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Reassessment of CAPM Relative Accuracy: Comparative Study with Actual Price Movement in Indonesia (2019-2022)

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Abstract**—** *This study aims to investigate the accuracy of the Capital Asset Pricing Model (CAPM) in predicting stock returns on the Indonesian Stock Exchange (IDX) during the period of 2019 to 2022. The objectives of the research are to benefit individuals and communities such as enhancing individuals' decision-making in predicting stock returns, advancing community understanding of financial markets, and contributing new investment insight for societal benefits. The sample comprises 45 selected stocks out of more than 700 stocks, using K-Means Clustering to ensure a diverse and representative dataset. The study compared CAPM's predictions with the Moving Average (MA) method. Findings show CAPM's decisions align 87% with MA-analyzed price movements, underscoring CAPM's effectiveness and the value of using multiple methods for financial predictions. While CAPM proves robust during economic recovery, further analysis is needed for optimal investment strategies. This study's results challenge some arguments against CAPM's accuracy.*

Keywords**—** *Capital Asset Pricing Model, Moving Average, Indonesian Stock Exchange, Investment, Financials, Data Analyst*

I. INTRODUCTION

Indonesia's economy and stock market faced both positive and negative changes during the pandemic COVID-19. Despite all the challenges, Indonesia's economic growth in 2021 was resilient and was mainly driven by the government's efforts to boost economic growth and the vaccination rate increased. The government's policies and stimulus measures helped support domestic demand, while the rebound in the global economy boosted external demand. However, as a country begins to recover and rebuild its economy, it is important to understand the long-term effects of the pandemic on the global economy and to understand the potential future performance of the stock investment.

Indonesia's main stock index, the Jakarta Composite Index (JCI), has been subject to a significant recovery in recent years. However, the JCI could be affected by global economic conditions and political uncertainty, leading to fluctuations in performance. The stock market is a critical indicator of a country's economic health, and forecasting its performance is essential for investors and policy-makers alike. Some factors such as economic conditions, political stability, foreign investment, interest rates, currency exchange rates, corporate earnings, and geopolitical risks. Every investing opportunity will have some level of risk. In order to select which sectors and company shares are good to invest in, it is required to analyze the fair value of stocks and compare them to the market value.

There are several models used to predict the risk and return of stocks. Most commonly using Capital Asset Pricing Model (CAPM) and based on this method the author ought to analyze the accuracy of the Capital Asset Pricing Model (CAPM) that can impact investment decision-making. Many studies have been conducted to evaluate the effectiveness of the Capital Asset Pricing Model (CAPM) in estimating the expected return of stocks with the results mostly are not explicitly stated whether it is effective, accurate, or relevant to estimate the expected return of stocks and suggested to conduct more alternative models to improve the accuracy of CAPM.

It is important to investigate the accuracy of CAPM in predicting the return of stocks to ensure that investors can make informed investment decisions. This study aims to analyze CAPM and its practical applicability by conducting a comprehensive reassessment of its accuracy. Is the CAPM more accurate in predicting stock returns compared to other models? This study intends to make a significant contribution to both individuals and communities. For individuals, understanding the strengths and limitations of the CAPM can help individuals in decision-making when it comes to investing in some stocks by learning how accurate the CAPM is in predicting stock returns. For communities, the study of the CAPM'S accuracy can help to understand how financial markets work. This study can also contribute to finance and economics, it can provide new insights into better investment strategies that can benefit society.

II. LITERATURE REVIEW

This research will require comprehensive data and theories that involve studying several key areas. These include conducting an analysis of the historical performance of Indonesia's Stock Market before, during, and post-pandemic in 2019 to 2022. The examination of the current state of the Indonesian economy and its potential vulnerabilities, and analysis using forecasting models to assess the fair value of the stocks based on the previous study course in Financial Data Analytics and some published journals as references.

The author aims to integrate 4 distinct concepts into this research using K-Means Clustering, Linear Regression, CAPM, and Moving Average in the research process. However, K-Means clustering is not the primary focus of this study. It serves merely as a tool to help the Author select the most recommended stocks. These selected stocks will then be

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analyzed for the accuracy of the CAPM. On the other hand, Moving Average is a technical analysis tool to identify trends in financial markets and manage risk over time. This technique assists as a final tool to evaluate the result of CAPM is accurate in a certain period by comparing the CAPM result with the actual price movement in the market.

A. Linear Regression

Linear Regression is a machine learning algorithm based on supervised learning. It performs a regression task. It is mostly used for finding out the relationship between variables and forecasting. Different regression models differ based on – the kind of relationship between the dependent and independent variables they are considering, and the number of independent variables used (Gupta, Mohit., 2022). The formula for Linear Regression:

$$Y = \alpha + ßx$$

Description:
Y = y-coordinate/ dependent value
α = y-intercept/ constant
ß = slope/ coefficient of X
X = x-coordinate/ independent value

B. Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) is a model that establishes a linear relationship between the expected return and systematic risk. In other means, the CAPM model is a model to describe the relationship between risk and expected return to evaluate security prices. The Capital Asset Pricing Model (CAPM) was first introduced by William F. Sharpe (1964) and John Lintner (1965). The modern portfolio theory was developed by Markowitz (1952) afterward by introducing the terms systematic risk and unsystematic risk.[1] The formula of the Capital Asset Pricing Model (CAPM) is used to compute the expected return of the asset and its systematic risk. It can be derived by adding the risk-free rate of return to the Beta of the asset and market risk premium. CAPM formula can be defined by the following formula:

$$Re = Rf + ß(Rm - Rf)$$

Description:
Re = Expected Return or Cost of Equity
Rf = Risk-free rate
ß = Beta coefficient
Rm – Rf = Expected Equity Risk Premium on the market

Investment decisions in CAPM consist of the Beta coefficient, expected return on asset, market return, and Risk-Free Rate.

1. Beta Coefficient[2]

Beta is the measurement of the relationship between an individual stock return and the market return. The following are the criteria measurement in the Beta coefficient:

- Beta < 0 or negative, meaning that the individual stock behaves specifically and is contradictory with the capital market. The stock usually moves down, while the market goes up, and when the stock moves up, the market moves down.
- Beta = 1, meaning that for every 1% change in the market, the stock will also change as large as the market.
- Beta > 1, meaning that the risk level is over the average level of the market risk.
- Beta < 1, meaning that the stock has a lower risk than the level of the average market risk.

Beta can generally be referred to as an indicator of a stock's systematic risk in relation to market risk. The term Beta is calculated with the following formula:

$$\beta = \frac{Cov(Ri, Rm)}{Var\ (Rm)}$$

Description:
ß = Beta/ Covariance
Cov(Ri, Rm) = the covariance of the market's return and the asset's return.
Var (Rm) = Market's variance

2. Return on Stocks

Stock return is the rate of return on investment. The expected return on stocks is the expected rate of return that aims to compensate for the time and risks while providing profits associated with the investment undertaken. In other words, return is the result of profits obtained from investments made and one of the factors that motivate investors to invest in particular stocks. The formula for calculating the actual stock return rate is:

$$Ri = \frac{P(1) - P(0)}{P(0)}$$

Description:
Ri = Stock Return
P1 = Closing price of a stock in a certain period
P0 = Closing price of a stock in the previous period

3. Market Return

Market Return is the rate of return based on the development of the composite stock price index. In this research, the composite stock index used by the Indonesia Stock Exchange is the Jakarta Composite Index (JCI). This rate of return can be used as a basis for measuring investment performance. The formula for calculating the actual market return rate is:

$$Rm = \frac{JCI(1) - JCI(0)}{JCI(0)}$$

Description:
Rm = Market return
JCI(1) = Closing price of an index in a certain period
JCI(0) = Closing price of an index in the previous period

4. Risk-Free Rate

Risk can be defined as the possibility that the actual return may differ from the expected return and the result will be a loss on investment. Risk and return mutually influence each other, demonstrating a direct and linear relationship. This implies that the greater the risk of an asset, the higher the expected return on that asset, and vice versa.

The risk-free rate of return represents a benchmark for the minimum rate of return when beta (β) is zero. It is the

[1] Dakovic, Milos., Andrasic, J., Cicmil, D., (2022). Testing the Applicability of the CAPM Model Using Selected Shares Listed on the Belgrade Stock Exchange. *The University of Nis Serbia*, (2022): 184.

[2] Wijaya, Eric., Ferrari, Alecia., (2020). Stock Investment Decision Making Capital Asset Pricing Model (CAPM). *Journal Manajemen Vol.24*, No.01., (Feb, 2022): 93-108.

hypothetical rate of return for an investment with zero risk.[3] In this research, the risk-free rate of return is represented by the Government Bond Yield rate by Bank Indonesia website in a yearly period. Generally, the formula for calculating the risk-free rate is:

$$\text{Rf} = \frac{\sum Rf}{N}$$

Description:
Rf = Risk-Free Rate
N = Total period (1 year or 12 months)

C. Moving Average

Moving Average is a tool commonly used by investors or traders to evaluate the performance of the stocks or index market by averaging the closed prices over a specific period. According to (Arisoma, Supangat, & Narulita, 2019), Moving Average (MA) is a method of forecasting which is done by taking a group of observational values and looking for the average value as a forecast for the upcoming periods. This method can be done by calculating the average value of real data in the specific periods before the forecasting period. Moving Average in the stock market uses historical data to generate prediction values to identify trends by calculating the average price of an asset over a specific time period.

In this research study of evaluating the results of CAPM, moving average price can be used to analyze the performance of a stock or portfolio over time, which can help to identify trends and patterns in the returns. The Moving Average price can provide a clearer picture of the overall performance of the stock or portfolio, which can help investors to make investment decisions.

The formula that is commonly used in forecasting with Moving Average (MA) can be illustrated as the following equation:

$$F_{t+1} = \frac{1}{n} \sum_{i=t-n+1}^{t} \text{Ai}$$

Description:
F_{t+1} = Prediction for period t + 1
N = The number of periods used for forecasting calculations
Ai = Real value in period i

Mean Absolute Percentage Error (MAPE) is a statistical measurement of the accuracy of an estimate/ prediction in the forecasting method from the average absolute percentage error (Maulid, 2022). The use of Mean Absolute Percentage Error (MAPE) can be widely adopted by the general public because it is easy to understand and apply in predicting the accuracy of forecasts. The MAPE method provides information on how large the forecasting error is compared to the actual value of the series. The smaller the percentage error value in MAPE, the more accurate the forecast results. Some studies suggest that variations in MAPE values have different meanings:

- MAPE < 10%, the forecasting's ability is excellent
- MAPE 10%-20%, the forecasting's ability is good
- MAPE 20%-50%, the forecasting's ability is adequate
- MAPE > 50%, the forecasting's ability is bad

$$\text{MAPE} = \frac{1}{n} \sum \frac{\frac{(Actual - Forecast)}{Actual} x\ 100}{n}$$

Description:
Σ = summary
N = sample size
actual = the actual data value
forecast = the forecasted data value

In order to analyze the CAPM results using Moving Average, it needs to calculate the moving average of the asset's closing price over a specific time period, such as 1 year (12 months) or 6 months. Then, the results will be compared to the actual returns of the asset over the same time period with the expected returns calculated by the CAPM model.

III. METHOD

This research employed a quantitative approach and relied on secondary data or datasets obtained from historical data and financial data and ratios of Indonesian Stocks. In general, sample selection is conducted through the documentation method by collecting documents related to the variables under investigation, obtained from reliable sources and the data analysis employs quantitative/ statistical approaches. The required data includes the profitability ratios, solvency ratios adjusted closing stock prices, closing market prices, and government bond yield rate data, which are publicly available on the Internet. The data were obtained from documents released on annual performance by the Indonesian Stock Exchange (IDX) website and Yahoo! Finance from the year 2019 to 2022 (YoY).

The population of this study comprises all companies listed on the Indonesian Stock Exchange (IDX) from January 2019 to December 2022. Throughout these periods, the IDX has featured more than 700 stocks that have been or continue to be part of the stock market within that timeframe.

In this study, the sample consists of more than 700 listed companies in all sectors of Indonesia's stock market, such as Basic Materials, Consumer Cyclicals, Consumer non-cyclical, Energy, Financial, Healthcare, Industrial, Infrastructure, Technology, Property and Real Estate, Transportation and Logistic. The Author takes the whole listed companies on the Indonesia Stock Exchange (IDX) as a sample in order to generate wider insight for investment decision-making by analyzing the expected return and risk of each stock.

In the collecting data process, the author used a high-speed internet connection to download the whole data needed from the IDX website and Yahoo! Finance. The following are the criteria used to select the sample from the population:

1. Companies that are consistently listed and have never been delisted from Indonesia Stock Exchange (IDX) since 2019 or before 2019 to 2022 or the current year (2023).
2. Companies that are consistently in good performance based on financial ratios report period 2019 to 2022.
3. Companies with a big market capitalization, more than IDR 20 trillion.

[3] Wijaya, Eric., Ferrari, Alecia., (2020). Stock Investment Decision Making Capital Asset Pricing Model (CAPM). *Journal Manajemen Vol.24*, No.01., (Feb, 2022): 93-108.

Based on these considerations, the Author has selected several stocks by using the clustering method in order to get the optimum number of stocks that meet the criteria.
After conducting the data collection, the data needs to be analyzed through the following steps:

1. The data is processed using the K-Means clustering algorithm in machine learning – Phyton. In this case, the Author using Kaggle as a tool to process the clustering method.
2. The selected stocks from the best cluster will be processed using Linear Regression and Capital Asset Pricing Model (CAPM) in Microsoft Excel by compute the Return of Individuals stocks, Monthly Return of Individuals stocks, then visualize the data with Linear Regression, and identify the overvalued and undervalued stocks with CAPM by computing the expected return of stocks.

The formula of individual stocks return:

$$Y = Ri = \frac{(P(t1) - P(t0))}{P(t0)}$$

Description:
Ri = Rate of return of each company
P(t1) = closing price of the individual stock in the current month
P(t0) = closing price of the individual stock in the previous month
The formula of Monthly Return of individual stocks:

$$Y = Rm = \text{Average } (Ri)$$

Description:
Rm = Market of Return/ Annual Return

The linear regression line is an equation that accounts for past performance to predict future stock values. These lines can be generated using a scatter plot by identifying the value of α and ß in Regression. A stock may be overvalued when it falls above the linear regression line and undervalued when it's under the line. This method is an estimate of the real relation and can be used to give a prediction on Y using given X values, the formula is:

$$Y = \alpha + ßx$$

Description:
Y = y-coordinate/ dependent value
α = y-intercept/ constant
ß = slope/ coefficient of X
X = x-coordinate/ independent value

The risk-free rate is used as a reference that investors will be guaranteed no additional risk if the investment does not provide a higher return than the risk-free rate assets. The Author uses the Government Bond Yield Rate as the risk-free rate based on data released on February 2023.

The expected return can be computed using the Capital Asset Pricing Model (CAPM) formula in Microsoft Excel by identifying the Beta (ß) using the Covariance formula and computing the value of Annual Return (Ri).

$$\beta\ (Beta) = \frac{Covar\ (Ri, Rm)}{Var(Rm)}$$

$$\text{Annual Return} = (1 + \text{Rm})\text{^}12 - 1$$

The result will identify which stocks are overvalued and undervalued. Undervalued stock is when the price value of the stock is lower compared to the intrinsic value of the Jakarta Composite Index (JCI), while overvalued stock is when the price value of the stock is higher compared to the intrinsic value. Overvalued stocks present an opportunity to sell or to go short. Undervalued stocks present an opportunity to buy or to go long.

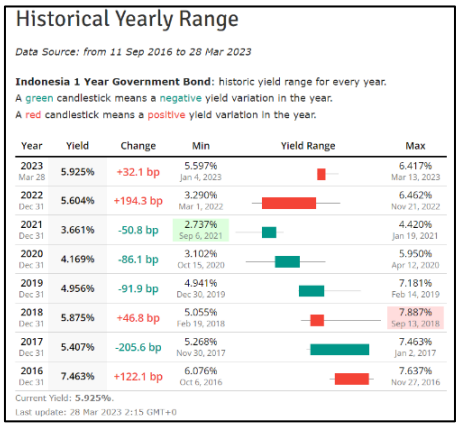

Fig. 1 Yearly Government Bond

3. Comparing the CAPM result with the Moving Average based on current actual price changes. This final step can be processed using data analysis tools in Microsoft Excel using actual prices yearly from January 2019 to January 2023.

IV. Result and Discussion

Based on the results of the clustering calculation and the analysis of all sector companies from the 2019 – 2022 period, it was observed the summary data for each year.
The result of the clustering analysis for all sectors in Indonesia's stock market for the year 2019 reveals 6 different clusters and 6 rankings, ranging from best to worst performance of each company. The 1st rank represents the top-performing cluster and 6th rank represents the out-performing cluster. Each cluster consists of different total numbers of companies.
The clustering results must be filtered according to the criteria employed for selecting the sample of research and subsequently processed to obtain specific results in the next calculation.
The selection of the dataset is based on the following criteria:

1. Companies that are consistently positioned in the top 3 rankings of clustering or those that move to higher rankings year after year.
2. Companies that are consistently listed and have never been delisted from Indonesia Stock Exchange (IDX) between 2019 to 2022.
3. Companies that are consistently in good performances in the year 2019 to 2022. This is indicated by the Debt-to-Equity ratio (D/E) is negative or has decreased, Return on Asset (ROA) and Net Profit Margin (NPM) being positive or increased from 2019 to 2022.
4. Companies listed in First-liner, Second-liner, and Third-liner.

According to the result, 45 companies have been identified to be recommended that meet the specified criteria, with the majority belonging to the Energy sector, consisting of 14 companies, followed by the Consumer Non-Cyclicals and Basic Materials sectors. Furthermore, all sectors and companies are subdivided into different segments to facilitate investment diversification

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The list of companies that meet the criteria is presented in the following table:

TABLE 1. Summary Clustering of All Sectors

Sectors	Total Companies
Basic Materials	6
Consumer Cyclicals	1
Consumer Non-Cyclicals	9
Energy	14
Financials	3
Healthcare	5
Industrials	3
Infrastructures	1
Properties & Real Estate	1
Technology	1
Transportation & Logistic	1
Grand Total	**45**

Source: Processed by Microsoft Excel

In order to measure systematic risk which is related to expected return as a consideration in investment decision-making. Systematic risk can be measured by beta, an inaccurate measurement of beta could lead to the ineffectiveness of expected return. Beta effectively describes the activity of a stock's returns as it responds to swings in the market. The value of beta (β) can be estimated by data analysis tools of linear regression in Microsoft Excel or manual calculation using the linear regression formula. The result of beta (β) values for each stock can be seen in Appendix Table 1.

In the year 2019 to 2022, DMMX, ACST, WIIM, and ANTM are more volatile than the market. High-beta stocks, which values are more than 1 are supposed to be riskier but provide higher return potential. Meanwhile, BSSR, DAYA, BMSR, and BYAN are less volatile than the market. A lower beta value, which is a value less than 0 or negative, poses less risk but also provides lower returns.

Based on the results of linear regression, data obtained beta (β) for each dependent variable (the stock) associated with the independent variable (market index), which can be processed to find expected return using the Capital Asset Pricing Model (CAPM). The result of this study shows an efficient and inefficient stock portfolio based on 45 selected stocks from before, during, and after the pandemic Covid-19. The output of this calculation provides deeper insight from the year 2019 to 2022, which can be used as a reference or recommendation when considering investment decisions for the 45 sample stocks in the future by comparing the results from the last 4 years.

However, the investors should consider the annual return (Ri), market return (Rm), and Risk-free rate (Rf) in order to predict the expected return of the stocks. Based on the calculation of the expected return of individual stocks, if the expected return values are greater than the annual return values, it means that the stocks are overvalued and it is not recommended to buy. Meanwhile, if the expected return values are less than the annual return values, it means that the stocks are undervalued and it is recommended to buy. The result of each stock that is undervalued and overvalued can be seen in Appendix Table 2.

The Capital Asset Pricing Model (CAPM) is not the only method used in predicting the return of stocks, as there are many other approaches available. However, many researchers have claimed that the CAPM method is the most effective model for predicting the return of stocks. In order to find out how accurate the results of the CAPM were, this study examined the data results from the years 2019 to 2022 by comparing them to using the Moving Average. However, in the forecasting system, there will be a difference between the actual data and the forecast results. In this case, the error level calculation is done using Mean Absolute Percentage Error (MAPE). The results of forecasting using Moving Average and MAPE are presented in Appendix Table 3.

The study revealed that CAPM's result is almost aligned with Moving Average results. However, due to using different comparison methods with other studies, the CAPM's accuracy is not straightforward "accurate" or "inaccurate." Instead, it is more relative. This relative accuracy means that CAPM might be on point in some situations but not so much in others, it depends on various factors.

When we talk about accuracy in financial models like CAPM, it can be evaluated from both an absolute and a relative standpoint.

1. Absolute Accuracy:

This refers to how closely a mode's predictions align with actual observations. In the case of CAPM, it involves comparing the projected returns and risk of an asset against the asset's actual performance. Absolute accuracy is crucial in determining the reliability of a model's predictions.

2. Relative Accuracy:

Relative accuracy takes into account how well a model performs compared to alternative models or benchmarks. In this study, CAPM's accuracy is evaluated relative accurate to the Moving Average technique. It acknowledges that while CAPM might not be absolutely accurate, it can still offer valuable insights when considered alongside other models.

V. CONCLUSION

Based on the result and discussion that has been done in the previous chapter, the conclusion of the research can be summarized as follows:

1. The Moving Average result indicates the actual price moved almost as predicted price in 2019 to 2022 period, and the pricing error (PE) has been tested using Mean Absolute Percentage Error (MAPE) as an accuracy measurement. The results show that the accuracy measurement for 44 out of 45 stocks is <10%, which indicating very good accuracy. The remaining stock (DMMX) has an accuracy measurement of 14.45%, which is still considered good.
2. The comparison between the investment decision recommendations derived from the CAPM and the actual price movement observed through MA demonstrates an 87% match. This finding indicates that CAPM is generally effective in predicting stock returns for investment strategies underscoring its potential value for investors aiming to optimize their portfolio performance.

In conclusion, this study describes the accuracy of CAPM when tested against actual price movement using the Moving Average technique. The study aligns with previous research in suggesting that CAPM's accuracy is not an absolute quality. It varies on the specific situation and the influencing factors.

Therefore, although the CAPM method identifies as a relatively good predictor against to the results of price movement through Moving Average for a portfolio with a moderate risk level. However, investors still need to consider other factors such as market trends, company-specific news updates, geopolitical, etc due to economic recovery when making investment decisions.

It is essential to consider other models to get a more comprehensive understanding of how assets are priced in the market. This balanced approach can lead to more informed investment decisions. In order to have a deeper understanding towards the accuracy of CAPM, this study proposed the following suggestions:

1. Further research should test between stock market in a developing country and a developed country.
2. The accuracy test can be utilized with another method in determining investment decision-making, for example, the Arbitrage Pricing Theory (APT) method, and compared the result to CAPM, so that it may prove which one is more valid.
3. The results of this study can be used as a reference for information before making investment decisions, especially for companies listed on the Indonesia Stock Exchange (IDX).

APPENDIX

TABLE 2. Summary of overvalued and undervalued stocks

No	Sectors	Emiten	Periode 2019-2022			
			2019	2020	2021	2022
1	Infrastructures	ACST	OVERVALUED	UNDERVALUED	OVERVALUED	OVERVALUED
2	Energy	ADRO	UNDERVALUED	UNDERVALUED	UNDERVALUED	UNDERVALUED
3	Consumer Non-Cyclicals	ANJT	OVERVALUED	OVERVALUED	UNDERVALUED	OVERVALUED
4	Basic Materials	ANTM	UNDERVALUED	UNDERVALUED	OVERVALUED	UNDERVALUED
5	Industrials	ASII	OVERVALUED	UNDERVALUED	OVERVALUED	UNDERVALUED
6	Basic Materials	BMSR	OVERVALUED	OVERVALUED	UNDERVALUED	UNDERVALUED
7	Basic Materials	BRPT	UNDERVALUED	UNDERVALUED	OVERVALUED	OVERVALUED
8	Energy	BSSR	OVERVALUED	OVERVALUED	UNDERVALUED	UNDERVALUED
9	Energy	BYAN	OVERVALUED	OVERVALUED	UNDERVALUED	UNDERVALUED
10	Consumer Non-Cyclicals	CAMP	OVERVALUED	OVERVALUED	UNDERVALUED	UNDERVALUED
11	Consumer Non-Cyclicals	CEKA	UNDERVALUED	UNDERVALUED	UNDERVALUED	UNDERVALUED
12	Consumer Non-Cyclicals	CPIN	OVERVALUED	OVERVALUED	UNDERVALUED	OVERVALUED
13	Consumer Non-Cyclicals	DAYA	UNDERVALUED	UNDERVALUED	OVERVALUED	OVERVALUED
14	Technology	DMMX	UNDERVALUED	UNDERVALUED	UNDERVALUED	OVERVALUED
15	Energy	GEMS	OVERVALUED	UNDERVALUED	UNDERVALUED	UNDERVALUED
16	Financials	GSMF	UNDERVALUED	UNDERVALUED	UNDERVALUED	OVERVALUED
17	Properties & Real Estate	GWSA	OVERVALUED	OVERVALUED	UNDERVALUED	OVERVALUED
18	Energy	HRUM	OVERVALUED	UNDERVALUED	UNDERVALUED	OVERVALUED
19	Healthcare	INAF	OVERVALUED	UNDERVALUED	OVERVALUED	OVERVALUED
20	Basic Materials	INCO	UNDERVALUED	UNDERVALUED	OVERVALUED	UNDERVALUED
21	Consumer Cyclicals	INDS	UNDERVALUED	UNDERVALUED	UNDERVALUED	OVERVALUED
22	Energy	ITMG	OVERVALUED	UNDERVALUED	UNDERVALUED	UNDERVALUED
23	Transportation & Logistic	JAYA	OVERVALUED	UNDERVALUED	UNDERVALUED	OVERVALUED
24	Consumer Non-Cyclicals	JPFA	OVERVALUED	UNDERVALUED	UNDERVALUED	OVERVALUED
25	Healthcare	KAEF	OVERVALUED	UNDERVALUED	OVERVALUED	OVERVALUED
26	Industrials	LION	OVERVALUED	UNDERVALUED	OVERVALUED	UNDERVALUED
27	Energy	MBSS	OVERVALUED	UNDERVALUED	UNDERVALUED	UNDERVALUED
28	Energy	MEDC	UNDERVALUED	UNDERVALUED	OVERVALUED	UNDERVALUED
29	Healthcare	MIKA	UNDERVALUED	UNDERVALUED	OVERVALUED	UNDERVALUED
30	Financials	PNBS	OVERVALUED	UNDERVALUED	UNDERVALUED	OVERVALUED
31	Energy	PSSI	UNDERVALUED	UNDERVALUED	UNDERVALUED	UNDERVALUED
32	Energy	PTRO	OVERVALUED	UNDERVALUED	UNDERVALUED	UNDERVALUED
33	Healthcare	PYFA	UNDERVALUED	UNDERVALUED	UNDERVALUED	OVERVALUED
34	Energy	RUIS	UNDERVALUED	UNDERVALUED	OVERVALUED	OVERVALUED
35	Financials	SFAN	UNDERVALUED	UNDERVALUED	UNDERVALUED	UNDERVALUED
36	Energy	SHIP	OVERVALUED	OVERVALUED	UNDERVALUED	UNDERVALUED
37	Healthcare	SIDO	UNDERVALUED	UNDERVALUED	UNDERVALUED	OVERVALUED
38	Consumer Non-Cyclicals	SKLT	UNDERVALUED	UNDERVALUED	UNDERVALUED	OVERVALUED
39	Consumer Non-Cyclicals	SMAR	UNDERVALUED	UNDERVALUED	UNDERVALUED	UNDERVALUED
40	Basic Materials	SMGR	UNDERVALUED	UNDERVALUED	OVERVALUED	UNDERVALUED
41	Industrials	SPTO	UNDERVALUED	OVERVALUED	UNDERVALUED	OVERVALUED
42	Energy	TCPI	UNDERVALUED	UNDERVALUED	UNDERVALUED	OVERVALUED
43	Basic Materials	TINS	OVERVALUED	UNDERVALUED	OVERVALUED	UNDERVALUED
44	Energy	TOBA	OVERVALUED	UNDERVALUED	UNDERVALUED	OVERVALUED
45	Consumer Non-Cyclicals	WIIM	UNDERVALUED	UNDERVALUED	OVERVALUED	UNDERVALUED

Source: Processed by Microsoft Excel

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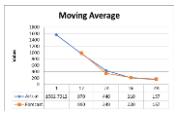
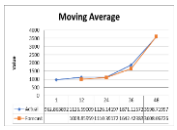
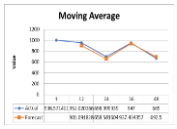
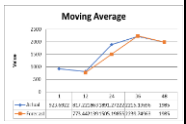
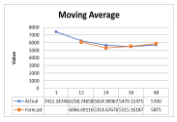
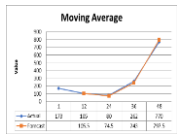
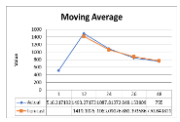
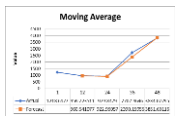
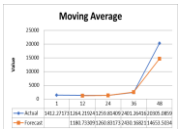
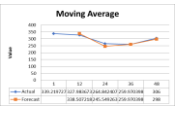
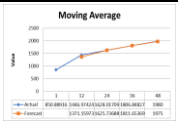
TABLE 3. Comparison CAPM Results and Price Movement

No	Emiten	RESULT CAPM				Moving Average Trend	Validity
		Comparison result 2019	Comparison result 2020	Comparison result 2021	Comparison result 2022		
1	ACST	MATCH	NOT MATCH	MATCH	MATCH		*80%*
2	ADRO	MATCH	MATCH	MATCH	MATCH		*100%*
3	ANJT	MATCH	MATCH	MATCH	MATCH		*100%*
4	ANTM	NOT MATCH	MATCH	MATCH	NOT MATCH		*60%*
5	ASII	MATCH	NOT MATCH	MATCH	MATCH		*80%*
6	BMSR	MATCH	MATCH	MATCH	MATCH		*100%*
7	BRPT	MATCH	NOT MATCH	MATCH	MATCH		*80%*
8	BSSR	MATCH	MATCH	MATCH	MATCH		*100%*
9	BYAN	MATCH	MATCH	MATCH	MATCH		*100%*
10	CAMP	MATCH	MATCH	MATCH	MATCH		*100%*
11	CEKA	MATCH	MATCH	MATCH	MATCH		*100%*

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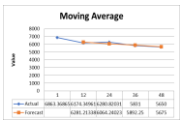
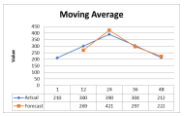
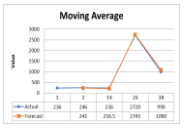
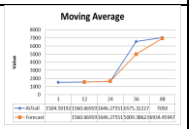
12	CPIN	MATCH	MATCH	NOT MATCH	MATCH		*80%*
13	DAYA	MATCH	MATCH	MATCH	MATCH		*100%*
14	DMMX	MATCH	MATCH	MATCH	MATCH		*100%*
15	GEMS	NOT MATCH	MATCH	MATCH	MATCH		*80%*
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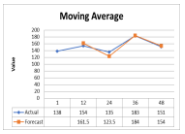
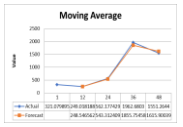
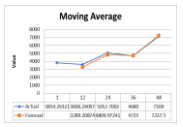
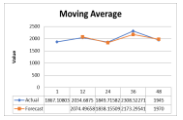
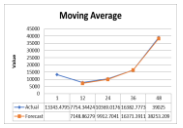
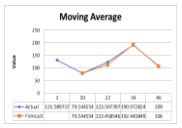
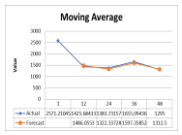
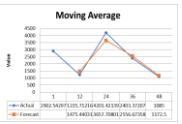
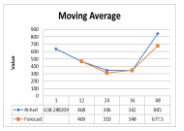
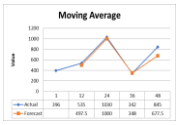
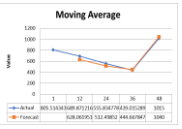
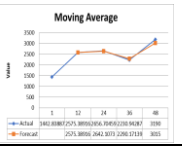
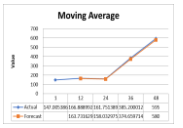
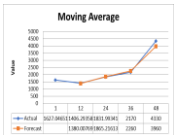
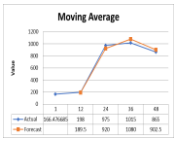
17	GWSA	NOT MATCH	MATCH	MATCH	MATCH		*80%*
18	HRUM	MATCH	MATCH	MATCH	MATCH		*100%*
19	INAF	MATCH	MATCH	MATCH	NOT MATCH		*80%*
20	INCO	NOT MATCH	MATCH	MATCH	MATCH		*80%*
21	INDS	MATCH	NOT MATCH	MATCH	MATCH		*80%*
22	ITMG	MATCH	MATCH	MATCH	MATCH		*100%*

23	JAYA	MATCH	MATCH	MATCH	MATCH		*100%*
24	JPFA	MATCH	NOT MATCH	MATCH	MATCH		*80%*
25	KAEF	MATCH	MATCH	MATCH	MATCH		*100%*
26	LION	MATCH	NOT MATCH	MATCH	MATCH		*80%*
27	MBSS	NOT MATCH	MATCH	NOT MATCH	MATCH		*60%*
28	MEDC	NOT MATCH	NOT MATCH	MATCH	MATCH		*60%*
29	MIKA	MATCH	MATCH	MATCH	MATCH		*100%*
30	PNBS	MATCH	MATCH	MATCH	MATCH		*100%*
31	PSSI	MATCH	MATCH	MATCH	MATCH		*100%*
32	PTRO	MATCH	MATCH	MATCH	MATCH		*100%*
33	PYFA	MATCH	MATCH	MATCH	MATCH		*100%*

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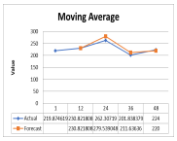
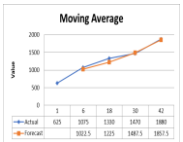
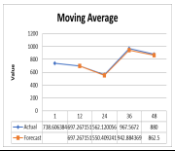
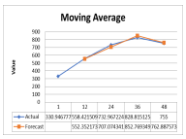
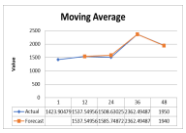
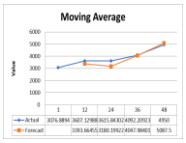
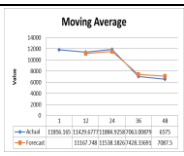
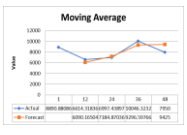
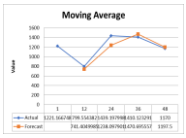
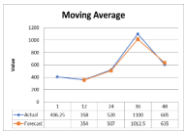
34	RUIS	MATCH	MATCH	MATCH	NOT MATCH		*80%*
35	SFAN	MATCH	MATCH	MATCH	MATCH		*100%*
36	SHIP	MATCH	MATCH	MATCH	NOT MATCH		*80%*
37	SIDO	MATCH	MATCH	MATCH	MATCH		*100%*
38	SKLT	MATCH	MATCH	MATCH	MATCH		*100%*
39	SMAR	MATCH	MATCH	MATCH	MATCH		*100%*
40	SMGR	MATCH	MATCH	MATCH	NOT MATCH		*80%*
41	SPTO	MATCH	MATCH	MATCH	MATCH		*100%*
42	TCPI	NOT MATCH	MATCH	MATCH	MATCH		*80%*
43	TINS	MATCH	MATCH	MATCH	NOT MATCH		*80%*
44	TOBA	MATCH	MATCH	MATCH	MATCH		*100%*

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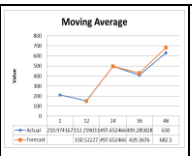
45	WIIM	NOT MATCH	MATCH	MATCH	MATCH		*80%*
TOTAL AVERAGE							***87%***

Source: Processed by Microsoft Excel

ACKNOWLEDGMENT

I acknowledge that completing this thesis would have been challenging without the assistance and guidance of various individuals throughout my academic journey. Thus, I would like to express my gratitude to:

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3. My mother and sisters who are always pray for me and support me in accomplishing this thesis.
4. All friends in dual degree program batch 3 in Central Queensland University and Bakrie University.

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