American Journal of Humanities and Social Sciences Research (AJHSSR)
e-ISSN : 2378-703X
Volume-4, Issue-12, pp-237-244
www.ajhssr.com
Research Paper Open Access

Study of Optimal Portfolio Performance Comparison: Single Index Model and Markowitz Model on LQ45 Stocks in Indonesia Stock Exchange

I Komang Agus Adi Swara Putra[1], I Made Dana[2]
Faculty of Economics and Business, Udayana University (Unud), Bali, Indonesia

ABSTRACT : The purpose of this study is to determine the company stocks that are included in the optimal portfolio and the proportion of funds for each share and to determine the performance of the portfolio model and the difference in the average return of the single index model and the Markowitz model. The research is conducted at the Indonesia Stock Exchange on stocks included in the LQ45 index for the period February 2017 - January 2020. The study used secondary data with data collection methods using non-participant observation methods. The research sample consisted of 28 stocks obtained using purposive sampling method. The data analysis technique used is the Wilcoxon-Mann-Whitney test. The results show that the optimal portfolio model performance using the single index model has better performance than the Markowitz model, but statistically there is no significant difference in the average return using the single index model and the Markowitz model.
Keywords -*portfolio, single index model, Markowitz model, LQ45 index*

I. INTRODUCTION

Investments have begun to be seen by the public because the rapid development in the economic sector has made people think about their needs in the future and think that investment is a necessity. In financial management, there are three financial decisions in profit-oriented organizations, including funding decisions, investment and dividend policies. Investment is a commitment to a resource or an amount of funds that is carried out now, with the hope of obtaining benefits in the future. Various kinds of activities can be associated with investment, such as investing funds in real assets or financial assets. Activities to invest funds in financial assets can be carried out in the Capital Market(Setyantho & Wibowo, 2019).

According to Indonesian Law Number 8 of 1995 concerning Capital Market Article 1 point 13 states that an activity involving securities trading and public offerings, public companies and institutions and professions related to securities is called the capital market. In principle, the capital market is a long-term securities market in the form of debt and equity and their derivatives. Various long-term securities traded on the Indonesian capital market include common stock and preferred stock, convertible bonds and corporate bonds, government bonds, warrants, option contracts, proof of rights, futures contracts, and mutual funds. The place where the buying and selling of securities occurs is called the stock exchange. According to Indonesian Law no. 8 of 1995 concerning the Capital Market Article 1 point 4 defines a stock exchange as a party that provides and administers systems and facilities for parties making offers in the form of buying and selling securities for the purpose of trading securities. In Indonesia, there is one stock exchange that is still active in providing facilities for buying and selling securities, which is the Indonesia Stock Exchange (IDX).

Financial assets are claims in the form of securities on a number of assets of the securities issuer. Investors prefer financial assets because they are more liquid (easy to cash in) and easier to diversify. Investors prefer to invest in financial assets because these investments promise a high rate of return compared to investing in real assets. Investors hope that the capital invested in these investments will receive a low risk with a high return. One of the instruments traded in the capital market is stocks. Stocks are the most popular investment instrument in the capital market compared to the money market, such as in the form of savings and time deposits. Stocks have a fluctuating and very varied profit rate (Ariasih & Mustanda, 2018). Stock itself is the right security instrument to make short-term investments by utilizing capital gains. Capital gain is the profit obtained from the difference between buying and selling shares. This is the reason for investors who want quick profits, it is better if they invest in stocks, more precisely short-term investments in stocks because these investors can buy shares and sell them back in a very short period of time to get capital gains (Surya & Purbawangsa, 2016).

The Indonesia Stock Exchange provides a large selection of stocks in the capital market, seen from the types such as common stock, preferred stock, blue chip stocks and others. Based on the various types of stocks, the Indonesia Stock Exchange grouped stocks by issuing several stock indexes containing companies with various criteria in order to make it easier for investors to make choices, such as the JIC, Sectoral Index, LQ45, Jakarta Islamic Index (JII), KOMPAS100 and others. The index favored by many investors is the LQ45 index, because it is a collection of stocks with high liquidity(Wiryakusuma, 2020).

The LQ45 index consists of 45 stocks on the IDX with high liquidity and large market capitalization. The LQ45 index is trusted and objective by investment managers, financial analysts, and capital market observers in paying attention to the price movements of actively traded shares (Ariasih & Mustanda, 2018). Stock exchange conducts routine monitoring in observing the development of the 45 stocks in the LQ45 index. Every six months at the beginning of February and August, shares in the LQ45 index are replaced, if based on the selection criteria there are stocks that do not meet the criteria, they will be excluded from the index calculation and replaced with other shares. The stocks that are included in the LQ45 index make investors have to be careful in choosing which stocks to invest and whether the shares are feasible or not.

In making investment decisions, an analysis is needed that can help investors in choosing good investments, namely by analyzing securities and portfolio management. Portfolio theory is included as a modern theory of decision making in uncertain situations, aims to choose the optimal combination of stocks by owning (efficient portfolio), in the sense of providing results. the highest level of risk expected, or the lowest level of risk with the expected result(Logubayom & Victor, 2019).Determination of the optimal portfolio is very important for investors. The optimal portfolio will produce optimal returns with minimum risk that must be accounted for. A common problem is that investors are faced with uncertainty when choosing stocks to form their preferred portfolio, thus risk preference depends on each investor. Investors are faced with many combinations of stocks in a portfolio. A rational investor will choose the optimal portfolio. A rational investor will choose an investment that will provide maximum returns with minimal risk or provide a certain return with a certain risk according to the preferences of each investor(Hasanah et al., 2019).

In establishing a portfolio, of course, it must be related to which portfolio to choose by bearing the returns and risks that will be faced, because investors are faced with the many combinations of stocks that are in the portfolio. Returns or results from investment can be interpreted as the results of profits or losses obtained by investors from their investment activities, therefore it is common for investors that the purpose of investing is to get that return. Investors need to carefully calculate risk. The size of the deviation between the expected rate of return and the actual rate of return shows the risk in an investment activity (Yunita, 2018)

In forming an optimal portfolio, many analytical tools can be done. Investors tend to prefer to use easy analysis tools and simple calculations(Agustina & Sari, 2019). Analytical tools that can be used include the stochastic dominance, Treynor-Black model, single index model, Markowitz model, and others. The weakness of the stochastic dominance model is that investors must estimate the probability of a company. The disadvantage of the Treynor-Black model is that it often produces unrealistic weights in the portfolio. The weakness of the single index model is that it only puts forward a few assumptions to use, but this does not have a major effect on the results obtained. The Markowitz model also has a weakness, namely that this model only considers expected return and risk, does not consider risk-free assets (Adiningrum et al., 2016)

The analysis tools used to form the optimal portfolio are the single index model and the Markowitz model. The advantage of the single index model is that this model is based on observing the price of a stock that fluctuates in the direction of the market index, so this model considers risk-free assets (Adiningrum et al., 2016). The advantage of the Markowitz model is that it allows investors to choose portfolios according to their characteristics (providing the smallest risk with the expected return that follows, or choosing certain returns with risks that are ready to bear). In addition, this model is easy to apply because the optimal portfolio is assessed at the lowest point of the efficient portfolio (Maf'ula et al., 2018). The two analysis tools will provide different stock options so that a comparison of the two analysis tools is needed to find out the best stocks that are formed and have good performance.

Portfolio formation using a single index model can be done by comparing the ERB (Excess Return to Beta) value of a stock with its Ci (Cut-off rate) value. Hasanah et al. (2019) found that there are fifteen stocks listed as candidates for optimal portfolio stocks. Partono et al. (2017)found that there are 8 stocks from the most trusted companies in Indonesia that are candidates for the optimal portfolio. Poornima & Remseh (2016)found that there are 3 companies that are included in the optimal portfolio. Mulya & Herdiyana (2018)found that the optimal portfolio of the largest market capitalization weighs the majority of the property and real estate sector, then the chemical sector, then the cement sector, banks and the mining sector, while in the most active trading volume portfolio, the majority of weights are in the range above 10% to 15%, the second majority weight is in the range of 5%-10%, and the smallest weight is in the range of 0%-5%.

In the Markowitz approach, the selection of an investor's portfolio is based on the preference for the expected return and the risk of each portfolio choice. The results of the formation of the optimal portfolio of the

Markowitz model are highly dependent on investors' preferences for risk or return which are expected to function as constraints on the model. The optimal portfolio can also be formed by finding the best combination of return and risk. The combination can be obtained by finding the point of contact between the efficient frontier and the straight line drawn from the risk-free return. This point of contact is the point of contact between the efficient frontier and the straight line which has the greatest slope, by optimizing the slope, will get the best return and risk combination. This optimization requires estimation of results, estimation of variance and n (n - 1) / 2 co-variances for a total of 2n + n (n - 1) / 2 (Chasanah et al., 2017)

Plastun et al. (2019)found that the maximum return was 6.89% and the total risk was 2.69% from the responsible portfolio with a CSR strategy. Mahayani & Suarjaya (2019)found that there were 23 stocks included in determining the optimal portfolio of the Markowitz model. Setyawati & Sudiartha (2019)found that seven stocks that succeeded in becoming optimal portfolio candidates were formed by the Markowitz model. Portfolios that have been formed need to be evaluated to find out whether the level of return of the portfolio can provide returns beyond other portfolio returns that are used as benchmarks and whether the returns obtained are in accordance with the level of risk that must be borne. Portfolio return is the weighted average of security returns. This evaluation stage is carried out by measuring portfolio performance in which there are several methods that can be used, such as the Sharpe index, the Treynor index, and the Jensen index. The three indices have their own characteristics, the Sharpe index emphasizes total risk (standard deviation), the Treynor index considers market fluctuations to play a major role in influencing return (beta), while the Jensen index emphasizes alpha (Surya & Purbawangsa, 2016). This study uses one of these indices is the Treynor index.

II. HYPOTHESIS DEVELOPMENT

Anggraeni & Mispiyanti (2020) state that the single index model or one factor model assumes that the yields between two or more securities will be correlated, that is, they will move together and have the same reaction to one single factor or index that is included in the model. The factor or index is the Composite Stock Price Index. The assumption used in the single index model is that securities will be correlated only if they have the same response to market returns.There are three assumptions that underlie portfolio theory with the Markowitz model, namely a single investment period, no transaction costs, and investor preferences based solely on expected return and risk.

Chasanah et al. (2017)in their research obtained results that based on data in the Jakarta Islamic Index (JII) period December 1, 2015-30 November 2016, based on the MV Criteria, it can be concluded that the optimal portfolio formation with the Markowitz model is more dominant than the Single Model Index. Pudji et al. (2018)in their research found that there are differences in the optimal portfolio formation on the Kompas 100 and LQ45 indexes. This study shows that the optimal portfolio calculation with a single index model has better performance than the Constant Correlation Model and the Markowitz Model for both the Kompas 100 and LQ 45 indices.Varghese & Joseph (2018) in their research found that the single index model is superior to the Markowitz model which varies when viewed from the return equation and also the portfolio risk of each model. Research conducted by Chakraborty & Patel (2018)found that only 8 stocks met the optimal portfolio using the single Sharpe index model and then took 8 stock returns and the risk was also calculated using the Markowitz model. The optimal portfolio formation using a single index model is better used.Based on previous research that has been described, this research is in the same direction as this research, including research conducted by Chasanah et al. (2017), Pudji et al. (2018), Varghese & Joseph (2018) and Chakraborty & Patel (2018) where the study found that there were differences between the single index model and the Markowitz model. Most of the studies found that the single index model was better than the Markowitz model.

Based on this description, the hypothesis is proposed to answer the formulation of the fourth problem of this study:

H1: There is a significant difference in the average return using the single index model and the Markowitz model

III. METHODS

Based on the problems studied, this study belongs to a comparative study with a quantitative approach. The location or scope of the research is carried out on the Indonesia Stock Exchange (IDX) on stocks included in the LQ45 index by taking data from the Indonesia Stock Exchange, Bank Indonesia and Yahoo Finance. The object of this research is the stock portfolios of companies that are included in the LQ45 index on the Indonesia Stock Exchange (IDX) for the period February 2017 - January 2020.

The quantitative data in this study is the share price data from the sample to be studied because the data is in the form of numbers. The data source in this research is secondary data. Data obtained from secondary sources, such as stock price data, company financial reports and other sources. The data needed in this study are the stock data of companies that are included in the LQ45 Index for the period February 2017-January 2020;

Monthly stock closing price; Monthly Composite Stock Price Index (IHSG) at closing; Bank Indonesia Interest Rate (7-days Repo Rate) and Corporate Financial Statements

The population in this study were all companies included in the LQ45 index on the Indonesia Stock Exchange for the period February 2017-January 2020, as many as 45 companies. The sampling technique used in this study was purposive sampling method. The criteria that must be met in sampling include: The company is consistently included in the LQ45 index in the LQ45 index during the observation period and the Company does not conduct a stock split during the observation period. This research is limited to companies that do stock splits to avoid drastic changes in stock prices in the period February 2017-January 2020 and avoid incomplete data from the companies that are the research samples (Putri & Nila, 2018)

Based on a population of 45 companies, namely companies that are included in the LQ45 index on the Indonesia Stock Exchange, there were 28 companies from that population that met the criteria to be used as research samples, namely there were 13 companies that were not included in the LQ45 index consecutively and there were 4 companies. who did a stock split during the observation period. The data collection method used in this study is the non-participant observation method. The data analysis technique in this study uses a single index model and the Markowitz model as a method of forming an optimal portfolio. The next step is to measure optimal portfolio performance using the Treynor index.

IV. RESULTS AND DISCUSSION

The first stage in forming an optimal portfolio using a single index model is to calculate the value of realized return (R_{it}), *expected return* ($E(R_i)$), standard deviation (σ_i), and variants (σ_i^2) each share that is the research sample. Of the 28 stocks that were the research sample that had the highest realized return in the February 2017-January 2020 period, such as BBCA of 0.7779 with an expected return value of 0.0222, and the stocks with the lowest return and expected return were LPPF of -1, 1558 with an expected return of -0.0330.

The next step in forming the optimal portfolio is calculating the standard deviation and variance of each stock that is the research sample. The greater the value of the variance, the further the difference between the actual return and the average return. The standard deviation is the square root of the variance. The highest standard deviation value of the 28 stocks in the study sample was PTPP of 0.1464 with a variance value of 0.0214, and the stock with the lowest standard deviation value was BBCA of 0.0414 with a variance value of 0.0017.

The second stage in forming an optimal portfolio is to calculate the market return value (R_m), *expected return* ($E(R_m)$), market standard deviation (σ_i), and market variance (σ_i^2) by using the monthly historical data of the Composite Stock Price Index (JCI) as a market index. The value of market returns using the JCI monthly historical data as the market index is 0.1130 with an expected return of 0.0032, then the value of the market standard deviation is 0.0293 with a market variance of 0.0009.

The third stage in forming an optimal portfolio is calculating Beta (β_i) and Alpha (α_i) each share that is the research sample. The greater the beta, the greater the sensitivity of the security's return to market returns. Alpha is a return component related to the uniqueness of a company. The highest beta value of the stocks that were the samples of the study was ANTM of 2.2610 and the stocks with the lowest beta value were LPPF of -0.0387. The stock with the highest alpha value was PTPP at 3.4871 and the stock with the lowest alpha value was AKRA at -0.0208.

The fourth stage in forming the optimal portfolio is to calculate the residual error variance of each stock that is the research sample. Of the 28 stocks that were the research sample, there were stocks with the highest residual error variance value were MNCN of 0.0182 and stocks with the lowest residual error variance value were BBCA of 0.0008.

The fifth stage in forming an optimal portfolio is to calculate the Excess Return to Beta (ERB) of each stock that is the research sample. There are 8 stocks that have positive ERB values, namely ANTM, BBCA, BBNI, ICBP, INCO, INTP, MNCN, and SMGR, then there are 20 stocks that have negative ERB values. The stock that has the highest ERB value is BBCA of 0.0170.

The sixth step in forming an optimal portfolio is to calculate Ci (Cut of Rate), then determine the cut of point (C *). Cut of point (C *) lies at the BBCA of 0.0018. This means that the value of 0.0018 is used as a limiting point to determine which stocks are candidates for the optimal portfolio by comparing the ERB value of each share (ERB> 0.0018), if the ERB value of these stocks is greater than the limiting point. of 0.0018, then the stock is included in the optimal portfolio candidate. The stocks that are included in the optimal portfolio candidates are BBCA, ICBP, INCO, INTP, MNCN, and SMGR.

The seventh stage in forming an optimal portfolio is to calculate the proportion of funds for each security that are included in the optimal portfolio candidate. The highest proportion of funds from stocks that were candidates for the optimal portfolio was BBCA with a proportion of 83.59% and shares with the lowest proportion of funds was INTP at 0.34%. The proportion of each security that is an optimal portfolio candidate is BBCA (83.59%), ICBP (10.82%), INCO (2.94%), INTP (0.34%), MNCN (0.35%) , and SMGR (1.97%).

The eighth step in forming an optimal portfolio using a single index model is to calculate the amount of the expected return of the portfolio (E(IDR)) and the amount of portfolio risk (σ^2_p). The value of the expected portfolio return is 0.0205 and the portfolio risk is 0.0025. This shows that the expected rate of return is 2.05% with a risk level of 0.25%.

The first step in forming an optimal portfolio using the Markowitz model is calculating the level of individual stock returns and individual stock expected returns. There are 14 stocks that have positive return and expected return. The stock with the highest positive return was BBCA of 0.7779 with an expected return of 0.2222, while the stock with the lowest positive return was WIKA of 0.0118 with an expected return of 0.0003.

The second stage in forming an optimal portfolio using the Markowitz model is calculating the standard deviation and variance of each research sample stock that has a positive expected return. Standard deviation and variance are used in calculating the risk level of a stock. The stock with the highest standard deviation was INCO of 0.1411 with a variance of 0.0199, while the stock with the lowest standard deviation was BBCA's stock of 0.0414 with a variance of 0.0017.

The third stage is to calculate the value of the correlation coefficient between stocks that are candidates for the optimal portfolio. Stocks that have a correlation coefficient between 0 and -1 will help reduce risk. The fourth stage in forming an optimal portfolio using the Markowitz model is to calculate the covariance between stocks that are candidates for the optimal portfolio. The covariance between stocks is able to show a positive or negative value. A covariance with a positive value reflects that two securities tend to move in the same direction, while a covariance with a negative value reflects that two securities tend to move in opposite directions, and if a covariance with a value of zero reflects that one security is unrelated to another.

The fifth stage in forming an optimal portfolio using the Markowitz model is to calculate the expected return and standard deviation of stocks using the same proportion. The calculation of the same proportion is by dividing 100% by the number of shares that are candidates for the optimal portfolio, so that each share has the same proportion of 100% / 14 = 0.0714. The portfolio formed by 14 stocks that have a positive expected return and are candidates for the optimal portfolio using the same proportion of 0.0714 produces an expected return of 0.0075 or 0.75% and a risk level of 0.0488 or 4.88%.

The sixth stage is the final stage in forming an optimal portfolio using the Markowitz model is calculating the expected return and standard deviation by using the covariance between the optimal portfolio candidate stocks with optimal proportions. Of the 14 stocks that are candidates for the optimal portfolio, 9 stocks are eligible to become members of the optimal portfolio with BBCA shares of 38.629% as the stock with the highest proportion value. The nine members of the optimal portfolio consist of ANTM, BBCA, BBTN, EXCL, ICBP, INDF, JSMR, MNCN, and TLKM shares with the respective proportion of funds of 0.18%, 38.63%, 0.04%, 2, 01%, 24.72%, 1.54%, 8.36%, 0.07%, and 23.82%. The nine stocks that are members of the optimal portfolio provide an expected return of 1.16% with a risk level of 2.80%.

The value of the expected return portfolio of the single index model is 0.2050 while the Markowitz model is 0.0116, this means that based on the expected return parameter, the single index model provides a greater return rate than the Markowitz model. The portfolio risk parameter of each model also shows that the risk level of the single index model is smaller, which is 0.0025 compared to the Markowitz model, which is 0.0280. The single index model again shows that the beta parameter of the portfolio is greater at 1.0120 than the Markowitz model of 0.6900 which means that the single index model is better. The next parameter is the Treynor index parameter which measures the rate of return by considering the risk free rate, indicating that the single index model has a greater value than the Markowitz model of 0.0161 and the Markowitz model of 0.0107, this means that based on the Treynor index, the single index model is better. .

Table 1. Wilcoxon-Mann-Whitney Test Results

	Return
Mann-Whitney U	19,000
Wilcoxon W	64,000
Z	-,944
Asymp. Sig. (2-tailed)	,345
Exact Sig. [2*(1-tailed Sig.)]	,388[b]

Source: Data processed, 2020

Based on the results of calculations and analyzes that have been done, it shows that the average return test using the Wilcoxon-Mann-Whitney test on the single index model and the Markowitz model has a Sig value. Expected return (0.345)> sig α (0.05), it can be concluded that H0 is accepted and H1 is rejected, which means that there is no significant difference in the average return between the single index model and the Markowitz model.

The rate of return obtained by using a single index model and the Markowitz model is not higher than the risk free rate of return. This could be due to inflation which causes poor investment performance, if the interest rate of Bank Indonesia rises, it will have an impact on the value of bad credit for a salary increase, the implication is that stock prices fall, if stock prices fall, the stock return will also decrease. Poor performance due to inflation is felt by various industrial sectors such as manufacturing because loan funds used to expand the company or other costs do not provide profit, then this makes investors withdraw their shares from the company and affects stock prices and stock returns.

The single index model with the Markowitz model is the same. The difference lies in the calculation where the calculation of the Markowitz model is more complex and complicated, while the single index model is a simplification of the Markowitz model. Logically, the results of the optimal portfolio formation obtained by the single index model with the Markowitz model have no significant difference because they come from the same source.

Based on the results of the calculation, it shows that of the 28 LQ45 index stocks which were the research samples in forming an optimal portfolio using the single index model for the period February 2017 - January 2020 resulted in 6 stocks forming an optimal portfolio with different proportions. The six stocks that form optimal portfolios with the proportion of funds for each share, are BBCA (83.59%), ICBP (10.82%), INCO (2.94%), INTP (0.34%), MNCN (0 , 35%), and SMGR (1.97%) which gave an expected return of a portfolio of 0.0205 or 2.05% with a risk level of 0.0025 or 0.25%, while the optimal portfolio formed using the Markowitz model resulted in The 9 stocks that make up the optimal portfolio with different proportions for each share are ANTM (0.18%), BBCA (38.63%), BBTN (0.04%), EXCL (2.01%) stocks.), ICBP (24.72%), INDF (1.54%), JSMR (8.36%), MNCN (0.70%), and TLKM (23.82%) which gave an expected return of 0.0116 or 1.16% with a risk level of 0.0280 or 2.80%.

The optimal portfolio that has been formed using the single index model and the Markowitz model, then evaluates the optimal portfolio performance of each model using several parameters, namely the expected return portfolio, portfolio risk, portfolio beta, and the Treynor index. The results obtained indicate that the single index model is better used than the Markowitz model based on the performance measured by these parameters. The parameter value used in evaluating the optimal portfolio performance of each model is a single index model that has an expected return portfolio of 0.0205 or 2.05%, a portfolio risk value of 0.0025 or 0.25%, a portfolio beta value of 0.0205 or 2.05%. 1.0120 and the Treynor index value of 0.0161 or 1.61%, while the Markowitz model has an expected return of 0.0116 or 1.16%, the portfolio risk value is 0.0280 or 2.80%, the portfolio beta is 0.69003 and the Treynor index value of 0.0107 or 1.07%. This shows that the single index model is better than the Markowitz model because it produces a higher expected return with a lower level of risk and has a higher beta value of the portfolio and a higher Treynor index value.

The results of this study provide theoretical implications which state that stocks included in the LQ45 index can be used to form optimal portfolios using a single index model or the Markowitz model. Portfolios that are formed by diversifying are proven to help reduce the level of investment risk. These results are in accordance with Markowitz's portfolio theory, which states that the Markowitz model portfolio is based on investor preferences for investment returns and risks. These results also show that a portfolio formed with a single index model is in accordance with the theory of a single index model portfolio that this model is based on the observation that the price of a stock fluctuates in the direction of the market price index. The results of this study indicate that there is no significant difference in the average return between the single index model and the Markowitz model which is statistically supported by the results of previous studies, such as, Yuwono & Ramdhani (2017), Suresh & Harshitha (2017), and Azizah et al. (2017)

The results of this study provide practical implications that investors with the type of dislike of high risk (risk averse) can choose LQ45 index stocks which are the optimal portfolio stocks formed using a single index model. The single index model provides a portfolio expected return of 0.0205 or 2.05% with a risk level of 0.0025 or 0.25% which is formed from 6 optimal portfolio stocks, namely BBCA, ICBP, INCO, INTP, MNCN, and SMGR. Investors who like risk (risk seekers) can choose stocks that are optimal portfolio stocks formed using the Markowitz model which provides more shares, which are 9 company stocks including ANTM, BBCA, BBTN, EXCL, ICBP, INDF, JSMR, MNCN, and TLKM with an expected return of 0.0116 or 1.16% and a risk level of 0.0280 or 2.80%. The single index model and the Markowitz model are basically the same, the only difference is the calculation.

V. CONCLUSION

The optimal portfolio formation using a single index model shows that there are 6 stocks that make up the optimal portfolio, namely BBCA, ICBP, INCO, INTP, MNCN, and SMGR stocks. The formation using the Markowitz model on index stocks shows that there are 9 stocks that make up the optimal portfolio, namely ANTM, BBCA, BBTN, EXCL, ICBP, INDF, JSMR, MNCN, and TLKM stocks.

The proportion of funds in LQ45 index stocks which are the research samples that form an optimal portfolio using a single index model are BBCA (83.59%), ICBP (10.82%), INCO (2.94%), INTP (0, 34%), MNCN (0.35%), and SMGR (1.97%). The proportion of funds in the LQ45 index stocks which are the research samples that form the optimal portfolio using the Markowitz model are ANTM (0.18%), BBCA (38.63%), BBTN (0.04%), EXCL (2.01%), ICBP (24.72%), INDF (1.54%), JSMR (8.36%), MNCN (0.70%), and TLKM (23.82%).

Evaluating optimal portfolio performance using parameters shows that the optimal portfolio formation using a single index model provides the best performance with the performance parameter values used, namely portfolio return of 0.0205, portfolio risk of 0.0025, portfolio beta of 1.0120, and Treynor index. amounting to 0.0161. Based on the results of hypothesis testing using the Wilcoxon-Mann-Whitney test, it can be concluded that there is no significant difference in the average return of the single index model with the Markowitz model.

Investors with a conservative type have a tendency to avoid risk (risk averse) can invest their funds in optimal portfolio stocks formed using a single index model because the level of risk given is lower, while investors with the aggressive type have the principle of high risk high return (risk taker), can invest funds in optimal portfolio stocks formed by the Markowitz model. For future researchers who will conduct similar research in order to focus more on the object of research which includes companies with the same sector by prioritizing liquid companies because the stocks included in the LQ45 index are classified in different sectors so that they cannot comprehensively compare companies in one sector. Future researchers are also expected to use different analytical tools that use the concept of risk and use a study period with a longer time span with a daily closing price.

REFERENCES

[1] Adiningrum, T. R., Hidayat, R. R., & Sulasmiyati, S. (2016). Penggunaan Metode Single Index Model Dalam Menentukan Portofolio Optimal Tahun 2012-2015 (Studi pada Saham-Saham yang Terdaftar dalam Indeks IDX30 di Bursa Efek Indonesia Periode Februari 2012 – Agustus 2015). *Jurnal Administrasi Bisnis (JAB)*, *38*(2), 89–96.

[2] Agustina, P. A. A., & Sari, M. M. R. (2019). Comparison of Two Optimization Models in Assessing LQ-45 Index Optimal Portfolio Performance. *Research Journal of Finance and Accounting*, *10*(12), 39–43. https://doi.org/http://dx.doi.org/10.7176/RJFA/10-12-05.

[3] Anggraeni, R. W., & Mispiyanti. (2020). Analisis Pembentukan Portofolio Optimal Saham dengan Menggunakan Model Indeks Tunggal (Studi Kasus pada Perusahaan Terdaftar Indeks Sri-Kehati Periode 2016-2018). *Jurnal Ilmiah Mahasiswa Manajemen, Bisnis Dan Akuntansi*, *2*(1), 47–54. https://doi.org/https:// doi.org/10.32639/jimmba.v2i1.442

[4] Ariasih, N. L. P. I., & Mustanda, I. K. (2018). Pembentukan Portofolio Optimal Menggunakan Model Indeks Tunggal pada Saham Indeks LQ45. *E-Jurnal Manajemen Unud*, *7*(8), 1–30. https://doi.org/https://doi.org/10.24843/EJMUNUD .2018.v07.i08.p17

[5] Azizah, L. R. N., Tandika, D., & Nurdin. (2017). Analisis Perbandingan Pembentukan Portofolio Optimal Menggunakan Single Index Model dan Markowitz Model pada Saham-Saham JII di Bursa Efek Indonesia Periode Januari 2015 – Desember 2016. *Prosiding Manajemen*, *3*(1), 435–450.

[6] Chakraborty, S., & Patel, A. K. (2018). Construction of Optimal Portfolio Using Sharpe's Single Index Model and Markowitz Model An Empirical Study on Nifty 50 Stock. *Journal of General Management Research*, *5*(1), 86–103.

[7] Chasanah, C. I. ., Lesmana, D. C., & Purnaba, I. G. P. (2017). Comparison of The Markowitz and Single Index Model Based on M-V Criterion in Optimal Portfolio Formation. *International Journal of Engineering and Management Research*, *7*(4), 323–328.

[8] Hasanah, N. N., Irdiana, S., & Lukiana, N. (2019). Formation of Portfolio Analysis Optimal Model with A Single Index (Studies in IDX30 Index Period 2016-2018). *Progress*, *2*(2), 355–364.

[9] Logubayom, A. I., & Victor, T. A. (2019). Portfolio Optimization of Some Stocks on The Ghana Stock Exchange Using Markowitz Mean-Variance Approach. *Journal of Financial Risk Management*, *8*(1), 29–41. https://doi.org/http://doi.org/10.4236/jfrm.2019.81003

[10] Maf'ula, Z., Handayani, S. R., & Zahroh, Z. . (2018). Portofolio Optimal dengan Penerapan Model Markowitz Sebagai Dasar Keputusan Investasi. *Jurnal Administrasi Bisnis (JAB)*, *63*(1), 17–23.

[11] Mahayani, N. P. M., & Suarjaya, A. A. G. (2019). Penentuan Portofolio Optimal Berdasarkan Model Markowitz pada Perusahaan Infrastruktur Di Bursa Efek Indonesia. *E-Jurnal Manajemen*, *8*(5), 2057–3085. https://doi.org/https:// doi.org/10.24843/EJMUNUD.2019.v08.i05.p17

[12] Mulya, Y., & Herdiyana. (2018). Optimal Portfolio Construction Using Single Index Model: A Comparative Study of Largest Market Capitalization and Most Active Trading Volume Stocks. *International Journal of Engineering & Technology*, *7*(3), 553–558. https://doi.org/http://dx.doi.org/10.14419/ijet.v7i3.20.22 940.

[13] Partono, T., Widiyanto, A. Y., & Vidayanto, H. (2017). The Analysis of Optimal Portfolio Forming with Single Index Model on Indonesian Most Trusted Companies. *International Research Journal of Finance and Economics*, *163*(1), 50–59.

[14] Plastun, A., Makarenko, I., Yelnikova, Y., & Bychenko, D. (2019). Optimal Investment Portfolio Selection From The Largest Ukrainian Companies: Comparative Study of Conventional and Responsible Portfolios. *Public and Municipal Finance*, *8*(1), 44–53. https://doi.org/http://dx.doi.org/10.21511/pmf.08(1).2019.04

[15] Poornima, & Remseh, A. P. (2016). A Study on Optimal Portfolio Construction Using Sharpes Single Index Model with Special Preference to Selected Sectors Listed in NSE. *National Journal of Advanced Research*, *2*(3), 28–31.

[16] Pudji, A., Ahmad, F., & Yolanda. (2018). Analysis of Optimal Portfolio Performance in Kompas 100 and LQ45 of Indonesia Stock Exchange. *Russian Journal of Agricultural and Socio-Economics Sciences*, *12*(48), 12–21. https://doi.org/https://doi.org/10.18551/rjoas.2018-12.02

[17] Putri, I. M. J., & Nila, F. N. (2018). Pembentukan Portofolio Optimal dengan Model Indeks Tunggal (Studi pada Saham Perusahaan yang Tercatat Dalam Indeks IDX30 Di Bursa Efek Indonesia dan Strait Times Index Di Singapore Exchange Tahun 2015-2016). *Jurnal Administrasi Bisnis (JAB)*, *61*(2), 1–10.

[18] Setyantho, K. S., & Wibowo, S. H. (2019). Comparison of Optimal Between Single Index Models and Markowitz Models (Case Study of Daily Return Implementation of OJK Rules Regarding Investments of State Values For Non-Bank Financial Institutions 2016-2017). *Business and Entrepreneurial Review*, *19*(1), 43–66. https://doi.org/http://dx.doi.org/10.25105/ber.v19i1. 5349.

[19] Setyawati, N. P. E. C., & Sudiartha, G. M. (2019). Pembentukan Portofolio Optimal Menggunakan Model Markowitz. *E-Jurnal Manajemen*, *8*(7), 4213–4238. https://doi.org/https://doi.org/10.24843/EJMUNUD.2019.v08.i07.p08

[20] Suresh, A. ., & Harshitha, N. (2017). Comparison of Returns and Risk Using Markowitz and Sharpe's Model. *International Journal of Management and Commerce Innovations*, *5*(1), 806–813.

[21] Surya, D., & Purbawangsa, I. . A. (2016). Studi Komparatif Portofolio Optimal Saham LQ 45 dan 50 Most Active Stocks By Trading Frequency. *E-Jurnal Manajemen Unud*, *5*(11), 7185–7213.

[22] Varghese, J., & Joseph, A. (2018). A Comparative Study on Markowitz Mean-Variance Model and Sharpe's Single Index Model in the Contest of Portfolio Investment. *PESQUISA-International Refereed Journal of Research*, *3*(2), 36–41.

[23] Wiryakusuma, I. G. B. Y. (2020). Analysis of Optimal Portfolio Performance Comparison on Companies Listed in LQ45 Index and Companies Unregistered in LQ45 Index. *International Business Management*, *1*(1), 250–261. https://doi.org/http://doi.org/10.18502/kss.v4i3.6410

[24] Yunita, I. (2018). Single Index Model In Determining Optimal Portfolio Composition of Jakarta Islamic Index (JII). *International Learning Organization*, *1*(1), 238–248.

[25] Yuwono, T., & Ramdhani, D. (2017). Comparison Analysis of Portfolio Using Markowitz Model and Single Index Model: Case in Jakarta Islamic Index. *Journal of Multidisciplinary Academic: Science, Engineering and Social Science Series*, *1*(1), 25–31.