Effectiveness of Using Candlestick Charts in Stock Investment: Evidence from Indonesia in the New Normal Era

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ABSTRACT

This study aims to determine whether there is a difference between the stock price prediction results of support and resistance based on candlestick data from the closing price of retail sector companies during the new normal. Samples were taken from retail companies (ERAA and ACES) and included in the LQ45 index for the period January - June 2022. Secondary data from daily data were used in the form of graphs or charts of stock price movements. The results of the study show that the movement of the Moving Average indicator has nothing in common with the closing price of the candlestick data, where the inequality of this movement produces buy and sell signals. Candlestick technical analysis shows a downtrend trend where there are 8 signals consisting of 4 buy signals and four sell signals from each sample, so it is concluded that there is a difference or inequality that occurs between the moving average indicator and the closing price showing the support level and resistance level that can predict the movement of the share prices of two retail companies listed on the LQ45 index. The results of this study prove that the use of candlesticks with moving averages during the new standard can be recommended to short-term and long-term investors to determine the trend of future price movements in determining the buy and sell points of shares to get the desired return.

1.   INTRODUCTION

The COVID-19 pandemic has physically and psychologically affected more than 8,9 billion people in Asia, the Americas, Europe, Australia, Africa and Antarctica. Keeping a safe distance, staying at home and working from home is part of the social distancing phase. The pandemic has had a significant impact on the world economy and some countries to the point that the threat of recession, even depression looms over powerful countries such as Singapore, South Korea, Japan, the United States, New Zealand, the United Kingdom, France. Indonesia has also experienced an impact on the national economic growth rate, which contracted to 5,32% for two consecutive quarters in 2020 (Junaedi and Salistia, 2020).

The slumping economy during the COVID-19 pandemic in Indonesia since March 2020 can be seen from the growth of -2,07% in gross domestic product (GDP),

but GDP still grew up to 5,02% in the previous year. The slowdown in economic growth due to the pandemic also affected the capital market sector, which saw the Jakarta Composite Index (JCI) fall from 6.300 to 3.900 within three months. Government Regulation Number 21 of 2020 also triggered this economic decline and slowdown, which regulates large-scale social restrictions (PSBB) in handling COVID-19. Along with the outbreak and the spread of Delta variants, economic growth is also slow, but national economic growth can grow positively by 3,51% (yoy) at the beginning of the third quarter of 2021 (Pransuamitra, 2020; Arman, Haanurat and Nur'aeni, 2022; Lukman, Kartini and Rura, 2023).

However, Indonesia's GDP growth trend from 2021 to 2023 fluctuated, starting with the results in the first quarter of 2021, which showed a figure of -0,69% during the Covid-19 pandemic. The low economic growth did not last long, as evidenced in the second quarter of 2021, Indonesia's economic growth touched 7,08%. However, in the third quarter of 2021, the figure decreased to 3,53%. But constantly, from the fourth quarter of 2021 to the first quarter of 2023, Indonesia's economic growth rate was at 5% (Syaharani, 2023).
The continuing impact of the COVID pandemic with the announcement of the implementation of the new normal by the government on 1 June 2020. *New normal* is a term aimed at human behavior that has changed with the coronavirus disease 2019 (COVID-19) outbreak. The occurrence of the COVID-19 pandemic has disrupted the pattern of life order as has been done before (Zaharah, Kirilova and Windarti, 2020)
The implementation of the *new normal* by the government has made the *mood of* capital market players in the financial sector improve from 2 June to 5, 2020; it was seen that the JCI level was at 4.847,51, this recorded a strengthening because the figure was higher than the previous month with a difference of 1,98% increase and became the highest level since 7 April 2020. The strengthening of the *Indonesia Stock Exchange* (IDX) recorded a 5-day winning streak and became the most extended joint stock price index (JCI) rally since October 2019. In addition, data from Indonesia's Central Bureau of Statistics (BPS) in May 2020 showed inflation of 0,07%, with inflation occurring in 67 cities and 23 cities experiencing deflation; also recorded year-on-year inflation of 2,19%, and year-to-date inflation reached 0,9%. The low inflation illustrates the decline in people's purchasing power due to the surge in layoffs during the Covid-19 pandemic. However, from an investment point of view, this has a positive impact because low inflation makes the *real return on* investing in Indonesia higher, which triggers the flow of foreign capital into the country (Pransuamitra, 2020).

One of the investment vehicles in the financial sector is the *stock market*. In Indonesia, the *stock market* is known to have two functions or roles. The first function is to finance businesses so that companies get capital from investors or the general public. The company will use the funds collected to increase working capital and expand the business. The second function as a means of investment, such as stocks, bonds, and mutual funds, is also intended for the general public to invest in the capital market (Aeni, 2022; I. Haanurat et al., 2021; Rizal Fadly, 2021; Haanurat.A.I et al., 2023).
Shares, proof of company ownership, are one of the investment products affected by the Covid-19 pandemic. It is known that stock prices are constantly changing, just like commodities in the market that follow the law of supply and demand. The price of a stock in the capital market is determined not only by the financial performance factors of a company but also by events that can affect the price of a stock and investor decisions (Haanurat, Jaya and Nurlina, 2023a). The COVID-19 outbreak or pandemic is one of the many events that affect stock prices. As a result of the pandemic, investors sold their shares amid fears of the coronavirus (COVID-19), of course, this was also influenced by

the law of *supply and demand,* which resulted in a very significant decline in stock prices (Lathifah *et al.*, 2021).

The main reason for this is that capital market players (investors) are conservative in anticipating other policies that are sensitive to the capital market so as not to fall into losses; it does not fully support the *signaling theory* (Herowati Erlina, 2022). This means that in making investment decisions, the human dimension is considered, especially regarding perceived identity and emotional factors, because it is influenced by financial literacy (Syahfi, 2023). The existence of financial literacy should make market participants rational (Meisa Dai, Kostini and Wulan Tresna, 2021), However, some studies show that investor behaviour is not always rational and can be systematically illogical, making the stock market increasingly volatile. Stock market volatility increases investment risk (Syahfi, 2023). In financial literacy, financial behaviour is an important component because it assesses how a person acts in financial transactions, including decisions in investing, using and managing their financial resources (Lalawigan, Badoc-Gonzales and Mandigma, 2024)**.**

Investors making investment decisions require additional analytical tools to determine which stocks are worth investing in. So, in predicting the future price *trend of* a stock, investors should know, understand and analyze the upcoming price *trend* from information in the capital market so that investors can make or decide on the right investment. Therefore, every capital market player needs an analytical tool to help make decisions about buying or selling stocks, one of the analytical tools that can be used is *candlestick* technical analysis (Susanto and Subardi, 2010)**.**

Based on this description, this study looks at *candlestick* and MA (*Moving Average*) technical analysis, which aims to determine whether there is a difference between the predicted stock prices of *support* and *resistance* based on *candlestick* data from the *closing* price of companies in the retail sector during the *new normal* which can be a consideration in making investment decisions, be it selling or buying decisions. The findings in this study will deepen understanding of the use of technical analysis, especially *candlesticks* and MA, to identify *support* and *resistance* levels despite differences with *closing prices* to prove and predict stock price movements.

Previous research that discusses the use of *Candlestick Chart* and MA, namely research from (Ananthi and Vijayakumar, 2020) which shows that using predicted stock prices and data collected from various sources regarding certain equities, and the overall sentiment of the stock is predicted. Stock price prediction is done by regression and *candlestick* pattern detection. The accuracy of stock exchange prediction has been analyzed and improved to 85% using the algorithm. Later research (Chen, Hu and Xue, 2024) , which examined six stocks from various industries in the Chinese stock market by predicting stock price movements using *candlesticks* and integrating them with SSA. The results show the potential to serve as a decision-making tool for investors, reducing investment risk to a certain extent.

Furthermore(Qian, 2023), his study uses Xiaomi Inc's stock price data, which is one of the leading technology companies in China, and uses three *Moving Average* methods to analyze the data, namely SMA, EMA, and MACD. The results showed that MACD accuracy is better than SMA and EMA among the three Moving Average methods. Another study in line, namely (Deng *et al.*, 2022) examined the profitability of 10 candlestick chart patterns on the component stocks of the SSE50 index in China, which found that specific candlestick patterns, such as *Bullish Gap* and *Long White*, have a significant predictive ability to generate positive returns, especially within a specific holding period and when considering market conditions.

Similarities with the above study were conducted in the *capital market* but in

different countries, and technical analysis tools were used to predict stock price movements with significant effectiveness under certain and different conditions. In this study, *the moving average* (MA) is used to identify *support* and *resistance* levels despite the difference with the *closing price*, to prove and predict stock price movements. So, this study will confirm that with the right approach and parameters, technical analysis can be useful for investors and traders in improving trading decisions or investment decisions during new every day or different situations.

2. LITERATURE REVIEW

2.1. Investment Decision in Capital Market

The capital market is a place where various kinds of financial instruments, both long-term and short-term, are traded, such as assets or equity; besides that, the capital market has an important role that has the aim of creating facilities in developing the industry and meeting demand and supply. That is, the capital market is a place where parties, especially corporations, sell stocks and bonds to use the proceeds to replenish funds or increase the Company's capital (Fahmi, 2012; Achmadi, Haanurat and Rustam, 2020; Haanurat, Jaya and Nurlina, 2023b).

Investment in the capital market involves several instruments that are traded, one of which is shares. Shares prove that a person or business entity has provided or deposited its capital to a limited liability company. A person or organization that owns shares is called a shareholder (*stockholder*). The decline and increase in stock prices cannot be separated from stock trading activities, because of price fluctuations. Demand and supply are the shapers of stock prices, as are the factors that affect demand and supply, such as the results achieved by the company and the industry in which the company is engaged. In addition, rising interest rates, rising prices of goods, currency exchange rates and political conditions affect demand and supply (Hendra Perdana, Nurin Hafizah, 2019; Haanurat, Jaya and Nurlina, 2023b).

Several indices in the Indonesian capital market serve to measure the performance of investment products, including the LQ45 index. This index consists of 45 listed companies operating for a long time and having a good financial history. The stocks included in the LQ45 index often pay investors dividends and have stable incomes (Widioatmodjo, 2015; Pratama, 2019). Some of the characteristics of companies included in the LQ45 index are consistent dividends, solid company performance, and a large capitalization value. The purpose of the LQ45 index is to provide information on active stock price movements every day and to be an objective and reliable tool for investment managers in determining the best stocks. In addition, the LQ45 index also aims to complement the composite stock price index (JCI) (A. I. Haanurat et al., 2023; Hadijah, 2022; Mujiyono & Dananti, 2022).

2.2. Signal Theory and Efficient Market Theory

The company's desire to provide or publish information such as financial reports, to parties outside the company is the definition of *signaling theory*. The main reason the company provides its financial statement information to the public is because the company knows more about the company's future performance. Another reason that the company does this is because investors or creditors as external parties do not have direct information from the company that investors can use so that investors can trust to invest in the company. (Ross, 1977) explains that the existence of *signaling theory* encourages companies to provide information to outside parties, such as investors, so that the company's share price they own rises or increases. Companies with good information or

news are different from companies with bad news in terms of their position in the eyes of investors, which will positively affect *signaling theory.*

In addition (Brigham and Houston, 2014) explain that *signaling theory* is a theory that explains that shareholders consider dividend changes as a sign of management's estimated earnings. Although this signal theory has explained the actual condition of the company, investors in determining market prices also need information from external companies such as government policies, political issues that occur, economic developments related to the company's field, known as efficient market theory (Ross, 1977).

An efficient market is indicated by the existence of a *price* or *value of* a stock or asset price that represents all information related to the asset (Hanafi, 2004; Haanurat, Jaya and Nurlina, 2023b). This is in line with the opinion of Fama's theory, which is described by the perception of market efficiency, that an asset price at a time describes the available information. This means that the information comes from past and present information and is complemented by information from the company (*insider* information) (Fama, 1970). further explained that, there are three forms of efficient capital markets, namely *strong form, semi-strong form* and *weak form.*

2.3. Technical Analysis Candlestick and Moving Average
Technical analysis is a technique for predicting future price movements using statistical analysis of past market activity to determine or evaluate an asset such as stocks, commodities, or other assets. This technical analysis is different from fundamental analysis; the analysis technique aims to identify patterns that occur using graphical data on price movements and trading volume (Utami and Gunarsih, 2019). The pattern or Model that is the meaning of this can be interpreted as a trading trend, which is the essence of price movements or shifts over a period. There are three trends in technical analysis; the first is an *uptrend*, which is when prices reach the highest point of a high valley in the chart. The second is a *downtrend,* which is a condition when the price hits a lower bottom from a lower peak in the chart. While a *sideways* or *flat trend* occurs when prices trade within a specific range without any significant upward or downward movement (Hendra Perdana, Nurin Hafizah, 2019). To see the trend requires a visual form of the price of a stock, commonly called a *candlestick.*

The development of the Japanese *candlestick* is thought to have started in the 18th century by Munehisa Homma, a major Japanese financial instrument trader, and was introduced to the Western world by Nison. Japanese *candlestick* charts contain the closing price and the high, low, and opening price information. Japanese *candlestick* charts generally represent three components, namely: bar, upper wick, and lower wick (Meng *et al.*, 2021). Visual patterns from *candlestick* charts can be identified quickly, and the related information obtained can be used to help predict price movements, which may be difficult to learn by reading many financial reports. For example, in a *bearish* three-line decline pattern, those three short red candlesticks are followed by a longer green candlestick. This pattern indicates that a continuation of the current downtrend is expected, although it seems that the bulls have regained their strength and pushed prices higher and higher on the fourth day (Hung *et al.*, 2020).

Moving Average (MA) is the most straightforward indicator to use in technical analysis, so many technical experts use it. Past data from stock price movements is used in a formula, and the results are plotted as a line on a graph. The line is used to determine the trend of the stock price movement, signal a new trend or confirm that the current trend is about to reverse. Moving *average* lines can also be used to determine support and resistance instead of traditional trend lines. Another function of the *moving average* is to

reduce the wild volatility of stock prices and other indicators (Utami and Gunarsih, 2019).

3.   METHODOLOGY

This study uses quantitative research methods with a descriptive approach and uses a population of all retail companies included and listed in the LQ45 index from January 2022 to June 2022. Two retail companies (ERAA and ACES) are sampled to observe their stock movements every trading day for 6 months. The data used is secondary data in the form of primary data obtained from the Profits Desktop application in tables, diagrams and graphs.

The data collection method in this study is documentary; researchers directly download the LQ45 index stock movement chart of the retail sub-sector from the Chart Profits application. A comparative test was used to analyze the differences between the two variables in this study. Comparison is a study of solving problems with a descriptive causal relationship, namely determining a factor related to the situation being studied and looking for differences between other factors (Sugiyono, 2017; Creswell and Creswell, 2018). This study tests whether there is a difference between the *actual closing price* and *the closing price of* the *support* or *resistance* results of the *moving average* indicator.

3.1   *Closing Price* is when the market has closed at the end of the trading session which market participants or investors will use as a reference for the opening price the next day or the next day. Investors can find the value or closing price of the shares of each company on the Indonesia stock exchange. in this study, the main focus wants to examine the *closing* price of retail companies included in the LQ45 index (Arifiani, 2019).
3.2   *Support* and *resistance* on stock price movements. The *support* level is the lowest bottom point of the stock price change, while the *resistance* level is the highest point of the stock price change. If the price of a stock reverses direction through the *resistance*, the level will become the *support* level. Vice versa, if the stock price reverses direction through the *support*, then the level becomes the new *resistance* (Hartono, 2020).
3.3   *Candlestick* is a chart consisting of several information, namely the opening, closing, highest, and lowest prices. *Candlestick* consists of two colours that distinguish the green colour when the price is rising (strengthening) and the red colour when the price is falling (weakening) (Meng *et al.*, 2021).

The data analysis technique used is descriptive statistical analysis, normality test, and t-test (*Wilcoxon Signed Rank Test*), which means a statistical number test used to find different things from two paired data categories (Sugiyono, 2017).

4.   RESULTS AND DISCUSSION

4.1 Research Results

4.1.1 Descriptive Statistical Analysis
The descriptive statistical analysis results of *Closing Price* and *Moving Average* include 232 observations, with an average value of 813,03 for *the Closing Price* and 824,69 for *the Moving Average*, respectively. The range of values shows significant price variations, namely 891 on the *Closing Price* (from a minimum of 494 to a maximum of 1.385) and 863 on the *Moving Average* (from a minimum of 499 to a maximum of 1.362). The degree of data dispersion is quite large, as seen from the standard deviation of 296.801 for the

Closing Price and 301.157 for the *Moving Average*. The data variance is also relatively high, amounting to 88.090.691 and 90.695.256 respectively, reflecting significant price fluctuations.

Table 1. Test Results of Descriptive Statistics of *Closing Price* and *Moving Average*

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Closing Price	232	891	494	1385	813,03	19.486	296.801	88090.691
Moving Average	232	863	499	1362	824,69	19.772	301.157	90695.256
Valid N (listwise)	232							

4.1.2 Normality Test Results
The normality test is carried out to determine whether the data on the *Closing Price* and Moving *Average* variables are normally distributed. Kolmogorov-Smirnov (KS) and Shapiro-Wilk (SW) test analysis used with the help of IBM SPSS Version 25 shows the following results:

Table 2. Closing Price and Moving Average Normality Test Results

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Closing Price	.260	232	.000	.840	232	.000
Moving Average	.272	232	.000	.831	232	.000

a. Lilliefors Significance

The normality test results, both *Kolmogorov-Smirnov* and *Shapiro-Wilk*, show the probability value (Sig.) on *Closing Price* and *Moving Average* Sig < 0,05, meaning the data is not normally distributed.

Data often exhibits a non-normal distribution due to the presence of one or more extreme values, both univariate and multivariate. These extreme values, known as outliers, can cause bias in research results. To overcome outliers, the authors used statistical analysis with a non-parametric method, the Wilcoxon Signed Rank Test.

4.1.3 Difference Test Analysis
The statistical analysis of the Wilcoxon Signed Ranks Test aims to compare two groups of paired data when the data distribution is not normal and determine whether there is a statistically significant difference between the two variables. The decision-making criteria in the *Wilcoxon Signed Rank Test* are as follows:
a.   If the probability value (*Asymp.Sig*) is less than 0,05, then H0 is rejected.
b.   If the probability value (*Asymp.Sig*) is more than 0,05, then H0 is accepted.

To determine whether there is a significant difference between *Closing Price* and *Moving Average*, further testing is carried out through a t-test.

Table 3. Wilcoxon Signed Rank Result on Closing Price and Moving Average[a]

	Moving Average - Closing Price
Z	-4.880[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

The difference test results using the Wilcoxon Signed Rank Test in the table 3 show a Z value of -4,880 with an asymp sig value. (2-tailed) of 0,000, which is smaller than 0,05, Therefore, it can be concluded that there is a statistically significant difference between *Moving Average* and *Closing Price*. The negative value indicates that the dominant difference is below the *Moving Average* median which means the closing price tends to be lower than the *Moving Average*.

There is a statistically significant difference between the *Closing Price* and the *Moving Average* in the two retail companies listed on the LQ45 index, which indicates that the *Closing Price* does not move in the same direction as the *Moving Average* in both stocks, which could indicate a pattern of volatility or an imbalance between the actual price trend and the average trend. The significant difference between the *Closing Price* and *the Moving Average* indicates that although they are highly correlated, they reflect different information about the stock price. *The Closing Price* is more volatile and sensitive to daily changes, while the *Moving Average* is slower to change and reflects long-term trends. The results of this analysis are relevant for decision-making in technical analysis, where the difference between the current price and the moving average can signal when to buy or sell a stock.

4.2 Discussion

The results of this study study show a significant number, namely 0,000<0,05, which means that overall the *moving average* has nothing in common with the *closing price; from* the results of the data processing, it can be seen that the two retail companies that are the objects show significant results, meaning that the *moving average* movement has nothing in common with the *closing* price, the difference or inequality that occurs between the *moving average* and *the closing price* means that the *moving average* indicator which shows the *support* level and *the resistance* level is concluded to be able to predict the movement of the share price of two retail companies listed on the LQ45 index in January - June 2022.

The conclusion of the statistical results above is also seen in Figures 1 and 2, which show the *Moving Average* or MA indicator line depicting the *support level* and *resistance level of* the *candlestick chart* movement. When the MA line is above the *candle*, it can be interpreted that MA is a *resistance* line that indicates market conditions are rising also called *Bullish*. Conversely, when the MA line is below the *candle*, it can be interpreted that MA is a *support* line that shows market conditions are falling often called *Bearish*. When market conditions are *bearish*, investors should take careful action when making decisions to buy or sell shares. The decision to buy or sell shares can be made by investors when there are indications of movement, namely if the stock *candle* is below the *Moving Average* line (*resistance*) and moves over the line to the top then the decision that investors can take is to buy, Conversely, if the stock *candle* is above the *Moving Average* line *(Support)* and moves over the line to the bottom then the decision that can be taken

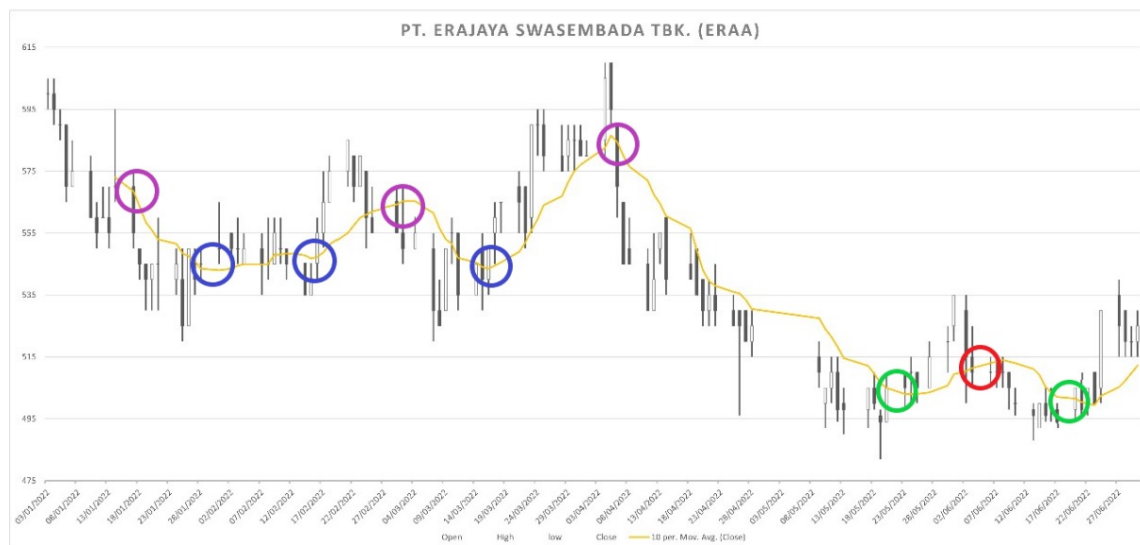is to sell shares, this explanation can be seen in the picture below.

Figure 1: Stock Price Movement of PT Erajaya Swasembada, Tbk.

Figure 1 above shows the stock price movement of PT Erajaya Swasembada Tbk (ERAA) using *candlestick charts* and *moving averages*. The figure shows an *Uptrend Trend* from January to early April, concluding that there are three signals to sell seen in purple marks and three buy signals seen in the blue marked image. In addition to the *uptrend* movement, in the May to June 2022 analysis period, there was a *downtrend* movement condition where there were two buy signals seen in the green colour mark and one sell signal with a red colour mark.

Figure 2: Share price movement of PT Aspira Hidup Indonesia, Tbk.

Figure 2 shows PT Aspira Hidup Indonesia Tbk (ACES) stock movement using *candlestick charts* and *moving averages* with an analysis period of January to June 2022. The analysis in Figure 2 shows a *downtrend* movement, with 4 signals to buy shares marked with blue circles and 5 signals to sell shares marked with purple circles. This

shows a difference with PT Erajaya Swasembada Tbk.

Figure 1 and Figure 2 show a decline in stock prices or *downtrend*, the psychology of investors or traders influences this as market participants who cannot be predicted due to the many negative sentiments towards stock prices. However, one factor that impacts this negative sentiment is the outbreak of the omicron variant of the COVID-19 pandemic during the new normal from the end of 2021 to mid-2022, which is the period for sample collection. This can be seen from the stock movement data at the end of November to early December 2021 which shows that the JCI fell 0,35% to the level of 6.538 the cause of this decline was market pressure due to the outbreak of omicron variants that occurred in November 2021, this is in line with study (Puminda and Pujiati, 2022) which shows a significant difference in stock prices and trading volume before and during the Omicron variant pandemic, where investors tend to delay stock purchases due to concerns about the decline in stock value due to Omicron variants. Also study (Liu, 2023), which shows that the pandemic as a new variant and creates volatility in global financial markets, and the existence of Omicron increases uncertainty in the market and affects investor behavior, especially in critical times such as the new normal period.

5.   CONCLUSIONS

The results of the study and discussion above conclude that one of the strategies carried out in retail companies (ERAA and ACES) to determine and predict future stock price movements is done by using and combining *candlestick* data with *moving average* indicators so that it can be a guide for investors and traders in the Indonesian capital market in determining the action of buying or selling shares in the New Normal situation. The *Candlestick* and *Moving Average* (MA) has also been used in the Chinese Capital Market. It provides results as a decision-making tool for investors who can reduce investment risk to a certain extent (Qian, 2023)(Chen, Hu and Xue, 2024) . The use of MA and candlesticks for stocks with rapid price changes, with shorter time spans or periods resulting in better predictions, while for stocks with slow price changes, data with longer time spans are more effective in forecasting.

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