SUSTAINABLE : JURNAL AKUNTANSI
Vol. 5, No. 1, Mei, 2025
http://journal.um-surabaya.ac.id/index.php/sustainable/index
http://doi.org/10.30651/stb.v5i1.26265
E-ISSN : 2807-7318, P-ISSN: 2808-3482

ANALYSIS OF THE APPLICATION OF THE CAPITAL ASSET PRICING MODEL (CAPM) AND REWARD TO VARIABILITY RATIO (RVAR) METHODS IN STOCK INVESTMENT DECISION-MAKING

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ABSTRACT

The aim of this research is to analyze the grouping of stocks within the LQ45 index that can be considered in the construction of an investment portfolio using the Capital Asset Pricing Model (CAPM) and Reward to Variability Ratio (RVAR) methods. The CAPM method is used to measure the expected return of a stock based on its systematic risk. Furthermore, the RVAR method is applied to rank stock performance by comparing return levels with associated risk. This research employs a descriptive method with a quantitative approach. The data used includes monthly stock closing prices, IDX Composite as a market proxy, and the risk-free interest rate for the period from February 2020 to January 2025. The analysis results indicate that the top-performing stocks based on the combination of both methods, in order, are PT Alamtri Resources Indonesia Tbk (ADRO), PT Indo Tambangraya Megah Tbk (ITMG), PT Bukit Asam Tbk (PTBA), PT Aneka Tambang Tbk (ANTM), and PT United Tractors Tbk (UNTR).
Keywords: Capital Asset Pricing Model (CAPM); Reward to Variability Ratio (RVAR); stock portfolio; stock return; stock risk

Submitted: May 13, 2025
Revised: May 27, 2025
Accepted: June 3, 2025

INTRDUCTION

Indonesia's economy continues to grow, with investment serving as one of its primary drivers (Paningrum, 2022). The capital market has become an attractive option for investors due to its potential for high returns, despite being accompanied by significant risks. From 1988 to 2024, the number of listed companies in the capital market increased from 24 to 934. Although the COVID-19 pandemic in 2020 created uncertainty and led to a decline in stock prices, the number of investors continued to rise during the 2021–2024 period.

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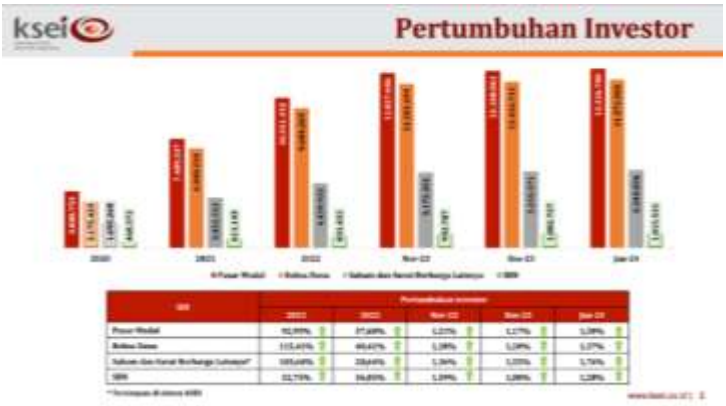

Figure 1. Number of Capital Market Investors in Indonesia (2020-2024)

Investment growth in Indonesia involves various risks, making it essential for investors to assess long-term risk before making decisions. Diversification helps reduce risk and improve returns through effective portfolio management (Febriyanto, 2018). Despite more people entering the market, 85–90% of investors fail due to limited knowledge, lack of access to reliable information, and poor awareness of illegal investments emphasize the need for financial literacy and diversification to avoid losses (Brama, 2019)

Aulia & Ahmad (2022) Investors often struggle to identify stocks with high returns and low risk. The Capital Asset Pricing Model (CAPM) helps analyze risk versus return to determine if a stock is fairly valued. Meanwhile, the Reward to Variability Ratio (RVAR), or Sharpe Ratio, assesses portfolio performance by comparing returns to risk taken (Aulia and Ahmad 2022). Market indices like LQ45 are used as benchmarks to evaluate stock performance.

This study presents a novelty by applying both the CAPM and RVAR methods over a broader time frame, covering the period from economic crisis to post-pandemic recovery. Unlike previous research by Mustika (2021), which focused solely on LQ45 stocks within a short pre-pandemic period, and Kurniawan et al., (2021), which analyzed only four state-owned banks, this study includes 23 companies from various sectors. This broader scope makes the findings more representative and relevant to current market conditions.

This study covers a time span from the economic crisis, through the recovery period, to a phase of economic stability Given the continued relevance of CAPM and RVAR, this research

E-ISSN : 2807-7318, P-ISSN: 2808-3482

aims to guide investors in making better stock investment decisions. The study is titled: "Analysis Of The Application Of The Capital Asset Pricing Model (CAPM) And Reward To Variability Ratio (RVAR) Methods In Stock Investment Decision-Making (Case Study: Companies Listed on the LQ45 Index on the Indonesia Stock Exchange from February 2020 – January 2025)."

LIERATURE REVIEW

1. Markowitz Portfolio Theory

   Harry Markowitz introduced the Mean-Variance Model in 1952, forming the foundation of modern portfolio theory. This approach highlights the need to balance risk and return when investing, with diversification—allocating assets across different investments—being a core strategy to reduce potential losses, aligning with the idea of not placing all resources in one option (Tandelilin, 2017). The theory also assumes that investors will choose a portfolio with the highest expected return and the lowest risk. Therefore, the higher the potential return of an investment, the greater the associated risk (Simorangkir, 2021).

2. Stock Return

   Return reflects the yield on investment risk and indicates the expected return rate (Desiyanti, 2017). According to Mardiah & Wana (2020), stock return is the profit obtained from stock investment activities. Return consists of two main components: yield, which refers to regular income such as dividends or interest, and capital gain (or loss), which represents changes in the value of financial instruments that result in profit or loss (Tandelilin, 2017). Hartono (2019) classifies return into three types: realized return, which is derived from historical data; expected return, which is predictive in nature; and total return, which includes the overall investment results within a specific period.

3. Risk

   Risk in investment refers to the difference between the expected return and the actual return achieved, as well as the potential for failure or deviation from the

E-ISSN : 2807-7318, P-ISSN: 2808-3482

predicted results (Desiyanti, 2017). Sudarmadji (2022) defines risk as a measure of deviation between the expected and realized return, where the larger the difference, the higher the level of risk faced. Thus, risk reflects the likelihood of a discrepancy between the expected and received return, with a larger discrepancy indicating higher risk.

4. Capital Asset Pricing Model (CAPM)

   The Capital Asset Pricing Model (CAPM) is a model used to assess the pricing of capital assets by considering their characteristics and risk levels. This model aims to measure the inefficiency of portfolio risk in the capital market, represented by β (beta) (Adnyana 2020).

5. Reward to Variability Rasio (RVAR)

   The Reward to Variability Ratio, or Sharpe Index, evaluates how effectively a portfolio manages risk in relation to return. A high return isn't always ideal if it comes with high risk, while a modest return may still be favorable if risk is low. This ratio helps compare and rank portfolios, with a higher value indicating stronger overall performance (Tandelilin, 2017).

METHOD

This study uses a descriptive type with a quantitative approach, which aims to describe the data as it is without making generalizations or drawing conclusions that apply universally (Siyoto 2015). The quantitative method includes the following steps:

1. Capital Assets Pricing Model (CAPM)

   1) Calculating individual return (Ri)

$$R_i = \frac{(P_t - P_{t-1}) + D_t}{P_{t-1}}$$

Explanation:
R_i : Return of stock i
P_t : Stock price at the end of the period

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P_{t-1} : Stock price at the beginning of the period
D_t : Dividend received during the period

2) Calculating market return (Rm)

$$R_m = \frac{IHSG_t - IHSG_{t-1}}{IHSG_{t-1}}$$

Explanation:

R_m : Market Return
$IHSG_i$: Composite Stock Price Index in the current period
$IHSG_{t-1}$: Composite Stock Price Index in the previous period

3) Calculating risk-free return (Rf)

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

Explanation:

R_f : Risk-free Return
$\sum R_f$: Total of risk-free returns over the observation period
N : Number of observation periods (months) in a year

4) Calculating the systematic risk of each stock (β_i)

$$\beta i = \frac{\sum_{t=1}^{n}(R_{it} - \overline{R_{it}}) \,.\, (R_{mt} - \overline{R_{mt}})}{\sum_{t=1}^{n}(R_{mt} - \overline{R_{mt}})^2}$$

Explanation:

βi : Systematic risk (beta) of individual stock i at time t
R_{it} : Return of individual stock i at time t
$\overline{R_{it}}$: Average return of individual stock i
R_{mt} : Market return at time t
$\overline{R_{mt}}$: Rata-rata Tingkat pengembalian pasar waktu t

5) Calculating expected return [E(R_i)].

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$$E(R_i) = R_f + \beta_i [E(R_m) - R_f$$

Explanation:

$E(R_i)$: Expected Return

R_f : Risk-free rate

$E(R_m)$: Expected return of the market portfolio

6) Categorizing efficiency and investment decision-making in stocks

2. Reward to Variability Ratio (RVAR)

The calculation of the RVAR is performed by dividing the excess return by the level of return variability in the portfolio.

The formula used to calculate the Reward to Variability Ratio is as follows:

$$RVAR = \frac{\overline{TR_p} - \overline{R_{BR}}}{\sigma_p}$$

Explanation:

$RVAR$: *Reward to Variability Ratio* or indeks Sharpe

$\overline{TR_p}$: The average return of portfolio p during the observation period

$\overline{R_{BR}}$: The average risk-free rate of return during the observation period

σ_p : The standard deviation of portfolio p's return during the observation period

$\overline{TR_p - R_{BR}}$: Excess return portfolio

RESULT AND DISCUSSION

1. Capital Asset Pricing Model (CAPM)

a) Individual Stock Return (Ri)

Based on the calculations, the stock with the highest individual return (Ri) is PT. Indo Tambangraya Megah Tbk, which recorded a value of 0.03550 or 3.55%. This indicates that the stock experienced a significant price increase or paid out a relatively large dividend during that period compared to other stocks.

E-ISSN : 2807-7318, P-ISSN: 2808-3482

b) Market Return (Rm)

The highest market return during the study period reached 9.44% in November 2020. This increase was driven by a significant surge in the IHSG value, which rose from Rp 5,128.225 in October 2020 to Rp 5,612.415 in November 2020, marking an increase of 484.190 points.

c) Risk-free Return

Based on Table 3 above, it shows that the average annual risk-free return in Indonesia is 0.04750 or 4.75%, while the average monthly return is 0.00396 or 0.40%. The risk-free return in the Capital Asset Pricing Model (CAPM) calculation uses the monthly average because all historical data in this study is calculated on a monthly basis.

d) Systematic Risk of Each Stoc (β_i)

Table 1 Systematic Risk (β)

Periode Februari 2020 – January 2025

No	Issuer Code	Issuer Name	Beta
1	ADRO	Alamtri Resources Indonesia Tb	1,022
2	ANTM	Aneka Tambang Tbk	2,326
3	ASII	Astra International Tbk	1,293
4	BBCA	Bank Central Asia Tbk	0,910
5	BBNI	Bank Negara Indonesia Tbk	2,129
6	BBRI	Bank Rakyat Indonesia Tbk	1,572
7	BBTN	Bank Tabungan Negara Tbk	2,562
8	BMRI	Bank Mandiri Tbk	1,609
9	CPIN	Charoen Pokphand Indonesia	0,319
10	EXCL	XL Axiata Tbk	1,068
11	ICBP	Indofood CBP Sukses Makmur	0,029
12	INCO	Vale Indonesia Tbk	1,267
13	INDF	Indofood Sukses Makmur Tbk	0,192
14	INKP	Indah Kiat Pulp & Paper	1,405
15	INTP	Indocement Tunggal Prakarsa	0,974
16	ITMG	Indo Tambangraya Megah Tbk	1,783
17	KLBF	Kalbe Farma Tbk	0,230

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18	PGAS	Perusahaan Gas Negara Tbk	2,112
19	PTBA	Bukit Asam Tbk	0,885
20	SMGR	Semen Indonesia Tbk	1,492
21	TLKM	Telkom Indonesia Tbk	1,022
22	UNTR	United Tractors Tbk	0,880
23	UNVR	Unilever Indonesia Tbk	-0,225

Source: Data Processed by the researcher, 2025

The results in Table 1 show that the majority of the sample stocks, 14 out of 23, have a beta greater than 1, indicating a high level of risk. The stock of Bank Tabungan Negara Tbk (BBTN) has the highest beta of 2.562, which indicates that this stock is aggressive and highly responsive to market changes.

e) Expected Return [E(R_i)]

Table 2 Expected Return [E(Ri)]

Periode Februari 2020 – January 2025

No	Issuer Code	Issuer Name	Rf	Bi	E(Rm)	E(Rm) - Rf	Bi [E(Rm) - Rf]	E(Ri)
1	ADRO	Alamtri Resources Indonesia Tb	0,00396	1,023	0,0052	0,00122	0,00125	0,00521
2	ANTM	Aneka Tambang Tbk	0,00396	2,326	0,0052	0,00122	0,00284	0,00680
3	ASII	Astra International Tbk	0,00396	1,293	0,0052	0,00122	0,00158	0,00554
4	BBCA	Bank Central Asia Tbk	0,00396	0,910	0,0052	0,00122	0,00111	0,00507
5	BBNI	Bank Negara Indonesia Tbk	0,00396	2,129	0,0052	0,00122	0,00260	0,00656
6	BBRI	Bank Rakyat Indonesia Tbk	0,00396	1,572	0,0052	0,00122	0,00192	0,00588
7	BBTN	Bank Tabungan Negara Tbk	0,00396	2,562	0,0052	0,00122	0,00313	0,00708
8	BMRI	Bank Mandiri Tbk	0,00396	1,609	0,0052	0,00122	0,00196	0,00592
9	CPIN	Charoen Pokphand Indonesia	0,00396	0,319	0,0052	0,00122	0,00039	0,00435
10	EXCL	XL Axiata Tbk	0,00396	1,068	0,0052	0,00122	0,00130	0,00526
11	ICBP	Indofood CBP Sukses Makmur	0,00396	0,029	0,0052	0,00122	0,00003	0,00399

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12	INCO	Vale Indonesia Tbk	0,00396	1,267	0,0052	0,00122	0,00155	0,00550
13	INDF	Indofood Sukses Makmur Tbk	0,00396	0,192	0,0052	0,00122	0,00023	0,00419
14	INKP	Indah Kiat Pulp & Paper	0,00396	1,405	0,0052	0,00122	0,00171	0,00567
15	INTP	Indocement Tunggal Prakarsa	0,00396	0,974	0,0052	0,00122	0,00119	0,00515
16	ITMG	Indo Tambangraya Megah Tbk	0,00396	1,783	0,0052	0,00122	0,00218	0,00613
17	KLBF	Kalbe Farma Tbk	0,00396	0,230	0,0052	0,00122	0,00028	0,00424
18	PGAS	Perusahaan Gas Negara Tbk	0,00396	2,112	0,0052	0,00122	0,00258	0,00654
19	PTBA	Bukit Asam Tbk	0,00396	0,885	0,0052	0,00122	0,00108	0,00504
20	SMGR	Semen Indonesia Tbk	0,00396	1,492	0,0052	0,00122	0,00182	0,00578
21	TLKM	Telkom Indonesia Tbk	0,00396	1,022	0,0052	0,00122	0,00125	0,00521
22	UNTR	United Tractors Tbk	0,00396	0,880	0,0052	0,00122	0,00107	0,00503
23	UNVR	Unilever Indonesia Tbk	0,00396	-0,225	0,0052	0,00122	-0,00027	0,00368
			TOTAL					0,12380
			AVERAGE					0,00538

Source: Data Processing, 2025

Table 2 shows the results of the E(Ri) calculation using the CAPM approach for 23 sample companies, with an average expected return of 0.00538 or 0.54%. The highest value of 0.00708 (0.71%) is held by BBTN stock, while the lowest value of 0.00368 (0.37%) is held by UNVR stock. This difference aligns with the differences in beta values, where the higher the risk, the higher the expected return.

f) Classification of Stock Efficiency

Stocks are classified as efficient if their actual return (Ri) exceeds the expected return [E(Ri)]. The illustration in the following figure aims to show the comparison between the actual return of each stock (Ri) and the estimated return [E(Ri)].

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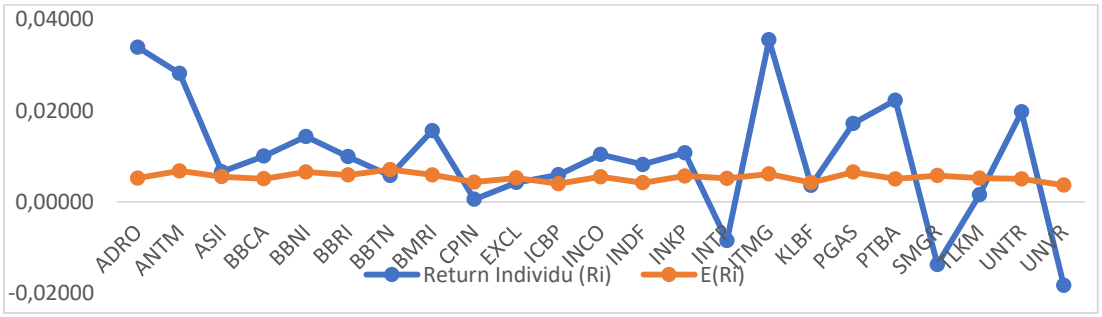

Source: Data Processing, 2025

Table 3: Classification of Efficiency and Investment Decisions of Stocks

Issuer Code	Issuer Name	Individual Return (Ri)	E(Ri)	Stock Evaluation	Decition
ADRO	Alamtri Resources Indonesia Tbk	0,03390	0,00520	Efficient	Buy (*Underpriced*)
ANTM	Aneka Tambang Tbk	0,02816	0,00680	Efficient	Buy (*Underpriced*)
ASII	Astra International Tbk	0,00662	0,00554	Efficient	Buy (*Underpriced*)
BBCA	Bank Central Asia Tbk	0,01004	0,00507	Efficient	Buy (*Underpriced*)
BBNI	Bank Negara Indonesia Tbk	0,01432	0,00656	Efficient	Buy (*Underpriced*)
BBRI	Bank Rakyat Indonesia Tbk	0,00991	0,00588	Efficient	Buy (*Underpriced*)
BBTN	Bank Tabungan Negara Tbk	0,00576	0,00708	Inefficient	Sell (*Overpriced*)
BMRI	Bank Mandiri Tbk	0,01561	0,00592	Efficient	Buy (*Underpriced*)
CPIN	Charoen Pokphand Indonesia	0,00058	0,00435	Inefficient	Sell (*Overpriced*)
EXCL	XL Axiata Tbk	0,00425	0,00526	Inefficient	Sell (*Overpriced*)
ICBP	Indofood CBP Sukses Makmur	0,00593	0,00399	Efficient	Buy (*Underpriced*)
INCO	Vale Indonesia Tbk	0,01040	0,00550	Efficient	Buy (*Underpriced*)
INDF	Indofood Sukses Makmur Tbk	0,00819	0,00419	Efficient	Buy (*Underpriced*)
INKP	Indah Kiat Pulp & Paper	0,01077	0,00567	Efficient	Buy (*Underpriced*)
INTP	Indocement Tunggal Prakarsa	-0,00847	0,00515	Inefficient	Sell (*Overpriced*)
ITMG	Indo Tambangraya Megah Tbk	0,03550	0,00613	Efficient	Buy (*Underpriced*)
KLBF	Kalbe Farma Tbk	0,00365	0,00424	Inefficient	Sell (*Overpriced*)
PGAS	Perusahaan Gas Negara Tbk	0,01719	0,00654	Efficient	Buy (*Underpriced*)
PTBA	Bukit Asam Tbk	0,02227	0,00504	Efficient	Buy (*Underpriced*)
SMGR	Semen Indonesia Tbk	-0,01370	0,00578	Inefficient	Sell (*Overpriced*)
TLKM	Telkom Indonesia Tbk	0,00155	0,00521	Inefficient	Sell (*Overpriced*)

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UNTR	United Tractors Tbk	0,01973	0,00503	Efficient	Buy (*Underpriced*)
UNVR	Unilever Indonesia Tbk	-0,01825	0,00368	Inefficient	Sell (*Overpriced*)

Source: Data Processed by the researcher, 2025

From the 23 companies analyzed in this study, 15 stocks (65.22%) were identified as efficient, meaning their actual returns exceeded expected returns during the February 2020 to January 2025 period. The remaining 8 stocks—including Bank Tabungan Negara Tbk, Charoen Pokphand Indonesia, and Unilever Indonesia Tbk—were deemed inefficient, as their actual returns fell below expectations. Investors are advised to buy efficient (underpriced) stocks and consider selling inefficient (overpriced) ones before potential value corrections occur.

2. Reward to Variability Ratio (RVAR)

Reward to Variability Ratio (RVAR) is one of the approaches used to evaluate the performance of stock investments or portfolios. This method aims to measure the extent to which the return earned by investors is proportional to the total risk borne, which in this case is represented by the standard deviation of the return.

Table 4 RVAR Calculation

Periode Februari 2020 – January 2025

Issuer Code	Ri	Rf	Excess Return	Std Deviasi	RVAR	Rank
	a	b	(a-b)			
ADRO	0,03334	0,00396	0,02938	0,1143	0,2570	1
ITMG	0,03491	0,00396	0,03095	0,1374	0,2252	2
PTBA	0,02190	0,00396	0,01794	0,1009	0,1779	3
ANTM	0,02769	0,00396	0,02374	0,1551	0,1531	4
UNTR	0,01940	0,00396	0,01544	0,1024	0,1507	5
BMRI	0,01535	0,00396	0,01139	0,0862	0,1322	6
BBCA	0,00988	0,00396	0,00592	0,0522	0,1134	7
PGAS	0,01690	0,00396	0,01294	0,1257	0,1030	8
BBNI	0,01408	0,00396	0,01012	0,1085	0,0933	9
INDF	0,00806	0,00396	0,00410	0,0555	0,0738	10
BBRI	0,00974	0,00396	0,00579	0,0974	0,0594	11
INCO	0,01023	0,00396	0,00627	0,1133	0,0553	12
INKP	0,01059	0,00396	0,00663	0,1233	0,0538	13

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ASII	0,00651	0,00396	0,00255	0,0863	0,0296	14
ICBP	0,00584	0,00396	0,00188	0,0665	0,0282	15
BBTN	0,00567	0,00396	0,00171	0,1464	0,0117	16
EXCL	0,00418	0,00396	0,00022	0,1026	0,0022	17
KLBF	0,00359	0,00396	-0,00037	0,0539	-0,0068	18
TLKM	0,00153	0,00396	-0,00243	0,0661	-0,0368	19
CPIN	0,00057	0,00396	-0,00338	0,0751	-0,0451	20
INTP	-0,00833	0,00396	-0,01229	0,0907	-0,1354	21
SMGR	-0,01347	0,00396	-0,01743	0,1109	-0,1571	22
UNVR	-0,01795	0,00396	-0,02191	0,0751	-0,2916	23

Source: Data Pricessing, 2025

Based on Table 4, Adaro Energy Tbk (ADRO) achieved the highest RVAR value at 0.2570 or 25.70%, indicating the most favorable risk-adjusted performance among the 23 LQ45-listed stocks. This means that for every 1% of risk, ADRO offers an excess return of 25.70%, making it a strong candidate for investment. According to Markowitz's Portfolio Theory, investors should not focus solely on returns but must also consider risk and diversification. RVAR, as a risk-adjusted return measure, aligns with this theory by highlighting stocks that provide optimal returns for a given level of risk. The top five stocks—ADRO, ITMG, PTBA, ANTM, and UNTR—demonstrate efficient risk-return profiles and can be considered for portfolio inclusion to enhance performance. Conversely, stocks like UNVR, which showed a declining RVAR due to factors such as product boycotts and declining sales, reflect higher risk without sufficient return, making them less desirable. Thus, integrating RVAR rankings into investment decisions supports the core principle of modern portfolio theory: maximizing returns while minimizing risk through informed selection.

CONCLUSION

Between February 2020 and January 2025, the average return of 23 stocks is 0.00974 outperformed the market 0.0052. PT Bank Tabungan Negara Tbk (BBTN) had the highest beta and expected return, while PT Unilever Indonesia Tbk had the lowest. Based on CAPM, 15 stocks were efficient (actual return > expected return), including ADRO, ANTM, BBCA, and UNTR. However, since CAPM only identifies efficient stocks, RVAR was used to rank and

E-ISSN : 2807-7318, P-ISSN: 2808-3482

select the most optimal ones for portfolio formation. The top five based on RVAR—ADRO, ITMG, PTBA, ANTM, and UNTR—offered the best risk-adjusted returns.

Investors and prospective investors are advised not to focus solely on high returns when selecting stocks but also to consider the associated risks and efficiency as reflected in CAPM and RVAR values. A combined approach using CAPM to identify efficient stocks and RVAR to construct optimal portfolios enables more rational investment decisions. For future studies, it is recommended to broaden the sample size, extend the observation period, and explore additional models like the Treynor Ratio or Jensen's Alpha for deeper, more comprehensive analysis.

E-ISSN : 2807-7318, P-ISSN: 2808-3482

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