Using the Markowitz Model in the Analysis of Optimal Portfolio Forming on Idx30 Index Stock on the Indonesia Stock Exchange

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Abstract:- This study aims to determine the optimal portfolio formation by using the Markowitz model on the IDX30 index stock, in order to obtain stocks that are used as investment choices or form a portfolio. The population in this study is all shares of issuers or companies that have been included in the IDX30 Index on the Indonesia Stock Exchange for the period February 2017-January 2022, as many as 53 companies while the sample in this study was 50 company shares selected based on nonprobability sampling technique with purposive sampling method. Data collection is done by using documentation techniques. Data analysis was performed using the Markowitz model. The results of this study indicate that of the 50 IDX30 Index stocks that were used as research samples, 14 stocks were included in the optimal portfolio, namely ICBP, MIKA, TLKM, ACES, UNTR, CPIN, MDKA, BBCA, TOWR, ADRO, KLBF, PTBA, TBIG, ANTM stocks. The optimal portfolio that is formed produces an expected return portfolio value of 0.0075 or 0.75% per month with a portfolio risk level of 0.0313 or 3.13% per month. The formation of an optimal portfolio is more recommended for investors who want to invest in IDX30 Index shares on the Indonesia Stock Exchange. This is because the portfolio formed as a form of investment diversification is proven to be able to reduce investment risk compared to investing in only one stock.

Keywords:- Using the Markowitz Model in the Analysis of Optimal Portfolio Forming on Idx30 Index Stock on the Indonesia Stock Exchange.

I. INTRODUCTION

Investments are additional sources of income, such as direct or indirect investments to generate future profits or returns. Ekananda (2019: 2) argues that investment is an act of delaying current consumption spending and saving it to earn more income. Likewise with the theory (Tandelilin, 2017) which states that investment is a commitment made at this time on a number of funds to be able to realize a maximum number of benefits in the future.

One of the most popular investment vehicles traded on the Indonesian stock exchange is stock investment. Shares are securities issued by a company in the form of a deed of ownership of a company and returns to shareholders in the form of dividends and an increase in share prices (capital gain)(Ekananda, 2019: 27). In measuring the development of the stock market, the Composite Stock Index (JCI) is used as a reference to see the movement of all stocks listed on the Indonesia Stock Exchange.

The Indonesian stock market index (CSPI) will range from sentiment both from within and from abroad (Saraswati, 2020).In recent years, the JCI's performance has fluctuated greatly. One of the causes of the decline in the JCI performance, especially in 2018 is believed to be the US-China trade war and the increase in the Fed Funds Rate (FFR) of the US central bank, which triggered foreign investors to conduct net sells in the capital market. In the following year, in unstable conditions, the world was again shaken by the outbreak of the Covid-19 virus in Wuhan, China (Saraswati, 2020).

Looking at the condition of the JCI, which is quite fluctuating, it indicates that investment in the capital market is an investment full of uncertainty because investments are generally carried out in the long term. In investment science, it is assumed that investors are rational beings so they will not like uncertainty or risk (Ilham et al., 2020:26).

One way to reduce investment risk with a portfolio approach is to diversify investments. Portfolio is a collection of investment assets (stocks) combined with low risk to achieve the expected return (Dewi & Candradewi, 2020:1616). The model of diversification or optimal portfolio formation that examines the relationship between return and investment risk so as to minimize the level of risk without reducing portfolio returns is the Markowitz model (Ramli et al., 2020). Markowitz model or mean variance model is one of the best models in determining the optimal portfolio. The mean means the expected return which is calculated on average while the variance is the risk measurement used (Mahayani & Suarjaya, 2019: 3067). The main assumption in the Markowitz model is that investors avoid risk and rational investors will certainly choose to hold an efficient portfolio by maximizing expected profits and minimizing risk.

In helping investors choose stocks to analyze in the capital market, a measuring instrument/indicator is needed that can observe the movement of stock prices that have high liquidity and large market capitalization. Like the IDX30 stock index.

The IDX30 index is a stock index that has 30 issuer shares with good liquidity performance and a large market capitalization value (blue chip) whose constituents are selected from the LQ45 index, but unfortunately the growth rate of the IDX30 stock price index is still relatively low compared to the LQ45 index.

Tahun	Harga Tertinggi	Harga Terendah	Harga Penutupan	Perubahan Pertahun	Perubahan Pertahun (%)
2017	593,11	526,28	593.11	-	-
2018	545,52	488,99	540.77	-52	-8,83%
2019	558,46	508,10	553.86	13	2,42%
2020	525,46	409,10	502.27	-52	-9,31%
2021	519,01	471,60	497.10	-5	-1,03%

Sumber : Laporan Statistik (Bursa Efek Indonesia, n.d.)(data diolah)

Table 1

Based on the data above, the performance of the IDX30 stock index has also fluctuated during the last 5 (five) years. It can be seen that although the IDX30 stock index contains 30 leading stocks or shares of large companies that have good performance and are known in national and international markets. However, the growth rate of the IDX30 stock price index is still relatively low and unstable (very risky).

The IDX30 index is an important part of the JCI index, indicating that the capital market in Indonesia is a market full of uncertainty. So to help investors who want to invest their funds in the capital market, especially the IDX30 index, consideration is needed in determining the optimal portfolio in order to maximize returns for certain risks.

Previous research by Jayati et al. (2017) on the IDX30 Index for the period August 2013 to July 2016, using a single index model, resulted in an expected portfolio return of 1.596% and a portfolio risk of 0.046. The proportion of funds allocated for each share is ADRO (12.777%), GGRM (51.070%), UNVR (33.680%), and INDF (2.473%). This is different from research (Rifaldy & Sedana, 2016) which uses the Markowitz model approach which states that of the 27 Bisnis27 index stocks, there are only 5 stocks that deserve to be included in the optimal portfolio, namely, AKRA (55.145%), ICBP (2.444%), LPKR (16.056%), SCMA (21.297%), and MNCN (5.057%).

Another previous study conducted by (Sudarsana et al., 2014) used the Markowitz model on the IDX30 index for the period August 2013 - January 2014 with the criteria that stocks with positive price earnings to growth ratios deserved to be optimal portfolios. From this study, it was found that of the 15 stocks that were used as research samples, only 5 stocks were selected to form the optimal portfolio, namely ADRO stocks (16.42%), ANTM (5.00%), JSMR (34.11%), PGAS (27.47%), PWON (17.01%). (Setyawati & Sudiartha, 2019) using a Food and Baverage research sample that is consistently listed on the Index.

IDX30 for the period February 2017–January 2018, found that there were only 7 company stocks that had optimal portfolio qualifications. Fund allocation per share is ADRO (0.55%), ASII (0.15%), GGRM (17.61%), ICBP (9.46%), MEDC (5.27%), UNVR (41, 11 %) and UNTR (25.86). The resulting portfolio offers an expected return of 3.2% and a risk of 3.3%.

Based on the phenomena and several studies previously mentioned, the researcher is interested in conducting a study entitled: "The Use of the Markowitz Model in the Analysis of Optimal Portfolio Formation in IDX30 Index Stocks on the Indonesia Stock Exchange".

II. METHODS

This type of research is a quantitative descriptive research. The purpose of using this type of research is to explain how the use of the Markowitz model in forming an optimal portfolio on the IDX30 index stock on the Indonesia Stock Exchange (IDX).

The population in this study is the stock of all companies included in the IDX30 index from February 2017 to January 2022. The sample for this study was determined by an objective sampling method that identified a number of considerations used as sampling criteria. Companies selected as samples for this study must meet the following criteria:
1. Companies/issuers in the IDX30 stock index were never suspended during the study period February 2017-January 2022.
2. The required data can be accessed and fully available during the research period February 2017-January 2022.

Based on the criteria above, there are 50 of the total 53 companies listed on the Indonesia Stock Exchange Index IDX30 from February 2017 to January 2022 that can be included as samples in this study.

The data analysis technique used in this study uses the Markowitz model which is calculated using the Microsoft Excel 2016 application, and the steps for compiling the optimal portfolio use the Markowitz model which carried out in this study are as follows.
1. Collect issuers whose shares are listed in the IDX30 stock index during the period February 2017 – January 2022.
2. Collecting closing price data for issuers listed in the IDX30 stock index for the period February 2017 – January 2022.
3. Processing the data using the Markowitz model optimal portfolio analysis technique:
- Calculating the Realized Return and Expected Return of each company.
- Calculating the Risk (variance and standard deviation) of each company.
- Calculate the covariance between two items in the portfolio.
- Calculating the correlation coefficient of stock prices between companies.
- Determine the proportion of funds for each share.
- Calculate the Expected Return and risk (variance and standard deviation) of the portfolio.

III. RESULT

The formation of an optimal stock portfolio using the Markowitz model requires several steps. In this study, the process of forming the optimal stock portfolio is divided into three major steps, namely determining the composition of the optimal stock portfolio, determining the proportion of funds allocated to each stock, and determining the return and risk (variance and standard deviation) of the Markowitz model portfolio.

The stock price data studied is the monthly closing price for the period February 2017-January 2022, which is 50 company shares.

The following are the stages of analysis of optimal portfolio formation using the Markowitz model:

A. Calculating realized return and expected return of each individual stock.

The initial stage is to determine the realized return value from the monthly closing price of all samples in the study using the equation (3.1) Stock Return $(Rit) = (P_t - P_{(t-1)})/P_{(t-1)}$.

Furthermore, researchers can find the value of the expected return of each stock by using equation (3.2) Expected return $E(Rit) = (\sum_{j=1}^{t2} R_{it})/T$. The expected return value can also be found using the =AVERAGE formula in the Excel program. The following table shows the results of calculating realized returns and expected returns.

Table 2 Expected Return of Each Individual Stock

Nama Perusahaan	∑Rit	E(Rit)
Ace Hardware Indonesia Tbk	0,6936	0,0116
Adaro Energy Tbk	0,6927	0,0115
Aneka Tambang Tbk	4,9733	0,0829
Bank Central Asia Tbk	0,1493	0,0025
Bank Negara Indonesia (Persero) Tbk	0,6454	0,0108
Bank Rakyat Indonesia (Persero) Tbk	0,7414	0,0124
Bank Tabungan Negara (Persero) Tbk	0,6483	0,0108
Barito Pacific Tbk	2,4732	0,0412
Charoen Pokphand Indonesia Tbk	0,9707	0,0162
Erajaya Swasembada Tbk	2,5694	0,0428
XL Axiata Tbk	0,4585	0,0076
Indofood CBP Sukses Makmur Tbk	0,1282	0,0021
Vale Indonesia Tbk	1,2221	0,0204
Indah Kiat Pulp & Paper Tbk	3,0333	0,0506
Indocement Tunggal Prakarsa Tbk	0,0696	0,0012
Indo Tambangraya Megah Tbk	1,0313	0,0172
Japfa Comfeed Indonesia Tbk	0,4374	0,0073
Jasa Marga (Persero) Tbk	0,1355	0,0023
Kalbe Farma Tbk	0,2414	0,0040
Merdeka Copper Gold Tbk	2,7263	0,0454
Medco Energi Internasional Tbk	1,8320	0,0305
Mitra Keluarga Karyasehat Tbk	0,2577	0,0043
Bukit Asam Tbk	0,5555	0,0093
Pakuwon Jati Tbk	0,0703	0,0012
Semen Gresik (Persero) Tbk	0,0979	0,0016
Summarecon Agung Tbk	0,0340	0,0006
Tower Bersama Infrastructure Tbk	1,5699	0,0262
Timah Tbk	1,1896	0,0198
Pabrik Kertas Tjiwi Kimia Tbk	3,3542	0,0559
Telekomunikasi Indonesia (Persero) Tbk	0,2077	0,0035
Sarana Menara Nusantara Tbk	0,7220	0,0120
United Tractors Tbk	0,3049	0,0051

Based on the data in the table above, it is known that the IDX30 Index company shares during the period February 2017-January 2022 there were 32 stocks that gave a positive expected return while the others had a negative expected return value. Company shares PT. Aneka Tambang Tbk (ANTM) is a stock that has the largest expected return value of 0.0829 or 8.29%, which means that by investing in PT.

Aneka Tambang Tbk (ANTM) will provide an expected return on investment of 8.29% from 100% of the funds invested. Meanwhile, the lowest expected return value was obtained by PT. Hanjaya Mandala Sampoerna Tbk (HMSP), namely -0.0200 or - 2.00% which means that by investing in shares of PT. HanjayaMandala Sampoerna Tbk (HMSP) will only provide losses.

Meanwhile, 18 other companies' stocks gave negative and zero expected returns. To avoid losses for investors, company shares that have negative and zero expected returns will not be included in the next calculation. On the other hand, company stocks that have a positive expected return will be included in the efficient portfolio as the optimal portfolio candidate. Stocks with a positive expected return deserve to be considered in investing because the expected return is the return that is expected to be obtained in the future.

B. *Calculating the risk (variance and standard deviation) of each company's shares*

The next step is to calculate the risk (variance and standard deviation) of individual stocks. In calculating the variance, we can use the equation $\sigma_i^2 = \frac{\sum_{i=1}^{n}(R_{it} - E(R_{it}))2}{n}$ and $\sigma_i = \sqrt{\sigma_i^2}$ to calculate the stock standard deviation. In addition to these equations, variance can also be calculated with the help of the Excel program using the =VAR formula with the monthly stock return range for each stock that is included in the efficient portfolio category. Meanwhile, to calculate the standard deviation of stocks with the help of the Excel program, the formula =STDEV is used.

Table 3 Risk (Variant and Standard Deviation) of individual stocks

Nama Perusahaan	Varian	Standar Deviasi
Ace Hardware Indonesia Tbk	0,0064	0,0801
Adaro Energy Tbk	0,0150	0,1226
Aneka Tambang Tbk	0,4075	0,6384
Bank Central Asia Tbk	0,0135	0,1162
Bank Negara Indonesia (Persero) Tbk	0,0122	0,1103
Bank Rakyat Indonesia (Persero) Tbk	0,0062	0,0785
Bank Tabungan Negara (Persero) Tbk	0,0258	0,1606
Barito Pacific Tbk	0,0355	0,1883
Charoen Pokphand Indonesia Tbk	0,0090	0,0947
Erajaya Swasembada Tbk	0,0375	0,1936
XL Axiata Tbk	0,0110	0,1047
Indofood CBP Sukses Makmur Tbk	0,0030	0,0552
Vale Indonesia Tbk	0,0181	0,1346
Indah Kiat Pulp & Paper Tbk	0,0390	0,1975
Indocement Tunggal Prakarsa Tbk	0,0130	0,1142
Indo Tambangraya Megah Tbk	0,0245	0,1567
Japfa Comfeed Indonesia Tbk	0,0171	0,1307
Jasa Marga (Persero) Tbk	0,0117	0,1083
Kalbe Farma Tbk	0,0040	0,0636
Merdeka Copper Gold Tbk	0,0147	0,1213
Medco Energi Internasional Tbk	0,0407	0,2017
Mitra Keluarga Karyasehat Tbk	0,0087	0,0933
Bukit Asam Tbk	0,0125	0,1117
Pakuwon Jati Tbk	0,0105	0,1025
Semen Gresik (Persero) Tbk	0,0135	0,1161
Summarecon Agung Tbk	0,0212	0,1456
Tower Bersama Infrastructure Tbk	0,0185	0,1360
Timah Tbk	0,0317	0,1781
Pabrik Kertas Tjiwi Kimia Tbk	0,0439	0,2094
Telekomunikasi Indonesia (Persero) Tbk	0,0044	0,0663
Sarana Menara Nusantara Tbk	0,0123	0,1111
United Tractors Tbk	0,0087	0,0932

The higher the risk (variance and standard deviation) of a stock, the greater the deviation level between the realized return and the expected return. In table 4.4 above, it can be seen that from the calculation of variance and standard deviation of each stock, the company's shares of PT. Aneka Tambang Tbk (ANTM) has the highest risk with a variance value of 0.4075 or 40.75% with a standard deviation of 0.6384 of 63.84%. The shares of companies that have the lowest risk are obtained by shares of PT. Indofood CBP Sukses Makmur Tbk (ICBP) with a variance value of 0.0030 or 0.30% with a standard deviation of 0.0552 or 5.52%.

Based on the risk calculation data above, it shows that the most risky stocks are shares of the company PT. Aneka Tambang Tbk (ANTM). Although previously the company's shares of PT. Aneka Tambang Tbk (ANTM) has the highest positive expected return value but this stock is also certainly not free from a number of risks which are quite high as well.

C. Calculating the covariance matrix and the correlation coefficient between two company stocks In finding the covariance value in the Markowitz method, you can use the equation "Cov

$$\text{Cov}(R_A, R_B) = \sigma_{RA,RB} = \sum_{i=1}^{n} \frac{[(R_{Ai} - E(R_A).(R_{Bi} - E(R_B)]}{n}$$

=COVAR formula in Microsoft excel. Meanwhile, to find the correlation coefficient value, use the =CORREL formula or the equation $r_{AB} = \rho_{AB} = \frac{\sigma_{RA,RB}}{\sigma_A.\sigma_B}$

Based on the results of the calculation of the covariance matrix between the two stocks, it shows that there are 1024 stock combinations that can be grouped into three parts, namely the combination of stocks that have a positive covariance value (+) of 910, a combination of stocks with a negative value of (-) as many as 108, the last combination of stocks which has a covariance value of zero (0) as much as 6. As for the results of the calculation of the correlation coefficient, it can be seen that if there is a correlation between the same stocks, the value is (+1), which means the risk of thisstock portfolio will not change the same as the risk of the individual stocks so that it does not provide risk reduction benefits to investors or the risk cannot be diversified. Conversely, if two stocks have returns with a correlation coefficient (-1), then all risks can be diversified or portfolio risk will be equal to zero. In addition, if the correlation coefficient is in the range of (+1) or (-1), there will be a decrease in portfolio risk but does not eliminate all risks.

Covariance is used in the Markowitz method to show the extent to which the return from combining two stocks in a portfolio has a tendency to move simultaneously. While the correlation coefficient is used to describe the movement of riskbetween two company stocks in the portfolio.

D. Determine the proportion of funds

In forming the optimal portfolio, the researcher makes an initial portfolio with the assumption that the proportion of funds invested in each stock in the portfolio when added up is the same as one ($\sum W = 1$). Of the 50 company stocks sampled in this study, there are only 32 stock candidates that deserve tobe included in the optimal portfolio category so that the proportion of initial portfolio funds is 0.0313 (1/32). Next, the researcher uses a solver program to determine the proportion offunds. The following is a table containing the proportion of funds for each share with the help of the solver program.

Based on the data in table 3, of the 32 stock candidates thatdeserve to be included in the optimal portfolio category, there are only 14 stocks that make up the optimal portfolio with the total proportion of funds being 100%. Shares of PT. Indofood CBP Sukses Makmur Tbk (ICBP) is known to have the largest proportion of funds in the optimalportfolio formed, which is 34.17%, although previously it had an expected return value of (-0.0018) or (-0.18%) but this stockhas the minimum level of stock risk where the variance and standard deviation are 0.0030 and 0.0552, respectively.Meanwhile, the shares with the smallest proportion of funds were obtained by PT. Aneka Tambang Tbk (ANTM) is 0.11%.This is due to one of the factors that determine whether or not the proportion of funds is large, namely the risk of the stock inquestion optimal portfolio.

In addition to calculating the expected return and risk of each stock, the researcher will also calculate the expected return and risk of the previously formed optimal portfolio. In the calculation of the expected return portfolio can use the formula $E(R_p) = \sum_{i=1}^{n}(w_i . E(R_{it}))$.

Table 4 Expected Return and Portfolio Risk

| Nama Perusahaan	Proporsi Dana
Ace Hardware Indonesia Tbk	9,51%
Adaro Energy Tbk	2,46%
Aneka Tambang Tbk	0,11%
Bank Central Asia Tbk	3,76%
Charoen Pokphand Indonesia Tbk	6,05%
Indofood CBP Sukses Makmur Tbk	34,17%
Kalbe Farma Tbk	2,27%
Merdeka Copper Gold Tbk	4,29%
Mitra Keluarga Karyasehat Tbk	12,84%
Bukit Asam Tbk	1,62%
Tower Bersama Infrastructure Tbk	1,27%
Telekomunikasi Indonesia (Persero) Tbk	11,42%
Sarana Menara Nusantara Tbk	2,73%
United Tractors Tbk	7,51%
Expected Return Portofolio	0,0075
Varian Portofolio	0,0010
Standar Deviasi Portofolio	0,0313

Expected Return portfolio is a measure that shows the rate of return obtained from the formed portfolio. Of these stocks, the portfolio yielded an expected return of 0.75 percent with a portfolio risk (variant and standard deviation)

of 0.10 percent and 3.13 percent, respectively. Portfolio risk in the Markowitz model is not the sum of the risks of individual assets in the portfolio, thus allowing portfolio risk to be smaller than the individual risk of each portfolio-

forming stock.

The expected return and standard deviation of this optimal portfolio can be compared with each individual stock return to see if there is a difference in the expected return and standard deviation of the two. The following is an illustration of the differences in the points that connect the return and standard deviation of stock portfolios and individual stocks.

Fig 2 Comparison of Expected Return and risk between individual stocks and portfolios.
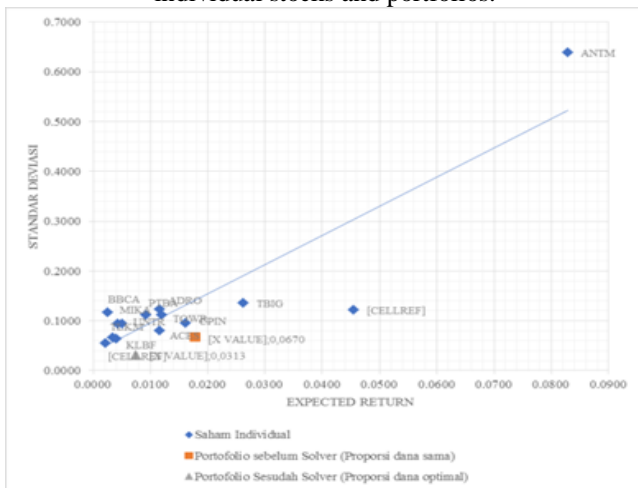
Based on Figure 2, it is clear that there are differences between investments in portfolios and investments in only one stock, as well as differences when investing with the same proportion of funds with the optimal proportion of funds. The comparison of the expected return value and the standard deviation of the three alternatives in the figure above shows that the proportion of funds is quite influential in determining the amount of expected return to be obtained.

IV. DISCUSSION

In the results of research using the Markowitz model with 50 company shares as the research sample, where these shares are shares of stock Of the 14 stocks in the optimal portfolio, PT. Indofood CBP Sukses Makmur Tbk (ICBP) occupies the top position with the largest proportion of funds, which is 34.17% compared to other stocks. This means that as much as 34.17% of 100% of the funds owned by investors will be used to invest in shares of PT. Indofood CBP Sukses Makmur Tbk (ICBP) while the rest will be used to invest in shares of PT. Mitra Keluarga Karya Sehat Tbk (MIKA) by 12.84%, PT. Telekomunikasi Indonesia (Persero) (TLKM) by 11.42%, PT. Ace Hardware Indonesia Tbk (ACES) of 9.51%, PT. United Tractors Tbk (UNTR) by 7.51%, PT. Charoen Pokphand Indonesia Tbk (CPIN) of 6.05%, PT. Merdeka Copper Gold Tbk (MDKA) by 4.29%, PT. Bank Central Asia Tbk (BBCA) by 3.76%, PT. Sarana Menara Nusantara Tbk (TOWR) of 2.73%, PT. Adaro Energy Tbk (ADRO) by 2.46%, PT. Kalbe Farma Tbk (KLBF) by 2.27%, PT. Bukit Asam Tbk (PTBA) by 1.62%, PT. Tower Bersama Infrastructure Tbk (TBIG) of 1.27%, PT. Aneka Tambang Tbk (ANTM) by 0.11%.

In this portfolio, the optimal proportion of funds produces the lowest expected return and risk values, which are 0.0075 and 0.0313, respectively, when compared to portfolios with the same proportion of funds, which are 0.0178 and 0.0670. This explains that the optimal proportion of funds portfolio produces an expected return that is almost the same with the same proportion of funds and the level of risk borne is smaller than the same proportion of funds. Based on this, the level of expected return from a portfolio is influenced by the large proportion of funds allocated, as well as the number of investment assets in the portfolio.

In addition, investing in individual stocks without diversifying has a high enough risk compared to the expected return to be obtained. For example, when investing in ICBP company shares with a standard deviation of 0.0552, it will only provide an expected return of 0.0021. The case is different when diversifying, although the risk of individual stocks cannot be eliminated but can be minimized. The formation of a portfolio will provide a combination of certain expected returns with a low level of risk.

So it can be concluded that investors who are risk averse or risk averse can choose a portfolio with the optimal proportion of funds because it will provide the lowest level of risk among individual stocks. A portfolio with the same proportion of funds is very suitable for investors who have a risk indifference nature or investors who choose a return according to the level of risk they face. Meanwhile, investors who tend to have a risk-seeking nature or who like to face risks with a certain level of return can choose alternative investments in only one stock in the optimal portfolio.

V. CONCLUSION AND SUGGESTION

Based on the results of data analysis and discussion of optimal portfolio formation using the Markowitz model on the IDX30 Index stock for the period February 2017 – January 2022, it can be concluded that:
1. The use of the Markowitz model in forming an optimal portfolio is able to produce 14 stocks which are included in the optimal portfolio of 50 IDX30 Index stocks that are used as research samples. With the proportion of funds from these shares, namely PT. Indofood CBP Sukses Makmur Tbk (ICBP) by 34.17%, PT. Mitra Keluarga Karya Sehat Tbk (MIKA) by 12.84%, PT. Telekomunikasi Indonesia (Persero). (TLKM) of 11.42%, PT. Ace Hardware Indonesia Tbk (ACES) of 9.51%, PT. United Tractors Tbk (UNTR) by 7.51%, PT. Charoen Pokphand Indonesia Tbk (CPIN) of 6.05%, PT. Merdeka Copper Gold Tbk (MDKA) by 4.29%, PT. Bank Central Asia Tbk (BBCA) by 3.76%, PT. Sarana Menara Nusantara Tbk (TOWR) of 2.73%, PT. Adaro Energy Tbk (ADRO) by 2.46%, PT. Kalbe Farma Tbk (KLBF) by 2.27%, PT. Bukit Asam Tbk (PTBA) by 1.62%, PT. Tower Bersama Infrastructure Tbk (TBIG) by 1.27% and PT. Aneka Tambang Tbk (ANTM) by 0.11%.
2. The optimal portfolio formed produces an expected return portfolio value of 0.0075 or 0.75% with a portfolio risk level of 0.0313 or 3.13%.

3. Comparison of the expected return value in the portfolio of the same proportion of funds with the optimal proportion of funds portfolio shows that the more investment assets contained in the portfolio, the greater the effect on the expected return value and the risk to be obtained, and vice versa.

Based on the results of the discussion and the conclusions that have been put forward in this study, the researchers can provide the following suggestions:

1. For investors and potential investors who want to invest in the IDX30 Index, they must be more careful in choosing the analytical tools to be used so that there are no fatal mistakes that lead to losses. The researcher suggests using an optimal portfolio- forming analysis tool with the Markowitz model that can provide the desired level of risk or return and is ready to be borne by investors according to investor preferences.
2. To minimize the risk of investing in IDX30 Index stocks, it is recommended to choose stocks in the optimal portfolio according to the proportion of funds in the analysis results of this study. However, because the stocks in the portfolio are not always optimal, it is hoped that they will continue to monitor their development.
3. And also because there are several (systematic) risks that cannot be controlled such as inflation, interest rates and others, the expected return value in the optimal portfolio may be wrong, which means that the expected return may be higher or lower than the result. analysis of this research.
4. In the next research, it is hoped that this research can be developed and can also be combined with other assets such as bonds or mutual funds. In addition, portfolio determination models can be compared to see which one is more optimal, such as the Single Index model, Constant Correlation Model (CCM), Multi Index Model (MIM), Simple Criteria for Optimal Portfolio Selection (SCFOPS), Stochastic Dominance and CAPM (Capital Asset Pricing Model).

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