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Optimal Portfolio Selection Using the Single Index Method on LQ45 Shares in the Banking Sector

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Abstract

The purpose of this study is to determine the proportion of each stock that makes up the optimal portfolio so that it is easier for investors to determine which company has the optimal portfolio. The population that is the focus of this study refers to stocks belonging to the LQ45 index in the banking sector during the 2021-2023 period, namely 7 stocks. The sampling method is carried out by applying a purpose sampling technique, which results in 5 stocks that qualify according to the criteria of this study. The data used is secondary data derived from monthly stock prices. From the research results, all stocks showed positive returns, with BBRI having the highest return. In addition, the analysis results show that using the single index model approach, the stocks of the LQ45 Index members in the banking sector in the period August 2021 to July 2023 show that 4 out of 5 stocks (BBRI, BMRI, BBCA, and BBNI) form an optimal portfolio. Meanwhile, BBTN shares cannot be said to be an optimal portfolio because ERBi is smaller than Ci.

Keywords: *Optimal Portfolio, LQ45 Stocks, Single Index Method*

INTRODUCTION

Investment in the capital market is one of the most popular financial instruments in Indonesia. Many investors want to maximize their profits through stock investments. However, investing in the capital market also has risks that cannot be avoided. Therefore, it is important for investors to understand the basic concepts of investment, especially the relationship between expected return and risk. Expected return is the expected return in the future, while risk is the deviation from the expected result (Irma Yuana, 2016).

One of the most popular sectors in the Indonesian capital market is the banking sector. The banking sector has an important role in the Indonesian economy, and changes in banking performance can influence stock market movements. Therefore, it is very important for investors to understand how to build an optimal portfolio in the LQ45 banking sector. According to (Setyawan, 2017) an optimal portfolio is a portfolio that provides the most profitable results for investors, taking into account the level of return and risk in accordance with investor preferences. Optimal portfolio analysis of the LQ45 banking sector index using the single index method is an approach that allows investors to understand how they can allocate their investments in banking stocks contained in the LQ45 index (Husnan, 2009).

The aim of this research is to examine the portfolio approach analysis using a single index method, which can help investors in choosing the right shares for their portfolio in the LQ45 banking sector. This analysis will involve historical data on stock prices, the financial performance of banking companies, as well as external factors that influence stock price movements, such as monetary policy, regulatory changes and macroeconomic conditions. The results of this optimal portfolio analysis can also help investors make smarter investment decisions and have the potential to get optimal results in the long term. In addition, this research can also provide deeper insight into the relationship between banking sector performance and the LQ45 index as a whole, which can be useful in understanding and predicting financial market conditions in Indonesia.

Research question

1) What are the shares in the banking sector included in the LQ45 index that can form an optimal portfolio, and what proportion is obtained from the shares included in the optimal portfolio?

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2) What are the measures of portfolio expected return E(Rp) and portfolio risk (σp) from forming an optimal portfolio in the banking sector which is included in the LQ45 index?

Research purposes

1) Find out what shares are in the banking sector and included in the LQ45 index which can form an optimal portfolio, and what proportion is obtained from each share.
2) Knowing the expected portfolio return E(Rp) and portfolio risk (σp) from forming an optimal portfolio in the banking sector which is included in the LQ45 index

LITERATURE REVIEW

A. Optimal portfolio

An optimal portfolio is a portfolio chosen by investors based on their preferences from a group of effective portfolios. (Tandelilin, 2017). An investor chooses the best portfolio from the many options available in an efficient portfolio collection to create an optimal portfolio. Investor preferences influence portfolio returns and risks. (Hidayat, 2019).

B. Single index

(Jogiyanto, 2014) according to William Sharpe. The Single Index model investment theory was developed for the Markowitz correlation model. This model provides the necessary input parameters and describes market risk as a benchmark. The one-index model is based on the observation that the market price index and stock prices change in the same direction. In particular, it can be observed that individual stock prices tend to rise when the stock price index rises. Prices of various shares fall along with the share price index.

C. Stocks

Shares are one of the most commonly used money market instruments. Stocks, also known as shares or securities, are securities that represent ownership in a company or business unit. The participation of a person or company in a company or limited liability company can also be symbolized by shares.

D. Investment

Investment usually refers to long-term capital investment to acquire complete assets or purchase shares and securities to realize profits. According to (Reilly, 2019), investment is a person's willingness to use money of a certain value in the present to generate income in the future

E. LQ45 Index

The LQ45 stock index measures the price performance of 45 stocks with high liquidity, market capitalization and good fundamental data. This index was introduced in February 1997 with a focus on measuring liquidity based on standard market transaction values. Then, in January 2005, the number of trading days and transaction activity were added as additional benchmarks for calculating equity market developments and improving liquidity criteria. When selecting an issuer, market capitalization is also taken into account when assessing liquidity. The LQ45 stock index was developed to complement the IHSG

F. Optimal Portfolio Based on the Single Index Method

The Single Index method is actually a simplification of the Markowitz method and functions as a provider of input parameters for the Markowitz method. The Single Index Model works by calculating the return calculation for each investment instrument on the market index return. The Single Index method is used with the assumption that several securities or investment instruments can be said to be correlated if the investment instruments have the same response to market changes. The formation of an optimal portfolio using the Single Index method is based on the results of observations of investment instrument prices which are fluctuating and in line with the market price index. Thus, an increase in the stock price index will have an impact on an increase in individual stock prices, or in other words, the rate of return on individual stocks tends to be correlated with the rate of return on shares in the market.

FRAMEWORK OF THINKING

The thinking framework of this research is regarding the LQ45 stock index which is used for investment selection using a single index model to view company returns and risks. Apart

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from that, the aim of this research is to identify which stocks are included in the optimal portfolio so as to help investors in making investment decisions. Based on this analysis, it is shown in Figure 1, namely:

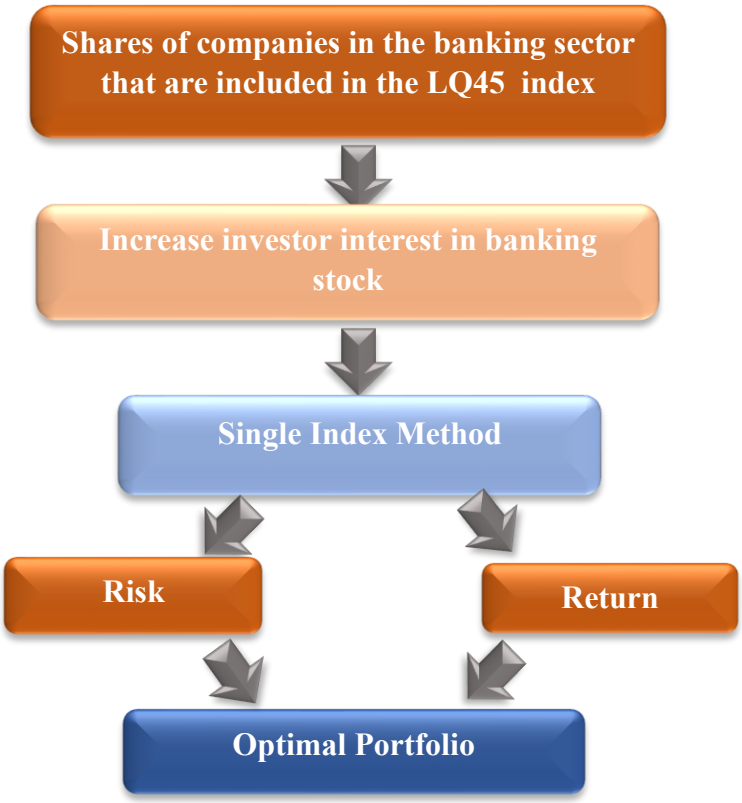

Figure 1. Thinking Framework

METHODS

1. **Design**

   This research determines the type of qualitative descriptive research (Sugiyono, 2019). The qualitative approach is often referred to as the "naturalistic approach" because the research is carried out in natural conditions (natural settings). The naturalistic approach is to collect data collected using a single index method to find out which shares are included in the optimal portfolio based on the results of research on the share prices of LQ45 companies on the Indonesia Stock Exchange in the period August 2021 to July 2023. The results of research data analysis can help investors in making investment decisions.

2. **Place and Time of Research**

   This research was carried out on the Indonesia Stock Exchange (BEI) which can be accessed via the official website https://www.idx.co.id. and uses the closing stock price every month which can be accessed via the web https://m.investing.com/. This research uses a purposive sampling method using shares from 5 banking companies included in the LQ45 Index with the criteria being that shares of LQ45 companies are listed as still active and banking on the Indonesia Stock Exchange from August 2021 to July 2023.

3. **Data Type**

   This research uses qualitative descriptive analysis. A qualitative approach analyzes and explains observed phenomena using numerical data. The numerical data used in this research comes from share prices from the banking sector which are included in the LQ45 index for the period August 2021 to July 2023.

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4. Data Source

The data source required for this research is secondary data that supports the research variables. This data comes from the list of closing stock prices taken from the official website. https://m.investing.com/.

5. Population and Sample

The population in this study are shares that were included in the LQ45 shares in the banking sector during 2021-2023, namely 7 shares. From this population, 5 stocks were selected as samples for this research.

6. Data Collection Techniques

Collecting relevant information from sources or documents is the data collection stage. Data for this study was provided by various sources including:

1) Official website: https://www.idx.co.id which provides a list of banking sector shares included in the LQ45 index;
2) The closing price of the issuer's shares and the composite stock price index (IHSG) obtained from the official website: https://m.investing.com/
3) Risk-free return (RBR) is obtained via the official website: https://www.bi.go.id/id/default.aspx

7. Data Analysis Techniques

1) Calculate the total realized return for each share per year

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

Information :
R_i = Return Share i
P_t = Current share price
P_{t-1} = Share price last period
D_t = Ordinary share dividend

2) Calculate the expected return of each stock

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

Information:
Ri = Return realization
n = Number of observation periods

3) Calculate market return (RM) and expected market return E(RM) with IHSG as the basis

$$R_M = \frac{IHSG_t - IHSG_t - 1}{IHSG_t - 1}$$

$$E(R_M) = \frac{\sum_{n=1}^{n} RM}{n}$$

Information:
RM = Return market realization
n = Number of observation periods

4) Calculate the Beta and Alpha values for each stock.

$$\beta_i = \frac{\sigma iM}{\sigma M2}$$

$$\alpha_i = E(R_i) - (\beta_i . E(RM)$$

5) Determining the risk-free rate of return (RBR) involves calculating the average interest rate over the study period. If a stock's rate of return (E(Ri)) exceeds RBR, the stock will be subject to further analysis because it has the potential to generate positive extra returns (ERB).

6) Calculating Excess Return of Beta (ERB)

$$ERB_i = \frac{E(R_{i)-RBR}}{\beta_i}$$

Information:
ERB_i = Excess return to beta securities to-i
$E(R_i)$ = Expected return based on a single index model for securities to-i

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RBR = Risk-free return on assets

7) Calculating Cut Off Point

$$C_i = \frac{\sigma M2 \sum_{j=1}^{i} Aj}{1+\sigma M2 \sum_{j=1}^{i} \beta j}$$

Information:
σm2= market return variant

8) Set the right proportion size for each security in the optimal portfolio

$$w_i = \frac{z_i}{\Sigma_{j=1}^{k} Zj}$$

With a Zi value of:

$$z_i = \frac{\beta_i}{\sigma ei2} \ (ERB - C*)$$

Information:
Wi = Proportion securities to-i
K = The number of securities in the portfolio is optimal
βi^2 = stock's individual beta
σei2 = Variance of residual error securities to-i
ERB= Excess return to beta
C* = The cut point value is the largest Ci value

9) Calculating Portfolio Alpha and Beta

$$\beta p = \Sigma_{t=1}^{n} \text{wi.}\beta\text{i}$$
$$\alpha p = \Sigma_{t=1}^{n} \text{wi.}\sigma\text{i}$$

10) Determine the expected portfolio return

$$E(R_p) = \sigma p + \beta p$$

Information:
E(RP) = Portfolio expected return
σP = Alpha portfolio
βP = Beta portfolio
Wi = Proportion of each security
αi = Alpha securities
βi = Beta securities

11) Calculate portfolio risk

$$\sigma P^2 = \beta p^2 \cdot \sigma M^2$$

Information:
β_P = beta portfolio
σM^2 = market variant

RESULTS AND DISCUSSION

In the framework of this research, the research focus lies on companies listed on the Indonesia Stock Exchange in the banking sector, especially those related to the LQ45 Index. There are five companies that are the focus of the research, namely PT. Bank Central Asia Tbk (BBCA), PT. Bank Rakyat Indonesia (Persero) Tbk (BBRI), PT. Bank Tabungan Negara (Persero) Tbk (BBTN), PT Bank Mandiri (Persero) Tbk (BMRI), and PT. Bank Negara Indonesia (Persero) Tbk (BBNI). The first step in determining the optimal portfolio is to calculate the real return (Ri) of each company as well as the market return (Rm). This calculation involves monthly stock price data, especially the closing price at the beginning of each month. Table 1.1 below presents the results of return calculations for each issuer during the period August 2021 to July 2023.

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Table 1. Realization of Issuer Share Returns (Ri) and Average Rate of Return on Individual Shares E(Ri) for the Period August 2021 – July 2023

No	Company Code	Ri	E(Ri)
1	BBCA	0.35614	0.01548
2	BBNI	0.57548	0.02502
3	BBRI	0.42451	0.01846
4	BBTN	0.0277	0.00120
5	BMRI	0.67675	0.02942

To calculate the market rate of return (RM) in this research, data from the Composite Stock Price Index (IHSG) is used. Information regarding RM data is obtained from the monthly share value (Closing Price), which includes the closing price at the beginning of the month, with a total market return of 0.126088. Meanwhile, the expected market return value E(Rm) is 0.0058, which is obtained from the total market return during the period August 2021-July 2023 divided by the number of research periods (24 months).

Table 2. Calculation of Expected Return, Standard Deviation, Beta I, Alpha I, Unique Risk, and Excess Return to Beta for the Period August 2021 – July 2023

Risk Free Return (RBR)	5,75%	Per Year			0.24%	Per Month
	BBCA	BBNI	BBRI	BBTN	BMRI	RM
E(Ri)	0.01548	0.02502	0.01846	0.00120	0.02942	0.00548
σi	0.04411825	0.082904579	0.0541576	0.072658268	0.059072008	0.023292856
βi	1.177462	2.303385	0.979698	1.979993	1.770560	
αi	0.01	0.01	0.01	(0.01)	0.02	
σei2	0.001	0.004	0.002	0.003	0.002	
ERBi	0.01111569	0.009822575	0.0163937	-0.000601782	0.015265189	

Based on the data in table 2, it can be concluded that the risk-free return (RBR) reaches 5.75% per year and 0.24% per month. Of the five shares taken as samples, all showed positive return expectations, with BBRI shares having the highest value of 0.01846. Meanwhile, the lowest standard deviation was found in BBCA shares at 0.04412, while the stock with the highest standard deviation was BBNI with a value of 0.08290. Investors tend to avoid investing in shares with a high standard deviation. The highest company beta is found in BBNI shares with a value of 2.3034, while BBRI shares have the lowest beta, namely 0.9797.

Alpha has varying values, some companies have Alpha values that vary between negative and positive. Alpha Refers to the expected value of stock returns independently of market returns. When there is a change in market returns, be it an increase or a decrease, this does not affect individual stock returns. Alpha reflects the portion of an individual stock's profits that remains stable and is not affected by the market. BMRI shares have the highest Alpha value, namely 0.02, while BBTN shares have the lowest value with -0.01. In addition, the highest unique risk is found in BBNI shares, reaching 0.004, while BBCA shares have the lowest unique risk value, namely 0.001. Investors generally tend to choose shares with the lowest Alpha value, which is related to the level of risk faced.

The ERBi value reached its peak in BBRI shares at 0.0164, while the lowest ERBi value was recorded in BBTN shares at -0.000602. Market Return (RM) is used as a representation of market data, submitted by IHSG which has an expected return of 0.0055 or 0.55%, and a standard

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deviation of 0.0233 or 2.33%. The existence of positive market return expectations provides evidence that investment in the capital market can provide returns for investors.

Table 3. ERBi sorting results from largest to smallest

ERBi sorting results from largest to smallest					
	BBRI	BMRI	BBCA	BBNI	BBTN
ERBi	0.01639374	0.015265189	0.0111157	0.009822575	-0.000601782
E(Ri)	0.01845675	0.029423771	0.0154841	0.025021009	0.001204309
σi	0.05415755	0.059072008	0.0441182	0.082904579	0.072658268
βi	0.9796984	1.77056025	1.1774617	2.303385457	1.97999276
αi	0.01308598	0.019717441	0.0090292	0.012393695	-0.009650144
σei2	0.00241229	0.001788649	0.0011942	0.003994586	0.003152198

Based on table 3, the ERBi sorting from largest to smallest aims to identify stocks that have excess stock returns compared to risk-free returns. This is important to do because investors want to get a high return above the risk-free return. By knowing which stocks have the largest excess returns, investors can more easily determine which stocks are worth including in their portfolio. Investors can determine the value of ERBi > C*, where C* is the cut off point which determines the limit of the ERB value which is said to be high. Stocks with ERBi > C* have a greater opportunity to provide high returns above the risk-free return.

Table 4. Calculation of Ci Values

Calculation of Ci Values					
Aj	6.52278993	26.75460697	12.904739	13.04628152	-0.748433055
∑Aj	6.52278993	33.2773969	46.182136	59.22841725	58.4799842
BJ	397.88304	1752.654767	1160.9482	1328.193694	1243.694335
∑Bj	397.88304	2150.537807	3311.486	4639.679676	5883.374011
Ci	0.00291065	0.008332553	0.0089594	0.009136235	0.007568757

In table 4, in column Ci, C* has a value of 0.00913, which refers to the 'BBNI' security with an ERBi value of 0.00982, where the final ERBi still exceeds the Ci value. Meanwhile, the ERBi value is -0.000602 for 'BBTN' securities, smaller than the Ci value of 0.00757. Therefore, 'BBTN' securities are not included as part of the optimal portfolio. A comparison between ERBi and Ci values can be found in table 5 below

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Table 5. Comparison Results of ERBi and Ci

Comparison Results of ERBi and Ci				
No	**Company Code**	**ERBi**	**Ci**	**Description**
1	BBRI	0.016393737	0.0029107	Optimal
2	BMRI	0.015265189	0.0083326	Optimal
3	BBCA	0.011115689	0.0089594	Optimal
4	BBNI	0.009822575	0.0091362	Optimal
5	BBTN	-0.000601782	0.0075688	Not Optimal

Based on the comparison results from table 5, it can be seen that company shares that have an ERBi value greater than the Ci value are shares from BBRI, BMRI, BBCA, and BBNI. BBRI has an ERBi of 0.016394 and a Ci of 0.00291, BMRI has an ERBi of 0.015265 and a Ci of 0.00833, BBCA has an ERBi of 0.11116 and a Ci of 0.00896, while BBNI has an ERBi of 0.00982 and a Ci of 0.00914. Thus, the shares of these four companies can be considered as optimal shares because their ERBi exceeds the Ci value. Meanwhile, BBTN shares are not said to be optimal because the Ci value of 0.00757 is greater than the ERBi which is only -0.00060.

Table 6. Proportion of each asset in the optimal portfolio

Proportion of each asset in the optimal portfolio				
	BBRI	**BMRI**	**BBCA**	**BBNI**
Zi	2.94747539	6.066972824	1.9516927	0.395761652
wi	0.25941741	0.533975079	0.1717752	0.03483234

In Table 6, we can see the proportion of each selected stock in the portfolio. With a proportion of 0.2594, BBRI (Bank Rakyat Indonesia) has a significant weight in the portfolio. Meanwhile, BMRI (Bank Mandiri) has a proportion of 0.53398, making it the stock with the highest weight in the portfolio. BBCA (Bank Central Asia) has a proportion of 0.1718, and BBNI (Bank Negara Indonesia) has a proportion of 0.0349 in the portfolio. The proportion diagram of each selected share can be seen in Figure 2.

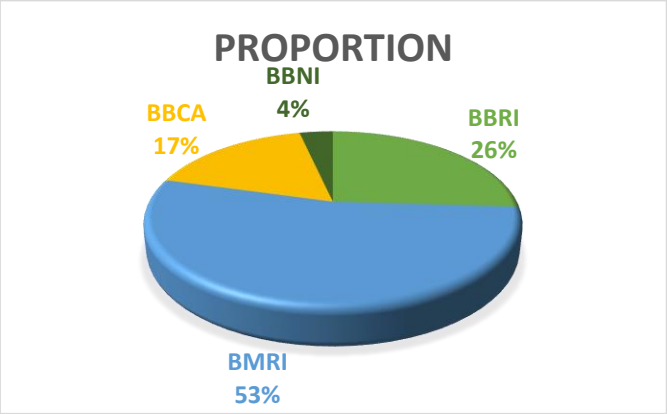

Figure 2. Proportion Diagram

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Expected Return Portfolio E(Rp) is used to assess the level of return that can be expected from the portfolio that has been formed, which consists of the sum of portfolio alpha 0.0159 and portfolio beta 1.4820. Based on the results of E(Rp), a portfolio consisting of four shares is able to provide E(Rp) of 1.4979. Meanwhile, the portfolio risk (σp) consisting of four shares contains a risk of 0.00119. The optimal portfolio results can be seen in table 7.

Table 7. Optimal Portfolio

Optimal Portfolio	
Total Proportion	**1.000**
αp	0.01590605
βp	1.48207685
E(Rp)	**1.49798290**
Unique Risks	0.00071242
Systematic Risk (βp^2 σm^2)	0.00119175
Total Portfolio Risk (σp)	**0.00190418**
Portfolio Corner	**785.425**

CONCLUSION

1. A portfolio formed from four shares, namely BBRI, BMRI, BBCA, and BBNI provides an E(Rp) of 1.4979 and a portfolio risk (σp) of 0.00119.
2. Company shares with an ERBi value that is higher than the Ci value are considered optimal, because the ERBi value is higher than the Ci value. Company shares that have an ERBi value greater than the Ci value are shares from BBRI, BMRI, BBCA, and BBNI. However, BBTN shares are considered not optimal, because the ERBi value is lower than the Ci value.
3. LQ45 Index shares for the period August 2021 to July 2023 can form an optimal portfolio, consisting of BBRI with a proportion of 26%, BMRI with a proportion of 53%, BBCA with a proportion of 17%, and BBNI with a proportion of 4%.

SUGGESTION

1. When selecting stock investors, it is best to invest in stocks that have an ERBi value greater than Ci. This is because the company's shares have greater profit potential, so they can provide more optimal investment results
2. Investors who want to invest in LQ45 Index shares should consider creating an optimal company portfolio in order to get the expected return with relatively low risk.

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