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Effectiveness of RSI and Bollinger Bands in Identifying Buy and Sell Signals

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ABSTRACT

This research compares the accuracy levels of the RSI indicator and Bollinger Bands and evaluates their combination in determining buy and sell signals for stocks in IDXMESBUMN17. This index comprises 17 State-Owned Enterprises (SOEs) that comply with sharia principles. The study population includes all companies listed in IDXMESBUMN17, with the sample selected through purposive sampling based on three criteria, resulting in seven issuers: ANTM, ELSA, PTPP, SMBR, TLKM, WEGE, and WTON. Data was collected using documentation techniques, capturing buy and sell movements from chart intersections generated between January and December 2023 using Profits Anywhere software. The Mann-Whitney test was employed for data analysis, revealing a significant difference in accuracy levels. The RSI indicator achieved an accuracy of 65.6%, Bollinger Bands 70.2%, and their combination 87.5%. These findings indicate that combining RSI and Bollinger Bands provides a more accurate method for identifying buy and sell signals than using either indicator alone. This suggests that investors can enhance their trading decisions by integrating both indicators to optimize stock market strategies.

Keywords: Bollinger Bands, Buy and Sell Signals, RSI, Technical Analysis.

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INTRODUCTION

The capital market is a financial mechanism where various types of securities, including stocks, bonds, mutual funds, and other instruments, are traded (Soumaré et al., 2021; Suttipun, 2023). This market enables companies, governments, and other entities to raise funds from the public, both to finance operations and to develop their businesses (Nerlinger & Utz, 2022). Investors participating in the capital market do so with the expectation of earning profits, either from capital gains or periodic income such as dividends. Additionally, the capital market plays a crucial role in driving the economic growth of a country (Mukhsin et al., 2024).

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In recent years, there has been significant growth in the number of investors in the Indonesian stock market. Chart 1 illustrates that there were 1,695,268 stock and other securities investors in 2021, 3,451,513 in 2022, 4,439,933 in 2022, and 5,255,571 in 2023 (Kustodian Sentral Efek Indonesia, 2024). Stocks, as one of the main instruments of the capital market, offer opportunities for investment value growth in line with the underlying financial performance (Keppo et al., 2021). In addition to stocks, other securities such as bonds and mutual funds are also increasingly favored by investors seeking diversification and risk management.

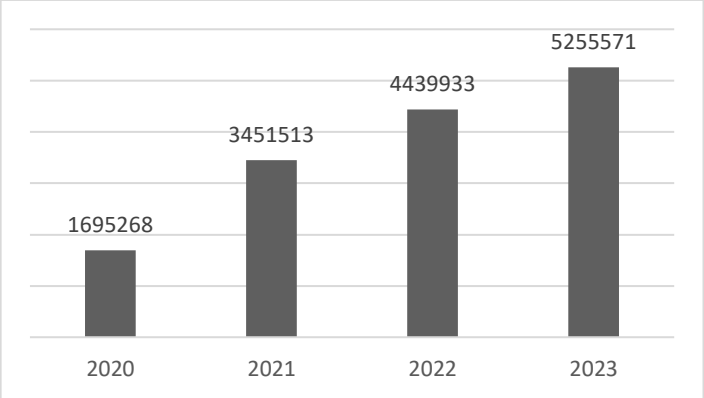

Figure 1. Growth chart of stock investors
Source: www.ksei.co.id (data processed)

The stock market offers the potential for very high returns if investors can accurately make buy and sell decisions (Minh Ngoc et al., 2023). Identifying the right buy and sell points certainly starts with selecting stocks that demonstrate strong potential and performance. To aid investors in choosing stocks with specific potential and performance, the Indonesia Stock Exchange (IDX) publishes various stock indices based on certain criteria (Indonesia Stock Exchange, 2024). As of August 2024, the Indonesia Stock Exchange has issued 45 stock indices, including Sharia indices such as IDXMESBUMN17, which serves as the object of this study. This index comprises 17 state-owned enterprises (BUMN) that meet Sharia investment criteria, making it appealing to investors who prioritize Sharia principles in their investment decisions. Additionally, the companies in this index come from various sectors, providing a broader scope for market analysis and enhancing the relevance of the research findings for various types of investors. The selection of IDXMESBUMN17 is also based on its high liquidity and market capitalization, ensuring that the data used reflects conditions in an active market. Furthermore, the stocks within this index are chosen based on strong company fundamentals, making them more stable and representative for technical analysis. Moreover, since IDXMESBUMN17 contains BUMN shares that play a strategic role in the economy, this research is expected to offer valuable insights for investors focusing on long-term investment strategies (Niska, 2024). However, investors must conduct further analysis to determine the buy and sell points. These points can be established using technical analysis (Rijken Irahadi et al., 2022).

Technical analysis serves various roles and functions, including Moving Average (MA) for identifying stock trends, Moving Average Convergence Divergence (MACD) for generating buy and sell signals, Stochastic for assessing prices over a specific time frame, Relative Strength Index (RSI) which indicates whether a stock is overbought or oversold, and Bollinger Bands that measure stock price volatility and assist in identifying optimal buying and selling moments (Shahvaroughi Farahani & Razavi Hajiagha, 2021). Consequently, investors must integrate these tools to pinpoint buy and sell opportunities to maximize profits.

The Relative Strength Index (RSI) can help investors identify overbought and oversold conditions; however, the RSI indicator is less reliable in scenarios where price trends are very strong in one

direction (either up or down) (Montalvo et al., 2021). When the price trend is rising, the RSI line may remain in the overbought zone for a significant duration, and similarly, when the price trend is falling, the RSI line can linger in the oversold zone for an extended period (Oktaba & Grzywińska-Rąpca, 2024). To mitigate this limitation, it can be combined with Bollinger Bands, which are designed to pinpoint buy and sell signals by assessing whether a stock's price movement is experiencing oversold or overbought conditions (Dockery & Todorov, 2023).

In 1973, Michael Spence introduced the signaling theory in his research (Connelly et al., 2024). Signaling theory elucidates the use of signals when one party possesses asymmetric information, with one sender (the company) opting to communicate information to investors. The company serves as the signal sender, while the investors function as the signal receivers (Taj, 2016). Signaling theory aids investors in making informed investment decisions (Yasar et al., 2020). The RSI and Bollinger Bands indicators produce signals that can be interpreted in line with the principles of signaling theory, which outline how information is transmitted, received, and utilized effectively.

Stocks are securities that signify an individual's ownership in a company and are among the financial products issued by companies to raise capital (Lian Winny, 2021). When making investment decisions regarding stocks, several analytical tools are employed, namely technical analysis and fundamental analysis. Technical analysis involves using charts that display price movements and volume to identify current price movement patterns (Ho & Huang, 2021; Ong Edianto, 2016). In contrast, fundamental analysis entails examining the company's financial information, as it can provide insights into the company's intrinsic value, which can then be compared to the market value to guide investors in their buy or sell decisions (Putri & Shabri, 2022).

The Relative Strength Index (RSI) was first introduced by J. Welles Wilder in 1978 (Setiadi Galuh, 2022). The RSI serves as a measurement tool in technical analysis to assess whether a stock is in the overbought or oversold territory. Overbought signifies excessive buying activity, reaching a saturation point, prompting investors to sell. Conversely, oversold indicates excessive selling activity, suggesting that investors should buy (Chien et al., 2021). Traders and investors utilize the RSI as a momentum indicator, with overbought and oversold conditions represented by RSI values above 70 and below 30, respectively. When the line exceeds the 70 mark, it signals overbought conditions, while a line below 30 indicates oversold conditions (Panigrahi et al., 2021). buy signal is generated when the RSI rises from a level below 30, and a sell signal occurs when the RSI starts to decline from a level above 70 (Martín-García et al., 2020; Šarabon et al., 2022).

Bollinger Bands are a widely used technical analysis tool among stock traders for measuring price volatility and identifying potential buy or sell signals (Vergura, 2020). Developed by John Bollinger in the early 1980s (A. Akbar, 2024). Bollinger Bands consist of three lines: 1) Middle Band, 2) Upper Band, and 3) Lower Band (Su, 2024). These bands assist investors in recognizing overbought and oversold conditions; when the price nears or touches the lower band, it suggests that the asset is oversold, indicating that traders or investors might consider buying. Conversely, when the price nears or touches the upper band, it suggests that the asset is overbought, indicating that traders or investors might consider selling (Beyazid Yeldrim Alhaziva & Herdiana, 2023).

The combination of the Relative Strength Index (RSI) and Bollinger Bands has demonstrated significant potential in technical analysis for stock trading. Research has indicated that this combination is notably effective in identifying buy and sell signals (Firdaus, 2021; Valle-Cruz et al., 2022). Specifically, as illustrated in Figure 2, a buy signal is generated when the stock price touches or dips below the lower band of the Bollinger Bands indicator while the RSI is in the oversold region, whereas a sell signal occurs when the price touches or surpasses the upper band while the RSI is in the overbought region. Comparative analysis has revealed that the Bollinger Bands strategy outperforms both the RSI and the buy-and-hold approach in terms of returns and efforts to mitigate risk (Lutey & Rayome, 2022). Consequently, employing multiple indicators in conjunction typically yields more accurate results compared to relying on a single indicator (Ayala et al., 2021). This

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integrated approach can offer valuable insights for investors and analysts in making informed investment decisions.

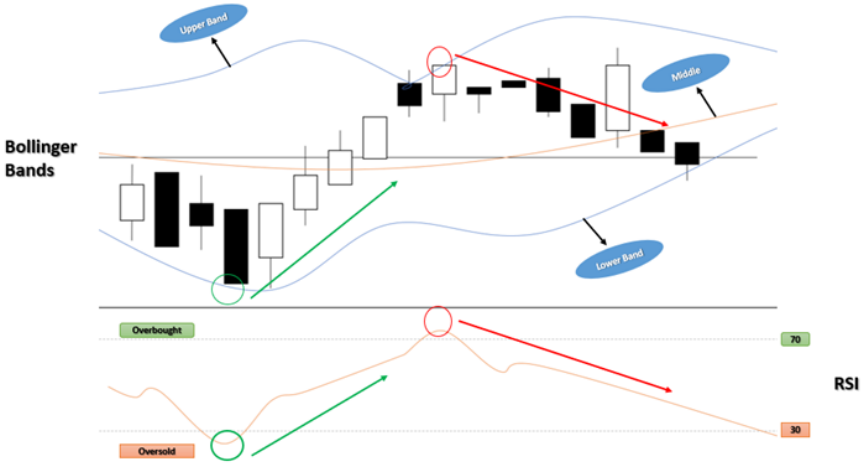

Figure 2. Integration of RSI with Bollinger Bands
Source: Author

Based on Figure 2, the buy signal on the Relative Strength Index (RSI) indicator occurs below 30, indicating an oversold condition, while the Bollinger Bands indicator generates a buy signal when the price touches or falls below the lower band. The sell signal for the Relative Strength Index (RSI) appears above 70, indicating an overbought condition, whereas the Bollinger Bands indicator generates a sell signal when the price touches or rises above the upper band.

There are various studies that integrate multiple indicators to determine Buy (Entry) and Sell (Exit) decisions. For instance, the research by Pramudya & Pramudya, (2020) combines the technical indicators Bollinger Bands and RSI, which can yield more accurate buy and sell signals for stock trading compared to relying on a single indicator. The study by Martia & Yasmine, (2021) utilizes the Simple Moving Average (SMA) and Relative Strength Index (RSI) to identify buy and sell signals in the infrastructure sector, concluding that both indicators provide fairly accurate signals. According to the research by Akbar & Mulyani, (2022), which employs the Bollinger Band and RSI indicators for investment decision-making, it reveals that to buy stocks, the RSI should be in an Oversold condition and the closing candle should be outside the Bollinger Bands (Lower Band), while to sell stocks, the RSI should be in an Overbought condition and the closing candle should be outside the Bollinger Bands (Upper Band), although it does not clarify the accuracy of these two indicators. Meanwhile, the study by Apriliani et al., (2023), which combines the MACD, Stochastic, RSI, and Bollinger Bands indicators, concludes that these four indicators exhibit significant differences in generating buy and sell signals.

There has been extensive research on the Relative Strength Index (RSI) and Bollinger Bands in their application to the stock market, yielding varying results. However, to the author's knowledge, studies on the combination of RSI and Bollinger Bands remain limited, making this research valuable for building on previous findings to enhance profits and reduce losses in stock market investments. The integration of the Relative Strength Index (RSI) with Bollinger Bands seeks to identify more precise buy and sell signals, yet this combination is infrequently utilized, coupled with a lack of research in the sharia market, particularly in IDXMESBUMN17, thus necessitating further exploration.

Based on the background presented above, the limitations of the RSI indicator can be integrated with other indicators to enhance the accuracy of investment decisions. Thus, the aim of this research is to compare the accuracy levels between the Relative Strength Index (RSI) and Bollinger Bands, as well

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as to evaluate the combination of the Relative Strength Index (RSI) with Bollinger Bands in generating buy and sell signals for the IDXMESBUMN17 stock.

The hypothesis of this study is as follows: H1: There is a significant difference in the accuracy levels of the RSI and Bollinger Bands indicators for the IDXMESBUMN17 stock, and H2: There is a significant difference in the accuracy levels of the combination of the RSI and Bollinger Bands indicators for the IDXMESBUMN17 stock.

METHODS

This research utilizes a quantitative method with a comparative approach, focusing on the accuracy levels of the Relative Strength Index (RSI) and Bollinger Bands, as well as their combined use. The study examines the IDXMESBUMN17 stock listed on the Indonesia Stock Exchange (IDX), accessible via the idx.co.id website and the Profits Anywhere application.

The research period spanned 261 trading days from January 1 to December 31, 2023. This study utilized secondary data. The RSI data employed the default settings (length 14) sourced from the Profits Anywhere application, while the Bollinger Bands used the default settings (length 20, mult 2). Furthermore, a combination was created by integrating the RSI indicator with the Bollinger Bands, maintaining the default settings (length 14) for the RSI and (length 20, mult 2) for the Bollinger Bands.

The population of this study comprises stocks from IDXMESBUMN17. The sample selection employs purposive sampling techniques based on the following criteria:

Table 1. Sample Criteria

Number	Criteria	Emitters
1	Companies registered in IDXMESBUMN17	17
2	Companies that have been consistent in IDXMESBUMN17 from their establishment until 2023	12
3	Companies whose stock activities experienced uptrends and downtrends during the year 2023 Chat	7
	NUMBER OF SAMPLES	**7**

Source: www.idx.co (data processed)

Based on the criteria outlined, the sample for this study consists of seven issuers with stock codes: ANTM, ELSA, PTPP, SMBR, TLKM, WEGE, and WTON. In this research, the researcher employed documentation techniques, and the data analysis method utilized involves technical analysis using the RSI and Bollinger Bands indicators, as well as combining the RSI indicator with Bollinger Bands to identify buy and sell signals for accuracy assessment. Before conducting the analysis, the data collected through Profits Anywhere charting software was processed through several stages: first, daily stock price data from the seven issuers (ANTM, ELSA, PTPP, SMBR, TLKM, WEGE, and WTON) were obtained based on the intersections of the RSI and Bollinger Bands indicators and the Combination of the RSI and Bollinger Bands indicators during the period from January to December 2023. Second, the identified intersections of the indicators on the charts were analyzed to determine when buy and sell signals emerged, with each buy and sell signal classified based on the indicators that generated them. Third, the accuracy level between the RSI, Bollinger Bands, and the combination of the RSI and Bollinger Bands was determined using a formula to calculate the percentage of technical analysis accuracy as the total number of successful

signals divided by the total number of signals, multiplied by one hundred. Finally, statistical testing was conducted using a non-parametric Mann-Whitney test. The Mann-Whitney test serves as an alternative to the t-test when the data being tested is not normally distributed. This test was used to conduct hypothesis testing aimed at assessing the significance of differences between independent samples from a population (Patrick E et al., 2010).

RESULTS AND DISCUSSION

The initial phase of the analysis carried out in this study involves identifying the data indicators of the Relative Strength Index, Bollinger Bands, and the combination of the Relative Strength Index with Bollinger Bands.

Table 2. Comparative data on the indicators of the Relative Strength Index, Bollinger Bands, and the combination of the Relative Strength Index with Bollinger Bands.

Indicator	Issuer	True	False	Amount	True	False	Total Signal	Accuracy Level
RSI	ANTM	7	2	9	42	22	64	65,6%
	ELSA	5	2	7				
	PTPP	8	4	12				
	SMBR	3	4	7				
	TLKM	5	1	6				
	WEGE	7	5	12				
	WTON	7	4	11				
Bollinger Bands	ANTM	8	3	11	52	22	74	70,2%
	ELSA	7	4	11				
	PTPP	8	5	13				
	SMBR	6	2	8				
	TLKM	9	1	10				
	WEGE	6	2	8				
	WTON	8	5	13				
RSI combination with Bollinger Bands	ANTM	8	1	9	56	8	64	87,5%
	ELSA	9	0	9				
	PTPP	8	2	10				
	SMBR	6	2	8				
	TLKM	5	0	5				
	WEGE	11	2	13				
	WTON	9	1	10				

Source: Processed data

In Table 2, it is shown that the total signals generated by the Relative Strength Index (RSI) indicator amount to 64 signals, of which 42 are successful while 22 are failures, resulting in an accuracy rate of 65.6% for the RSI in predicting stock prices and a failure rate of 34.4%. The total signals generated by the Bollinger Bands indicator total 74 signals, with 52 being successful and 22 being

failures, leading to an accuracy rate of 70.2% for Bollinger Bands in predicting stock prices and a failure rate of 29.8%. Meanwhile, the combination of the Relative Strength Index and Bollinger Bands produced 64 signals, with 56 being successful and 8 being failures, resulting in an accuracy rate of 87.5% for the combination of RSI and Bollinger Bands in predicting stock prices and a failure rate of 12.5%.

The highest number of signals generated by the RSI is observed in the stocks PTPP and WEGE, each producing 12 signals, with the highest accuracy level in the stock TLKM. The greatest number of signals generated by the Bollinger Bands is found in the stocks PTPP and WTON, each yielding 13 signals, also with the highest accuracy level in the stock TLKM. Meanwhile, the highest number of signals generated by the combination of the RSI indicator and Bollinger Bands is seen in the stocks PTPP and WTON, each generating 10 signals, with the highest accuracy level in the stocks ELSA and TLKM.

Mann-Whitney Test

The Mann-Whitney test is performed to assess whether significant differences exist between the Relative Strength Index and Bollinger Bands indicators, as well as between the combination of the Relative Strength Index and Bollinger Bands.

Table 3. Mann Whitney Test

Comparison	Mann Whitney Asymp. Sig
RSI and Bollinger Bands with actual results	0.361
Combination of RSI and Bollinger Bands with actual results	0.000

Source: SPSS Results (Processed Data)

Based on the results of the Mann-Whitney test, the first result indicates a significance value of 0.361, which is greater than 0.05. Therefore, the null hypothesis (Ho) is accepted, and the alternative hypothesis (H1) is rejected. This implies that there is no significant difference in the accuracy levels of the RSI and Bollinger Bands indicators for the IDXMESBUMN17 stock.

The assumption of the second finding indicates a significance value of 0.000 < 0.05, which allows us to conclude that Ha is accepted and Ho is rejected. This means there is a significant difference in the accuracy level of the combination of the RSI indicator with Bollinger Bands on the IDXMESBUMN stock. Therefore, when determining buy and sell signals, technical analysis that combines two indicators, such as the Relative Strength Index and Bollinger Bands, proves to be more accurate than using a single indicator alone.

This research examines seven issuers listed on IDXMESBUMN17: ANTM, ELSA, PTPP, SMBR, TLKM, WEGE, and WTON. It employs technical analysis to inform buy and sell decisions in the stock market by utilizing the Relative Strength Index (RSI) and Bollinger Bands indicators, as well as their combination. After thorough research and testing using indicator accuracy techniques, the Relative Strength Index (RSI) demonstrated an accuracy level of 65.6%, the Bollinger Bands indicator yielded 70.2%, and the combination of the Relative Strength Index (RSI) with Bollinger Bands achieved an accuracy level of 87.5%. Based on the Mann-Whitney test results, there is a significant difference in the accuracy level of the combined RSI and Bollinger Bands indicators. The Relative Strength Index (RSI) has the lowest accuracy level compared to Bollinger Bands and their combination because it solely measures price momentum strength (overbought or oversold) without accounting for market volatility, making RSI prone to generating false signals, particularly during strong market trends. In contrast, combining RSI with Bollinger Bands can enhance accuracy by integrating two distinct approaches: momentum and volatility, thereby helping to reduce false signals. Therefore, by merging the Relative Strength Index (RSI) with Bollinger Bands, more precise

buy and sell signals can be generated, enabling investors to improve their investment returns compared to relying on a single indicator alone.

The total signals generated by the Relative Strength Index (RSI) indicator amounted to 64 signals, comprising 42 successful signals and 22 failed signals. The Bollinger Bands indicator produced 74 signals, with 52 successful signals and 22 failed signals. In contrast, the combination of the Relative Strength Index (RSI) and Bollinger Bands yielded 64 signals, featuring 56 successful signals and 8 failed signals. Analyzing the total signals generated reveals that combining the RSI indicator with Bollinger Bands results in fewer failed signals compared to using a single indicator alone. This is due to the RSI measuring market momentum by indicating overbought or oversold conditions, while Bollinger Bands assess volatility by showing how close the price is to the upper band (potentially overbought) or lower band (potentially oversold). When the RSI indicates overbought and the price is at the upper band of the Bollinger Bands, that signal can be deemed reliable.

The Relative Strength Index (RSI) indicator has a lower accuracy level compared to the Bollinger Bands indicator and the combination of the RSI with Bollinger Bands. RSI signals tend to be less reliable in strong trends, as they may generate false signals when the market remains in overbought or oversold conditions (Zatwarnicki et al., 2023). In contrast, Bollinger Bands are more precise because they directly capture price changes and volatility, yielding better signals, particularly in stock market conditions. The combination of RSI with Bollinger Bands enhances accuracy, minimizing the risk of false signals and generating improved signals across various market scenarios. According to the signal theory applied, it is noted that the combination of RSI with Bollinger Bands achieves the highest accuracy level by utilizing two types of signals (momentum from RSI and volatility from Bollinger Bands), ensuring that the signals are more relevant and trustworthy for investors. This analysis is consistent with the research by Pramudya & Pramudya, (2020), which indicates that the combination of the RSI and Bollinger Bands indicators can deliver more accurate buy and sell signals compared to relying on a single indicator alone.

This research indicates that there is no significant difference in accuracy levels when utilizing the Relative Strength Index (RSI) and Bollinger Bands indicators. This occurs because, during market uptrends or downtrends, the Relative Strength Index (RSI) tends to be less reliable and can remain in the overbought or oversold regions for extended periods, leading to buy and sell signals that may ultimately be false (Montalvo et al., 2021). In contrast, the width of the Bollinger Bands expands when volatility increases; under these conditions, prices can frequently breach the upper or lower bands without substantial reversals, resulting in buy and sell signals that are not always valid or may be misleading. This study contradicts the findings of Apriliani et al., (2023), which concluded that there is a significant difference between the buy and sell signals generated by the MACD, Stochastic, Relative Strength Index, and Bollinger Bands indicators.

The limitations of this research encompass several aspects, including the reliance on historical data from a specific period that may not accurately represent various market conditions, leading to less generalizable findings. This study concentrates exclusively on technical indicators, neglecting fundamental factors or market sentiment that also impact stock price movements. Moreover, the default settings for RSI and Bollinger Bands may not be ideal for all market conditions, and the signals generated can be subjective based on interpretation. Additionally, the limitations of the IDXMESBUMN17 stock data may further influence the validity of the research results. Consequently, the findings of this study may not be entirely applicable to other stocks or timeframes.

CONCLUSION

Based on the signal data from the Relative Strength Index (RSI) indicator, Bollinger Bands, and the combination of the RSI and Bollinger Bands, the results indicate no significant difference in accuracy when using the RSI and Bollinger Bands indicators on the IDXMESBUMN17 stock.

However, there is a notable difference in the accuracy level when combining the RSI indicator with Bollinger Bands for the IDXMESBUMN17 stock. Therefore, the Relative Strength Index (RSI) proves to be more effective when paired with other indicators like Bollinger Bands. In terms of accuracy, the results are 65.6% for the Relative Strength Index (RSI), 70.2% for Bollinger Bands, and 87.5% for the combination of the Relative Strength Index with Bollinger Bands. This demonstrates that by combining two indicators, such as RSI with Bollinger Bands, the buy signals generated are more precise, enabling investors to improve their investment returns compared to relying on a single indicator, which serves complementary functions.

Suggestions for future research include broadening the scope of this study by utilizing a larger sample and incorporating additional indices listed on the Indonesia Stock Exchange, ensuring a more diverse sample. This is important as there are numerous stock indices on the Indonesia Stock Exchange, such as LQ45, JII, JII70, and others. This approach would yield more varied outcomes. Additionally, it is advisable to extend the observation period to attain a higher level of precision in maximizing profits.

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