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Comparing Optimal Portfolios: Markowitz vs Single Index Models for IDX High Dividend 20 Stocks (2022)

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Abstract

This study aims to implement portfolio models using the Markowitz Model and Single Index Model, and to qualitatively compare the portfolios formed by these two models. A quantitative descriptive approach is employed. The study focuses on a population of 24 companies listed in the IDX High Dividend 20 stock index for the year 2022. The optimal portfolio formation through the Single Index Model results in 5 candidate companies: ADRO (36.06%), BBCA (12.87%), BBNI (22.34%), BBRI (21.86%), ITMG (6.87%) with a return of 3.44% and a portfolio risk of 0.23%. Meanwhile, the Markowitz Model results in 6 candidate companies: ADRO (18.81%), BBCA (2.21%), INDF (20.25%), ITMG (12.75%), KLBF (40.82%), UNVR (4.86%) with a return of 2.89% and a portfolio risk of 0.10%.

Keywords: *IDX High Dividend 20, Markowitz Model, Single Index Model, Optimal Portfolio*

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1. Introduction

Investment is the act of allocating money or capital in the present with the goal of generating profits in the future. Investment decisions typically involve managing funds over a specific period, whether short-term or long-term. Prior to making an investment, investors are expected to conduct analyses and calculations to ensure that the investment can yield optimal returns with minimal risks. One of the investment options available to investors is stocks. Stock prices reflect a company's value (Risman et al., 2017; 2021). Therefore, stock prices fluctuate in line with the developments and prospects of the respective companies. As such, investing in stocks can provide returns in the form of capital gains and dividend yields, but it also comes with associated risks.

Investors often employ diversification as a strategy to allocate capital with the aim of mitigating potential risks and maximizing returns. Diversification involves creating a portfolio by selecting a combination of specific assets in a way that minimizes risk without reducing the expected return.

According to Nurdianingsih & Suryadi (2021), a portfolio is a collection of stock investments that offer maximum returns within a specific level of risk. Optimal portfolios can be formed using various methods, including the Markowitz Model and the Single Index Model. The Markowitz Method creates an optimal portfolio by minimizing risk while determining the expected return, whereas the Single Index Model creates an optimal portfolio by maximizing the comparison between the expected return and the portfolio's risk.

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Investors who make careful calculations are likely to choose an optimal portfolio by measuring the level of risk and the expected return associated with their investment portfolio. Therefore, this research utilizes the IDX High Dividend 20 stock index. In the stock market, the IDX High Dividend 20 stock index comprises stocks that consistently distribute dividends with high yields. Consequently, this study aims to apply portfolio formation models using the Markowitz Model and the Single Index Model. Additionally, it seeks to make a qualitative comparison of the portfolios formed using both models.

1.1. Stocks

Stocks represent ownership in a company or limited liability corporation. It can also be said that stocks are one of the most favored forms of investment instruments by investors. Apart from the advantages, stock investments also come with disadvantages such as capital loss, non-distribution of dividends, fluctuating prices in accordance with market mechanisms, suspension and/or delisting, and bankruptcy of the company (www.idx.co.id, 2023).

One of the reasons investors engage in investments is to obtain returns. Return is the result, income, or compensation from an investment. According to Jogiyanto (2017), returns can be of various types: Realized Return, Expected Return, Market Return Rate, and Risk-Free Return Rate.

1.2. Stock Indices

Stock indices are statistical measures that reflect the overall movement of prices selected based on specific criteria and methodologies and are periodically evaluated. The IDX High Dividend 20 stock index measures the price performance of 20 stocks that have distributed cash dividends over the last 3 years and have high dividend yields (www.idx.co.id, 2023).

1.3. Optimal Portfolio

According to Hadi (2013), a portfolio is a collection of investment instruments formed to meet a general investment objective. Stock diversification is done with the aim of minimizing risk without reducing the expected return. According to Jogiyanto (2017), an optimal portfolio is a portfolio that provides the highest combination of returns with the lowest risk.

1.4. Markowitz Model

The Markowitz method calculates optimal risk according to investor preferences, whether they favor risk (risk-taker) or are risk averse (Anam et al., 2021). The Markowitz Model is a portfolio determination model that emphasizes the relationship between investment return and risk. Markowitz is based on a mean (average) and variance (variability) approach, where the mean measures the level of return, and variance measures the level of risk (Hasbiah et al., 2022).

1.5. Single Index Model

As stated by Zubir (2011), the Single Index Model is a technique for measuring the return and risk of a stock or portfolio. This model assumes that stock return movements are only related to market movements. According to Jogiyanto (2017), the Single Index Model (SIM) describes the relationship between the return of each individual stock and the market return (Rm).

2. Methods

In this research, a qualitative descriptive method with a comparative approach was employed. The data used was obtained through a documentary study of secondary data. The secondary data in this study consisted of the closing stock prices, JCI (Jakarta Composite Index), and the BI-7 Day Repo Rate, for the research year, which was 2022. The population used in this research included companies that were part of the IDX High Dividend 20 stock index, totaling 24 companies during the 2022 period. Sample selection was conducted using purposive sampling, a sampling technique based on specific considerations. The sample in this research consisted of 16 companies, determined based on the following criteria:

- Companies consistently included in the IDX High Dividend 20 stock index in the year 2022.
- Companies that did not undergo stock splits during the research period.
- Companies actively traded and not subject to suspension by the Indonesia Stock Exchange during the research period.

3. Result

3.1. Calculating the Realized Return (Ri) and Expected Return (E(Ri))

Realized return is the profit or loss that has occurred from investment activities over a specific period. On the other hand, the expected return represents the level of profit anticipated by investors from their investments. The calculation of the realized return and expected return values is done using the following formulas:

Realized Return:

$$R_i = \frac{P_t - P_{t-1}}{P_{t-1}}$$

Expected Return:

$$E(R_i) = \frac{\sum_{i=1}^{n} R_i}{n}$$

Based on the formulas above, the values of the realized stock return and expected stock return for each issuer are obtained as shown in Table 1.

Table 1. Realized Return and Expected Return

No	Stock	Realized Return	Expected Return	No	Stock	Realized Return	Expected Return
1	ADRO	0,59904291	0,04992024	9	INDF	0,07556572	0,00629714
2	ASII	0,04025791	0,00335483	10	ITMG	0,75367083	0,06280590
3	BBCA	0,17661536	0,01471795	11	KLBF	0,27013472	0,02251123
4	BBNI	0,34806957	0,02900580	12	PTBA	0,36718334	0,03059861
5	BBRI	0,20363876	0,01696990	13	TLKM	-0,05568346	-0,00464029
6	BMRI	0,37372510	0,03114376	14	TOWR	-0,00479444	-0,00039954
7	CPIN	-0,03072653	-0,00256054	15	UNTR	0,21220358	0,01768363
8	HMSP	-0,10103779	-0,00841982	16	UNVR	0,16531891	0,01377658

Source: Processing Results, 2023

Table 2. Realized Return Market and Expected Return Market

No	Period	Realized Return Market
1	January	0,00754677
2	February	0,03875949
3	March	0,02660663
4	April	0,02226875
5	May	-0,01105890
6	June	-0,03320593
7	July	0,00572098
8	August	0,03272375
9	September	-0,01919486
10	October	0,00825081
11	November	-0,00247604
12	December	-0,03257784
	Total Return (Rm)	0,04336361
	Expected Return (E(Rm))	0,00361363

Realized Return Market (JCI):

$$R_m = \frac{R_{mt} - R_{mt-1}}{R_{mt-1}}$$

Expected Return Market (JCI):

$$E(R_m) = \frac{\sum_{i=1}^{n} R_m}{n}$$

Based on the formulas above, the values of the realized return market and expected return market are obtained as shown in Table 2.

3.2. Calculating the Variance and Standard Deviation of Stocks, as well as the Variance and Standard Deviation of the Marke

Every investment instrument carries a different level of risk, and variance is used to measure the level of risk or deviation from the expected return. The larger the variance value, the higher the risk associated with the investment. On the other hand, standard deviation serves as a measure of how much deviation might be expected from the expected return value. The calculations for variance and standard deviation are done using the following formulas:

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Variance and Std. Deviation:

$$\sigma_i^2 = \sum_{t=1}^{n} \frac{\left(R_i - E(R_i)\right)^2}{n}$$

$$\sigma_i = \sqrt{\sigma_i^2}$$

Market Variance and Std. Deviation:

$$\sigma_m^2 = \sum_{t=1}^{n} \frac{\left(R_m - E(R_m)\right)^2}{n}$$

$$\sigma_m = \sqrt{\sigma_m^2}$$

Based on the calculation results, the variance and standard deviation values for each stock and the market are obtained as shown in Table 3.

3.3. Optimal Portfolio using Single Index Model

The optimal portfolio formed using the Single Index Model aims to maximize the trade-off between the expected return and the risk of the portfolio. Several steps are involved in creating a portfolio using the Single Index Model, including:

3.3.1. Calculating Beta, Alpha, and Residual Variance

The calculation of Beta (β) is used to measure the volatility of the realized returns of a stock concerning the realized returns of the market during a specific period. The Beta value is

Table 3. Variance and Std. Deviation

No	Stock	Variance	Std. Deviation
1	ADRO	0.00870816	0.09331750
2	ASII	0.00693135	0.08325475
3	BBCA	0.00293296	0.05415678
4	BBNI	0.00511509	0.07151987
5	BBRI	0.00304055	0.05514120
6	BMRI	0.00394313	0.06279433
7	CPIN	0.00349678	0.05913360
8	HMSP	0.00617307	0.07856890
9	INDF	0.00234589	0.04843441
10	ITMG	0.01578789	0.12564989
11	KLBF	0.00167240	0.04089496
12	PTBA	0.00924391	0.09614527
13	TLKM	0.00307004	0.05540794
14	TOWR	0.00295626	0.05437151
15	UNTR	0.00805940	0.08977414
16	UNVR	0.00545948	0.07388827
17	Market (JCI)	0.00053657	0.02316397

Source: Processing Results, 2023

considered to gauge the risk of the stock, particularly its systematic risk. The higher the fluctuation between the realized returns of the stock and the market, the higher the risk. On the other hand, Alpha (α) represents the portion of a stock's realized return that is not influenced by market changes. Beta and Alpha are used to calculate the Residual Variance (σ_{ei}^2), where the residual variance represents the unsystematic risk that is unique to each stock. The formulas for calculating Beta, Alpha, and Residual Variance are as follows:

Beta and Alpha:

$$\beta_i = \frac{\sum_{t=1}^{n} (R_i - E(R_i)) \, . \, (R_m - E(R_m))}{\sum_{t=1}^{n} (R_m - E(R_m))^2}$$

$$\alpha_i = E(R_i) - (\beta_i \, . \, E(R_m))$$

Residual Variance:

$$\sigma_{ei}^2 = \sum_{t=1}^{n} [R_i - \alpha_i + (\beta_i \, . \, R_m)]^2$$

Based on the calculation results, the values of Beta, Alpha, and Residual Variance for each stock are obtained as shown in Table 4.

3.3.2. Calculating the Risk-Free Rate

In this study, the risk-free rate is determined using the average Bi 7-Day Repo Rate for the year 2022, as calculated according to Table 5.

Table 4. Beta, Alpha, and Residual Variance

No	Stock	Beta	Alpha	Residual Variance
1	ADRO	2.41024189	0.04121051	0.01182523
2	ASII	2.89021829	-0.00708937	0.01141351
3	BBCA	1.62352826	0.00885111	0.00434727
4	BBNI	2.41599115	0.02027529	0.00824705
5	BBRI	1.43691155	0.01177742	0.00414841
6	BMRI	1.68975284	0.02503761	0.00547518
7	CPIN	-1.13761940	0.00155040	0.00419120
8	HMSP	1.20173215	-0.01276244	0.00694796
9	INDF	-1.04877130	0.01008702	0.00293608
10	ITMG	2.08578353	0.05526864	0.01812224
11	KLBF	-0.12699252	0.02297013	0.00168105
12	PTBA	1.89666100	0.02374477	0.01117413
13	TLKM	1.92184747	-0.01158514	0.00505186
14	TOWR	-0.18228275	0.00025917	0.00297409
15	UNTR	2.79139030	0.00759657	0.01224027
16	UNVR	-0.93042053	0.01713878	0.00592397

Source: Processing Results, 2023

Table 5. Risk-Free Rate (R_f)

No	Period	BI 7-Day
1	January	3.50%
2	February	3.50%
3	March	3.50%
4	April	3.50%
5	May	3.50%
6	June	3.50%
7	July	3.50%
8	August	3.75%
9	September	4.25%
10	October	4.75%
11	November	5.25%
12	December	5.50%
	Total	48.00%
	Average	4.00%
	Monthly Risk-Free Rate	0.003333333

Source: Processing Results, 2023

3.3.3. Calculating Excess Return to Beta (ERB)

Excess Return to Beta is the difference between the expected return and the risk-free return on an investment, considering the Beta value. The formula for calculating Excess Return to Beta is as follows:

$$ERB_i = \frac{E(R_i) - R_f}{\beta_i}$$

Based on the calculation results, the values of Excess Return to Beta for each issuer are obtained, as shown in Table 6.

3.3.4. Calculating Ai, Bi, and Ci

The calculation of Ai, Bi, and Ci is used to determine the Cut off Rate (C*) for each stock. The values of Ai, Bi, and Ci are calculated using the following formulas:

$$A_i = \frac{\left[E(R_i) - R_f\right] . \beta_i}{\sigma_{ei}^2} \qquad B_i = \frac{\beta_i^2}{\sigma_{ei}^2} \qquad C_i = \frac{\sigma_m^2 \sum_{j=1}^{i} A_j}{1 + \sigma_m^2 \sum_{j=1}^{i} B_j}$$

Based on the calculation results, the values of Ai, Bi, and Ci for each stock are obtained as shown in Table 7.

3.3.5. Determining the Cut-off Point (C*)

The Cut-off Point (C*) is the threshold value used to determine whether a stock will be included in the optimal portfolio or not. The value of C* is the highest value of Ci among all the values calculated for each issuer in the previous calculations. Therefore, the C* value used is the Ci value held by PT Adaro Energy Indonesia Tbk, which is 0.00403211.

3.3.6. Determining the Stocks Included in the Optimal Portfolio

Stocks included in the optimal portfolio are those with an Excess Return to Beta (ERB) value greater than the Cut-off Point (C*). Additionally, the βi value must be positive to avoid negative proportions in the subsequent calculations. Based on these criteria, 5 stocks are identified as candidates for the optimal portfolio. More detailed information about the stocks included in the candidate optimal portfolio can be found in Table 8.

3.3.7. Calculating the Investment Allocation Proportions (Zi and Wi)

The calculation of investment allocation proportions is performed by determining the values of Zi and Wi using the following formulas:

$$Z_i = \frac{\beta_i}{\sigma_{ei}^2}\,(ERB_i - C*) \qquad W_i = \frac{Z_i}{\sum_{j=1}^{k} Z_j}$$

Table 6. Excess Return to Beta

No	Stock	Excess Return to Beta
1	ADRO	0.01932873
2	ASII	0.00000744
3	BBCA	0.00701227
4	BBNI	0.01062606
5	BBRI	0.00949019
6	BMRI	-0.00348801
7	CPIN	0.01033135
8	HMSP	0.00246628
9	INDF	-0.05670690
10	ITMG	0.00919458
11	KLBF	-0.21469988
12	PTBA	-0.00420403
13	TLKM	-0.00194233
14	TOWR	-0.07872549
15	UNTR	0.00374123
16	UNVR	-0.00030126

Source: Processing Results. 2023

Table 7. Values of Ai, Bi, and Ci

No	Stock	Ai	Bi	Ci
1	ADRO	9,49543595	491,26026963	0,00403211
2	ASII	0,00544259	731,88364596	0,00000210
3	BBCA	4,25168905	606,32162996	0,00172132
4	BBNI	7,52079994	707,76946518	0,00292472
5	BBRI	4,72337964	497,71181336	0,00200024
6	BMRI	-1,81897290	521,49278300	-0,00076261
7	CPIN	3,19016377	308,78466316	0,00146845
8	HMSP	0,51262576	207,85371561	0,00024746
9	INDF	-21,24370373	374,62290487	-0,00949094
10	ITMG	2,20728479	240,06381777	0,00104921
11	KLBF	-2,05971545	9,59346323	-0,00109952
12	PTBA	-1,35341740	321,93325984	-0,00061924
13	TLKM	-1,42007299	731,11679142	-0,00054727
14	TOWR	-0,87953371	11,17215922	-0,00046912
15	UNTR	2,38157891	636,57588163	0,00095253
16	UNVR	-0,04402416	146,13202321	-0,00002190

Source: Processing Results, 2023

Based on the calculation results, the values of Zi and Wi for each stock are obtained, as shown in Table 9.

3.3.8. Calculating the Expected Return Portfolio and Risk Portfolio

The calculation of the expected return portfolio and risk portfolio is used to determine the level of return and risk that will be obtained according to the optimal portfolio that has been found. The calculation of beta, alpha, expected return, and risk of the portfolio uses the following formulas:

$$\beta_p = \sum_{i=0}^{n} W_i \,.\, \beta_i \qquad \alpha_p = \sum_{i=0}^{n} W_i \,.\, \alpha_i$$

$$E(R_p) = \alpha_p + \beta_p \,.E(R_m) \qquad \sigma_p^2 = \beta_p^2 \,.\sigma_m^2$$

Based on the calculation results, the values of Beta, Alpha, Expected Return, and Risk of the Portfolio are as shown in Table 10.

3.3.9. Optimal Portfolio using Markowitz Model

The Markowitz Model aims to minimize risk while determining the expected return level. Based on the previous calculations, some stocks with negative expected returns (as seen in Table 1) are not included in the formation of the optimal portfolio using the Markowitz Model.

Table 8. Values of Ai, Bi, and Ci

No	Stock	ERB	Ci	C*	Decision
1	ADRO	0.01932873	0,00403211	0,00403211	Optimal
2	ASII	0.00000744	0,00000210	0,00403211	-
3	BBCA	0.00701227	0,00172132	0,00403211	Optimal
4	BBNI	0.01062606	0,00292472	0,00403211	Optimal
5	BBRI	0.00949019	0,00200024	0,00403211	Optimal
6	BMRI	-0.00348801	-0,00076261	0,00403211	-
7	CPIN	0.01033135	0,00146845	0,00403211	-
8	HMSP	0.00246628	0,00024746	0,00403211	-
9	INDF	-0.05670690	-0,00949094	0,00403211	-
10	ITMG	0.00919458	0,00104921	0,00403211	Optimal
11	KLBF	-0.21469988	-0,00109952	0,00403211	-
12	PTBA	-0.00420403	-0,00061924	0,00403211	-
13	TLKM	-0.00194233	-0,00054727	0,00403211	-
14	TOWR	-0.07872549	-0,00046912	0,00403211	-
15	UNTR	0.00374123	0,00095253	0,00403211	-
16	UNVR	-0.00030126	-0,00002190	0,00403211	-

Source: Processing Results, 2023

Table 9. Investment Allocation Proportion

No	Stock	Zi	Wi	Investment Proportion
1	ADRO	3.11778607	0.36055511	36.1%
2	BBCA	1.11296566	0.12870846	12.9%
3	BBNI	1.93170943	0.22339176	22.3%
4	BBRI	1.89054708	0.21863155	21.9%
5	ITMG	0.59417486	0.06871311	6.9%

Source: Processing Results, 2023

This is consistent with the research conducted by Husni et al. (2023), where stocks with negative returns are not included as candidate portfolio components. Based on the calculations, 12 stocks will continue to be used in the formation of the optimal portfolio using the Markowitz Model.

3.3.10. Calculating Covariance Values

The calculation of covariance measures the extent to which two variables can change together. A positive covariance value indicates that the relationship between two variables is in the same

direction, while a negative covariance value indicates an inverse relationship between the variables. The calculation of covariance can be done using the formula below. The calculation is performed for all 12 stocks in pairs, resulting in a total of 144 paired data points.

$$COV\ (R_A\ .R_B) = \sum_{i=1}^{n} \frac{[(R_{Ai} - E(R_A)\ .(R_{Bi} - \ E(R_B)]}{n-1}$$

Table 10. Beta, Alpha, Expected Return, and Risk of the Portfolio

No	Stock	α_p	β_p
1	ADRO	0,01485866	0,86902504
2	BBCA	0,00113921	0,20896183
3	BBNI	0,00452933	0,53971251
4	BBRI	0,00257492	0,31415421
5	ITMG	0,06871311	0,00379768
	Total	0,09181523	1,93565126
Expected Return Portfolio			0,03439872
Risk Portfolio			0,00231065

Source: Processing Results, 2023

Table 11. Optimal Portfolio with Balanced Investment Proportions

No	Stock	Investment Proportion
1	ADRO	8.33%
2	ASII	8.33%
3	BBCA	8.33%
4	BBNI	8.33%
5	BBRI	8.33%
6	BMRI	8.33%
7	INDF	8.33%
8	ITMG	8.33%
9	KLBF	8.33%
10	PTBA	8.33%
11	UNTR	8.33%
12	UNVR	8.33%
Total		100.00%
Expected Return Portfolio		0,02489880
Risk Portfolio		0,00198344

Source: Processing Results, 2023

Table 12. Optimal Portfolio with the Best Investment Proportions

No	Stock	Investment Proportion
1	ADRO	18.81%
2	BBCA	2.21%
3	INDF	20.55%
4	ITMG	12.75%
5	KLBF	40.82%
6	UNVR	4.86%
Total		100.00%
Expected Return Portfolio		0,028875571
Risk Portfolio		0,001004217

Source: Processing Results, 2023

Table 13. Comparison of Optimal Portfolio Result

No	Indicator	Single Index Model	Markowitz Model
1	Stocks and Investment Proportions	ADRO (36.06%), BBCA (12.87%), BBNI (22.34%), BBRI (21.86%), ITMG (6.87%)	ADRO (18.81%), BBCA (2.21%), INDF (20.55%), ITMG (12.75%), KLBF (40.82%), UNVR (4.86%)
2	Expected Return Portfolio	0.034398723	0.028875571
3	Risk Portfolio	0.002310654	0.001004217

Source: Processing Results, 2023

3.3.11. Calculating the Expected Return Portfolio and Risk Portfolio with Balanced Investment Proportions Assumption

The formation of the optimal portfolio with the assumption of balanced investment proportions is carried out by evenly distributing the investment allocation proportions to each stock included in the candidate optimal portfolio. Therefore, the investment proportion for each issuer is 8.33%. Based on the calculations, the expected return portfolio and risk portfolio with balanced investment proportions can be seen in Table 11.

3.3.12. Calculating the Expected Return Portfolio and Risk Portfolio with the Best Investment Proportions Assumption

The optimal portfolio using the Markowitz Model can be formed with the assistance of the Excel Solver program available in Microsoft Excel. The Excel Solver program will determine the best stocks and investment proportions to achieve the highest possible expected return while minimizing the risk. Based on the results obtained from the Excel Solver calculations, 6 stocks are included in the candidate optimal portfolio. Subsequently, the calculation of the portfolio's expected return and risk is performed for these 6 stocks. The expected return portfolio and risk portfolio with the best investment proportions can be seen in Table 12.

4. Discussion

The comparison of results in this research can be observed from the stocks forming the optimal portfolio, the investment proportions for each stock, expected return portfolio and risk portfolio. A more detailed comparison of the optimal portfolio with the Single Index Model and the Markowitz Model can be seen in Table 13

Based on the analysis and calculations conducted, it can be concluded that the analysis of the formation of the optimal portfolio using the Single Index Model and the Markowitz Model results in different stocks and proportions. The Single Index Model result in 5 candidate stocks that form the optimal portfolio with proportions: ADRO (36.06%), BBCA (12.87%), BBNI (22.34%), BBRI (21.86%), and ITMG (6.87%). On the other hand, the Markowitz Model results in 6 candidate stocks forming the optimal portfolio with proportions: ADRO (18.81%), BBCA (2.21%), INDF (20.55%), ITMG (12.75%), KLBF (40.82%), and UNVR (4.86%).

The different stocks and proportions ultimately lead to different portfolio's expected returns and risks between the Single Index Model and the Markowitz Model. The Single Index Model results in an expected return of 0.03439872 (3.44%) with a portfolio risk of 0.002310654 (0.23%), while the Markowitz Model yields an expected return of 0.028875571 (2.88%) with a portfolio risk of 0.001004217 (0.10%).

5. Conclusion

Before embarking on stock investments, it is advisable for investors to conduct an analysis of the optimal portfolio, whether using the Markowitz Model or the Single Index Model. This analysis will provide valuable insights into the stocks that make up the portfolio, the allocation proportions, the expected returns, and the risks associated with the portfolio. It will help investors make better investment decisions.

For further research, it is recommended to conduct an analysis of the optimal portfolio using other stock indices such as LQ45, KOMPAS100, JII (Jakarta Islamic Index), or other relevant indices. This can provide a broader perspective for investors looking to invest in the Indonesian Stock Exchange. Investors should consider diversifying their stock investments and forming portfolios with the goal of reducing investment risk and achieving optimal returns.

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