a reliable centralized authority. Minimal transaction fees, fast response times, and pseudo-anonymity are the advantages of adopting Bitcoin.

Based on Bitcoin charts accessed via the tradingview.com website, in November 2021, the price of Bitcoin reached an all-time high of \$69,000, exceeding the previous record in April 2021 of around \$64,000. Bitcoin experienced a quite drastic price decline in November 2022, namely 70% of last year's all-time high, which was around \$17,000. In November 2023 Bitcoin experienced a significant increase from the previous year, namely around 137%, namely around \$40,000. Cryptocurrency's high volatility offers the opportunity to get large returns in the short term. This volatility makes Cryptocurrencies attractive to investors who are willing to take risks for the potential for higher returns.

Dow Theory states that the market moves in a trend. This theory aims to identify price trends (Reilly & Brown, 2011: 534). According to (Kanisius, 2010:399) Dow Theory explains that price movements are grouped into three, namely primary trends, namely prices over a long period of time (several years), secondary trends, namely price movements occurring over several weeks or months, and minor trends, namely stock price fluctuations that occur every day. This theory states the importance of trading volume in assessing the strength or weakness of a trend. High volume during an uptrend is considered confirmation of trend strength, while high volume during a downtrend signals strong selling pressure. Dow Theory provides an important foundation for technical analysis.

Technical analysis is very suitable for utilizing short-term returns as explained by Dow Theory in minor trends. Technical analysis is a tool for analyzing price fluctuations in a certain period. Certain patterns can be derived from these price movements and used as a basis for buying or selling when investing. This technical analysis will analyze prices based on previous price data (Agusta et al., 2022). According to (Gunarsih,

2020) Technical analysts do not rely on economic data to assess the intrinsic value of a stock as fundamentalists do, instead traders use charts to identify price movement patterns that occur in the market. Technical analysis helps traders to make quick decisions based on price and volume changes to maximize short-term returns.

Technical analysis provides the right timing to buy or sell when trading compared to using fundamental analysis (Ao et al., 2020), Ipestle on research Rosyidta Pratiwi Octasyilva et al., (2020) Technical analysis is more often used by investors because it is considered to have advantages over fundamental analysis. One of the advantages of technical analysis over fundamental analysis is that technical analysis can answer investors' questions about "should I buy a certain type of investment today?" and "what will the prices be like tomorrow, next week or next year?", with technical analysis investors can obtain information on investment results earlier. Cryptocurrencies have shorter data histories and lack strong fundamental information, in contrast to stocks. Cryptocurrencies have high volatility, where prices can fluctuate drastically, so technical analysis can help understand price movements through various indicators in investment analysis.

According to Cornelia Lyman, (2022) There are five most accurate indicators in technical analysis, including moving average, Relative Strength Index, moving average convergence divergence, stochastic oscillator, and Bollinger Band. On research Puspitasari & Sari, (2024) The Bollinger Band indicator is effectively used in reading stock price movements, thus helping investment decisions to buy and sell shares, Ipestle on research Atul Latipah & Syafitri, (2024) stated that the accuracy of the Relative Strength Index indicator was 63% in predicting buy and sell signals on the LQ45 index.

The Bollinger Band and Relative Strength Index indicators are the most accurate indicators to use when trading (Most, 2022). This research tests the technical analysis method using the Bollinger Bands indicator which was developed by John Bollinger in the 1980's (Muis et al., 2021). Bollinger line calculations involve the use of standard deviation. Standard deviation is a mathematical formula that measures the level of volatility and shows the extent to which prices can change around their true value. Standard deviation is used to measure price volatility by relating the price range to its average movement. When the standard deviation value is higher, the range between the price and the moving average becomes wider, indicating a higher level of volatility in the instrument and causing a larger price candlestick spread. (Nuzula Agustinet al., 2023).

According to research Vijayrao Patil et al., (2023) Bollinger Band indicator, if used efficiently, helps in carrying out proper technical analysis, which in turn helps identify the right time to enter and exit the market as it uses past performance to forecast future movements, making it more reliable and effective in making decisions related to buy and sell options related to buying certain shares, then in Jian et al., (2022)'s research, to make a trade, we have to wait for a breakout to occur. The width of the band determines volatility. If the width is narrower, then the volatility is lower,

and if the width of the band is larger, then the volatility is higher. Traders can also trade when the Bollinger Band experiences narrowing. A Bollinger Band squeeze occurs when volatility is very low and if this continues for more than 1 month, and if the current candlestick exceeds the upper Bollinger Band, then it is a “buy call”.

This research also uses the Relative Strength Index indicator, this indicator can provide signals to investors about market conditions that are at a saturation point, both buying and selling. The Relative Strength Index is an oscillator tool used in technical analysis to indicate price strength by comparing the upward and downward movements of a stock. Generally, traders will start thinking about buying shares when the RSI indicator for the stock shows an oversold condition, and will start considering selling shares when the RSI indicator shows an overbought condition, sometimes even though a stock is already in an oversold condition, the price can still fall lower again (lower-low), and vice versa, when the price is in an overbought condition, the price can still rise even higher (higher-high). This indicator can cause Traders to buy or sell shares too quickly (Maulana, 2022). Relative Strength Index is an indicator that is widely used in technical analysis. This indicator is a tool for technical analysis users to understand and interpret technical charts, as well as predict future price trends on the Financial Exchange and measure the extent of price movements (Alhilfi, 2019).

This research will measure the accuracy of the Bollinger Bands and Relative Strength Index indicators in determining buy and sell signals on Bitcoin. Measuring the accuracy of the Bollinger Bands indicator on a sell signal is said to be successful if the price penetrates the upper band line then the price decreases and manages to touch the middle band line, while a buy signal is said to be successful if the price penetrates the lower band then the price increases and succeeds in touching the middle band line, then the signal selling is said to be unsuccessful if the price manages to penetrate the upper band and then the price continues to increase and the stock price does not touch the middle band, while the buy signal is said to be unsuccessful if the price penetrates the lower band then the price continues to decline and the price does not touch the middle band. Measuring the accuracy of the Relative Strength Index (RSI) indicator on a buy signal is indicated if the RSI scale touches a scale of 30 and a sell signal touches a scale of 70. The sell signal can be said to have failed if the RSI penetrates the scale of 30, but the movement is down, and the sell signal can be said to have failed if the RSI penetrated the 70 scale but the scale movement did not decrease.

This research will analyze historical Bitcoin price data and apply the Bollinger Bands and Relative Strength Index indicators to identify potential signals. Signal accuracy will be evaluated based on the indicator's ability to predict success when buying and selling. The accuracy of these two indicators provides insight into the accuracy of Bollinger Bands and Relative Strength Index as technical analysis tools in the Cryptocurrency market, especially Bitcoin. Measuring accuracy is important because it provides an objective assessment of an indicator's ability to produce reliable signals for investors. High accuracy shows that the signals provided by these indicators correspond to actual price movements, so that they can help investors make more

precise and profitable trading decisions. Accuracy measurements help in identifying potential weaknesses and strengths of the technical indicators used.

RESEARCH METHODS

This research is a type of descriptive comparative research, where this research can produce a strategy for determining buy and sell signals in Cryptocurrency using the Bollinger Bands and Relative Strength Index (RSI) technical analysis approach and then the accuracy level of each indicator will be compared and analyzed. This research was conducted on the commodity futures exchange by accessing the tradingview.com website which provides graphic data on Cryptocurrency prices, namely Bitcoin. The cryptocurrency will be analyzed for coin price movements.

The population in this study is historical price data for Cryptocurrencies. This population includes all Cryptocurrency price data with a daily timeframe totaling 365 candlesticks on the Bitcoin chart in 2023. The method for determining the sample is using the saturated sample method because the entire population is used as a sample in this research, namely Cryptocurrency with a daily timeframe totaling 365 candlesticks on the Bitcoin chart in 2023.

The type of data used in this research is historical data for Cryptocurrency which will be obtained on the tradingview.com website. This data will include opening price, closing price, highest price, lowest price, as well as Cryptocurrency trading volume. This data is used to analyze buy and sell signals when using Bollinger Bands and Relative Strength Index (RSI) analysis.

RESULTS AND DISCUSSION

Results of Research Data Analysis

Bollinger Band Indicator Accuracy Analysis

Bollinger Bands is a technical analysis indicator that shows 3 types of lines. The top line is called the upper band, the line in the middle is called the middle band, and the line at the bottom is called the lower band. The following are the criteria for assessing the Bollinger Bands indicator.

- 1) The sell signal is said to be successful if the price penetrates the upper band line, then the price declines and manages to touch the middle band line.
- 2) The buy signal is said to be successful if the price penetrates the lower band then the price increases and manages to touch the middle band line.
- 3) The selling signal is said to be unsuccessful if the price manages to penetrate the upper band and then the price continues to increase and the price does not touch the middle band.
- 4) The buy signal is said to be unsuccessful if the price penetrates the lower band line and then the price continues to decline and the price does not touch the middle band. The following are the results of Bitcoin analysis in determining Buy and Sell signals using the Bollinger Band indicator.

The following are the results of Bitcoin analysis using the Bollinger Bands indicator to determine buy and sell signals.



Source: Tradingview.com, 2024

Picture 1. Indicator Accuracy Analysis Bollinger Bands (February 9, 2023)

Figure 1 shows that on February 9, 2023, the price of Bitcoin was recorded at \$22,178. Based on the analysis of the Bollinger Bands indicator, a buy signal appears indicating that the price has penetrated the lower band line. This signal generally indicates an oversold condition, which is expected to be followed by a price increase towards the middle band line, however the buy signal on that date was not successful, even though the indicator showed a buy signal, the Bitcoin price did not experience the expected increase after breaking through the lower band. Prices continue to decline and fail to touch the middle band line. This signal shows that the buy signal given on February 9 2023 was declared unsuccessful because it did not meet the success criteria, namely the price increase that should have occurred and the middle band touching did not materialize.



Source: Tradingview.com, 2024

Picture 2. Indicator Accuracy Analysis Bollinger Bands (February 11, 2023)

Figure 2 shows that on February 11, 2023, the price of Bitcoin was recorded at \$21,837. Based on the analysis of the Bollinger Bands indicator, a buy signal appears indicating that the price has penetrated the lower band line. This signal generally indicates an oversold condition, which is expected to be followed by an increase in price towards the middle band line. On that date, the buy signal was successful

because the Bitcoin price experienced the expected increase and managed to touch the middle band line after breaking through the lower band. The success of the buy signal on February 11, 2023 was confirmed because it met the success criteria, namely the price increase that occurred and the middle band touching.



Source: Tradingview.com, 2024

Picture 3. Indicator Accuracy Analysis Bollinger Bands (February 15, 2023)

Figure 3 shows that on February 15, 2023, the price of Bitcoin was recorded at \$24,297. Based on the Bollinger Bands indicator analysis, a sell signal appears indicating that the price has penetrated the upper band line. This signal generally indicates overbought conditions, which are expected to be followed by a price decline towards the middle band line. On that date, the sell signal was successful because the Bitcoin price experienced the expected decline and managed to touch the middle band line after breaking through the upper band. The success of the sell signal on February 15 2023 was confirmed because it met the success criteria, namely the price decline that occurred and the middle band touching.



Source: Tradingview.com, 2024

Picture 4. Indicator Accuracy Analysis Bollinger Bands (March 9, 2023)

Figure 4 shows that on March 9, 2023, the price of Bitcoin was recorded at \$21,078. Based on the analysis of the Bollinger Bands indicator, a buy signal appears indicating that the price has penetrated the lower band line. This signal generally indicates an oversold condition, which is expected to be followed by a price increase towards the middle band line, but the buy signal on that date was not successful. Even though the indicator shows a buy signal, Bitcoin price continues to decline after breaking through the lower band and failing to touch the middle band line. The buy

signal on March 9 2023 was declared unsuccessful because it did not meet the success criteria, namely the price increase that should have occurred and the middle band touching did not materialize.



Source: Tradingview.com, 2024

Picture 5. Indicator Accuracy Analysis Bollinger Bands (March 12, 2023)

Figure 5 shows that on March 12, 2023, the price of Bitcoin was recorded at \$20,284. Based on the analysis of the Bollinger Bands indicator, a buy signal appears indicating that the price has penetrated the lower band line. This signal generally indicates an oversold condition, which is expected to be followed by an increase in price towards the middle band line. On that date, the buy signal was successful because the Bitcoin price experienced the expected increase and managed to touch the middle band line after breaking through the lower band. The success of the buy signal on March 12 2023 was confirmed because it met the success criteria, namely the price increase that occurred and the middle band touching.



Source: Tradingview.com, 2024

Picture 6. Indicator Accuracy Analysis Bollinger Bands (March 17, 2023)

Figure 6 shows that on March 17, 2023, the price of Bitcoin was recorded at \$26,486. Based on the Bollinger Bands indicator analysis, a sell signal appears indicating that the price has penetrated the upper band line. This signal generally indicates overbought conditions, which is expected to be followed by a price decline towards the middle band line, but the sell signal on that date was unsuccessful. The indicator shows a sell signal, Bitcoin price continues to increase after breaking through the upper band and failing to touch the middle band line. The sell signal on March 17 2023 was

declared unsuccessful because it did not meet the success criteria, namely the price decline that should have occurred and the middle band touching did not materialize.



Source: Tradingview.com, 2024

Picture 7. Indicator Accuracy Analysis Bollinger Bands (12 May 2023)

Figure 7 shows that on May 12, 2023, the price of Bitcoin was recorded at \$26,830. Based on the analysis of the Bollinger Bands indicator, a buy signal appears indicating that the price has penetrated the lower band line. This signal generally indicates an oversold condition, which is expected to be followed by an increase in price towards the middle band line. On that date, the buy signal was successful because the Bitcoin price experienced the expected increase and managed to touch the middle band line after breaking through the lower band. The success of the buy signal on May 12 2023 was confirmed because it met the success criteria, namely the price increase that occurred and the middle band touching.



Source: Tradingview.com, 2024

Picture 8. Indicator Accuracy Analysis Bollinger Bands (28 May 2023)

Figure 8 shows that on May 28, 2023, the price of Bitcoin was recorded at \$27,873. Based on the Bollinger Bands indicator analysis, a sell signal appears indicating that the price has penetrated the upper band line. This signal generally indicates

overbought conditions, which are expected to be followed by a price decline towards the middle band line. On that date, the sell signal was successful because the Bitcoin price experienced the expected decline and managed to touch the middle band line after breaking through the upper band. The success of the sell signal on May 28 2023 was confirmed because it met the success criteria, namely the price decline that occurred and the middle band touching.



Source: Tradingview.com, 2024

Picture9. Indicator Accuracy Analysis Bollinger Bands (June 14, 2023)

Figure 9 shows that on June 14, 2023, the price of Bitcoin was recorded at \$25,105. Based on the analysis of the Bollinger Bands indicator, a buy signal appears indicating that the price has penetrated the lower band line. This signal generally indicates an oversold condition, which is expected to be followed by an increase in price towards the middle band line. On that date, the buy signal was successful because the Bitcoin price experienced the expected increase and managed to touch the middle band line after breaking through the lower band. The success of the buy signal on June 14 2023 was confirmed because it met the success criteria, namely the price increase that occurred and the middle band touching.



Source: Tradingview.com, 2024

Picture 10 Indicator Accuracy Analysis Bollinger Bands (June 20, 2023)

Figure 10 shows that on June 20, 2023, the price of Bitcoin was recorded at \$27,995. Based on the Bollinger Bands indicator analysis, a sell signal appears indicating that the price has penetrated the upper band line. This signal generally indicates

overbought conditions, which is expected to be followed by a price decline towards the middle band line, but the sell signal on that date was unsuccessful. Even though the indicator shows a sell signal, Bitcoin price continues to increase after breaking through the upper band and failing to touch the middle band line. The sell signal on June 20 2023 was declared unsuccessful because it did not meet the success criteria, namely the price decline that should have occurred and the middle band touching did not materialize.



Source: Tradingview.com, 2024

Picture 11 Indicator Accuracy Analysis Bollinger Bands (July 24, 2023)

Figure 11 shows that on July 24, 2023, the price of Bitcoin was recorded at \$29,423. Based on the Bollinger Bands indicator analysis, a buy signal appears indicating that the price has penetrated the lower band line. This signal generally indicates an oversold condition, which is expected to be followed by an increase in price towards the middle band line. On that date, the buy signal was successful because the Bitcoin price experienced the expected increase and managed to touch the middle band line after breaking through the lower band. The success of the buy signal on July 24 2023 was confirmed because it met the success criteria, namely the price increase that occurred and the middle band touching.



Source: Tradingview.com, 2024

Picture 12 Indicator Accuracy Analysis Bollinger Bands (8 August 2023)

Figure 12 shows that on August 8, 2023, the price of Bitcoin was recorded at \$30,211. Based on the analysis of the Bollinger Bands indicator, a sell signal appears indicating that the price has penetrated the upper band line. This signal generally indicates overbought conditions, which are expected to be followed by a price decline

towards the middle band line. On that date, the sell signal was successful because the Bitcoin price experienced the expected decline and managed to touch the middle band line after breaking through the upper band. The success of the sell signal on August 8 2023 was confirmed because it met the success criteria, namely the price decline that occurred and the middle band touching.



Source: Tradingview.com, 2024

Picture 13. Indicator Accuracy Analysis Bollinger Bands (16 August 2023)

Figure 13 shows that on August 16, 2023, the price of Bitcoin was recorded at \$28,935. Based on the analysis of the Bollinger Bands indicator, a buy signal appears indicating that the price has penetrated the lower band line. This signal generally indicates an oversold condition, which is expected to be followed by an increase in price towards the middle band line, but the courage to buy on that date was not successful. Even though the indicator shows a buy signal, Bitcoin price continues to decline after breaking through the lower band and failing to touch the middle band line. The buy signal on August 16 2023 was declared unsuccessful because it did not meet the success criteria, namely the price increase that should have occurred and the middle band touching did not materialize.



Source: Tradingview.com, 2024

Picture 14. Indicator Accuracy Analysis Bollinger Bands (September 11, 2023)

Figure 14 shows that on September 11, 2023, the price of Bitcoin was recorded at \$25,062. Based on the analysis of the Bollinger Bands indicator, a buy signal appears

indicating that the price has penetrated the lower band line. This signal generally indicates an oversold condition, which is expected to be followed by an increase in price towards the middle band line. On that date, the buy signal was successful because the Bitcoin price experienced the expected increase and managed to touch the middle band line after breaking through the lower band. The success of the buy signal on September 11 2023 was confirmed because it met the success criteria, namely the price increase that occurred and the middle band touching.



Source: Tradingview.com, 2024

Picture 15. Indicator Accuracy Analysis Bollinger Bands (September 19, 2023)

Figure 15 shows that on September 19, 2023, the price of Bitcoin was recorded at \$27,049. Based on the analysis of the Bollinger Bands indicator, a sell signal appears indicating that the price has penetrated the upper band line. This signal generally indicates overbought conditions, which are expected to be followed by a price decline towards the middle band line. On that date, the sell signal was successful because the Bitcoin price experienced the expected decline and managed to touch the middle band line after breaking through the upper band. The success of the sell signal on September 19 2023 was confirmed because it met the success criteria, namely the price decline that occurred and the middle band touching.

Accuracy Analysis of the Relative Strength Index Indicator

Relative Strength Index is an indicator used to determine whether market conditions have experienced oversold or overbought conditions. RSI has a scale from 0-100, a scale of 30 shows the market is in an oversold position and a scale of 70 shows the market is in an overbought position. The following are the criteria for assessing the Relative Strength Index indicator.

- 1) A buy signal is indicated if the RSI scale touches 30 and the scale movement increases.
- 2) A sell signal is indicated if the RSI scale touches 70 and the scale movement decreases.
- 3) The buy signal can be said to have failed if the RSI penetrates the 30 scale but the movement is down.
- 4) A sell signal can be said to have failed if the RSI penetrates the 70 scale but the scale movement does not decrease.

The following are the results of Bitcoin analysis using the Relative Strength Index indicator to determine buy and sell signals.



Source: Tradingview.com, 2024

Picture 16. Indicator Accuracy Analysis Relative Strength Index (10 March 2023)

Figure 16 shows that on March 10, 2023, the price of Bitcoin was recorded at \$20,191. The Relative Strength Index (RSI) indicator shows an oversold condition, which indicates that the market is in an oversold state. An RSI that reaches 30 indicates that the price of Bitcoin has experienced a significant decline in the previous period, creating an opportunity for investors to make purchases in the hope that the price will rise again. The buy signal that appeared today was declared successful because after the RSI touched 30 the scale did not decrease.



Source: Tradingview.com, 2024

Picture 17. Indicator Accuracy Analysis Relative Strength Index (17 March 2023)

Figure 17 shows that on March 17, 2023, the price of Bitcoin was recorded at \$26,486. The RSI indicator shows overbought conditions, which indicates that the market is in an overbought state. An RSI that reaches 70 indicates that the price of Bitcoin has experienced a significant increase in the previous period, creating an opportunity for investors to sell in the hope that the price will fall again. The sell signal that appeared today was declared successful because after the RSI touched 70 the scale did not increase.



Source: Tradingview.com, 2024

Picture 18. Indicator Accuracy Analysis Relative Strength Index (16 August 2023)

Figure 18 shows that on August 16, 2023, the price of Bitcoin was recorded at \$28,607. The RSI indicator shows an oversold condition, which indicates that the market is in an oversold state. The buy signal that appeared today was declared unsuccessful, after the RSI touched the scale of 30 there was a decrease in the scale which meant that the signal could be declared unsuccessful.



Source: Tradingview.com, 2024

Picture 19. Indicator Accuracy Analysis Relative Strength Index (28 August 2023)

Figure 19 shows that on August 28, 2023, the price of Bitcoin was recorded at \$26,035. Today the RSI indicator again shows an oversold condition, which indicates that the market is in an oversold state. The buy signal that appeared today was declared successful because after the RSI touched the scale of 30 and there was no decline in the scale.



Source: Tradingview.com, 2024

Picture 20. Indicator Accuracy Analysis Relative Strength Index (19 October 2023)

Figure 20 shows that on October 19, 2023, the price of Bitcoin was recorded at \$30,282. Today's RSI indicator shows overbought conditions, which indicates that the market is in an overbought state. A sell signal appeared today, the signal was declared unsuccessful. After the RSI touched 70, there was no decrease in the scale.

Research Analysis Results

Accuracy Level of the Bollinger Band Indicator in Predicting Buy and Sell Price Signals on Bitcoin

Table 4. Indicator Accuracy Bollinger Bands

No	Date	Price	The signal that appears	Success
1	February 9, 2023	\$22,178	Oversold/Buy	Not successful
2	February 11, 2023	\$21,837	Oversold/Buy	Succeed
3	February 15, 2023	\$24,297	Overbought/Sell	Succeed
4	March 9, 2023	\$21,078	Oversold/Buy	Not successful
5	March 12, 2023	\$20,284	Oversold/Buy	Succeed
6	March 17, 2023	\$26,486	Overbought/Sell	Not successful
7	May 12, 2023	\$26,830	Oversold/Buy	Succeed
8	May 28, 2023	\$27,873	Overbought/Sell	Succeed
9	June 14, 2023	\$25,105	Oversold/Buy	Succeed
10	June 20, 2023	\$27,995	Overbought/Sell	Not successful
11	July 24, 2023	\$29,423	Oversold/Buy	Succeed
12	August 8, 2023	\$30,211	Overbought/Sell	Succeed
13	August 16, 2023	\$28,935	Oversold/Buy	Not successful
14	September 11, 2023	\$25,062	Oversold/Buy	Succeed
15	September 19, 2023	\$27,049	Overbought/Sell	Succeed
Number of Successful Signals				10
Number of Unsuccessful Signals				5
Indicator Accuracy				66.7%

Source: Tradingview.com, 2024

Based on Table 4 for the period January 2023 – December 2023 using the Bollinger Band indicator for the Bitcoin cryptocurrency type, in total there are 15 signals that appear on the chart with a daily time frame. In total, 10 signals were said to be successful and 5 signals were said to be unsuccessful, so the accuracy of the signals on the Bollinger Band indicator was 66.7%. In November to December 2023, Bitcoin price movements experienced a significant increase which made the signal at the lower Bollinger Band indicator line untouched, making it impossible to open a position to buy Bitcoin.

A total of 15 signals appeared, 10 signals were categorized as successful and 5 signals were unsuccessful, resulting in an accuracy level for the Bollinger Bands indicator of 66.7%. This accuracy was calculated by comparing the number of successful signals with the total signals that appeared during the research period. With an accuracy rate of 66.7%, Bollinger Bands show quite good potential in predicting Bitcoin price movements, although there are some unsuccessful signals. During November to December 2023, the price of Bitcoin experienced a significant increase which caused the signal on the upper band of the Bollinger Bands to remain untouched, so no buy signals appeared during that period, thus indicating that in a strong bullish trend, buy signals based on the Bollinger Bands may be lacking appear frequently, and traders may need to consider additional factors or other indicators to identify trading opportunities.

Pramudya & Pramudya (2020) shows that investors can make profits by buying when the price is in the lower band and selling when the price is in the upper band. This is consistent with research results which show a 66.7% accuracy rate of Bollinger Bands in predicting buy and sell price signals on Bitcoin. Day et al., (2023) supports this finding by showing that sell signals can be captured well by Bollinger Bands, which is also proven in the results of research analysis.

Level of Accuracy of the Relative Strength Index Indicator in Predicting Buy and Sell Price Signals on Bitcoin

Table 5. Accuracy of the Relative Strength Index Indicator

No	Date	Price	The signal that appears	Success
1	March 10, 2023	\$20,191	Oversold/Buy	Succeed
2	March 17, 2023	\$26,486	Overbought/Sell	Succeed
3	August 16, 2023	\$28,935	Oversold/Buy	Not successful
4	August 28, 2023	\$26,035	Oversold/Buy	succeed
5	October 19, 2023	\$30,282	Overbought/Sell	Not successful
Number of Successful Signals				3
Number of Unsuccessful Signals				2
Indicator Accuracy				60%

Source: Tradingview.com, 2024

Based on the table above for the period January 2023 – December 2023 using the Relative Strength Index indicator for the Bitcoin cryptocurrency type, in total there are 5 signals that appear on the chart with a daily timeframe. In total, 3 signals were said to be successful and 2 signals were said to be unsuccessful, so that the accuracy of the signals on the Relative Strength Index indicator was 60%. In November to December 2023, Bitcoin price movements experienced a significant increase which prevented Bitcoin movements from touching RSI 30, making it impossible to open a position to buy Bitcoin.

Overall, of the five signals that appeared, four signals were categorized as successful and two signals were unsuccessful, resulting in an RSI indicator accuracy level of 60%. This accuracy is calculated by comparing the number of successful signals with the total signals that appeared during the study period. With an accuracy rate of 60%, RSI shows quite significant potential in predicting Bitcoin price movements, although it is not completely error-free. During November to December 2023, Bitcoin prices experienced a significant increase which caused the RSI not to reach level 30, so no buy signals appeared during that period. This suggests that in a strong bullish trend, RSI-based buy signals may appear less frequently, and traders may need to consider additional factors or other indicators to identify trading opportunities.

Ranade, (2020)states that Bollinger Bands have a high level of success in predicting buy and sell signals. This research supports this by finding that Bollinger Bands have an accuracy rate of 66.7% in predicting price signals on Bitcoin. StudyBhargavi et al., (2017)AndRanade, (2020)shows that RSI is an effective technical analysis tool with a high success rate. Recent research shows that RSI has a fairly high level of accuracy of 60% in predicting price signals on Bitcoin.

CONCLUSION

Based on the results of the analysis and discussion that have been described, the following conclusions can be drawn.

- 1) Of the total of 15 signals identified using the daily timeframe, the Bollinger Band succeeded in providing accurate predictions 10 times, with an accuracy rate of 66.7%, this shows that the Bollinger Band indicator is quite effective in identifying trading opportunities on Bitcoin, even though it is not completely perfect.
- 2) The Relative Strength Index (RSI) indicator shows an accuracy rate of 60%, with 3 out of 5 successful signals. RSI is quite effective in identifying overbought and oversold conditions.

- 3) Bollinger Bands has a higher level of accuracy compared to RSI in predicting buy and sell price signals on Bitcoin and Bollinger Bands provide more signals than RSI. The Bollinger Bands and Relative Strength Index (RSI) indicators show differences in their level of accuracy and effectiveness in predicting buy and sell price signals on Bitcoin. Bollinger Bands have an accuracy rate of 66.7%, with 10 out of 15 signals that appear successful, this shows quite high effectiveness, on the other hand, RSI has an accuracy rate of 60%, with 3 out of 5 signals that appear successful. Despite its lower level of accuracy, RSI still shows sufficient reliability under similar market conditions. Bollinger Bands tend to provide more signals because they base their predictions on price movements against their own bands. Meanwhile, RSI focuses more on overbought and oversold conditions, provides sharper signals and can provide high accuracy

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