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Formation of Optimal Portfolio Using Single Index Model in Investment Decisions

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A B S T R A C T

The objective to be achieved in this study is to analyze the extent to which the return and risk of the optimal portfolio that is formed provides better performance than the return and risk of individual stocks. While the data needed to support this analysis are in the form of stock price data, the Composite Stock Price Index, and Bank Indonesia Certificates. The samples selected in this study were 34 companies based on sampling techniques, namely using sampling techniques purposive, means choosing a sample from a set of populations based on certain considerations or criteria set by the researcher. The data analysis method used is to compare the return and risk of the optimal portfolio with the return and risk of individual stocks to show that diversification through the formation of an optimal portfolio using a single index model can minimize investment risk. The results show that portfolio returns tend to be greater than individual stock returns. And portfolio risk is lower than the risk of individual stocks. So that the return and risk from the optimal portfolio that is formed give better performance than the return and risk of individual stocks.

Keywords: Portfolio, Optimal, Return, Risk, Stock

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INTRODUCTION

The purpose of someone investing is basically to get some money. A statement like that maybe everyone will agree, but that assumption is too simple. Because in essence someone investing is to improve welfare. Welfare as referred to in this case is monetary welfare as measured by the sum of current income plus the present value of future income.

More specifically, the reasons for someone to invest will be described by several experts, including: Ahmad (2017: 3-4) "Mentioning that there are three goals why someone invests", namely: (1) to get a more decent life in the future. will come. A wise person will think about how to improve his standard of living from time to time or at least how to try to maintain his current level of income so that it does not decrease in the future; (2) reducing inflationary pressure. By investing in choosing companies or other objects, a person can avoid himself so that his wealth or

property does not decline in value because it is undermined by inflation; (3) the urge to save taxes. According to Suteja and Gunardi (2016: 3) There are four reasons for investors to invest both in real assets and in financial assets, namely; (1) to have a better life in the future; (2) get a better reward for the assets owned; (3) reduce inflationary pressure; (3) the urge to save taxes.

So that investment decisions can run as expected, assertiveness is needed that underlies investment decisions. Fahmi (2018: 6) states that there are four goals that underlie a person to invest, namely: (1) creating continuity in the investment; (2) creation of maximum or expected profit (actual profit); (3) creating prosperity for shareholders; (4) contribute to nation building.

The most basic thing in making investment decisions is the relationship between return and risk. Return and risk have a direct or linear relationship. This means that if a security offers a high rate of return, the risk that will be borne by potential investors will be high, as well as if a security offers a low rate of return, the level of risk borne by potential investors will be low.

In the context of portfolio management, it is known that there is a reduction in risk, namely by diversifying. Diversification (portfolio) in this statement means that an investor needs to form a portfolio by choosing a combination of a number of assets in such a way that risk can be minimized without reducing expected returns. Because minimizing risk without eliminating the expected return is the goal of investors in investing. Markowitz in Tandelilin (2010) provides very important advice in portfolio diversification, which is "don't put all the eggs in one basket, because if the basket falls, all the eggs in the basket will break". In the context of investment, this means "do not invest in just one asset, because if the asset fails, all the funds that have been invested will be lost".

According to Samsul (2018: 304) "Securities portfolio is a collection of securities (financial instruments) which includes stocks, bonds, derivative securities and money market securities for investment purposes. In investing, an investor can form a portfolio to reduce risk. One of the most important assumptions in building a portfolio is that all investors dislike risk. This means that in the formation of a portfolio, an investor will prefer to invest in a portfolio that offers a maximum rate of return with a certain risk or look for a portfolio that offers a minimum level of risk on a certain return. Portfolio characteristics like this are referred to as efficient portfolios (Tandelilin, 2010: 157). According to Fahmi (2018: 3) "Efficient portfolio is a portfolio that is in a group (set) that is feasible to offer investors maximum return expectations for various levels of risk and also minimum risk for various levels of expected returns".

An optimal portfolio can be formed by an investor by carrying out a portfolio analysis, which is a field of science that specifically studies how to reduce investment risk to a minimum. A portfolio can be categorized as efficient if it has a maximum expected rate of return with a certain risk or a minimum risk with a certain return. While the optimal portfolio is a portfolio that is taken from the many choices available in a collection of efficient portfolios, of course, in selecting the portfolio, it is adjusted to the preference of investors on the return or risk that they are willing to bear.

Optimal portfolio investors are portfolios chosen by investors from the many choices available in efficient portfolios (Suteja and Gunardi; 2016: 36) Selection of optimal portfolios based on investor preferences for returns and risks shown through an indifference curve tangent to the portfolio line efficient. According to Halim (2018: 74) "The tangent between the efficient surface and the highest indifference curve is an optimal portfolio which is a condition needed by investors. Of course, a portfolio that is chosen is in accordance with the preferences of the investor concerned with the returns or risks that he is willing to bear".

In forming a portfolio, there are models that can be used, including the single index model. Willian Sharpe in 1963 developed a model used to simplify calculations on the Markowitz model known as the single index model. Zubir (2011: 97) uses the term single index model to define a single

index model, namely "Single index model is a technique for measuring the return and risk of a stock or portfolio. The model assumes that stock return movements are only related to market movements " The single index model assumes that the rates of return between one or more securities will move together and have the same reaction to a single factor or index that is included in the model. The factor or index is the Composite Stock Price Index (IHSG). The rate of return on shares correlates with changes in market value.

The analysis technique in forming the optimal portfolio using a single index model is to compare the Excess Return to Beta (ERB) and Cut of Point (C *). The value of C * is the greatest value of Ci. Shares that make up the optimal portfolio are stocks that have an ERB value greater than or equal to the value at point C *. Shares that have an ERB value smaller than the C * value are not included in the optimal portfolio formation (Hartono, 2017: 452).

The advantage of the Single Index Model compared to the Markowitz Model is in its simpler calculations. The Markowitz model calculates risk using a matrix of variance and covariance relationships, so a more complex calculation is needed. Whereas in the Single Index Model, the risk is simplified into two compo nents, namely market risk and company uniqueness risk. So that the calculation of portfolio risk using the complex Markowitz Model can be further simplified by the Single Index Model (Tandelilin, 2010: 133-134).

METHOD

The sample selected in this research is a sample selected based on purposive sampling technique. Where this technique selects a sample from a set of populations based on certain considerations or criteria (Sujarweni, 2015: 88). The criteria set by the author in this research in order to obtain a research sample are; (1) companies listed on the IDX in 2018 – 2020, and consistently listed on the LQ-45 Index; (2) companies that provide stock price data monthly (monthly) during the study period.

Analysis of the Optimal Portfolio Forming Single Index Model . The steps needed to analyze the optimal portfolio formation using a single index model are; (1) calculating the total realization return of each share; (2) calculating the expected return or expected return of each stock; (3) calculating the risk of each share, where the risk of an individual stock can be measured by standard deviation (SD) and variance; (4) calculating market returns, expected market returns and market risk based on the IHSG; (5) calculating βi and αi for each share; (6) calculating the risk variance of risk that shows the unique risk of each share; (7) determine the rate of return on risk free assets (RBR); (8) calculating the ERB of each share, ERB is the excess return ratio obtained from the difference between the expected return on shares and the rate of return on risk-free assets with the beta of the i-th stock. ERB is needed to determine which stocks are included in the optimal portfolio candidate. The ERB value obtained will be sorted from largest to smallest.

Shares that have an ERB value greater than or equal to the value at point C * will be included in the optimal portfolio candidate, while stocks that have a smaller ERB value with a value at point C * are not included in the optimal portfolio candidate; (9) calculating the values of Ai and B, both of which are required to calculate the cut off rate (Ci); (10) calculating the value of Ci (cut off rate). (11) determining the proportion of funds in stocks that make up the optimal portfolio based on a single index model; (12) m Calculating the expected return and risk of the formed portfolio.

The basis for making investment decisions is return and risk. Therefore, in the final stage, investment decision making is done by comparing the return and risk of the optimal portfolio with the return and risk of individual stocks. This is to show that diversification through the formation of an optimal portfolio using a single index model can minimize investment risk

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RESULTS AND DISCUSSION

The initial composition in forming an optimal portfolio using a single index model is to calculate the realized return and the expected return of individual stocks. The return on realization of a share is calculated by reducing the share price in the current period by the share price in the previous period and then divided by the share price in the previous period. After the realized return is known, the next step is to calculate the expected return of individual shares obtained from the average realized return, as presented in Table 1 below;

Table 1. List of Return Realization and Expected Return of Individual Shares

No	Stock Code	Ri	E(Ri)	No	Stock Code	Ri	E(Ri)
1.	ADHI	-0,0864	-0,0024	18.	JSMR	-0,1129	-0,0031
2.	ADRO	1,0972	0,0305	19.	KLBF	0,2022	0,0056
3.	AKRA	-0,4047	-0,0112	20.	LPKR	-1,2446	-0,0346
4.	ANTM	6,0737	0,1687	21.	LPPF	-0,9278	-0,0258
5.	ASII	0,3709	0,0103	22.	MNCN	-0,5953	-0,0165
6.	BBCA	0,7119	0,0198	23.	PGAS	0,0716	0,0020
7.	BBNI	0,6739	0,0187	24.	PTBA	0,9714	0,0270
8.	BBRI	-0,2864	-0,0080	25.	PTPP	-0,5263	-0,0146
9.	BBTN	0,8841	0,0246	26.	SCMA	-0,3814	-0,0106
10.	BMRI	0,0053	0,0001	27.	SMGR	0,1657	0,0046
11.	BSDE	-0,2539	-0,0071	28.	SRIL	0,2025	0,0056
12.	GGRM	0,4830	0,0134	29.	SSMS	-0,3813	-0,0106
13.	HMSP	-0,9039	-0,0251	30.	TLKM	0,2504	0,0070
14.	ICBP	-0,0133	-0,0004	31.	UNTR	0,5994	0,0166
15.	INCO	1,0865	0,0302	32.	UNVR	0,2635	0,0073
16.	INDF	0,4469	0,0124	33.	WIKA	-0,1920	-0,0053
17.	INTP	0,0218	0,0006	34.	WSKT	0,1863	0,0052

Source: Processed secondary data, 2021

Based on table 1, we can see that of the 34 stocks that provide the highest rate of return realization and expected return, ANTM is 6.0737 and 0.1687. Meanwhile, the stocks that gave the lowest realized return and expected return were LPKR, namely -1.2446 and -0.0346. In the research sample above, it is known that there are 20 stocks that provide positive realized returns and expected returns. A rational investor would certainly choose to invest in stocks that have positive returns.

While comparison of the ERB value of each share with C * will be presented in the following table 2 below;

Table 2. The Optimal Portfolio Forming The Optimal Portfolio Forming

No	Stock Code	ERB_i	C^*	Information
1.	ANTM	0,0892	0,0043	Optimal
2.	INCO	0,0241	0,0043	Optimal
3.	BBCA	0,0131	0,0043	Optimal
4.	UNTR	0,0126	0,0043	Optimal
5.	ADRO	0,0125	0,0043	Optimal
6.	GGRM	0,0096	0,0043	Optimal
7.	BBTN	0,0093	0,0043	Optimal
8.	BBNI	0,0074	0,0043	Optimal
9.	TLKM	0,0070	0,0043	Optimal

No	Stock Code	ERB_i	C^*	Information
10.	INDF	0,0064	0,0043	Optimal
11.	ASII	0,0045	0,0043	Optimal
12.	SRIL	0,0037	0,0043	Not Optimal
13.	UNVR	0,0026	0,0043	Not Optimal
14.	KLBF	0,0010	0,0043	Not Optimal
15.	WSKT	0,0005	0,0043	Not Optimal
16.	SMGR	0,0002	0,0043	Not Optimal
17.	PGAS	-0,0014	0,0043	Not Optimal
18.	INTP	-0,0017	0,0043	Not Optimal
19.	ADHI	-0,0029	0,0043	Not Optimal
20.	BMRI	-0,0030	0,0043	Not Optimal
21.	WIKA	-0,0040	0,0043	Not Optimal
22.	BBRI	-0,0056	0,0043	Not Optimal
23.	BSDE	-0,0072	0,0043	Not Optimal
24.	MNCN	-0,0087	0,0043	Not Optimal
25.	PTPP	-0,0090	0,0043	Not Optimal
26.	JSMR	-0,0092	0,0043	Not Optimal
27.	SCMA	-0,0095	0,0043	Not Optimal
28.	AKRA	-0,0135	0,0043	Not Optimal
29.	ICBP	-0,0188	0,0043	Not Optimal
30.	LPPF	-0,0241	0,0043	Not Optimal
31.	LPKR	-0,0301	0,0043	Not Optimal
32.	SSMS	-0,0329	0,0043	Not Optimal
33.	PTBA	-0,1115	0,0043	Not Optimal
34.	HMSP	-0,7040	0,0043	Not Optimal

Source: Processed secondary data, 2021

Based on table 2, we can see that there are 11 stocks that make up the optimal portfolio, namely ANTM, INCO, BBCA, UNTR, ADRO, GGRM, BBTN, BBNI, TLKM, INDF and ASII.

Proportion of Funds That Must Be Invested. After the optimal portfolio is formed, the next step is to calculate the proportion (Wi) that must be invested in stocks that have formed the optimal portfolio. Calculation of Wi starts from calculating the value of Zi, which is the weighted scale of each share. The following will be presented the calculation of the weighted scale and the proportion of funds from each share, as shown in table 3 below;

Table 3. Fund Proportion Calculation

No	Stock Code	β_i	σ_{ei}^2	ERB_i	C^*	$Z_i = \frac{\beta_i}{\sigma_{ei}^2}(ERB - C^*)$	$W_i = \frac{Z_i}{\sum_{j=1}^{k} Z_i}$
1.	ANTM	1,8443	0,6127	0,0892	0,0043	0,2554	0,0124
2.	INCO	1,0744	0,0221	0,0241	0,0043	0,9613	0,0466
3.	BBCA	1,1808	0,001	0,0131	0,0043	10,15	0,4918
4.	UNTR	0,9807	0,006	0,0126	0,0043	1,364	0,0661
5.	ADRO	2,0978	0,0103	0,0125	0,0043	1,6597	0,0804

6.	GGRM	0,9591	0,0029	0,0096	0,0043	1,7493	0,0848
7.	BBTN	2,1781	0,008	0,0093	0,0043	1,3534	0,0656
8.	BBNI	1,9598	0,0031	0,0074	0,0043	1,9524	0,0946
9.	TLKM	0,3845	0,0032	0,007	0,0043	0,3253	0,0158
10.	INDF	1,281	0,0035	0,0064	0,0043	0,7439	0,036
11.	ASII	1,3496	0,0017	0,0045	0,0043	0,123	0,006
			Total			20,638	1

Source: Processed secondary data, 2021.

Table 3. shows the proportion of funds that must be invested in stocks that make up the optimal portfolio, namely ANTM of 0.0124 (1.24%), INCO of 0.0466 (4.66%), BBCA of 0.4981 (49 , 81%), UNTR was 0.0661 (6.61%), ADRO was 0.0804 (8.04%), GGRM was 0.0848 (8.48%), BBTN was 0.0656 (6.56 %), BBNI is 0.0946 (9.46%), TLKM is 0.0158 (1.58%), INDF is 0.0360 (3.60%), and ASII is 0.0060 (0.60%)). While the largest proportion of funds was in BBCA shares of 0.4981 (49.81%). Meanwhile, the lowest proportion of funds was ASII's shares of 0.0060 (0.60%). Stocks with the largest proportion are an investment alternative that rational investors should choose. In addition, these shares also have an ERB value greater than the C * value.

Portfolio Return Calculation Results**.** After knowing the proportion of stocks that make up the optimal portfolio, the next step is to calculate the expected return of the portfolio. Before calculating the expected portfolio return, first calculate the portfolio alpha and beta. The portfolio alpha is the weighted average of the alpha of each security (αi). Portfolio beta is also the weighted average of the beta of each security (βi). So that the calculation of the expected return portfolio can be generated as in table 4 below.

Table 4. Calculation of Optimal Portfolio Expected Return

No	Stock Code	W_i	β_i	α_i	$\alpha_p = W_i \cdot \alpha_i$	$\beta_p = W_i \cdot \beta_i$
1.	ANTM	0,0124	1,8443	0,1527	0,0019	0,0228
2.	INCO	0,0466	1,0744	0,0208	0,001	0,05
3.	BBCA	0,4918	1,1808	0,0095	0,0047	0,5807
4.	UNTR	0,0661	0,9807	0,0081	0,0005	0,0648
5.	ADRO	0,0804	2,0978	0,0122	0,001	0,1687
6.	GGRM	0,0848	0,9591	0,0051	0,0004	0,0813
7.	BBTN	0,0656	2,1781	0,0056	0,0004	0,1428
8.	BBNI	0,0946	1,9598	0,0017	0,0002	0,1854
9.	TLKM	0,0158	0,3845	0,0036	6E-05	0,0061
10.	INDF	0,036	1,281	0,0013	5E-05	0,0462
11.	ASII	0,006	1,3496	-0,0014	-8E-06	0,008
		Total			0,0101	1,3569

Source: Processed secondary data, 2021

Based on table 4, it can be seen that of the 8 stocks that make up the optimal portfolio, an expected return of 0.0219 is provided. This return will affect the investment decision of an investor, because it offers a higher expected return than the market expected return and risk-free expected return.

Portfolio Risk Calculation Results. To determine the risk of a portfolio, first you must know the beta of the squared portfolio, the systematic risk, and the unique risk of the portfolio, as listed in table 5, the optimal portfolio risk calculation below;

Table 5, Optimal Portfolio Risk Calculation

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No	Stock Code	W_i	W_i^2	β_i	σ_{ei}^2	$\beta_p = \sum_{i=1}^{n} W_i \cdot \beta_i$	$\sigma^2_{ep} = \sum_{i=1}^{n} W_i^2 \cdot \sigma_{ei}^2$
1.	ANTM	0,0124	0,0002	1,8443	0,6127	0,0228	9E-05
2.	INCO	0,0466	0,0022	1,0744	0,0221	0,0005	5E-05
3.	BBCA	0,4918	0,2419	1,1808	0,001	0,5807	0,0002
4.	UNTR	0,0661	0,0044	0,9807	0,006	0,0648	3E-05
5.	ADRO	0,0804	0,0065	2,0978	0,0103	0,1687	7E-05
6.	GGRM	0,0848	0,0072	0,9591	0,0029	0,0813	2E-05
7.	BBTN	0,0656	0,0043	2,1781	0,008	0,1428	3E-05
8.	BBNI	0,0946	0,0089	1,9598	0,0031	0,1854	3E-05
9.	TLKM	0,0158	0,0002	0,3845	0,0032	0,0061	8E-07
10.	INDF	0,0036	0,0013	1,281	0,0035	0,0462	5E-06
11.	ASII	0,0006	0,0005	1,3496	0,0017	0,0008	6E-08
			Total			1,3569	0,0006

Source: Processed secondary data, 2021

Based on table 5, it is known that the portfolio variant is 0.0018 and the standard deviation is 0.0430. When compared with the expected return of individual stocks with the expected return of the portfolio, the expected return of individual stocks is lower, with the risk level of individual stocks being higher than the risk of the optimal portfolio formed. This shows that forming an optimal portfolio can provide optimal returns for investors.

Investment Decision Making**.** Considering that this efficient portfolio does not reflect the optimization of the portfolio, therefore it is necessary to form an optimal portfolio, because the return and risk from an optimal portfolio are the best returns and risks. So to find out that by forming an optimal portfolio using a single index model can be used as a reference by an investor in making investment decisions, the researcher will make a comparison between the return and risk of the portfolio with the return and risk of individual stocks, as in table 6 below.

Table 6, Comparison of Optimal Portfolio Risk Return and Risk Return of Individual Shares

No	Stock Code	$E(R_i)$	$E(R_p)$	Conclusion	σ_i^2	σ_p^2	Conclusion
1.	ADHI	-0,0024	0,0219	better	0,0126	0,0018	Better
2.	ADRO	0,0305	0,0219	Worse	0,0134	0,0018	Better
3.	AKRA	-0,0112	0,0219	better	0,0058	0,0018	Better
4.	ANTM	0,1687	0,0219	Worse	0,6151	0,0018	Better
5.	ASII	0,0103	0,0219	Better	0,0030	0,0018	Better
6.	BBCA	0,0198	0,0219	Better	0,0020	0,0018	Better
7.	BBNI	0,0187	0,0219	Better	0,0057	0,0018	Better
8.	BBRI	-0,0080	0,0219	Better	0,0212	0,0018	Better
9.	BBTN	0,0246	0,0219	Worse	0,0113	0,0018	Better
10.	BMRI	0,0001	0,0219	Better	0,0095	0,0018	Better
11.	BSDE	-0,0071	0,0219	Better	0,0058	0,0018	Better
12.	GGRM	0,0134	0,0219	Better	0,0035	0,0018	Better
13.	HMSP	-0,0251	0,0219	Better	0,0288	0,0018	Better
14.	ICBP	-0,0004	0,0219	Better	0,0097	0,0018	Better
15.	INCO	0,0302	0,0219	Worse	0,0229	0,0018	Better
16.	INDF	0,0124	0,0219	Better	0,0047	0,0018	Better
17.	INTP	0,0006	0,0219	Better	0,0114	0,0018	Better
18.	JSMR	-0,0031	0,0219	Better	0,0049	0,0018	Better

19.	KLBF	0,0056	0,0219	Better	0,0034	0,0018	Better
20.	LPKR	-0,0346	0,0219	Better	0,0073	0,0018	Better
21.	LPPF	-0,0258	0,0219	Better	0,0106	0,0018	Better
22.	MNCN	-0,0165	0,0219	Better	0,0223	0,0018	Better
23.	PGAS	0,0020	0,0219	better	0,0206	0,0018	Better
24.	PTBA	0,0270	0,0219	Worse	0,0339	0,0018	Better
25.	PTPP	-0,0146	0,0219	Better	0,0135	0,0018	Better
26.	SCMA	-0,0106	0,0219	Better	0,0067	0,0018	Better
27.	SMGR	0,0046	0,0219	Better	0,0093	0,0018	Better
28.	SRIL	0,0056	0,0219	Better	0,0169	0,0018	Better
29.	SSMS	-0,0106	0,0219	Better	0,0034	0,0018	Better
30.	TLKM	0,0070	0,0219	Better	0,0033	0,0018	Better
31.	UNTR	0,0166	0,0219	Better	0,0066	0,0018	Better
32.	UNVR	0,0073	0,0219	Better	0,0034	0,0018	Better
33.	WIKA	-0,0053	0,0219	Better	0,0163	0,0018	Better
34.	WSKT	0,0052	0,0219	Better	0,0101	0,0018	Better

Source: Processed secondary data, 2021

Based on table 6 above, it can be seen that of the 34 stocks sampled in this study, the majority of individual expected returns are smaller than the expected portfolio returns, with a greater level of risk than portfolio risk. This suggests that the formation of an optimal portfolio using a single index model can provide a higher expected return with a minimal level of risk.
In addition, there are very few individual stocks that have an expected return that is greater than the expected return of the portfolio, however the risk of individual stocks is also higher than the portfolio risk. So, based on the comparison between return and portfolio risk with individual stock returns and risks, it shows that forming an optimal portfolio can reduce the risk of an investment.
Meanwhile, the placement of the proportion of funds that should be invested in a set of stocks that make up the optimal portfolio can be seen in diagram 1 below.

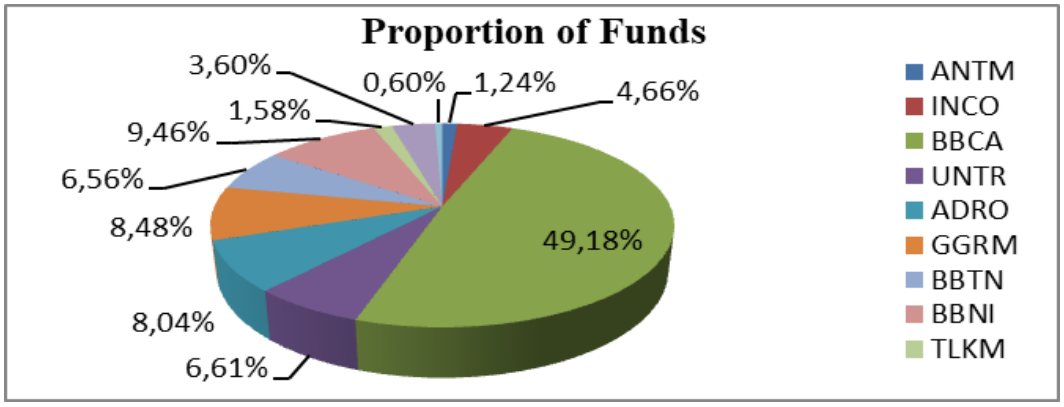

Figure 1 : Proportion of Funds
Source: Processed secondary data, 2021

Based on the fund proportion diagram above, we can see that the highest recommended proportion of funds is BBCA shares, amounting to 49.81%. When viewed from the risk offered by BBCA shares compared to the risk of other individual stocks is smaller and the individual return rate is also not too small compared to other individual stock returns. In addition, BBCA shares also have an ERBi value greater than C *.

Based on the results of the comparative analysis between optimal portfolio return and risk with individual stock returns and risks, it shows that investing in stocks that form an optimal portfolio is more profitable. This is because the risk offered to stocks that have formed an optimal portfolio is smaller, namely 0.0018 with a higher return rate than individual stocks, which is 0.0219. Based on the comparison, the shares with the highest proportion are in BBCA shares, while the shares with the lowest proportion are ASII.

The results of this study are also supported by previous researchers, namely research by Mustanwir and Zuhri (2018), Santoso (2019), and Darmawan and Purwanti (2015) that forming an optimal portfolio using a single index model can reduce investment risk, so that it can be used as a basis for decision making. investation. As in Mustanwir and Zuhri's (2018) research, it shows that the comparison results of the risk to return portfolio are smaller than the market risk to return, so it can be concluded that the optimal portfolio formed has better performance.

CONCLUSION

Based on the results of the analysis and discussion, it can be concluded; (1) comparison between optimal portfolio return and risk with individual stocks shows that portfolio returns tend to be greater than individual stock returns; (2) the formation of an optimal portfolio using a single index model can provide a higher expected return with a minimal level of risk.

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