Available online at http://iorajournal.org/indx.php/orics /index

Operations Research: International Conference Series

e-ISSN: 2722-0974
p-ISSN: 2723-1739

Vol. 5, No. 1, pp. 7-13, 2024

Exploring Investment Decision-Making with CAPM: Case Studies on Ten Raw Materials Companies Listed in Stock Exchange

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Abstract

The investment business in Indonesia experienced significant growth in line with the increasing stock trading activity in the capital market. The large number of capital markets in Indonesia means investors have to be careful in determining the shares to be chosen. Based on transaction value, the raw materials sector is the second largest sector that supports the Indonesian capital market. Given the large number of issuers in the raw materials sector, determining investment portfolios is important to obtain optimal results. CAPM can classify stocks as efficient or not based on their expected return value. The results obtained can be used as a consideration in portfolio decision-making. This research identifies 10 stocks in the raw materials sector listed on the IDX. Of the 10 stocks studied, 8 are included in the efficient category, which has a greater return than expected, and 2 are included in the inefficient category. This means that investors who want to invest in raw materials can make a decision to buy these 8 stocks, and it is not recommended to buy shares in 2 inefficient category stocks or sell 2 stocks.

Keywords: CAPM, raw materials, portfolio

1. Introduction

Business development in Indonesia, especially in the investment sector, shows significant growth from time to time. This rapid growth reflects the potential of capital markets, which are increasingly attractive to market participants and investors. This illustrates the increasing interest of investors in conducting investment activities in the capital market (Pufaa, 2023). This phenomenon is evident from the increase in stock buying and selling transactions in the capital market. In 2023, the number of capital market investors in Indonesia will reach 10,311,152 people, an increase of 37.68% from the previous year. As of February 2023, the number of capital market investors in Indonesia will reach 10,623,731 people. This increased by 3.03% compared to the previous year (Qoyum 2018).

Investment is the act of giving up resources (money, time, and effort) in the hopes of gaining more in the future (Laopodis 2020). In the investment process, there are three things to consider: the expected rate of return, the level of risk, and the availability of the amount of funds to be invested.

Portfolio is a collection of investments from a wide range of assets, such as stocks, bonds, future contracts, options, real estate, diamonds, gold, savings, and other assets with a level of profit and risk that varies within a certain period of time (Kapoor 2014). Portfolio theory deals with investor estimation of expected returns and levels of risk by combining assets into an efficient portfolio diversification. The goal is to try to achieve efficient stocks, that is, maximize return expectations with certain risks. An efficient stock can also be said to be a stock with an individual rate of return that is greater than the expected rate of return.

The capital asset pricing model is a model that determines the expected return that is feasible for an investment. In CAPM, the expected rate of return is determined by the market rate of return, the risk-free rate of return, and systematic or beta risk. CAPM can also assist investors in calculating non-diversifiable risks in a portfolio and comparing them to predicted returns. By seeing the importance of portfolio analysis for investors to determine investment in the capital market, it is hoped that portfolio analysis with the CAPM approach can help investors make investment decisions. Several studies have used CAMP in determining efficient stock classifications, including Musodik et al.(2021), who determined the classification of automotive sector stocks, and Rahmah Dewi et al. (2022), who carried out an effective IDX30 stock classification.

This research will conduct effective stock classification using CAPM in the raw materials sector. The Indonesia Stock Exchange (IDX) recorded the raw materials sector as the 4th largest sector that supports Indonesia's market capitalization. In addition, when referring to transaction value, the raw materials sector is also the second largest support sector after the financial sector. This research is expected to provide deep insights related to investment decision-making using CAPM for raw material sector companies listed on the IDX.

2. Materials and Methods

2.1. Materials

The data used is the closing price data of 10 raw material sector stocks listed on the Indonesia Stock Exchange and JCI obtained from www.yahoofinance.co.id. In addition, BI rate data obtained from www.bi.go.id is used. The data used in this study is from the last three years, namely data from December 2020 to November 2023. Here are 10 stocks in the raw material sector listed on the Indonesia Stock Exchange are given in Table 1.

Table 1: List of Companies of Basic Materials Listed in Indonesia stock Exchange (BEI)

Code	Issuer
ANTM	Aneka Tambang Tbk.
BRMS	Bumi Resources Minerals Tbk.
BRPT	Barito Pacific Tbk.
ESSA	ESSA Industries Indonesia Tbk.
INCO	Vale Indonesia Tbk.
INKP	Indah Kiat Pulp & Paper Tbk.
INTP	Indocement Tunggal Prakarsa Tbk.
ISSP	Steel Pipe Industry of Indonesia Tbk.
SMGR	Semen Indonesia (Persero) Tbk.
TINS	Timah Tbk.

2.2. Methods

2.2.1. Rate of Return on Individual Stocks

The rate of return of individual stocks refers to the total rate of return of a particular investment over a given period of time (Goetzmann 2014). The rate of individual stock returns is one of the considerations investors consider when investing. The rate of return on individual stocks is calculated using the following formula:

$$R_i = \frac{HS_i(t_1) - HS_i(t_0)}{HS_i(t_0)} \tag{1}$$

with:
R_i = Rate of return of company i
$HS_i(t_1)$ = closing price of individual stock in the present period
$HS_i(t_0)$ = closing price of individual stock in the last period

2.2.2. Market Rate of Return

The market rate of return is the rate of return that is based on the stock price index. This level of return can be used as a basis for measuring portfolio investment performance. One of the market indices that can be chosen for the IDX market is Jakarta Composite Index (JCI). The formula used to calculate the market rate of return when using JCI is

$$R_{M,t} = \frac{JCI_t - JCI_{t-1}}{JCI_{t-1}} \tag{2}$$

with:
$R_{M,t}$ = Market rate of return
JCI_t = benchmark value in the current period
JCI_{t-1} = benchmark value in the PREVIOUS period

2.2.3. Risk-Free Rate of Return

The risk-free rate of return is the rate of return obtained from risk-free assets or assets with zero variance (Reilly and Brown 2011). One of the assets that has no risk is a short-term debt certificate issued by the government, such as a Bank Indonesia Certificate (SBI). The formula for calculating the risk-free rate of return is as follows:

$$R_f = \frac{\sum R_f}{N} \tag{3}$$

with:
R_f = Risk-free rate of return
$\sum R_f$ = Amount of risk-free rate of return
N = Observation time

2.2.4. Capital Asset Pricing Model (CAPM)

CAPM is an important model in finance that helps link risk to return on investment. This model states that the relationship between risk and return is unidirectional. The CAPM also shows that the price of a risky asset depends on how related it is to the market as a whole. Using CAPM, we can gauge how well an investment is doing by looking at the risks and expected returns (Rui et al. 2018).

The CAPM states that, in balance, the expected return of any security expressed in (De Chiara and Puopolo 2015):

$$E(R_i) = R_f + \beta_{im} * \left[E(R_m) - R_f\right] \tag{4}$$

with

$$\beta_{im} = \frac{\sigma_{im}}{\sigma_m^2} \tag{5}$$

where
$E(R_i)$ = expected rate of return of securities i
$E(R_m)$ = expected rate of return on market portfolio
β_{im} = systematic risk of individual stocks i
σ_{im} = covariance of return of securities i with market return
σ_m^2 = market return variance

Based on value of $E(R_i)$ obtained, Jones et al. (2009:242-243) explained about investment decisions on stocks, namely efficient if $R_i > E(R_i)$ so that investors can buy the shares, and inefficient when $R_i < E(R_i)$ so that investors can sell a ham or short sell before the stock price rises.

3. Results and Discussion

The calculation of the individual rate of return of stocks is done by substituting monthly close price data into equation (1). The calculation results are summarized in Table 2.

Table 2: Result of Calculation of the Average Rate of Return on Individual Stocks (R_i)

Code	R_i
ANTM	0.0037
BRMS	0.0400
BRPT	0.0051
ESSA	0.0514
INCO	0.0034
INKP	0.0007
INTP	-0.0062
ISSP	0.0221
SMGR	-0.0136
TINS	-0.0179

The calculation results in Table 2 show that during the study period, TINS's company shares had the lowest individual rate of return at -0.0179, while the highest rate of return was ESSA's company shares at 0.0514. From Table 2, it can also be seen that of the 10 company stocks studied, there are 7 stocks that have a positive average individual rate of return and 3 stocks that have a negative average individual rate of return.

Next, the calculation of the market rate of return during the study period is carried out. The calculation results are presented in Table 3.

Table 3: Result of Calculation of the Average Market Return

Date	Close (Rupiah)	R_m
12/1/2020	5979.073242	0.0000
1/1/2021	5862.352051	-0.0195
2/1/2021	6241.795898	0.0647
3/1/2021	5985.521973	-0.0411
4/1/2021	5995.616211	0.0017
5/1/2021	5947.462891	-0.0080
6/1/2021	5985.48877	0.0064
7/1/2021	6070.039063	0.0141
8/1/2021	6150.298828	0.0132
9/1/2021	6286.942871	0.0222
10/1/2021	6591.346191	0.0484
11/1/2021	6533.932129	-0.0087
12/1/2021	6581.481934	0.0073
1/1/2022	6631.150879	0.0075
2/1/2022	6888.170898	0.0388
3/1/2022	7071.441895	0.0266
4/1/2022	7228.914063	0.0223
5/1/2022	7148.970215	-0.0111
6/1/2022	6911.582031	-0.0332
7/1/2022	6951.123047	0.0057
8/1/2022	7178.589844	0.0327
9/1/2022	7040.797852	-0.0192
10/1/2022	7098.890137	0.0083
11/1/2022	7081.312988	-0.0025
12/1/2022	6850.619141	-0.0326
1/1/2023	6839.341797	-0.0016
2/1/2023	6843.23877	0.0006
3/1/2023	6805.276855	-0.0055
4/1/2023	6915.71582	0.0162
5/1/2023	6633.26123	-0.0408
6/1/2023	6661.878906	0.0043
7/1/2023	6931.358887	0.0405
8/1/2023	6953.259766	0.0032
9/1/2023	6939.89209	-0.0019
10/1/2023	6752.210938	-0.0270
11/1/2023	7080.741211	0.0487
Average		0.0050

Next, a calculation of the risk-free rate of return was made during the study period. The calculation results are presented in Table 4.

Table 4: Result of Calculation of the Average Risk Free Rate

Date	R_f
17 December 2020	0.0375
21 January 2021	0.0375
18 February 2021	0.0350
18 March 2021	0.0350
20 April 2021	0.0350
25 Mei 2021	0.0350

17 June 2021	0.0350
22 July 2021	0.0350
19 August 2021	0.0350
21 September 2021	0.0350
19 October 2021	0.0350
18 November 2021	0.0350
16 December 2021	0.0350
20 January 2022	0.0350
10 February 2022	0.0350
17 March 2022	0.0350
19 April 2022	0.0350
24 Mei 2022	0.0350
23 June 2022	0.0350
21 July 2022	0.0350
23 August 2022	0.0375
22 September 2022	0.0425
20 October 2022	0.0475
17 November 2022	0.0525
22 December 2022	0.0550
19 January 2023	0.0575
16 February 2023	0.0575
16 March 2023	0.0575
18 April 2023	0.0575
25 Mei 2023	0.0575
22 June 2023	0.0575
25 July 2023	0.0575
24 August 2023	0.0575
21 September 2023	0.0575
19 October 2023	0.0600
23 November 2023	0.0600
Average Risk-Free	0.0438

Next, a systematic risk calculation is carried out for each stock. The calculation results are presented in Table 5. Based on the calculation of this value, all stocks have a positive beta value, which shows the movement of stock prices in the company in the direction of stock price movements in the market.

Table 5: Result of Calculation of Stock Beta

Code	COVAR (R_i, R_m)	VAR (R_m)	β
ANTM	0.0015418	0.000631	2.441594
BRMS	0.0014468	0.000631	2.291139
BRPT	0.0009666	0.000631	1.530627
ESSA	0.0011874	0.000631	1.880371
INCO	0.0013914	0.000631	2.203329
INKP	0.0007166	0.000631	1.13484
INTP	0.000586	0.000631	0.927977
ISSP	0.0007409	0.000631	1.173206
SMGR	0.0005134	0.000631	0.813062
TINS	0.0017595	0.000631	2.786252

Next, the calculation of the expected return is carried out using CAPM. The calculation results are presented in Table 6. From Table 6, it can be seen that TINS stocks that have the highest beta value obtain the lowest expected

return value of -0.0643 because they may experience capital losses. This capital loss can occur when the stock price increases and can cause losses for investors (Rahmah Dewi et al. 2022). On the other hand, SMGR stocks that have the lowest beta value have a high expected return. This indicates an anomaly in the relationship between expected return and beta.

Table 6: Result of Calculation of Expected Rate of Return with CAPM

Code	$E(R_i)$
ANTM	-0.05093
BRMS	-0.04509
BRPT	-0.01558
ESSA	-0.02915
INCO	-0.04168
INKP	-0.00022
INTP	0.007808
ISSP	-0.00171
SMGR	0.012268
TINS	-0.0643

Furthermore, classification and decision-making are carried out based on the value of the expected return and the individual return that has been obtained. The results of the classification are presented in Table 7.

Table 7: Classification of stock and Recommendation

CODE	R_i	$E(R_i)$	Results	Grouping Share	Decision
ANTM	0.0037	-0.05093	$R_i > E(R_i)$	Efficient	Buy
BRMS	0.0400	-0.04509	$R_i > E(R_i)$	Efficient	Buy
BRPT	0.0051	-0.01558	$R_i > E(R_i)$	Efficient	Buy
ESSA	0.0514	-0.02915	$R_i > E(R_i)$	Efficient	Buy
INCO	0.0034	-0.04168	$R_i > E(R_i)$	Efficient	Buy
INKP	0.0007	-0.00022	$R_i > E(R_i)$	Efficient	Buy
INTP	-0.0062	0.007808	$R_i < E(R_i)$	Not efficient	Sell
ISSP	0.0221	-0.00171	$R_i > E(R_i)$	Efficient	Buy
SMGR	-0.0136	0.012268	$R_i < E(R_i)$	Not efficient	Sell
TINS	-0.0179	-0.0643	$R_i > E(R_i)$	Efficient	Buy

Based on Table 7, there are 8 company stocks that are included in the efficient stock (undervalued) with a value of$R_i > E(R_i)$. The stocks included in efficient stocks include: ANTM, BRMS, BRPT, ESSA, INCO, INKP, ISSP, and TINS. The investment decision taken is to buy the shares. Meanwhile, the other 2 company stocks include overvalued stocks with a value of $R_i < E(R_i)$. Companies classified as having inefficient stocks are INTP and SMGR. The investment decision that should be taken by investors is to sell these shares.

4. Conclusion

The results of research that has been conducted using the CAPM method show that there are 8 raw material sector stocks that are included in the efficient category, namely ANTM, BRMS, BRPT, ESSA, INCO, INKP, ISSP, and TINS, which means that the right decision is to buy shares from the company. While INTP and SMGR companies fall into the category of inefficient, which means the right decision is to sell the shares, INTP and SMGR stocks have a beta value of less than 1, which indicates that the company's stock moves slower than the market movement, while other companies move faster than the market movement.

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