

Formation of an Optimal Portfolio of Shares of LQ-45 Indexed Companies Using the Markowitz Index Model

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Abstract:

Investment is an activity that cannot be separated from the business world. To achieve the expected return and reduce risk, it is necessary for a company to diversify its business. Diversification means investors need to form a portfolio through the selection of a combination of assets in such a way that risk can be minimized without reducing the expected return, because reducing risk without reducing return is the investor's goal in investing. The research Data used is historical data on the closing price of the company's shares indexed LQ-45 published by the Indonesia Stock Exchange. Data obtained from the official website of the Indonesia Stock Exchange, namely www.idx.co.id and www.yahoofinance.co.id in the form of quantitative data. The Markowitz model is a portfolio determination model that emphasizes the relationship between Return and investment risk

Keywords: Portfolio, Expected Returns, Markowitz Model

INTRODUCTION

Investment is an activity that cannot be separated from the business world. Investment can be defined as the postponement of consumption now to input into productive assets over a certain period of time which will increase the total utility (Hartono, 2013). There are many investment options for the community, one of which is investment in the capital market. Increasing public awareness of investing in the capital market is also supported by rapid advances in technology and information, so that people will be easier to channel funds in the capital market (Megawati et al., 2022). The capital market is a container of alternative investment options that can generate optimal profit levels for investors, and is a bridging relationship between fund owners (investors) and fund users (issuers) (Nisardi et al., 2024). The capital market offers a variety of investment options with different levels of risk and return.

Investments are made to be able to bring returns, but calculating returns alone is not enough, the risk of investment also needs to be taken into account. Investors in investing always try to minimize the various risks that arise, both short-term and long-term ((Irham & Yovi, 2011). Likewise, in the capital market, rational investors will invest their funds by choosing efficient stocks, which can provide maximum returns with certain risks or certain returns with minimal risk (Zubir, 2001). Financial theory states, when investment risk increases, the rate of return implied by investors is greater. Markowitz shows that to reduce investment risk in this case, investors can invest in various types of stocks by forming a portfolio (Hartono, 2013).

Portfolio risk in general can be divided into two, namely systematic risk and unsystematic risk (Zubir, 2001). Systematic risk is a market risk that is unlikely to be avoided by investors, while unsystematic risk is a corporate risk that can be avoided or

minimized through diversification. Markowitz Model that the very important thing in portfolio diversification is “do not put all the eggs into one basket, because if the basket falls, then all the eggs in the basket will break”.

Diversification means investors need to form a portfolio through the selection of a combination of assets in such a way that the risk can be minimized without reducing the expected return, because reducing risk without reducing return is the goal of investors in investing (Yunita, 2018). A portfolio can be categorized as efficient if it has the same level of risk, is able to provide a higher level of profit, or is able to generate the same level of profit, but with lower risk. An efficient portfolio is a good portfolio, but not the best. The best portfolio is the optimal portfolio. An efficient portfolio has only one of the best factors, the expected return factor or risk factor. An optimal portfolio is one that has the best combination of expected return and risk.

The Markowitz model is a portfolio determination model that emphasizes the relationship between Return and investment risk. Using the Markowitz model can cover the disadvantages of random diversification. This study chose to use the Markowitz model from the many other alternatives because the portfolio with the Markowitz Model can provide a level of return that is in accordance with the risk that investors dare to bear. The formation of a portfolio using the Markowitz model is an objective way to predict the price or return of securities because it is based on previous real data which is then averaged (Samsul, 2006).

LITERATURE REVIEWS

Investment

An investment is an investment in one or more assets that are owned and usually for a long period of time in the hope of making a profit in the future. Today many countries are doing policies that aim to increase investment both domestic and foreign capital. This is done by the government because investment activities will also encourage a country's economic activity, employment, increased output produced, foreign exchange savings or even foreign exchange addition. Investing aims to get a profit with a certain level of risk (Sunariyah, 2006)

Investment is buying an asset that is expected in the future can be resold at a higher value, investment is a commitment to a number of funds or other resources that are carried out at this time, with the aim of obtaining a number of benefits in the past. The purpose of investment is to improve the welfare of investors (Rizquillah et al., 2024). Shares are traded first on the primary market before finally being traded on the secondary market. Stock market value is the price of a stock in the ongoing market on the stock exchange when the stock exchange has closed then the market price is the closing price. Investment by buying shares of a company, means that investors have invested funds in the hope that they will benefit from the resale of these shares (Sunariyah, 2006) According to (Darmadji & Hendy M. Fakhruddin, 2011), there are several points of view to distinguish the types of stocks. In terms of ability to collect rights or claim shares are divided into ordinary shares and preferred shares. Viewed from the way the transition of shares is divided into shares on show and shares on behalf of. In terms of trading performance, stocks are divided into Blue Chip Stocks, Income Stocks, Growth Stocks, Speculative stocks and Counter Cyclical Stocks.

Investors benefit in the form of capital gain/loss from the sale of shares. Investors can also benefit in the form of dividends by investing funds in a security over a relatively longer period of time than investing for the purpose of buying and selling shares. Capital gain / loss and dividends are generally referred to as the return or rate of return on an

investment. The reward for the courage of the investor to bear the risk of the investment made is called return. Yield and capital gains are the two main components of return on investment.

Definition of risk described, risk is a possible difference between the actual return with the expected return. The more likely the difference is, the greater the risk of the investment. In general the risk may be reduced by combining several single securities into a portfolio form as shown by Harry M. Markowitz in the 1950s. The main requirement to be able to reduce risk in the portfolio is the return for each security is not positively correlated and perfect (Hartono, 2013)

Furthermore, it is also mentioned that one of the risk gauges is the standard deviation or variant which is the square of the standard deviation. The risk measured by this measure measures the risk of how much the value of each item deviates from its average. The magnitude of the standard deviation or variance of the return values of the single securities in it can be used to find portfolio risk. Risk is divided into two types, namely systematic risk and unsystematic risk to measure risk in general (Riski & Sulistianingsih, 2024).

Portfolio Markowitz

A portfolio is a set of papers or a set of investment opportunities. The purpose of the portfolio is to reduce risk by diversifying securities holdings. An efficient portfolio can be determined by choosing a certain expected rate of return and then minimizing the risk or determining a certain level of risk and then maximizing the expected return (Setyawati & Sudiarta, 2019). There is one portfolio that suits the preferences of investors from many efficient portfolios, this chosen portfolio is called the optimal portfolio. The optimal portfolio is a portfolio that an investor chooses from the many options available in a collection of efficient portfolios. The first thing that is needed to determine the optimal portfolio with these models, is to determine an efficient portfolio, all optimal portfolios are efficient portfolios.

The formation of a portfolio using the Markowitz model is an objective way to predict the price or return of securities because it is based on previous real data which is then averaged (Samsul, 2006). The selection of an investor's portfolio is based on their preference for the expected return and risk of each portfolio choice in this approach, a very important contribution to the investor is how it should optimally diversify.

The Investor can take advantage of all the information provided in the market if his portfolio is formed using the markowitz model. The time used in the study is only one period, investors base calculations on the expected return value and portfolio risk, there are no risk-free loans and deposits, and the absence of transaction cost calculations are the assumptions used in the markowitz model. Markowitz's portfolio also provides quite efficient results because it has a positive expected return value from each portfolio. The determining factor in choosing optimal portfolio members lies in the weight/proportion results for each stock (Hartono, 2013)

RESEARCH METHODOLOGY

This study was designed as a descriptive study that aims to determine the optimal stock portfolio in stocks indexed LQ-45 on the Indonesia Stock Exchange using the markowitz model for the period 2022. The research variables analyzed in this study there is an optimal portfolio. The data sources used are secondary data sources.

The research Data used is historical data on the closing price of the company's shares indexed LQ-45 published by the Indonesia Stock Exchange. Data obtained from

the official website of the Indonesia Stock Exchange, namely www.idx.co.id and www.yahoofinance.co.id in the form of quantitative data.

The source of data used in this study is secondary data in the form of stock prices of companies listed in the LQ 45 Index on the Indonesia Stock Exchange. Secondary Data is data that is not collected and not processed alone but obtained through other people, from companies, or from institutions related to this research. For example, the Indonesian Stock Exchange which can be accessed through www.idx.co.id.

The population used in this study is the shares of companies included in the LQ 45 index members for the period January 2018 to December 2022, namely as many as 95 companies. The sample in this study is 25 companies obtained using the purposive sampling method with the criteria of LQ 45 Index stocks that always appear successively during the observation period of January 2018 to December 2022.

The measures in the optimal portfolio of the markowitz model include:

First, calculating the stock return of each company that became the research sample can be calculated by the formula (Hartono, 2013) :

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

Descriptions:

- R_i : return saham
- P_t : stock prices at the time t
- P_{t-1} : stock prices at the time t-1
- D_t : cash dividend at the end of the period

Second, calculating the expected stock return of each company that became the research sample can be calculated by the formula (Jogiyanto, 2010:224):

$$E(R_i) = \frac{\sum_{t=0}^n R_{it}}{N}$$

- E(R_i) : expected return
- R_{it} : rate of return on investment i
- N : The number of events that may occur

Third, calculate the risk of each stock that has a positive expected return by calculating its standard deviation. calculated by the formula (Tandelilin, 2010: 55):

$$\sigma_{ij} = \frac{\sqrt{\sum_{t=0}^n (R_{it} - E(R_i))^2}}{(n-1)}$$

Descriptions:

- σ_{ij} : standard deviation of J shares
- R_{it} : Return on shares j in the period t
- E(R_i) : Expected Return shares j
- N : Period

Fourth, calculating the covariance between two stocks to determine the relationship between two stocks used to diversify, the covariance can be calculated using the formula (Hartono, 2013):

$$\sigma_{ij} = \sum_{t=0}^n \frac{(R_{it} - E(R_i))(R_{jt} - E(R_j))}{n}$$

Descriptions

σ_{ij} : covariance of shares i and j
 R_{it} : return of shares i in Period t
 $E(R_i)$: Expected return on shares i
 R_{jt} : return on shares j in the period t
 $E(R_j)$: Expected return on J shares

Fifth, calculate the expected return and portfolio risk with the same weight for each company. Expected portfolio return can be calculated using the formula:

$$E(R_p) = \sum_{i=0}^n X_i E(R_i) + X_j E(R_j)$$

Descriptions:

$E(R_p)$: Expected return portofolio
 X_i, X_j : Proportion of funds invested in shares i and j
 $E(R_i)$: Expected Return shares i
 $E(R_j)$: Expected Return shares j

Sixth, Use Solver Linear Programming. To calculate the weight of each share. Seventh, calculate the expected return and optimal portfolio risk using the weights obtained from the solver program. After each step has been done correctly, it will be obtained what stocks are included in the optimal portfolio and how much the weight of each stock.

RESULTS AND DISCUSSION

Analysis and calculations that have been done give the result that the formation of an optimal portfolio using the Markowitz model produces an optimal portfolio consisting of 4 Shares. The Solver program application is very helpful in determining the proportion of funds for each stock in the portfolio so that an optimal portfolio is formed. Four (4) shares that are eligible to be members of the optimal portfolio with the proportion of allocated funds respectively, namely TOWR (9.87 percent), INDF (6.23 percent), ICBP (50.56 percent), and KLBF (34.35 percent) which provide expected return of 1.63 percent and risk of 3.48 percent.

ICBP shares have the highest weight or proportion of funds at 50.56 percent because ICBP shares have the lowest risk among other portfolio candidate stocks, but even though ICBP shares have the lowest risk does not mean investors will get high profits if they invest only in these stocks because ICBP shares promise small expected returns.

KLBF shares have the second largest weight or proportion of funds, namely 34.35 percent, because KLBF shares have the highest expected return among all shares of the sample company and the value of the covariance with ICBP shares which negatively affects the determination of the weight of KLBF shares, but investors are not recommended to put all their funds in KLBF shares because of the high risk seen from the standard deviation value. INDF and TOWR stocks were chosen with a small weight of only 6.23 percent and 9, 87 percent because these stocks have a high risk but have 2 negative covariance values where this covariance value can reduce the risk of the portfolio.

The difference between portfolios with the same weight and portfolios with optimal weights is very clear from the expected return and the level of risk. Portfolios with the same weight provide an expected return of 1.15 percent while portfolios with optimal weights provide a greater expected return of 1.53 percent. The expected return received by investors increased by 0.38 percent, while the risk level generated by portfolios with

the same weight was 4.57 percent and the risk level generated by portfolios with optimal weight was 3.38 percent. The level of risk borne by investors decreased by 1.19 percent when using the Markowitz model in the formation of an optimal portfolio. This proves that the formation of an optimal portfolio with the Markowitz model can provide the minimum possible level of risk with the same and even greater profit than forming a portfolio without determining the weight that is worth investing in.

The Markowitz model portfolio formation is particularly suitable for risk averse investors. The steps in the formation of an optimal portfolio with the Markowitz model are easy for investors to follow and implement.

CONCLUSION

Based on the results of the research that have been described in the previous chapter, the starting point of this research is “the formation of an optimal portfolio of LQ-45 indexed company shares using the Markowitz model for the 2022 period consisting of 4 shares, namely TOWR PT. Sarana Menara Nusantara Tbk) with a weight of 9.87 percent, INDF (PT Indofood Sukses Makmur Tbk) with a weight of 6.23 percent, ICBP (PT Indofood CBP Sukses Makmur Tbk) with a weight of 50.56 percent, and KLBF (PT Kalbe Farma Tbk) with a weight of 34.35 percent. The optimal portfolio formed with the Markowitz model provides an expected return of 1.63 percent and a risk level of 3.48 percent.

The advice that researchers can give is as follows. Investors who want to invest in shares of building construction sub-sector companies are advised to invest their funds in accordance with the optimal portfolio formed from the following stocks, consisting of TOWR with a proportion of funds of 9.87 percent, INDF with a proportion of funds of 6.23 percent, ICBP with a proportion of funds of 50.56 percent and KLBF with a proportion of funds of 34.35 percent. The portfolio is able to offer a profit rate of 1.63 percent with a risk rate of 3.88 percent. As for some suggestions for further research are as follows: (a) the shares used as a population and sample in this study are the shares of companies indexed LQ-45. Further research is advised to use a variety of sectors and sub-sectors not just one sector but can cross-sector or research several sectors and sub-sectors at once, so that the optimal portfolio consists of many sectors. (b) the results of this study indicate that the optimal portfolio is formed from 4 Shares. For further researchers are advised to pay attention to the number of samples and types of companies that are sampled so that the results of research are more varied and do not consist of only persero companies.

REFERENCES

- Darmadji, T., & Hendy M. Fakhruddin. (2011). *Pasar Modal di Indonesia* (1st ed.). Salemba Empat.
- Hartono, J. (2013). *Teori Portofolio dan Analisis Investasi*. (8th ed.). BPF .
- Irham, F., & Yovi. (2011). *Teori Portofolio dan Analisis Investasi* (2nd ed.). Alfabeta.
- Megawati, M., Resmawan, R., Payu, B. R., & Adityaningrum, A. (2022). Prediksi Pergerakan Saham Menggunakan Metode Simulasi Monte Carlo untuk Pembentukan Portofolio Optimal dengan Pendekatan Model Markowitz: Studi Kasus pada Saham Jakarta Islamic Index 70 (JII70). *Jurnal Statistika Dan Aplikasinya*, 6(1), 86–95.

- Nisardi, M. R., Husain, H., Kusnaeni, K., & Resky, A. (2024). Penentuan portofolio saham optimal menggunakan metode Markowitz sebagai dasar keputusan investasi. *SQUARE: Journal of Mathematics and Mathematics Education*, 6(1), 33–40.
- Riski, T. R., & Sulistianingsih, H. (2024). Portofolio Saham Optimal dengan model Markowitz pada saham Perbankan yang terdaftar di LQ 45 tahun 2023. *Jurnal Ekonomika Dan Bisnis (JEBS)*, 4(4), 606–618.
- Rizqullah, T. Z., Hidayat, W. W., Supardi, S., & Ridwan, R. (2024). Analisis Pembentukan Portofolio Optimal di Bursa Efek Indonesia dengan Menggunakan Model Markowitz:(Indeks IDX30 Periode 2019-2023). *Master Manajemen*, 2(3), 94–108.
- Samsul, M. (2006). *Pasar Modal Dan Manajemen Portofolio* (1st ed.). Penerbit Erlangga.
- Setyawati, N., & Sudiartha, G. M. (2019). Pembentukan Portofolio Optimal Menggunakan Model Markowitz. *E-Jurnal Manajemen*, 8(7), 4213–4238.
- Sunariyah. (2006). *Pengantar Pengetahuan. Paar Modal* (5th ed.). UPP-STIM YKPN.
- Yunita, I. (2018). Markowitz model dalam pembentukan portofolio optimal (Studi kasus pada Jakarta Islamic Index). *Jurnal Manajemen Indonesia*, 18(1).
- Zubir, Z. (2001). *Manajemen Portofolio: Penerapannya dalam Investasi Saham* (1st ed.). Salemba Empat.