Formation of Optimum Portfolio Using Single Index Model (Case Study of Stock LQ 45 Period 2016 - 2019)

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Abstract---Investment is the investment of a number of funds or goods that are expected to provide more results in the future. The purpose of this study is to determine the optimal portfolio with its composition. The method used is the Single Index Model method and the data used in this study are quantitative data. Based on the results of this study it can be concluded that the optimal portfolio produced 3 optimal shares of 31 shares that were sampled in this study including ANTM 22%, SRIL 36% and INCO 42% with expected portfolio returns of 0.0546 with a portfolio standard deviation level of 0,1563.

Keywords---Portfolio, LQ45, Single Index Model.

I. INTRODUCTION

The capital market provides various alternatives for investors in addition to various other investments, such as: saving at a bank, buying land, insurance, gold and so on. The function of the capital market is also as a liaison between investors and companies or government institutions. The liaison of capital markets is usually through long-term trading instruments, such as securities which include stocks, bonds, warrants, and rights issues.

Investors in investing in shares in the capital market aim to obtain a rate of return in the form of capital gains and dividends. Rational investors will certainly expect a higher rate of return from their investments taking into account the risk or the possibility of deviations from the rate of return that will be obtained because of the element of uncertainty.In this case investors can use the concept of risk and return by applying portfolio theory (Saudi, 2018). Optimal portfolio analysis is one of the most popular investment strategies to produce high returns with fairly low risk. Portfolio selection discusses the problem of how to allocate investment in order to bring the most benefits with certain risks. Markowitz developed the index model as a simplification of the mean-variant model, which seeks to answer various problems in the preparation of portfolios, i.e. there are so many combinations of risk assets that can be selected and arranged into a portfolio. Of the many combinations of money chosen, a rational investor will definitely choose the optimal portfolio (efficient set). (Jogiyanto,2010). Investment is to save a certain amount of funds in an asset with a certain period of time with the aim of obtaining future profits.

The problem that often occurs is the uncertainty when investors have to choose stocks to be formed into a portfolio. The answer depends on the risk preferences of the investors themselves. Many analysts give recommendations for choosing LQ 45 shares. There are investors who tend to avoid risk (risk averter), there are also investors who tend to like high enough risk (risk takers). Investors are dealing with many combinations of stocks in

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a portfolio. A rational investor, of course, will choose the optimal portfolio. (Jogiyanto,2010). Invested in each of the securities that determine the asset class (Drobetz and Kohler, 2002). Markowitz argues that the portfolio selection process in the initial stages is based on observations and experiences that end with confidence in the future time performance of existing securities (Markowitz, 1952). From the point of view of investors, two important aspects will be examined, namely the expected level of profit as something that is desired, while the variance or risk as something that is not desired. This situation explains the relationship between trust and portfolio selection based on the rules put forward by Markowitz, namely expected benefits and variance of profits. While the formation of a portfolio is based on two objectives, namely to maximize the expected benefits, and minimize risk. The portfolio model proposed by Markowitz can be used to calculate the expected level of profit and portfolio risk, but the model requires calculation using covariance that is too complex, especially if faced with a large number of securities. This model has been developed by Sharpe by creating a single index model. This model links the calculation of the return of each asset to the return of the market index (Elton et al., 2003: 132).

II. LITERATURE REVIEW
II.I. Investment
Tandelilin (2014: 2) investment is a commitment to a number of funds or other resources made at this time, with the aim of obtaining a number of benefits in the future. An investor will buy a number of shares at this time in the hope that he will get a profit (capital gain) from the share price or dividend in the future.

II.II. Portfolio
Portfolio selection discusses the problem of how to allocate investment in order to bring the most benefits with certain risks. Markowitz developed the index model as a simplification of the mean-variant model, which seeks to answer various problems in the preparation of portfolios, i.e. there are so many combinations of risk assets that can be selected and arranged into a portfolio. Of the many combinations of money chosen, a rational investor will definitely choose an optimal portfolio (efficient set) (Jogiyanto, 2010).

II.III. Return
The purpose of investors investing their capital is to get a return (return) on the funds that have been invested in the company. These benefits can be in the form of dividends and capital gains called stock returns. Returns are the results obtained from investments, returns can be in the form of realized returns that have occurred or expected returns that have not yet occurred but are expected to occur in the future. (Jogiyanto, 2014:235).The Formulation is :

$$Return = \frac{Pt - P_{t-1}}{P_{t-1}}$$

Pt = Period Price T
Pt-1 = Stock Price in the previous one day period

II.IV. Single Index Model
Jogiyanto (2013: 369) the Single Index Model is based on the observation that the price of a security fluctuates in the direction of the market price index and links the calculation of asset returns with market index returns. This model can be used to simplify calculations on the Markowitz model by providing input parameters needed in the calculation of the Markowitz model and used as an alternative to determining efficient sets with simpler calculations and used to calculate expected return and portfolio risk. In particular it can be observed that most stocks tend to experience price increases if the stock price index rises. Vice versa, if the stock price index falls, most stocks experience a price decline.The Formulation :

$$E\ (Ri) = \alpha i + \beta i\ E(Rm)$$
$$\sigma^2_{i = \beta^2_i \sigma^2_{im} + \sigma^2_{ci}}$$

II.V. Risk
Risk is the possibility of the difference between the actual return received and the expected return. According to Fahmi (2012: 189), risk can be interpreted as a form of uncertainty about a situation that will occur later (future) with decisions taken based on various current considerations. The Formulation :
Unsystematic risk = Ri – (α + (β * Rm)^2

III. METHODOLOGY

In this study the method used is descriptive method with a quantitative approach. Quantitative approach gives freedom to researchers to determine various criteria or variables to be studied (Martono, 2012: 22). Data used in this study:

1. Closing Price, which is the closing price of shares in the period 2016 – 2019
2. Composite Indeks (IHSG)
3. Reference interest or interest rates determined by Bank Indonesia, namely the BI 7 Days Repo Rate. *The sampling steps are explained as follows:*

a. After obtaining individual stock price index data (closing price) and the combined stock price index of shares incorporated (and ever incorporated) in LQ-45, then look for the level of stock returns, the level of market profits, the level of expected profits from the market ;

b. Perform stock variance calculations, market variance, stock covariance and market covariance. Calculate the amount of beta each stock and its correction beta;

c. Perform calculations to look for systematic risk and unsystematic risk of each stock;

d. Look for the value of excess return to beta (ERB) of these shares;

e. Ranking from the highest ERB to the lowest ERB is performed;

f. Find the cut-off value (Ci) of each stock, and determine the cut-off rate (C *), which is the highest cut-off value;

g. Make a comparison between the cut off rate and the ERB value of each share; If ERB> C *; stocks are included in the formation of optimal portfolios and If ERB <C *; stocks out in the formation of optimal portfolio;

h. Finding the investment value of shares and the proportion of funds for investment in stocks that enter the portfolio.

IV. RESULT AND DISCUSSION

Based on the results of portfolio calculations using a single index model on stocks that consistently entered the LQ45 list during the period 2016 - 2019.

Table 1.1: *Expected Return.*

NO	Emiten	Expected Return	No	Emiten	Expected Return	No	Emiten	Expected Return
1	ANTM	-0,00693	11	PGAS	0,01173	21	BMRI	0,01133
2	SRIL	0,03394	12	ASII	-0,02702	22	PTPP	0,02751
3	INCO	0,15129	13	INDF	-0,00151	23	BBRI	-0,00648
4	BBCA	0,00898	14	WSKT	0,03844	24	ADHI	-0,00679
5	ADRO	0,02252	15	SMGR	0,00803	25	BSDE	0,00829
6	UNTR	0,02003	16	KLBF	0,00503	26	JSMR	0,01301
7	BBTN	-0,00603	17	TLKM	-0,00177	27	SCMA	0,00441
8	GGRM	0,02524	18	INTP	0,00676	28	LPPF	0,01426
9	BBNI	-0,00062	19	MNCN	-0,01630	29	ICBP	0,01036
10	UNVR	-0,00431	20	WIKA	-0,00034	30	PTBA	-0,00299
						31	HMSP	0,00897
							MAX	0,15129
							MIN	-0,02702
							AVERAGE	0,01126

Based on calculations using 31 LQ 45 shares, the highest expected return value is 0.15129 for INCO shares (PT Vale Indonesia Tbk) and the lowest value is -0,00062 for BBNI shares (PT Bank Negara Indonesia Tbk) with an average value of averaging 0.01126.

Table 1.2:*Deviation Standars*

No	Emiten	Deviation Standars	No	Emiten	Deviation Standars	No	Emiten	Deviation Standars
1	ANTM	0,0115	11	PGAS	0,0034	21	BMRI	0,0213
2	SRIL	0,0137	12	ASII	0,0284	22	PTPP	0,0338
3	INCO	0,6299	13	INDF	0,0096	23	BBRI	0,0162
4	BBCA	0,0029	14	WSKT	0,0229	24	ADHI	0,0063
5	ADRO	0,0021	15	SMGR	0,0037	25	BSDE	0,0095
6	UNTR	0,0057	16	KLBF	0,0110	26	JSMR	0,0141
7	BBTN	0,0213	17	TLKM	0,0052	27	SCMA	0,0032
8	GGRM	0,0114	18	INTP	0,0034	28	LPPF	0,0068
9	BBNI	0,0095	19	MNCN	0,0125	29	ICBP	0,0036
10	UNVR	0,0059	20	WIKA	0,0204	30	PTBA	0,0168
						31	HMSP	0,0109
							MAX	0,6299
							MIN	0,0021
							AVERAGE	0,0315

Based on calculations using 31 LQ 45 shares, the lowest standard value deviation results obtained by 0.0021 in ADRO shares (PT Adaro Energy Tbk) and 0,00029 in BBCA shares (PT Bank Central Asia Tbk) meaning that these shares have the lowest risk among the other and the highest value of 0.6299 in INCO shares (PT Vale Indonesia Tbk).

Table 1.3:*Regresion.*

No	Emiten	A	B	No	Emiten	A	B	No	Emiten	A	B
1	ANTM	0,14722	0,40414	11	PGAS	- 0,00663	1,78384	21	BMRI	- 0,01396	1,32463
2	SRIL	0,01114	0,18589	12	ASII	- 0,00424	1,31246	22	PTPP	- 0,03147	2,48153
3	INCO	0,02682	1,15360	13	INDF	- 0,00504	1,29751	23	BBRI	- 0,02742	2,12424
4	BBCA	0,01045	1,19856	14	WSKT	- 0,01265	2,14693	24	ADHI	- 0,02927	2,21873
5	ADRO	0,01265	2,11449	15	SMGR	- 0,01063	1,87905	25	BSDE	- 0,02014	1,57176
6	UNTR	0,00619	0,80120	16	KLBF	- 0,00675	1,34170	26	JSMR	- 0,01177	0,99268
7	BBTN	0,00430	2,07997	17	TLKM	0,00102	0,33682	27	SCMA	- 0,02140	1,45161
8	GGRM	0,00304	0,86352	18	INTP	- 0,01563	2,05138	28	LPPF	- 0,03186	1,54491
9	BBNI	0,00142	1,84848	19	MNCN	- 0,02635	2,58350	29	ICBP	- 0,00448	0,29486
10	UNVR	- 0,00170	1,19754	20	WIKA	- 0,02818	2,50173	30	PTBA	0,03014	- 0,26138
								31	HMSP	- 0,02771	0,06864

Table 1.4 *Unsystematic Risk.*

No	Emiten	Und Systematis Risk	No	Emiten	Und Systematis Risk	No	Emiten	Und Systematis Risk
1	ANTM	0,63002	11	PGAS	0,02363	21	BMRI	0,01078
2	SRIL	0,01413	12	ASII	0,00418	22	PTPP	0,02084
3	INCO	0,02390	13	INDF	0,00496	23	BBRI	0,02462
4	BBCA	0,00314	14	WSKT	0,01430	24	ADHI	0,01519
5	ADRO	0,01706	15	SMGR	0,01216	25	BSDE	0,00774
6	UNTR	0,00728	16	KLBF	0,00475	26	JSMR	0,00595
7	BBTN	0,01462	17	TLKM	0,00327	27	SCMA	0,00790
8	GGRM	0,00400	18	INTP	0,01416	28	LPPF	0,01432
9	BBNI	0,00825	19	MNCN	0,02537	29	ICBP	0,00963
10	UNVR	0,00469	20	WIKA	0,02145	30	PTBA	0,03387
						31	HMSP	0,02842

ANTM shares with the largest unsystematic risk of 0.63002 and BBCA with unsystematic risk of 0.00314.

Table1.5:_Excess Return To Beta._

No	Emiten	Erb	No	Emiten	Erb	No	Emiten	Erb
1	ANTM	-0,00498	11	PGAS	0,00882	21	BMRI	0,00404
2	SRIL	0,01411	12	ASII	-0,45356	22	PTPP	-0,08950
3	INCO	0,36416	13	INDF	-0,01909	23	BBRI	-0,00427
4	BBCA	0,00371	14	WSKT	0,02975	24	ADHI	-0,00751
5	ADRO	0,01535	15	SMGR	0,00302	25	BSDE	0,00222
6	UNTR	0,00861	16	KLBF	0,00044	26	JSMR	0,04785
7	BBTN	-0,00477	17	TLKM	-0,00593	27	SCMA	0,00087
8	GGRM	0,01016	18	INTP	0,00197	28	LPPF	0,01266
9	BBNI	-0,00357	19	MNCN	-0,01322	29	ICBP	0,00521
10	UNVR	-0,00536	20	WIKA	-0,00172	30	PTBA	-0,00284
						31	HMSP	0,00226

There are 18 stocks that have positive ERB SRIL (0.01411), INCO (0.36416), BBCA (0.00371), ADRO (0.01535), UNTR (0.00861), GGRM (0.01016), PGAS (0.00882), WSKT (0.02975), SMGR (0.00302), KLBF (0.00044), INTP (0.00197), BMRI (0.00404), BSDE (0.00222), JSMR (0.04785), SCMA (0.00087), LPPF (0.01266), ICBP (0.00521).

Table-1.6:_Shear Forming that Shoppers Optimum Portfolio._

Emiten	A	B	Unsystematic Risk	Erb	Ci	C*	Decision
ANTM	0,147219	0,404141	0,63002	0,364164	-0,00027942	0,021197	OPTIMUM
SRIL	0,011139	0,185891	0,01413	0,047855	-0,00054109	0,021197	OPTIMUM
INCO	0,02682	1,153598	0,02390	0,029751	0,006079079	0,021197	OPTIMUM
BBCA	0,010449	1,198559	0,00314	0,015354	0,016699293	0,021197	-
ADRO	0,012648	2,114487	0,01706	0,014105	0,010743109	0,021197	-
UNTR	0,006193	0,8012	0,00728	0,012664	-0,00495984	0,021197	-
BBTN	0,004301	2,079967	0,01462	0,010159	0,006407388	0,021197	-
GGRM	0,003038	0,863521	0,00400	0,008823	-0,00066389	0,021197	-
BBNI	0,00142	1,84848	0,00825	0,008612	0,003349692	0,021197	-
UNVR	-0,0017	1,197538	0,00469	0,005214	0,0149293	0,021197	-
PGAS	-0,00663	1,783843	0,02363	0,004043	0,010600105	0,021197	-
ASII	-0,00424	1,312458	0,00418	0,003707	0,004000497	0,021197	-
INDF	-0,00504	1,297507	0,00496	0,003017	0,005486993	0,021197	-
WSKT	-0,01265	2,146933	0,01430	0,002263	0,015392315	0,021197	-
SMGR	-0,01063	1,87905	0,01216	0,002225	0,009199798	0,021197	-
KLBF	-0,00675	1,3417	0,00475	0,001974	0,007814409	0,021197	-
TLKM	0,001016	0,336822	0,00327	0,000871	-0,00157387	0,021197	-
INTP	-0,01563	2,051383	0,01416	0,000444	0,003270435	0,021197	-
MNCN	-0,02635	2,583498	0,02537	-0,00172	0,013936017	0,021197	-
WIKA	-0,02818	2,501735	0,02145	-0,00284	0,009996612	0,021197	-
BMRI	-0,01396	1,324632	0,01078	-0,00357	0,000422359	0,021197	-
PTPP	-0,03147	2,481532	0,02084	-0,00427	0,021196561	0,021197	-
BBRI	-0,02742	2,124236	0,02462	-0,00477	0,002653982	0,021197	-
ADHI	-0,02927	2,218734	0,01519	-0,00498	0,00205165	0,021197	-
BSDE	-0,02014	1,571755	0,00774	-0,00536	0,006698293	0,021197	-
JSMR	-0,01177	0,992685	0,00595	-0,00593	0,016008429	0,021197	-
SCMA	-0,0214	1,451614	0,00790	-0,00751	0,000345351	0,021197	-
LPPF	-0,03186	1,544908	0,01432	-0,01322	0,017521362	0,021197	-
ICBP	-0,00448	0,294864	0,00963	-0,01909	0,000591618	0,021197	-
PTBA	0,03014	-0,26138	0,03387	-0,0895	1,53588E-05	0,021197	-
HMSP	-0,02771	0,068638	0,02842	-0,45356	4,92246E-05	0,021197	-

Based on the results of the formation of a portfolio using a single index model generated from 31 LQ 45 stock samples used there are 3 of the most optimal portfolio stocks, namely ANTM, SRIL and INCO.

Table 1.7:*Expexted Return And Varian*

Zi	Wi	αp	βp	σ^2_{ep}
0,2200	0,2237	0,0329	0,0904	0,1409
0,3507	0,3566	0,0040	0,0663	0,0050
0,4129	0,4198	0,0113	0,4843	0,0100
0,9837	1,0000	0,0482	0,6409	0,1560
	E(Rm)	0,0101		
SIM	E(Rp)	0,0546		
	σ^2_m	0,0007		
	σ^2_{ep}	0,1563		

Based on the proportion of funds from shares that make up the optimal portfolio invested in ANTM shares with a proportion of funds of 22%, SRIL with a proportion of funds of 36% and INCO with a proportion of funds of 42%. Expected return of the formed portfolio is generated at 0.0546 with a portfolio variance of 0.1563 meaning that the greater the return the greater the risk of the portfolio formed.

V. CONCLUSION

From all samples used, there were 3 issuers that formed an optimal portfolio for the monthly period of 2016 - 2019, namely ANTM, SRIL and INCO. The shares that had the highest expected return were INCO (PT Vale Indonesia Tbk) and the lowest expected return of -0,00062 in BBNI shares (PT Bank Negara Indonesia Tbk). In terms of the percentage of fund allocation if the investor has funds of Rp. 1,000,000, then the allocation of 3 shares is optimal ANTM 22% or the allocated funds of Rp. 223,659, - SRIL shares 36% or allocated funds of Rp. 356,553, - and 42% of INCO shares or allocated funds of Rp. 429,788. Apart from the results of the formation of the portfolio there is information that supports the prospects for INCO shares where the government has appointed a BUMN mining holding, Namely MIND ID (Formerly named Inalum) to absorb 20% of PT Vale Indonesia Tbk's shares, it is considered to have a positive impact on both business prospects, and some securities analysts recommend the stock.

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