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Analysis of the Effectiveness of RSI and MACD Indicators in Addressing Stock Price Volatility

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ABSTRACT

This research aims to compare the accuracy levels of the Relative Strength Index (RSI) and Moving Average Convergence Divergence (MACD) indicators in predicting stock volatility on the LQ45 index during the period from August 1, 2023, to July 31, 2024. The importance of this research is that it can provide research on the accuracy of the Relative Strength Index (RSI) and Moving Average Convergence Divergence (MACD) indicators, which can be a reference for capital market practitioners and stock investors in making more accurate and data-based investment decisions. The research method employs a comparative quantitative approach using secondary data in the form of stock closing prices. The analysis is conducted by calculating the accuracy of signals from both indicators using the accuracy formula and the Mann-Whitney test to determine significant comparisons. The results of this study indicate that RSI has an accuracy level of 97% with 31 successful signals out of 32 signals, while MACD has an accuracy level of 52% with 86 successful signals out of 166 signals. Statistical testing shows no significant difference between the two indicators ($p = 0.522$). Although RSI is more accurate, MACD is superior in generating returns in the long-term trend due to its sensitivity to small changes. This study concludes that RSI is more suitable for oversold and overbought market conditions, while MACD is effective for identifying momentum and long-term volatility direction. Future research suggestions could include combining other technical indicators for a more comprehensive analysis. These findings provide practical guidance for investors in selecting appropriate technical strategies for investment decision-making.

Keywords: Accuracy, LQ45, MACD, RSI.

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INTRODUCTION

The stock market is a part of the complex capital market, influenced by various factors such as economic conditions, company performance, and market sentiment. Investors' decisions to buy or sell stocks are based on factors that cause stock prices to fluctuate (Saham, 2008). This makes it challenging for investors to analyze the volatile movements of stock prices (Sumani et al., 2018). To understand stock price movements, technical expertise is required, one of which is technical analysis, used to predict stock price movements. In technical analysis, there is the concept of price trends, which refers to the patterns of price movements over a certain period, such as upward trends (bullish), downward trends (bearish), or sideways trends (Akbar, 2021).

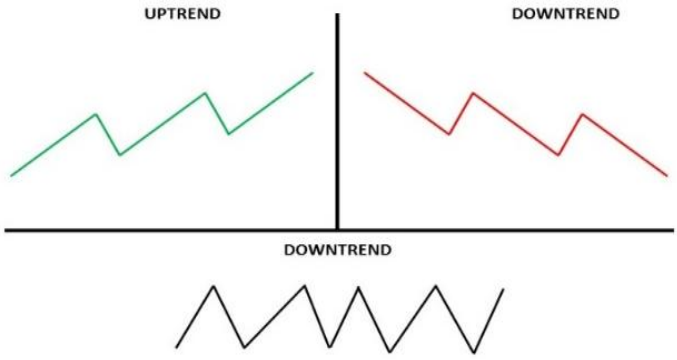

Figure 1. Stock Price Trend
Source: Author

A trend is a pattern of stock price movement, describing the direction of stock prices over a specific period. There are three main types of trends: uptrend, downtrend, and sideways (’Izzah et al., 2021). An uptrend occurs when the price of an asset consistently moves higher, forming a series of new highs and lows (Xiao & Ihnaini, 2023). Conversely, a downtrend occurs when the price of an asset continues to decline, forming a series of new highs and lows (Tiovandi, 2024). Meanwhile, sideways, also known as a horizontal trend, occurs when the price of an asset moves within a relatively narrow range without showing a clear trend, either upward or downward.

Technical analysis is a method commonly used by investors and traders as a primary tool in trading activities to predict price direction, establish movement limits under certain conditions, and indicate target directions along with their associated risks, as well as to find the right timing for buying and selling stocks to maximize capital gains (Herlambang et al 2024). Technical analysis utilizes historical trading data to forecast the future price movements of financial instruments. Momentum indicators such as the Relative Strength Index (RSI) and Moving Average Convergence Divergence (MACD) are very popular among various technical analysis tools (Noor Elma Monika1 & Meina Wulansari Yusniar2, n.d.). In technical analysis, there are two approaches that are often used.

The Relative Strength Index (RSI) is a momentum indicator that shows the strength and weakness of an asset's price movement over a specific period (Panigrahi et al., 2021). However, the drawbacks of RSI include providing lagging signals, not always being accurate, and being highly dependent on the chosen time period (Sami et al., 2022).

Moving Average Convergence Divergence (MACD) is a momentum indicator utilized in technical analysis to assess the strength and direction of an asset's trend (Dan & Anghel, 2015). This indicator compares two moving averages of varying periods to generate the MACD line and the signal line. The intersection of these two lines is frequently interpreted as a signal to buy or sell an asset (Rijken Irahadi et al., 2022). While both aim to aid traders in decision-making, each possesses distinct features, advantages, and disadvantages. Their primary difference lies in how they calculate and

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interpret market data. RSI emphasizes short-term momentum, whereas MACD typically offers slower yet more consistent signals.

Signaling Theory

Signaling theory in the realm of stock technical analysis interprets market price information and technical indicators as signals or indications of market conditions and prospects. This theory emphasizes how the signals derived from price charts, trading volume, and other technical indicators can provide crucial insights to investors or traders (Qotimah et al., 2023). When the RSI line falls below 30, it suggests that the price is at a low point and is likely to rise, signaling a buy opportunity (oversold). Conversely, when the RSI line exceeds 70, it indicates that the price is at a level likely to decline, signaling a sell opportunity (overbought). When the MACD line crosses above the signal line, it represents a bullish signal, indicating a buy opportunity. Conversely, when the MACD line crosses below the signal line, it represents a bearish signal, indicating a sell opportunity (Saiful Hasan et al., 2024).

Technical Analysis

Technical analysis is a method employed to assess and forecast stock price movements by leveraging historical price data and trading volume (Mahendra et al., 2022). Its primary purpose is to predict the direction of stock price changes, identify price trends, and establish optimal entry and exit points. By examining stock price charts and utilizing various technical indicators such as Moving Averages, RSI, and MACD, investors can evaluate momentum and the potential direction of trend shifts (Suryanto, 2021). Furthermore, trading volume serves as a crucial factor that reflects the strength behind price movements; a price rise accompanied by high trading volume indicates a robust trend. Support and resistance levels are utilized to comprehend where prices may reverse, aiding investors in pinpointing more precise entry and exit points while mitigating risk. Consequently, technical analysis can assist investors in making more effective and strategic decisions in identifying stock price trends that can generate profits and manage risks in stock investing (Economics & Accounting, 2024).

***Relative Strength Index* (RSI)**

The Relative Strength Index (RSI) is an indicator that reflects the ratio between a stock's price and a specific industry or market index. RSI can be utilized to evaluate the appeal of price fluctuations, with values ranging from 0 to 100. By using RSI, you can ascertain whether a price is overbought or oversold (Kara et al., 2011). Theoretically, employing RSI is quite straightforward; when the RSI is very high or exceeds 70, it signifies that the market is in an overbought state, indicating that prices are likely to fall and serving as a signal to sell. Conversely, when the RSI is below 30, it signifies that the market is in an oversold state, indicating that prices are likely to rise and serving as a signal to buy (Hamid et al., 2011).

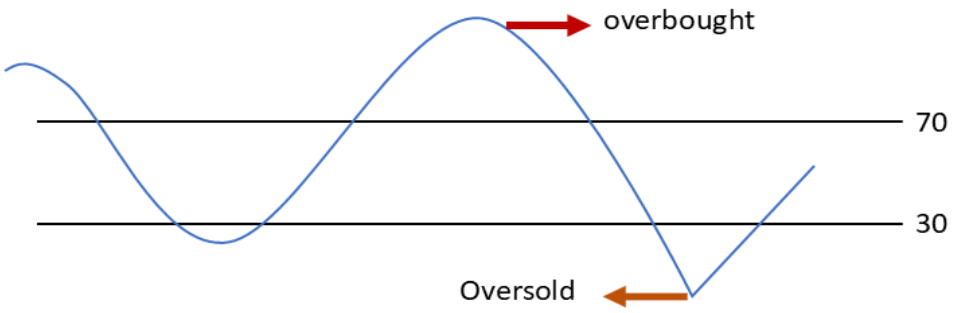

Figure 2. Collection of Data for the RSI Indicator
source: author

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RSI measures momentum, assessing the speed and change of price. When the oscillator line is above 70, indicating the overbought zone, it signals a sell; conversely, when the oscillator line is below 30, indicating the oversold zone, it signals a buy.

***Moving Average Convergence Divergence* (MACD)**

Moving Average Convergence Divergence (MACD) is a technical indicator used to identify changes in stock price direction (de Oliveira et al., 2013). Additionally, MACD provides insights into the strength of the current trend. When the MACD Line (the faster line) crosses above the Signal Line (the slower line), it signals a Bullish Crossover, commonly referred to as a buy signal. Conversely, when the MACD Line crosses below the Signal Line, it indicates a Bearish Crossover, known as a sell signal. MACD is classified as a lagging indicator, meaning it follows price movements after a trend has begun, which can result in delays. Due to its lagging nature, investors often purchase stocks at elevated prices when the MACD displays a golden cross (Rosillo et al., 2013).

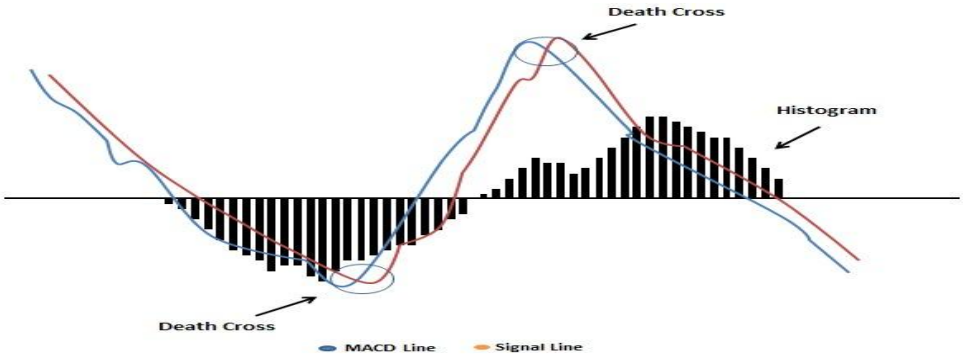

Figure 3. MACD Data Gathering
source: author

MACD is an indicator that measures momentum and shifts in market trends. When the MACD line is above the signal line, it suggests a buy position or buy signal; conversely, when the MACD line is below the signal line, it indicates a sell position or sell signal.

There are various studies comparing the accuracy levels of RSI and MACD. Santoso & Sukamulja (2020) found that during the 2018 period, the RSI indicator demonstrated more effective performance in yielding better results than MACD in the context of investment decision-making for companies listed in the LQ45 index. As explained by MACD and RSI, research by Martia & Yasmine (2021) stated that both the RSI indicator and Simple Moving Average are effective in determining the direction of stock price trends. Khairudin et al. (2022) noted that the RSI indicator is one of the technical analysis tools that individual investors can use as a strategy to identify the right timing in the market to achieve investment profits. However, other research indicates that the use of RSI yields less optimal results compared to VIDYA. Previous research by Setiyono et al. (2022) revealed that the stochastic oscillator generates more signals than RSI. Rosillo et al. (2013) stated that the RSI indicator is better at generating the highest profitability compared to the four indicators used.

Research conducted by Waheed et al. (2013) indicates that the moving average convergence divergence (MACD) is an effective indicator in the stock market context. Nurcahyo & Susliyanti (2024) reveal a difference in decision-making for buy and sell signals before and after applying MACD technical analysis; however, no difference was found in buy and sell signals when analyzing the Stochastic Oscillator (SO). The study by Setiani & Nugroho (2022) suggests that MACD and RSI do not yield returns greater than the buy and hold strategy. Findings from the research by Herlambang et al. (2024) imply that using MACD and RSI indicators in stock analysis results in a

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reasonably good average accuracy rate. This suggests that both indicators provide a satisfactory level of accuracy in generating buy and sell signals.

Based on prior research findings, the results of this study reveal varying outcomes concerning the effectiveness of both indicators in predicting stock price movements within the capital market context. Consequently, this research necessitates further investigation, particularly regarding stocks with high liquidity and substantial market capitalization. This study aims to deliver more comprehensive insights into these aspects by utilizing more recent data and a more holistic approach. This research focuses on stocks within the LQ45 index as the subject of study, as this index comprises liquid stocks that frequently undergo price fluctuations, often leaving investors perplexed when making investment decisions, thereby warranting further examination. The objective of this research is to provide insights into the accuracy of the Relative Strength Index (RSI) and Moving Average Convergence Divergence (MACD) indicators, which can serve as a reference for capital market practitioners and stock investors in making more precise and data-driven investment decisions. Based on the results of the research conducted, the hypothesis, H1, is accepted, namely that there is a difference in the level of accuracy of the RSI and MACD indicators.

METHODS

This research utilizes a comparative quantitative method to evaluate the accuracy levels achieved using the technical indicators RSI and MACD in analyzing the price trend direction of stocks listed on the LQ45 index, with a research period of one year, starting from August 1, 2023 to July 31, 2024. The data type employed is secondary data, with the analyzed stock prices being the closing prices sourced from the IDX website, while the signals for the RSI and MACD indicators utilize default settings obtained through the Profit Anywhere application. To determine the accuracy levels of these two indicators, the formula applied is the total number of successful signals divided by the total number of signals overall, multiplied by one hundred percent. Data analysis employs the Mann-Whitney test, aimed at examining the differences in accuracy levels between the two indicators under study. The population of this research consists of all stocks listed on the LQ45 index, and the sample for the study is selected using purposive sampling, which involves choosing stocks that are included in the LQ45 index and those that have experienced oversold and overbought conditions, consistently remaining on the LQ45 index throughout the research period.

The population in this study is all companies included in the LQ45 index. Sample selection and sampling techniques are taken based on the following criteria.

Table 1. sample criteria

No	criteria	amount
1	All Companies Listed On The LQ45 Index	45
2	Companies That Are Consistent On The LQ45 Index From August 1, 2023 To July 31, 2024	27
	Number Of Sampels	27

RESULTS AND DISCUSSION

Based on the analysis performed using the RSI and MACD indicators throughout the research period, here are the successful and unsuccessful signals generated from August 1, 2023, to July 31, 2024, derived from the RSI and MACD indicators calculated using the accuracy rate formula:

$$\frac{total\ success\ signal}{total\ overall\ signal}\ X\ 100\%$$

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Table 2. Number of Signals from Indicators

No	Indicator	Number of signals		Total Signals	Accuracy	Return
		success	failed			
1	RSI	31	1	32	97%	29.484
2	MACD	86	80	166	52%	66.093

Source: Processed Data

In Table 2, there is a count of signals from each indicator, where the RSI generates fewer signals because it tends to provide them more quickly compared to the MACD indicator, which is slower in generating signals. The RSI indicator achieves an accuracy rate of 97%, with 31 successful signals out of 32 generated. Meanwhile, the MACD indicator produces a signal accuracy of 52%. Although the MACD generates many signals, it also has a higher rate of false signals compared to the RSI, which generated a total of 94 signals in 2023. In terms of return or profit, the MACD indicator yields significantly higher returns, with a profit of 66,093 compared to the RSI indicator's lower profit level of 29,484.

Statistical Test

Table 3. Results of the Mann-Whitney Test

	Return
Mann-Whitney U	327,500
Wilcoxon W	705,500
Z	-0,640
Exact Sig. (1-tailed)	.0,522

Source: processed data. SPSS

Based on the results of the Mann-Whitney statistical test presented in Table 3, a comparison of the accuracy between the RSI and MACD indicators is provided. The test yielded an Exact Sig. (1-tailed) value of 0.522, indicating no significant difference between the RSI and MACD indicators, as this value exceeds 0.05. Consequently, it can be concluded that Ho is accepted and Ha is rejected, demonstrating that there is no significant difference between the RSI and MACD indicators. This study is consistent with the research by Bangsa (2024), which indicates that the Relative Strength Index (RSI) indicator has a higher accuracy, achieving a total score of 97%, compared to the Moving Average Convergence Divergence (MACD), which scored 52%.

The analysis of the data conducted to evaluate the returns from both the RSI and MACD indicators is illustrated in diagram 4.

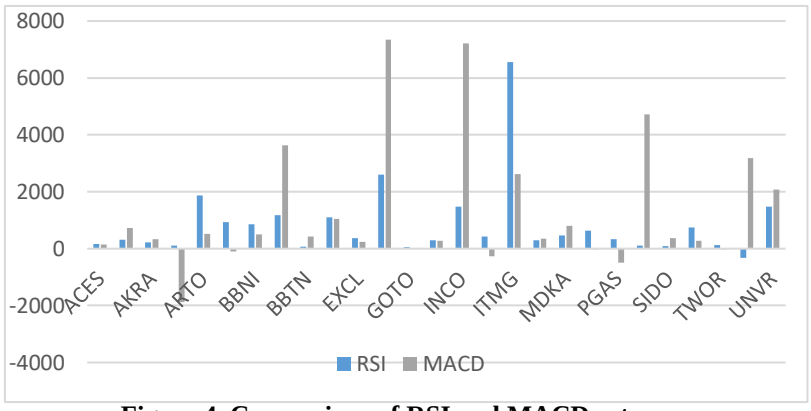

Figure 4. Comparison of RSI and MACD returns
Source: Processed Data

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Based on the diagram's results, these two indicators yield different profits. The MACD indicator reveals that GGRM stock generated a profit of 7350, while INCO produced a profit of 7211. In contrast, the RSI indicator resulted in a lower profit for ITMG stock at 6548, compared to MACD, which was more effective in generating profits at the same level of 6548. This discrepancy arises from the distinct methods by which the two indicators analyze the market.

Based on the analysis conducted, the RSI and MACD indicators demonstrate varying levels of accuracy in generating transaction signals for the stocks examined during the research period. The RSI indicator produces fewer signals compared to the MACD indicator, boasting an accuracy rate of 97%. While the RSI generates fewer signals than the MACD, its accuracy suggests that the RSI achieves a higher level of precision. This is due to the RSI indicator's specificity, focusing on overbought and oversold conditions, where a value of 70 indicates a potential downward correction and 30 signals a potential upward correction. This aligns with the signaling theory proposed by Michele Spence, which posits that the RSI indicator offers infrequent signals but with greater accuracy. This research corroborates the findings of Daniswara et al. (2022), which indicate that the RSI indicator is effective in predicting the direction of changes and price movements of stocks.

In comparison to the MACD indicator, which produces more trading signals than the RSI indicator, the MACD has a lower accuracy rate of 52% compared to the RSI. This is due to the MACD's sensitivity to minor price fluctuations. Furthermore, the MACD relies on the difference between two moving averages, meaning that even slight changes can trigger signals that may lead to noise or false alerts. Conversely, the RSI concentrates on overbought and oversold conditions, while the MACD functions based on momentum and changes in trend direction, often delivering signals more rapidly before a trend is firmly established. This research supports the findings of Waheed et al. (2013), which assert that the MACD indicator is more effective than the RSI indicator.

Meanwhile, regarding profit levels, both indicators yield different profit rates, with the MACD indicator generating higher returns compared to the RSI indicator, which produces lower profits. This suggests that while the MACD indicator generates many failed signals, the successful ones yield substantial profits, demonstrating that MACD is more reliable for profit generation. In contrast, the RSI indicator, which boasts a higher accuracy rate, is better suited for traders who prioritize precision in their trades, aiming to avoid significant losses even if the profits are smaller. Conversely, the MACD indicator, with its lower accuracy, is more appropriate for traders seeking the potential for large profits, despite the increased risk of failed signals.

Based on the Mann-Whitney test conducted to compare the return levels per stock, the MACD indicator yields higher returns compared to the RSI indicator. This is because MACD is effective in identifying the direction of trends and market momentum by combining two moving averages to provide clearer signals about changes in trend direction and market accuracy. The signals given by MACD, such as the closing between the MACD line and the signal line, provide insights into potential price reversals and ongoing trends. Meanwhile, the RSI indicator focuses more on overbought or oversold market conditions but often provides earlier signals and is less effective in strong trends. Thus, MACD is better at identifying long-term trends, while RSI is more effective in reversals in overbought or oversold market conditions.

CONCLUSION

Based on the results of the analysis of the use of technical indicators relative strength index (RSI) and moving average convergence divergence (MACD) it can be concluded that the RSI indicator produces fewer signals compared to the MACD indicator which tends to produce more signals, which indicates that the level of accuracy produced by these two indicators produces different presentations, which are influenced by the way each indicator works in producing the level of accuracy.

This research offers substantial benefits for investors and traders in choosing technical indicators that align with their trading objectives by examining the advantages and disadvantages of each of the two indicators, which can aid in making investment decisions that generate profits for investors. However, this study has limitations as it solely focuses on the comparison between the two indicators. Consequently, further research is necessary to explore other technical indicators or to integrate additional indicators to provide a more comprehensive understanding of the effectiveness of various technical indicators.

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