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Analysis of Return to Beta in Forming the Optimal Portfolio of Stocks on LQ45 in Indonesia Stock Exchange

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ABSTRACT:*This research aims to see how the LQ45 index stocks that can be used as a combining optimal portfolios, to know the optimal portfolio of the stock return LQ45 and the optimal portfolio risk stock LQ45, and also to find out how big the proportion of the funds on any shares to establish the optimal portfolio. Based on these goals, researcher select the stocks which on a part of Indonesia Stock Exchange's LQ45 (idx) of the period of 2011-2015 as the samples.This research use single-index model method to build an optimal portfolio. The sample consists of a consistent stocks in index LQ45 during periods of 2011-2015, share dividends continually, and also have no stock split, rights issues, reverse stock gained 14 shares. The results showed that 5 candidate portfolios stocks with a value of cut point (Ci) = 0.00602. Optimal portfolio was formed from BBCA, GGRM, LPKR, CPIN, JSMR stocks with each proportion : 73.14%, 5.23%, 7.85%, 6.98%, 6.79% , and also 1.58% portopolio return, 1.42% portopolio risk, 1.067 portfolio beta. Hypothesis test results showed there is no significant difference between the returns of stocks which is a portfolios candidate and the stocks that is not a candidate's portfolio but the existence of significant difference between the stock's risk portfolio with stock candidates instead of a candidate portfolio,*

Keywords: *Optimal Portfolio, Single Index Model, Cut off point*

I. INTRODUCTION

Investment is an activity to invest some funds purposely to gain a return from the investment in the future. The investors will choose the form of investment instrument that would provide high returns. Investors began to look at the capital market as a form of investment besides bank products. The development of the capital market indirectly attracts investors to make capital market products (i.e. stocks) as an alternativeinvestment. The phenomenon of stock investment is currently quite popular among the public. People began to pay attention in the form of investments in addition to deposits that have been known by the public. Currently, the public sees investing in the capital market as a means toget big profits and big losses at the same time. Such patterns of thinking are only suitable for speculators who actively make transactions. This can be prevented by using a proven method of establishing a collection of several stocks to form a stock portfolio.

Investors tend to use calculation methods that have not been tested out so the risks borne by investors are difficult to measure. The method that can be applied to various industry sectors to obtain optimal portfolio is the Single Index Model method. Shares that can be selected as an investment instrument are shares of companies listed on the Indonesia Stock Exchange. These shares will be grouped into several groups or indexes according to the criteria. One of the indexes in the stock is the LQ45 index. Stocks within the LQ45 index criteria are shares with criteria based on the level of liquidity, market capitalization, and growth prospects. The LQ45 index comprises 45 preferred stocks that have large capitalization value which is an indicator of the economy. Stocks included in this LQ45 index can be an option to as an investment with regard tothe returns and risks for the investors. Stocks in the LQ45 index is an indicator of economic growth rate. The LQ45 index covers 70% of the market capitalization and has a regular market transaction value (IDX Factbook, 2015). This indicates that LQ45 index which has a capitalization market can represent economic movement where LQ45 index is consisted of shares of big companies in Indonesia.

Portfolio analysis provides a rationale for establishing an optimal portfolio rather than buying just one securities. Single Index Method Model is a solution to overcome difficulties in securities analysis. Single Index Theory Model is used to build optimal portfolio by comparing *excess return to beta* (ERB) with *cut off rate* (Ci). Information on beta value and *excess return to beta* relating to unsystematic risk can be utilized in considering election alternatives and to optimize the preparation of stock portfolios.

II. THE THEORETICAL FRAMEWORK

Investment

Investment is an activity to delay the use of money or other things in the present with hopes of getting benefits in the future (Bodie et al., 2011: 1). Investments are made by everyone with different motives. Investments can be money, shares, property, gold, or in other forms. Investment activity is a way for people to secures the assets they have. Decision to invest is not only based on the expected returns, but also on the level of risk. According to Pratiwi and Irni (2013) return and risk are two things that cannot be separated in the principle of investment. Investments made by investors aim to expect more value or profit from assets invested. Investment is to make sacrifices by delaying current consumption needs. By making such delays, investors expect future profits. Where the future is full of uncertainty that needs to be taken into consideration because the investment has a risk of impairment of assets. The investment management process and conducting careful analysis will help investors to reduce the risks that occur. Investors need to consider choosing investment assets to allocate existing funds by considering returns, risks, and other factors attached to the investment asset (Bodie et.al, 2011: 129). The level of risk and return are the two things to pay attention to when investors decide to invest in an asset. Mary and Rhatika (2015) stated that this investment decision includes the selection of investment assets and any securities to be included in the portfolio.

Shares

Shares are an investment instrumentthat can be an optionfor investors. Issuance of shares in the stock exchange is one of the steps to obtain external funding sources. Stock is a form of capital participation of a person or business entity in a company or limited liability company. The investor who owns the shares has a claim on the company's revenue, claims on the company's assets, and is entitled to attend the General Meeting of Shareholders (IDX, 2016).

Portfolio Theory

Investments done in a single form will result in substantial risks, therefore investment should be made into a portfolio to maximize the profits and reduce the possible risks (Naveen, 2014: 3). To reduce the risk that may occur, investors need to diversify. One of them is to invest capital in the form of portfolio. Diversification system can be done in several ways, including *simple diversification* and *across industries diversification*. Simple diversification is by placing funds randomly without certain criteria while across industries diversification is placing investments among different industries (Francis 1993: 178).

A portfolio is a set of securities such as stocks, bonds and money market instruments. The process of merging several assets in groups to obtain maximum return with minimal risk is called the process of portfolio formation (Shah, 2015: 168). Poonima and Aruma (2015: 21) stated that the optimal portfolio will be chosen by every investor. Investors want to have a portfolio which gives maximum return with minimal risk. This process is done through optimal portfolio development. Portfolio analysis is an important aspect in making rational investment and decision-making process for investment. Investment by forming a portfolio tends to be more profitable than putting all capital in a single form of investment. Portfolio theory is based on how investors does not invest their funds in one type of stock ; thus dividingthem into various types of stock or in other words to diversify. Risk can be reduced by combining multiple securities in the portfolio. (Keown et.al, 2011: 182)

Markowitz's theory is based on the assumption that investors have the funds to be invested. Investment decisions are done based on possible returns and risks that may occur in the future. Markowitz's theory assumes that in a portfolio formation transaction there is no transaction and tax charges. Markowitz's portfolio is based on the concept of diversification to form an optimal portfolio. Markowitz's portfolio theory is a portfolio theory to analyze the formation of a combination of the proportions in various investment instruments to establish an efficient portfolio combination point on the *efficient frontier* line.

The portfolio theory proposed by Hary Markowitz is perfected by William Sharpe by simplifying calculations. Sharpe's theory is widely known by the *Single Index Model* method. Single Index Model refers to the observation of the effect of market indices on stock prices (Sharpe, 1963).

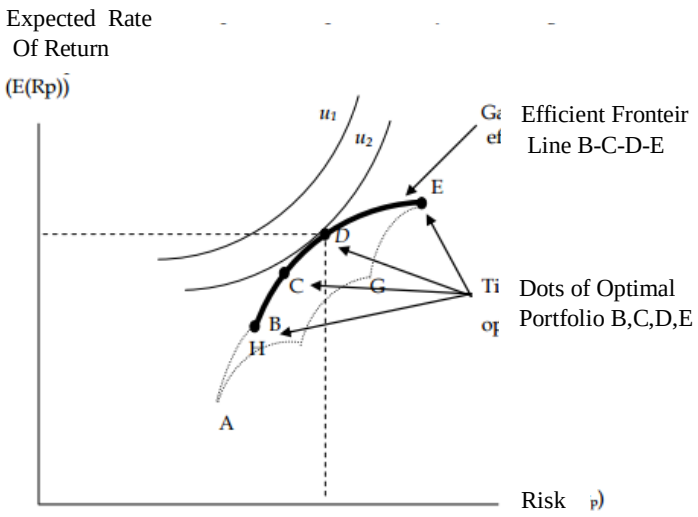
Optimal Portfolio

Investments have different risks and returns for investment assets. Investors are placing funds on risky investments because they expect high returns. The greater the investment risk the greater the *expectedreturn* (Keown et.al, 2011: 188). Investors invest funds in certain types of investments while expecting maximum returns with a certain level of risk. This is called an efficient portfolio. The optimal portfolio is a portfolio chosen by investors from many available options in efficient portfolio (Tandelilin, 2010: 113). The establishment of an optimal portfolio and the ability to perform careful calculations of securities are related to satisfactory outcomes (Elton et al., 2014: 133).

Portfolio is a collection of investments that have been selected and determine the proportion of funds to be placed on each investment instrument. The establishment of a portfolio is not limited to stocks but it can combine stocks with other instruments. Debasish and Jakki (2012: 38) stated the portfolio provides a rationale for establishing an optimal portfolio rather than buying just one securities. Ramanathan and Jahnavi (2014: 123) explained that the optimal portfolio development process aims to diversify to obtain maximum returns with certain risk or certain return with minimal risk. Portfolios are not formed based on brand identity or company performance but also consider the possible returns and risks that can be borne by investors.

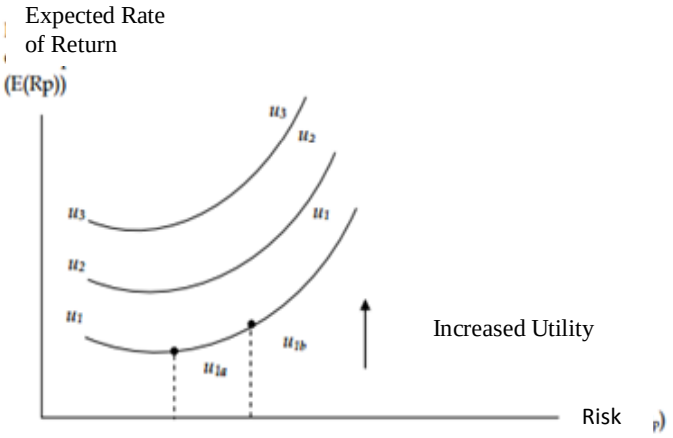
An efficient portfolio is a collection of possible portfolios that might be formed from a combination of portfolio building assets that provide a minimum risk value at a given rate of return or provide maximum benefits at a given level of risk (Tandelilin, 2010: 157). The optimal portfolio is one of the efficient portfolios selected by investors according to investors' own preferences (Tandelilin, 2010: 157). Investor preferences have 3 types, among others; *Risk seekers, risk-neutral investors, risk aversion investors* (Tandelilin, 2010: 156). The optimal portfolio for an investor may be different from other investors. One way that can be used to get the optimal portfolio is the Sharpe index approach. This method states that the best performing portfolio is the one with the highest *rewards to variability ratio* (comparison between portfolio return and portfolio risk). Tandelilin (2010: 156) stated that an optimal portfolio can be formed in the presence of three basic concepts of formationas follows:

1. Efficient Portfolio and Optimal Portfolio
   Tandelilin (2010: 157) states an efficient portfolio in which in the formation of a portfolio, investors always want to maximize the expected return with a certain level of risk that is willing to bear, or find a portfolio that offers the lowest risk with a certain expected return whereas, the optimal portfolio is the portfolio selected by an investor of the many options that exist in the collection portfolio efficiently and in accordance with the preferences of investors concerned to the expected return and the risks that are willing to bear.



Picture 1: Efficient Frontier Line
Source: (Tandelilin 2010:161)

2. **Utility Function and Indifference Curve**
   The utility function could be explained as a mathematical function that shows the value of all the alternative options available. The higher the value of an alternative (choice), the higher the alternative utility. In the context of portfolio management, utility functions indicate an investor's preference for various investment options with each risk and expected return rate. The utility function can be described in the form of the following indifference curve graph:



Picture 2: Indifference Curve
Source: (Tandelilin 2010:158)

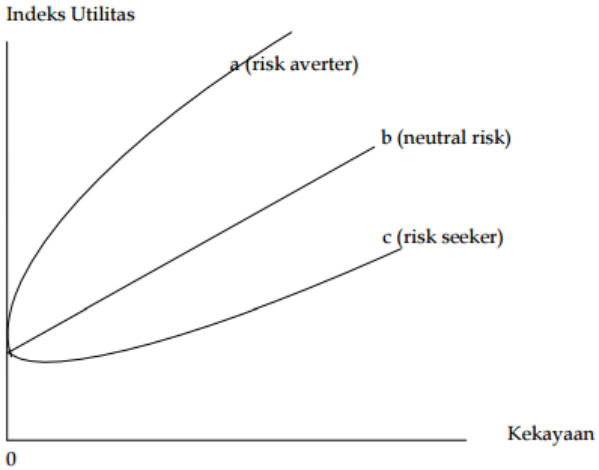
3. Risk Assets and Non-Risk Assets

Investors can choose to invest their funds in various assets, either risky asset so risk-free assets, or a combination of both. Riskyassets are assets which its actual returns in the future still contain uncertainty. Whiletherisk-free assetisanassetin whichitsreturnrate in thefuture can be ascertained at this time. Theinvestor'schoiceofthoseassetswilldependonhowfartheinvestorpreferstherisk. The more aninvestorreluctanttorisk (riskaverse), theinvestmentchoicewilltendto be more onrisk-free assets.

Tandelilin (2010:74) stated utility function as a mathematical function which shows the value from all available alternatives. Utility function, if related to the preference towards risk is differentiated into three (3) categories:

1. Attitude of disliking risk (*risk averter)*
2. Attitude of neutral towards risk (*neutral risk)*
3. Attitude of liking risk (*risk seeker)*

Thepicturebelow displays allthreetypesofrisksaboverelatedtoutility:



Picture 3: Relation of Risk with Utility
Source: Halim (2005:64)

Singh and Jayant (2014: 122) stated that yields and risks are taken into account by investors. Returns and risksplayanimportant role in makinginvestmentdecisions. Rationalinvestorswillchoosesecuritiesthatmaximize*returns*withminimumrisk in portfolioformation.Ramanathan and Jahnavi (2014: 122) statedthatsecuritiesanalysis and portfoliomanagementwillhelpinvestorstobuildanoptimal portfolio onthe capital market and helpinvestorstomakeinformeddecisionsoninvestments. Economistssuggestmanytheoriestobuildanoptimalportfolio.

Thewidelyusedtheoryformakingoptimalportfoliosis*Single IndexModel*. Thistheorystatestheexistenceofinfluencebythemarketofmarketindextowardsstock movements (Naveen, 2014: 2).

SingleIndexModel

SingleIndexIndextheorywasdevelopedby W.F. Sharpe. Thistheorytakes a slightlydifferentapproachfromMarkowitz'stheory, butitsapplicationisreliable. *SingleIndexTheory*modelassumesthat stock returns are correlatedwithonereason. Each stock affectstheentireportfolioof stocks in themarket. Ifthereisanyupwardmovement in themarket, then a single stock alsomovesupwards, and vice versa (Elton *et al*., 2014: 122).

Poonima and Aruma (2015: 22) saidthe*SingleIndexModel*methodis a solutiontoovercomedifficulties in securitiesanalysis. *SingleIndexMethod*Model can be usedtosimplifycalculationonMarkowitzmethod. ThereturnoninvestmentbySharpe (1963) in Elton et al (2014) isformulated as follows:

$$\mathbf{R_I} = \boldsymbol{\alpha} + \boldsymbol{\beta} + \boldsymbol{Rm} + \boldsymbol{ei}$$

Legend
R_i = Securities return number-i
α = The expected value of the securities return independent of the market return
β = Coefficient measuring changes in Ri as a result of changes in Rm
R_m = Return of market index
e_i = Residual error withzeroexpectationvalue

III. RESEARCH METHOD

The variables ofthisresearch are stock price, composite stock priceindex (IHSG), and Indonesia interestrate (SBI) duringJanuary 2011 untilDecember 2015. Accordingto Elton et.al (2014: 177) thevariable used in makingoptimalportfoliousing a single indexmethodis as follows:

1. *Realizedreturn* (R_t) isthechangeofclosingpriceofstock A in month t byminusclosingpriceof stock A onday t-1,thentheresultisdividedby stock closingprice A onday t-1.

$$R_{t(i)} = \frac{P_{t-l(i)}}{P_{t-1(i)}}$$

Legend
$R_{t(i)}$ = *Return* of realization on stocki
$P_{(t)}$ = *Closing pricing*stock i on day-t
R_{t-1} = *Closing price*of stocki on day t-1

2. *ExpectedReturn*orthelevelofthe profitrateexpectedfromevery stock is the percentage of average realized return i divided the amount realized return i.

$$E(R_i) = \frac{\sum R_{t(i)}}{n}$$

Legend
$E(R_i)$ = *expected return*
R_t = *return*from realization of stock-i
n = the amount of *realized return*from stock-i

3. Standard deviation is used to measure the risk from*realized return*, whereas *variance* is used to measure risk of *expected return* stock i. Variance can be calculated by squaring the standard deviation.

$$SD = \sqrt{\sum_{i=1}^{n} \frac{(X_i - \bar{X})^2}{n-1}}$$

Legend
σ = Deviation standard (SD)
X_i = Realized *return* number-iof stock i
$\bar{X}$ = Average of *realized return*ofstocki
n = Amount of *realized return*of stock i

$$Var = \sigma_i^2$$

Legend

Var : Variance
σ_i : Deviation Standard

4. Beta is a unique risk from individual stocks, calculating the slope or *slope realized return* of a stock with the *realized market return* within a given period.

$$\beta = \frac{n\sum XY - \sum X \sum Y}{n\sum X^2 - (\sum X)^2}$$

Legend

X = Market *Return* (Rm)
Y = Individual stock *Return* (Ri)
n = Sampling amount

5. Alpha is used to compare the calculation of *realized returns* of stock i with the *realized market return* within a certain period. Alpha is calculated by the regression equation

$$a = \frac{\sum Y - b\sum X}{n}$$

Legend
X = Market *Return* (Rm)
Y = Individual stock *Return* (Ri)
n = Sampling amount

6. Excess return to beta (ERB) is used to measure stock returns relative to a single unit of non-diversifiable risk as measured by beta.

$$ERB = \frac{E(R_i) - R_f}{\beta_i}$$

Legend
ERB = *Excess Returnto Beta*stock-i
$E(R_i)$ = *Expected Return*stock-i
R_f = *Risk free rate of return*
β_i = Beta stock-i

7. The Cut off point (Ci) is the value that shows the result between the market variant and the premium return on the stock *variance error* with the market variant and the sensitivity of the individual stock against the stock error variance.

$$C = \frac{\sigma_M^2 \sum_{j=1}^{i} A_j}{1 + \sigma_M^2 \sum_{j=1}^{i} B_j}$$

Whereas $A_i = \frac{[E(R_i) - R_f]\beta_i}{\sigma ei^2}$

And

$$B_i = \frac{\beta_i^2}{\sigma ei^2}$$

Legend
$\sigma^2 m$ = Variance of realized market return (IHSG)
C_i = *cut off rate*stock ke-1
σ_{ei}^2 = Residual error variance
βi = Beta stock-i
$E(R_i)$ = *Expected Returnof stock i*
Rf = *Risk free rate of return*

8. The proportion of the fund assets shaping the portfolio is calculated by the formula:

$$X_i = \frac{\beta_i}{\sigma_{ei}^2} \ (ERB - C^*)$$

Legend

X_i = Proportion of the fund assets of stock-i
β_i = Beta stock-i
σ_{ei}^2 = *Variance error*of stock-i
ERB = *Excess Return to Beta*on stock-i

9. The percentage of the fund assets shaping the portfolio is calculated by the formula:

$$W_i = \frac{X_i}{\sum X_i}$$

Legend

W_i = Percentageoffundassetson stock i
X_i = Proportionoffundassetson stocki
$\sum X_i$ = AmountofX_i

Population and Research Sample

The population of data used in this study are all stocks that are included in the LQ45 index during the 2011-2015period. Selection of data sample was done by *purposive sampling*, that is selection of data based on certain criterion or *judgment sampling* (Sekaran and Bougie, 2013: 252). These criteria are:

1. Company shares which are consistently in the LQ45 index during the 2011-2015period.

The consistent stocks during the 2011 - 2015 period on the LQ45 index serve as the criteria for data retrieval. This is because the stocks that always enter the LQ45 index is a stock which consistently has a large market capitalization value and alsoliquidity.

2. Company always divides dividend during 2011-2015

Research is also limited to firms that divide the dividend during the period of observation even though the dividend value was not included in the calculation. This is done so that the results of research can be a consideration for long-term investors who do not only expect returns in the form of *capital gain* alone but also *dividend yield*. This is because dividend payouts are related to the company's positive image towards future growth in earnings and good performance from the management (Elton et al., 2014). If other events occurred during the observation period, such as *Stock Split, Right Issues, Reverse Stock* or the *listing* of new shares, then the stock is *dropped ou*t of the sample. This limitation is made to avoid drastic change of stock price during observation period, average price and incomplete data.

Types and Sources of Data

The data used in this research in secondary data in the form of closing stock price of LQ45 stock index stocks during 2011-2015 period, composite share price index (IHSG), and Bank Indonesia interest rate data (SBI). Secondary data is in the form of publication.

1. Stock Price Data

Stock price data examined is the *closing price*in end of each month during the period 2011-2015 from the Yahoo! finance site.

2. Composite Stock Price Index (IHSG)
   The composite stock price index (IHSG) data is taken from the monthly closing for the period 2011-2015. The JCI is used as an indicator of the market index.
3. Indonesia Interest Rate Data (SBI)
   Indonesia Interest Rate Data is obtained from monthly data of Bank Indonesia (BI). SBI data is used as a risk free indicator (Rf).

V. RESULT AND DISCUSSION

Selection of data sample is done through *purposive sampling*. The research data is limited into 2 (two) criterions. Stocks which are consistent in the LQ45 index and always share its dividends during the research period from January 2011 until December 2015. Companies which went through *stock split, right issue, and reverse stock*will be eliminated from the equation. Stocks which went through one of the mentioned conditions does not included as a sample. Companies which are consistent in the LQ45 index, share its dividends consistently, and does not experience *stock split, right issue, and reverse stock*are shown on Table 1.

Table 1. Stocks on LQ45 Index 2011-2015 according to *purposive sampling*.

No.	Code	Company Name
1	AALI	PT. Astra Agro LestariTbk
2	ADRO	PT. Adaro Energy Tbk
3	BBCA	PT. Bank Central Asia Tbk
4	CPIN	PT. Charoen Pokphand Indonesia Tbk
5	GGRM	PT. Gudang Garam Tbk
6	INDF	PT. Indofood SuksesMakmurTbk
7	INTP	PT. Indocement Tunggal Prakarsa Tbk
8	ITMG	PT. Indo TambangrayaMegahTbk
9	JSMR	PT. Jasa Marga (Persero) Tbk
10	LPKR	PT. Lippo KarawaciTbk
11	PGAS	PT. Perusahaan Gas Negara Tbk
12	PTBA	PT. Bukit Asam (Persero) Tbk
13	SMGR	PT. Semen Indonesia (Persero) Tbk
14	TLKM	PT. Telekomunikasi Indonesia Tbk

Source: Processed Data

The stock return rate varied during the study period. Stock returns ranging from 0.1544% for TLKM shares up to 1.7878% for CPIN shares. This indicates if investors buy TLKM shares will gain 0.1544% per month and profit of 1.7878% per month for CPIN shares. In this study there are some stocks that provide losses that is the value of stock returns that are negative. The negative stock returns are ITMG shares (-2,8621%), ADRO shares (-1.8593%), PTBA shares (-1,8403%), PGAS shares (-0.2530%), and AALI shares (-0.0739%). This indicates if investors buy ITMG shares will get a loss (-2.8621%) per month in which ITMG shares get the rate of return with the largest negative value that provides the greatest loss compared to other stocks.

Analysis Process

The *return* from each share on the collected Stock price data will be gathered. The data used is the *closing price*and it is processed to get the *return*. From Individual Stock Price Indices (IHSI) data we obtained *return*of each individual share or *realized return*. The *expected return* is gathered from the average of the total of the *realized returns*. The data used in this research is secondary data. Selection of shares that become candidate portfolio is chosen using the *Single Index Model* method. The calculation steps are as follows:

1. Describing the development of stock price, IHSG and Bank Indonesia interest rates stock price data used is the *closing price*in end of each month during the period 2011-2015. The return value and stock risk are taken from the monthly stock price changes. The *closing price* of 14 stocks was

obtained from *finance.yahoo.com*. Composite Stock Price Index (IHSG) during the period of 2011-2015. IHSG data represents market data needed to calculate the market *return* (R_m) and market risk (σ_m). Bank Indonesia interest rate data during the period 2011 - 2015 obtained from Bank Indonesia is used as a risk-free indicator. This interest rate still contains risk if it cannot pay the interest rate, but this can be ignored because the risk of default is very small.

2. To calculate the *realized return, expected return,* deviation standard and the variance from each stock, IHSG, and Bank Indonesia Interest Rates using Excel program.

Table 2. Data E(Ri), STDev, and Stock Variance

No	Stocks Code	E(Ri)	STDev	Variance
1	AALI	-0.0739%	9.7280%	0.9463%
2	ADRO	-1.8593%	11.1000%	1.2321%
3	BBCA	1.6393%	6.0395%	0.3648%
4	CPIN	1.7878%	13.3233%	1.7751%
5	GGRM	0.9714%	7.9763%	0.6362%
6	INDF	0.3889%	6.7695%	0.4583%
7	INTP	1.2048%	8.6048%	0.7404%
8	ITMG	-2.8621%	11.1016%	1.2325%
9	JSMR	1.1458%	6.3667%	0.4053%
10	LPKR	1.6487%	11.5560%	1.3354%
11	PGAS	-0.2530%	9.5400%	0.9101%
12	PTBA	-1.8403%	11.0707%	1.2256%
13	SMGR	0.9785%	8.1355%	0.6619%
14	TLKM	0.1544%	12.3735%	1.5310%

Source: Processed Data

3. Calculating the Alpha, Beta, and the residual error variance of each stock

The α values of calculations vary from -0.0021 to 0.0102. The smallest alpha value is owned by INDF shares and the largest alpha is owned by BBCA shares. The value of α represents the return of a securities independent from market performance and is an *unsystemic risk* (Elton et al. 2014: 128).The calculated beta values vary from 1.566822 to 0.431409. The largest beta value is owned by CPIN shares and the lowest beta is owned by AALI shares. CPI beta value of 1.566822 CPI indicates if the market return changed 1% then the stock return CPIN will change by 1.566822% in the direction of market movement. This is also true for AALI stock which has the smallest beta of 0.431409 which will experience a direct change with changes in market return. This indicates if the market return changed 1% then AALI stock return will change by 0.431409% in the direction of market movement.

Table 3. Alpha, Beta, and the Residual Variance of Stocks

No	Stocks Code	α	β	σ_{ei}^2
1	AALI	-0.0033	0.4314	0.0091
2	ADRO	-0.0228	0.7108	0.0115
3	BBCA	0.0102	1.0501	0.0018
4	CPIN	0.0086	1.5668	0.0118
5	GGRM	0.0068	0.4943	0.0060
6	INDF	-0.0021	1.0173	0.0028
7	INTP	0.0058	1.0593	0.0055
8	ITMG	-0.0319	0.5486	0.0118
9	JSMR	0.0064	0.8501	0.0028

10	LPKR	0.0086	1.3427	0.0103
11	PGAS	-0.0093	1.1522	0.0069
12	PTBA	-0.0242	0.9768	0.0106
13	SMGR	0.0014	1.4249	0.0032
14	TLKM	-0.0062	1.3146	0.0124

Source: Processed Data

4. Measure the *Excess Return to Beta* (ERB) and the value of C_1 of each stock.

The first step to perform ERB calculation of each stock and then sort the results from the largest ERB and then the smallest. The value of C_i is the result of dividing the market variant and the premium return against the *residual error variance* of stock with the market variant on the sensitivity of individual shares against the *residual variance of stock error*. The largest stock of ERB is BBCA (0.0102) and the smallest is SMGR (0.0029).

Table 4. ERB Data of Each Stock

NO	Stocks Code	Ri - Rf	β	ERB
1	AALI	-0.0064	0.4314	-0.0149
2	ADRO	-0.0243	0.7108	-0.0342
3	BBCA	0.0107	1.0501	0.0102
4	CPIN	0.0122	1.5668	0.0078
5	GGRM	0.0040	0.4943	0.0081
6	INDF	-0.0018	1.0173	-0.0018
7	INTP	0.0063	1.0593	0.0060
8	ITMG	-0.0343	0.5486	-0.0626
9	JSMR	0.0058	0.8501	0.0068
10	LPKR	0.0108	1.3427	0.0080
11	PGAS	-0.0082	1.1522	-0.0071
12	PTBA	-0.0241	0.9768	-0.0247
13	SMGR	0.0041	1.4249	0.0029
14	TLKM	-0.0042	1.3146	-0.0032

Source: Processed Data

From the calculation of 14 ERB stocks above, then the positive ERB value is continued in the next process. The value of the ERB is ranked from the largest to the smallest. *Excess Return toBeta* value indicates the amount of *premium return*a stock can generate relative to a single unit of undetermined risk measured by beta. Beta shows the *return volatility* of a stock return against *market returns*, measuringthe systematic risk of a stock relative to market risk. Beta also shows stock sensitivity to market changes (Bodie *et al.*, 2011: 268). The greater the value of beta then the stock is easier to adapt to changes in the market.

5. Determine the cut-of-point (C *)

The next step after the ERB ranking is to determine the *cut-off point* that separates between candidate stocks who enter the portfolio and whichis not an optimal portfolio candidate. The *cut-off point* value is the largest C_i value among the candidate C_i values. The calculation result of *cut-of-point* value in this research is 0.00602.

Table 5. *Cut-of-point* Data (C*)

NO	SAHAM	σ_m^2	Aj	Bj	C
1	BBCA	0.00169	6.27884	616.60051	0.00519
2	GGRM	0.00169	6.61232	657.67070	0.00529
3	LPKR	0.00169	8.01654	832.46945	0.00562
4	CPIN	0.00169	9.63615	1040.84689	0.00590
5	JSMR	0.00169	11.36294	1295.78616	0.00602
6	INTP	0.00169	12.58287	1499.36429	0.00601
7	SMGR	0.00169	14.40422	2134.60838	0.00528
				C*	0.00602

Source: Processed Data

6. Determining the Stocks into Portfolio Candidate

The process of selecting the stocks to be combined into the candidate for portfolio are stocks that has *excess return to beta* value more than or the same as the *cut of point* value. With *cut-of-point* value (C*) = 0.00602.

Table 6. ERB Data vs C_i

NO	SAHAM	Ri - Rf	β	ERB	C_i	ERB >C_i
1	BBCA	0.0107	1.0501	0.01018	0.00519	Fortfolio Candidate
2	GGRM	0.0040	0.4943	0.00812	0.00529	Fortfolio Candidate
3	LPKR	0.0108	1.3427	0.00803	0.00562	Fortfolio Candidate
4	CPIN	0.0122	1.5668	0.00777	0.00590	Fortfolio Candidate
5	JSMR	0.0058	0.8501	0.00677	0.00602	Fortfolio Candidate
6	INTP	0.0063	1.0593	0.00599	0.00601	Not a portofolio Candidate
7	SMGR	0.0041	1.4249	0.00287	0.00528	Not a portofolio Candidate

Source: Processed Data

In Table 5.9 shares that enter the candidate portfolio are consisted of 5 (five), that is BBCA, GGRM, LPKR, CPIN, JSMR. Those stocks with excess *return to beta* value are greater than the cut of point value (C_i), while the other 2 stocks do not enter the candidate because they have a smaller *return to beta value* than the *cut of point* value (C_i). The five stocks are candidates to form an optimal portfolio.

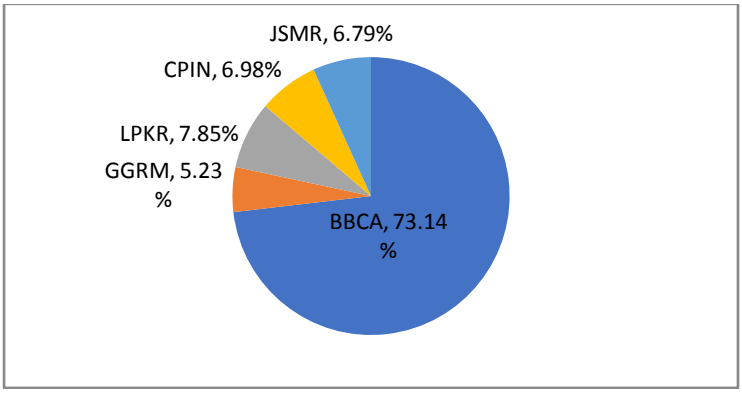
7. Determine the optimal portfolio and the proportion of funds of each share building the portfolio.

Table 7. Proportion of Funds from Each Stock

NO	SAHAM	β	σei^2	ERB	C*	Xi	Wi
1	BBCA	1.050122	0.00179	0.010183	0.006016	2.447015	73.14%
2	GGRM	0.494344	0.00595	0.00812	0.006016	0.174834	5.23%
3	LPKR	1.342745	0.01031	0.008033	0.006016	0.262677	7.85%
4	CPIN	1.566822	0.01178	0.007772	0.006016	0.233663	6.98%
5	JSMR	0.850144	0.00283	0.006773	0.006016	0.227258	6.79%
					∑	3.345447	100.00%

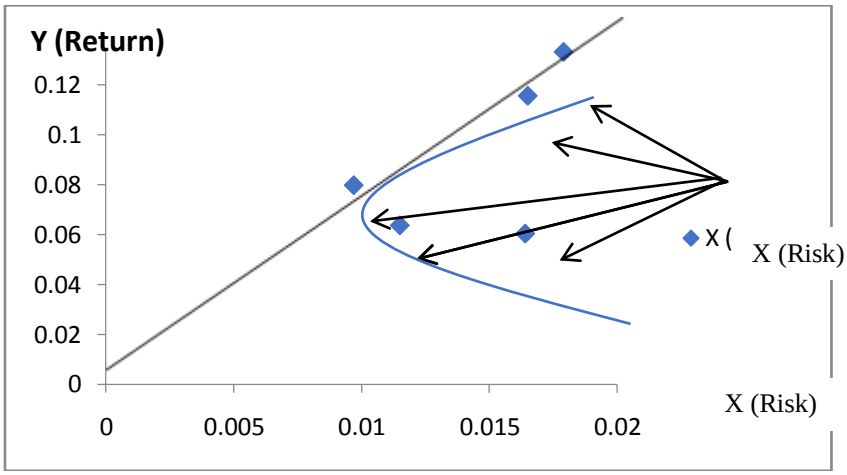
Source: Processed Data

Based on Table 7 above we obtained proportion of funds for each share. The largest share is BBCA with 73.14% followed by GGRM shares (5.23%), LPKR shares (7.85%), CPIN (6.98%), and the smallest proportion of JSMR shares (6.79%). The proportion of BBCA shares is the largest compared to other stocks. Investors who have funds worth 100 million and want to invest all funds in shares then the share of funds for each share is 73.14 million for shares of BBCA, 5.23 million for shares GGRM, 7.85 million for shares of LPKR, 6.98 million for CPIN shares, and 6.79 million For JSMR shares. The allocation for each candidate share can be seen in Figure 4.



Picture 4: The allocated funds of each portfolio candidate stocks
Source: Processed Data

Portfolio which lies in the *efficiency frontier* is an efficient portfolio,thus we cannot say which portfolio is optimal. The optimal portfolio is needed by the investor, which optimal portfolio will be chosen by the investor concerned to the profit or risk that is willing to bear. The optimal portfolio contains assets with high ERB ratios. To determine the ERB value limit that is high we needed a limitation point or *cut-off point* (Jogiyanto, 2003: 253).



Picture 5: Efficiency Frontier of Stocks Shaping the Portfolio
Source: Processed Data

8. To determine the correlation coefficient and covariance between stocks which forms the optimal portfolio.

The coefficient and covariance values of stocks forming the optimal portfolio will be sought. The correlation coefficient is needed to find out the correlation of stock *returns* forming portfolio and the relation of stock *return* with market *return* calculated by Correl formula. Covariance is a comparison of the calculation of realized return of stock A with realized return of stock B. Covariance is calculated by Excel program using Covar formula.

Table 8. Correlation Coefficient of Stocks Forming the Optimal Portfolio

CORELATION	BBCA	CPIN	GGRM	JSMR	LPKR
BBCA	1.00	0.42	0.15	0.54	0.27
CPIN	0.42	1.00	0.31	0.49	0.22
GGRM	0.12	0.36	1.00	-0.01	0.17
JSMR	0.45	0.42	0.17	1.00	0.28
LPKR	0.35	0.17	0.09	0.28	1.00

Source: Processed Data

Table 9. Covariance of Stocks Forming the Optimal Portfolio

COVARIANCE	BBCA	CPIN	GGRM	JSMR	LPKR
BBCA	0.00359	0.00335	0.00069	0.00122	0.00180
CPIN	0.00335	0.01745	0.00323	0.00237	0.00637
GGRM	0.00069	0.00323	0.00625	0.00123	0.00048
JSMR	0.00122	0.00237	0.00123	0.00398	0.00203
LPKR	0.00180	0.00637	0.00048	0.00203	0.01313

Source: Processed Data

9. Calculating *expected return*, alpha and beta of portfolio

The calculation result of *expected return*, alpha and beta optimal portfolio for the five stocks ofportfolio candidate is shown in Table. 5.13. The results show the *expected return* of portfolio $E(R_p)$ = 1.58% with beta portfolio (β_p) = 1.066 and portfolio risk (σ_p) = 1.42%. The market *return* value (R_m) = 0.5907% indicates the *return* generated by the portfolio is higher than the *market return*. A 0.57% risk-free return also shows that the portfolio established exceeds the risk-free return.

Table 10. Expected Return, Alpha, and Beta of Portfolio

NO	SAHAM	E(Ri)	Wi	βi	αi	Σi	E(Rp)	βp	αp	σp
		1	2	3	4	5	1*2	2*3	2*4	2*5
1	BBCA	0.0164	0.7314	1.0501	0.0102	0.0604	0.0120	0.7681	0.0075	0.0442
2	GGRM	0.0097	0.0523	0.4943	0.0068	0.0798	0.0005	0.0258	0.0004	0.0042
3	LPKR	0.0165	0.0785	1.3427	0.0086	0.1156	0.0013	0.1054	0.0007	0.0091
4	CPIN	0.0179	0.0698	1.5668	0.0086	0.1332	0.0012	0.1094	0.0006	0.0093
5	JSMR	0.0115	0.0679	0.8501	0.0064	0.0637	0.0008	0.0578	0.0004	0.0043
	∑						0.0158	1.0666	0.0095	0.0142

Source: Processed Data

Hypothesis Experiment

Normality test results indicate that the data used in the study is normally distributed. This is seen in the value of significance greater than α = 5%, that is equal to 0.147> 0.05 for stock return and 0.200> 0.05 for stock risk. The results of normality test by using One Sample Kolmogorov Smirnov Test seen in table 11 follows:

Table 11. ***One Sample Kolmogorov Smirnov Test***

One-Sample Kolmogorov-Smirnov Test

		Return	Risiko
N		14	14
Normal Parameters[a,b]	Mean	.002165	.095490
	Std. Deviation	.0146475	.0230297
Most Extreme Differences	Absolute	.197	.174
	Positive	.142	.101
	Negative	-.197	-.174
Test Statistic		.197	.174
Asymp. Sig. (2-tailed)		.147[c]	.200[c,d]

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.

The result of *One Sample T-test* shows the value of t for *return* (t = 0.553) with df = 13, sig. (92 tailed) = 0.590, where 0.590> 0.05, or P> 0.05. This means H_o: there is no difference between *stock returns* that enter the candidate portfolio with the stock return that does not enter the candidate portfolio received. This means that based on the empirical data obtained through statistical tests show that there is no significant difference between stock returns incoming portfolio candidates and stock returns that do not enter the portfolio.

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Return	14	.002165	.0146475	.0039147
Risiko	14	.095490	.0230297	.0061549

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Return	.553	13	.590	.0021650	-.006292	.010622
Risiko	15.514	13	.000	.0954897	.082193	.108787

In the second hypothesis, the *one sample T-test* shows the value of t for risk (t = 15.514) with df = 13, sig. (92 tailed) = 0.000, where 0.000 <0.005, or P <0.005. This means H_0: there is no difference between the risk of shares between the stocks that enter the portfolio candidate and the *return of the stock* that does not enter the portfolio candidate is rejected. This means that based on empirical data through statistical tests show that there is a significant difference between the risk of entering the portfolio candidate and who did not enter the candidate portfolio.

VI. CONCLUSION

The result of return to beta analysis in forming optimal portfolio of LQ45 stock in Indonesia Stock Exchange during 2011-2015 period can be summarized as follow:

A. Stocks that enter the candidate portfolio to form an optimal portfolio consist of BBCA, GGRM, LPKR, CPIN, and JSMR
B. The results of statistical tests show that there is no difference between the *return of stocks* that enter the portfolio candidate with the stock that does not enter the candidate portfolio. This indicates the *stock return* of candidate portfolio is not different from *stock return*of not portfolio candidate.
C. The results of statistical tests show that there is a significant difference between the risk of stocks that enter the portfolio candidate with the stock that does not enter the candidate portfolio. Stock risk has a significant difference between the stock of the portfolio candidate and the non-portfolio portion of the stock indicating that the risk is a consideration in choosing a portfolio-building stock.
D. D. The optimal portfolio forming stock consists of BBCA, GGRM, LPKR, CPIN and JSMR with the proportion of 73.14%, 5.23%, 7.87%, 6.98%, 6.79% respectively with the Return portfolio of 1.558% with the risk of 1.420%.

Suggestion

Suggestions in this study aims to develop research in the field of investment. Some suggestions that can be done in further research include:

1. For researcher: Researcher then do comparison of *return to beta analysis* for period per year at LQ45 index to see the difference of *return* and risk of candidate stock. In addition, further research is expected to compare with indices other than LQ45 such as Compass 100 index or Sharia Stock Index in Indonesia Stock Exchange.
2. For investors: Investors are expected in the selection of shares to form an optimal portfolio based on the tested method is not based on information alone and realize that stocks have high risk high return properties.

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