Critical Analysis of Sharpe, Treynor and Jensen Methods In Analyzing Stock Portfolio Performance LQ-45 Stock Studies

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Abstract
The purpose of this study is to determine the stocks of the LQ-45 Index which form a portfolio based on a single index model, analyzed by Sharpe, Treynor, and Jensen methods, whether there are differences in the results of calculations and which is the most appropriate in measuring portfolio performance. The method used in this research is descriptive research with a quantitative approach and the data source used is secondary data from the Indonesia Stock Exchange. The population used is the LQ-45 Index shares for the period 2013-2018 and based on established criteria, a sample of 22 shares was obtained. Based on the methods of Sharpe, Treynor, and Jensen, the portfolio performance that is formed experiences a similar and fluctuating movement. Because the three methods produce almost the same value movement, the determination of slope (linear curve) requires accuracy. Therefore re-testing is done by using Robustness Test, namely by doing the Regression Test. With the magnitude of the value of b, it shows that the Sharpe method is most appropriate to be used in measuring portfolio performance in this study. Researchers suggest for further research, in the formation of portfolios can use other portfolio formation models. This research in the formation of LQ-45 stock portfolios using the single index model method, the portfolio formed is only one portfolio each year which causes less number of portfolios compared. In addition to the Sharpe, Treynor, and Jensen methods, researchers can then use other performance measurement methods for comparisons, such as M2 (Modigliani-Modigliani) and Information Ratio (RI).

Keywords
Sharpe Method, Treynor Method, Jensen Method, LQ-45 Index

Introduction
Performance appraisal of a company is crucially necessary to obtain information about whether or not it serves a good performance from the company. Performance is a matter that becomes a benchmark to judge whether or not, as well as the growth or failure of a company. Performance appraisal is a measure for investors in making decisions about an investment (Santosa & Sjam, 2012). Tandelilin (2001, p. 33) mentioned that investment as a commitment to severa...
funds or resources made at this time to obtain some benefits in the future. Investment focuses on managing investor wealth for future income (Jones, 2014, p. 3). Investment analysis often faces problems that are about risk assessment faced by investors. If the investment risk increases, the level of profit required by the investor will be even greater. To reduce investment losses or risks, investors can invest in various types of shares by forming a portfolio. Portfolios are closely related to investments in various financial instruments that can be traded on the Stock Exchange and the money market to spread the source of the acquisition of returns and possible risks (Jones, 2000, p. 13).

The intended financial instruments include stocks, bonds, foreign exchange, deposits and other derivative products (Samsul, 2006, p. 22). Portfolios are also defined as a combination of several assets that are invested and held by investors, both individuals, and institutions. The existence of a positive relationship between return and risk in investing is known as a high risk-high return, which means that the greater the risk that must be borne, the greater the return generated.

One of the calculation models for obtaining stocks as a portfolio is the Single Index Model developed by William Sharpe in 1963. This model calculates the Excess Return to Beta (ERB) and the Cut-off rate (Ci) of each stock. ERB is the excess return on the risk-free rate of return on other assets compared to the stock beta. If ERB is greater than Ci, the share can be translated into portfolio composition and vice versa (Elton, 1995).

Three parameters can be used to measure portfolio performance developed by William Sharpe, Jack Treynor, and Michael Jensen. Sharpe Method calculation uses the concept of the capital market line (capital market line) as a guess. The Sharpe Index can be used to measure the risk premium for each portfolio risk unit by dividing the portfolio risk premium by its standard deviation. The higher the Sharpe index of a portfolio, the better the portfolio's performance (Tandelilin, 2001, p. 47).

The Treynor Method is a measure of portfolio performance by comparing portfolio risk (the difference between the average rate of return of a portfolio and the average rate of risk-free interest) and portfolio risk (market risk or systematic risk) expressed in beta (β) (Halim, 2003, p. 78). The Treynor Index is relevant for investors who have various portfolios or invest their funds in various mutual funds, or diversify their portfolio so that portfolio risk is expressed in beta (β), which is a market risk or systematic risk (Halim, 2003, p 80).

The Jensen Method is based on the concept of a security market line (SML) that links a market portfolio with a risk-free investment opportunity (Halim, 2003, p. 83). According to Tandelilin (2001, p. 54), the Jensen Index is an index that shows the difference between the actual rate of return obtained by the portfolio and the expected rate of return if the portfolio is on the capital market line. A positive value index means that the stock portfolio gives a greater return than its expected return (above the securities market line) so that it is a good thing because the portfolio has a relatively high return for the level of systematic risk, and vice versa.

Measuring the performance of stock portfolios can be made easier by using a certain proxy such as based on a sectoral index or using a constituent index such as the LQ-45 Index. The stocks included in the LQ-45 Index have characteristics that are almost the same for each other in many
aspects including high market capitalization, the company's financial condition, and good growth prospects, the frequency and number of trading days for regular market transactions are high, and periodically selected objectively by the IDK (Hartono, 2013, p. 171). Kontan.co.id an online newspaper also mentioned since the beginning of 2019, the LQ45 index has grown 4.67%. That figure is higher than the Composite Stock Price Index (CSPI) which grew by 4.08%. It is common knowledge, the LQ45 index is an index whose main measurement is transaction liquidity and transaction value on the regular market. Because it is quite liquid, it is natural that shares in this index will experience a high share price increase.

Although, as explained earlier that portfolios that provide a greater level of profit, do not always have better performance than other portfolios. This is due to the importance of considering risk factors so that there is a need for a portfolio performance measurement standard. The author through this study intends to find out whether there are differences in portfolio performance formed by the calculation of the Sharpe, Treynor, and Jensen methods.

Theoretical and Conceptual Background

Related Work

Research conducted by Yasemin & Lawrence (1996) tested that 94 UK investment funds from 1975-1993 using portfolio performance measurements that are Sharpe, Treynor, and Jensen. The research method used was the CAPM and the Watson Durbin Test. The results found by the Spearman test that there is a high degree of relationship between the three measuring devices but the results of Treynor have the results of calculations that are greater than other methods.

Different from Kolbadi's research (2011) which evaluated the function and impact of portfolio management on corporate investment, which has a portfolio on the Tehran Stock Exchange for the period 2005-2010. The research method used is the Least Square Differences (LSD) pre-test and Kruskal Wallis Test. Sharpe, Sortino, and Sterling ratios are used in portfolio measurements. The final results show that the measurement of portfolio performance using the Sharpe, Sortino and Sterling methods is proven to have similar results. The calculation of the mean of the three Sharpe methods shows the smallest number (negative value).

Likewise, Jagic's research (2007) examined eight open-end mutual funds in Serbia in 2009-2012 to test the truth of active portfolio management in the form of mutual funds, and determining the ability of managers to choose portfolios in Serbia. Returns from mutual funds compared to the Belex15 Index use performance measurements of the Sharpe, Treynor, and Jensen Ratios. The research method used is the CAPM and t-test. The results of this study are mutual fund portfolios in Serbia showing inferior performance compared to market portfolios and the lack of ability of portfolio managers. Also, the results of the Sharpe method calculation show a greater number than the other methods.

Research conducted by Arna & Eva (2015) focuses on analyzing the performance of LQ 45 portfolios. It aims to analyze the consistency of the Sharpe, Treynor, and Jensen Index as a risk-adjusted performance measurement tool. The method used is the Z-score. The results of this study are that there are no differences in the three indices, but Treynor shows consistent results from other performance measures.
Different results are shown by Habib's research (2010). This study aims to evaluate the performance of ICB (Investment Corporation of Bangladesh) portfolio management in 2004-2011. Portfolio performance analysis tools used are the Sharpe, Treynor, Jensen and Fama Ratios. The research method used is the CAPM and t-test. The results of the study using the Sharpe and Treynor ratio show that the performance of ICB portfolio managers is less satisfactory. From the results of calculations Sharpe, Treynor, and Jensen show almost the same number.

Another study was conducted by Poornima and Saranya (2016) who tested 5 mutual funds (Baroda Pioneer Fund, Franklin India Bulechip Fund, HSBC Dynamic Fund, 50-Growth Box, SBI Blue Chip Fund) in India in 2002-2012 using Sharpe performance measurement, Tryenor, and Jensen. The research method used is descriptive research with a quantitative approach. The results of this study indicate that in assessing the performance of 5 Sharpe, Tryenor, and Jensen mutual funds the value is almost the same but Sharpe has the smallest (negative) value. In general, mutual funds do not meet investor expectations because many have negative values.

Research conducted by Murphy (2015) is to measure the performance of stock portfolios using the Sharpe, Treynor, and Jensen methods formed by the Single Index Model, Constant Correlation, and Multigroup in the period 2005-2009. The sample used was 36 shares in the S&P 500 Index from 5 industries, namely Electric Utilities, Independent Oil & Gas, Money Center Banks, Certified Utilities, and Drug Manufactures-Major. Conclusions drawn as a whole model used in the formation of the portfolio there is no problem, Sharpe shows more accurate results if the market index as a benchmark in assessing portfolio performance.

Other research conducted by Wahyu (2017) is analyzing 58 OJK equity funds in 2012-2014. This research is a descriptive study with a quantitative approach and uses the methods of Sharpe, Treynor, and Jensen. The results of this study indicate that there are mutual and consistent work that is positive and outperforming. These mutual funds are RHB OSK Alpha Sector Rotation and the SAM Indonesian Equity Fund, so that both mutual funds and these are suitable for investment.

Further developing Tripathy (2017) uses Sharpe, Treynor, and Jensen to investigate the performance of mutual fund schemes, selectivity and market timeliness of investment managers. This study uses daily observations of the NAV and NIFTY indexes for the period 2008-2014. The results showed that most of the mutual fund schemes performed well.

Tan (2015) also conducted a study evaluating the performance of South Afirka equity funds using the Sharpe, Treynor, and Jensen methods in the 2009-2014 period. The sample used was 10 equity funds with the Johannesburg Stock Exchange (JSE) Index. In addition to evaluating performance, it also tests the ability of managers in market timing of mutual funds using the Treynor and Mazuy methods. The results of this study all three methods provide equally good performance, indicated by ranking the same 10 mutual funds.

**LQ-45 Index**

The LQ-45 index is formed from only the 45 most actively traded stocks. The LQ-45 index is updated every 6 months, at the beginning of February and August. The considerations underlying the selection of
shares included in the LQ-45 Index are liquidity and market capitalization with the following criteria.

1) Over the past 12 months, the average stock transaction entered the 60th largest order on the regular market.
2) Over the past 12 months, the average market capitalization value has entered the 60th largest in the regular market.
3) It has been listed on the IDX for at least 3 months (Hartono, 2013, p. 130).

**Stock Investment**

Investment is a commitment to several funds or other resources made at this time, intending to obtain some benefits in the future. Investment can also be defined as the association of sources in the long run to generate future profits (Tandelilin, 2001, p. 2). Investment is an investment of funds made by a company into an asset with the hope of earning income in the future (Martono & Harjito, 2010, p. 138).

**Return and Risk**

**Return**

Sharpe (1995) stated that risk and return are characteristic of investment, therefore it is very important to know its origin. Important factors that cause must be identified and evaluated. This is the main task of securities analysis and the results are crucial elements for forming a portfolio, revising, evaluating and defining a long-term investment strategy.

Return or rate of return according to Tandelilin (2001, p. 102) consists of two main components, yield and capital gain (loss). Yield is a component of return that describes the cash flow or income periodically obtained from an investment. Capital gain (loss) as the second component of return is an increase (decrease) in the price of a security (stocks or other long-term securities), which can provide profits (losses) for investors. In other words, capital gain (loss) can be interpreted as a change in the price of a security.

**Risk**

Risk is a prediction of the difference between the actual return received and the expected return. The risk of a stock portfolio depends on the proportion of individual shares, variance, and covariance of these shares. Changes that occur in these variables will change the risk of the portfolio. Still related to this, it is common knowledge that if stocks are chosen randomly and combined into a portfolio, portfolio risk will decrease according to the number of different shares (Statman, 1987).

**Portfolio Theory**

Husnan (2003, p. 19) mentioned portfolio theory based on the fact that generally investors in securities do not invest all their funds in one type of stock, but share it in various types of shares. Ang (1997) is supported by the statement of Rodoni & Ali (2010, p. 73) mentioning a portfolio is a collection of investment instruments formed to meet investment targets. According to Jones (2000) argues that a portfolio means a set of securities in which a relatively small amount of funds can be invested by buying shares from companies operating in various types of industries, in addition to that the portfolio will reduce risk.

**Single Index Model**

Halim (2003, p. 64) explained the Single Index Model or one factor model assumes that the yield or return between two or more securities will be correlated that will move
together and have the same reaction to one single factor or index included in the model. The factor or index used in the Single Index Modemel is the Composite Stock Price Index (CSPI).

**Measuring the Portfolio Performance**

*Sharpe Index*

The Sharpe Method was developed by William Sharpe and is often also referred to as a reward-to-variability ratio (RVAR). The Sharpe Index bases its calculations on the concept of a capital market line as a benchmark by dividing the risk portfolio risk stock by its standard deviation. Thus, the Sharpe Index can be used to measure the risk premium for each unit of risk in the stock portfolio (Tandelilin, 2010, p. 494).

*Treynor Method*

The Treynor Method is a measure of portfolio performance developed by Jack Treynor, and this index is often referred to as the reward to volatility ratio. As with the Sharpe index, portfolio performance on the Treynor index is seen by linking the level of portfolio return to the magnitude of the risk of the portfolio. The assumption used by Traynor is that the portfolio is well diversified so that the risk that is considered relevant is systematic (measured by beta) (Tandelilin, 2010, p. 497).

*Jensen Method*

The Jensen Method is an index that shows the difference between the actual rate of return obtained by the portfolio and the expected rate of return if the portfolio is on the capital market line. The Jensen index is the excess return above or below the security market line. The Jensen Index can easily be interpreted as a measure of how much a portfolio "beats the market." An index that is positive means that the portfolio gives a return greater than its expected return (above the securities market line) so that it is a good thing because the portfolio has a relatively high return for the level risk, and vice versa (Tandelilin, 2010, p. 501).

**Research Hypothesis**

The hypotheses proposed in this study are as follows:

H0 = There is no difference in the performance of the LQ 45 stock portfolio analyzed using the Sharpe, Treynor, and Jensen Methods.

H1 = There is a difference in the performance of the LQ 45 stock portfolio which is analyzed using the Sharpe, Treynor, and Jensen Methods.

**Research Method**

This type of research used in this research is descriptive research with a quantitative approach. Understanding quantitative research is research that uses data in the form of numbers or quantitative data that are assumed for example contained in the measurement scale (Sugiyono, 2005, p. 14). This study uses numerical data that is the closing price of shares, the LQ-45 Index and the BI Rate. The data source used is a list of shares included in the LQ-45 Index, closing price data for each month from the sample company, the LQ-45 Index, and the BI Rate for the 2013-2018 period.

**Sample**

The determination of the sample in this study is the purposive sampling method. The consideration used by researchers as a criterion in determining the research sample is stocks that are listed continuously in the LQ-45 Index during the 2013-2018 period. These stocks are good company shares.
because they can meet the criteria of shares included in the LQ-45 Index amid global economic uncertainty. Based on the selected sample data processing, there are 22 company shares that is ADRO (Adaro Energy Tbk), AKRA (AKR Corporindo Tbk), ASII (AstraInternational Tbk), BBCA (Bank Central Asia Tbk), BNNI (Bank Negara Indonesia (Persero), BBRI (Bank Rakyat Indonesia Tbk), BMRI (Bank Mandiri Tbk), BSDE (Bumi Serpong Damai Tbk), GGRM (Gudang Garam Tbk), ICBP (Indocement Tunggal Perkasa Tbk), INDF (Indofood Sukses Makmur Tbk), INTP (Indocement Tunggal Perkasa Tbk), JSMR (Jasa Marga (Persero) Tbk), KLBF (Kalbe Farma Tbk), LPPR (Lippo Karawaci Tbk), MNCN (Media Nusantara Citra Tbk), PGAS (Perusahaan Gas Negara Tbk), PTBA (Tambang Batubara Bukit Asam Tbk), SMGR (Semen Gresik Tbk), TLKM (Telekomunikasi Indonesia Tbk), UNTR (United Tractor Tbk), and, UNVR (Unilever Tbk).

Data Analysis Method

Data analysis is a very important step in research because with analysis, data can be given meaning in solving research problems (Nazir, 2003, p. 346). Researchers used stock performance analysis with the Sharpe, Treynor, and Jensen Methods. The steps in conducting data analysis in this study are as follows:

1. Calculating the total return of realization of each share per year

\[
(R_t) = \frac{P_t - P_{t-1} + D_t}{P_{t-1}}
\]

(Hartono, 2013, p.237)

The return calculation above uses monthly share price data which is the closing price at the end of the month. If there is data this calculation also uses dividends.

2. Calculating the expected return of each stock

\[
E(R_i) = \frac{\sum_{i=1}^{n} R_i}{n}
\]

(Husnan, 2003, p.47)

Owned share \( E(R_i) > 0 \) will be continued, while stocks that have \( E(R_i) < 0 \) will be ignored.

3. Calculating the market return \( (R_M) \) and expected market return \( E(R_M) \) with the base of ILQ 45

\[
R_M = \frac{\text{HILQ} \cdot 45_i - \text{HILQ} \cdot 45_{i-1}}{\text{HILQ} \cdot 45_{i-1}}
\]

(Hartono, 2013, p.370)

\[
E(R_M) = \frac{\sum_{i-1}^{n} R_M}{n}
\]

(Hartono, 2013, p.225)

4. Calculating Beta and Alpha from each share

\[
\beta_i = \frac{\sigma_{iM}}{\sigma_{M^2}}
\]

in which:

\[
\sigma_{iM} = \sum_{i=1}^{n} [(R_i - E(R_i))(R_M - E(R_M))]
\]

\[
\sigma_{M^2} = \sum_{i=1}^{n} (R_M - E(R_M))^2
\]

(Hartono, 2013, p.413)

\[
\alpha_i = E(R_i) - (\beta_i \cdot E(R_M))
\]

(Hartono, 2013, p.372)
5. Calculating investment risk
   a. Calculates the variance of residual errors
   \[ \sigma_e^2 = \frac{\sum_{i=1}^{n} (R_i - \alpha_i - \beta_i \cdot R_M)^2}{n} \]
   (Hartono, 2013, p.377)

   b. Counting stock risk
   \[ \sigma_i^2 = \beta_i^2 \cdot \sigma_M^2 + \sigma_{ei}^2 \]
   (Hartono, 2013, p.376)

6. Determining risk free return (R_{BR})
The R_{BR} is determined by the monthly BI Rate level for the period 2013-2018. The amount of R_{BR} is the average interest rate during the study period. Shares that have E (R_i)> R_{BR} will be further analyzed because they will produce a positive ERB.

7. Calculating the Excess Return to Beta (ERB)
   \[ \text{ERB}_i = \frac{E(R_i) - R_{BR}}{\beta_i} \]
   (Hartono, 2013, p.391)

8. Determining the Value of A_i and B_i
   \[ A_i = \frac{E(R_i) - R_{BB}}{\sigma_{ei}^2} \beta_i \]
   \[ B_i = \frac{\beta_i^2}{\sigma_{ei}^2} \]
   (Hartono, 2013, p.393)

9. Calculating Cut-Off Point (C*)
   \[ C_i = \frac{\sigma_M^2 \sum_{j=1}^{l} A_i}{1 + \sigma_M^2 \sum_{j=1}^{l} B_i} \]
   (Hartono, 2013, p.393)

The size of C* is the value of C_i where the last ERB value was still greater than C_i. Securities that form an optimal portfolio are securities that have an ERB value greater than or equal to the ERB value at point C*.

10. Determining the magnitude of the proportion of each security in the portfolio
   \[ w_i = \frac{z_i}{\sum_{j=1}^{k} z_j} \]
   (Hartono, 2013, p.396)

11. Calculating Alpha and Beta of the portfolio
    \[ \alpha_p = \sum_{i=1}^{n} w_i \cdot \alpha_i \]
    \[ \beta_p = \sum_{i=1}^{n} w_i \cdot \beta_i \]
    (Hartono, 2013, p.386)

12. Determining expected portfolio return
    \[ E(R_p) = \alpha_p + \beta_p \cdot E(R_M) - C* \]
    (Hartono, 2013, p.387)

13. Calculating the stock performance by using Sharpe Method
    \[ S = \frac{E(R_p) - R_f}{\sigma_p} \]
    (Marhfor, 2016)
14. Calculating the stock performance by using Treynor Method

\[ T = \frac{E(R_p) - R_f}{\beta_p} \]

(Marhfor, 2016)

15. Calculating the stock performance by using Jansen Method

\[ \alpha = E(R_p) - R_f - \beta_r (E(Rm) - R_f) \]

(Tandelilin, 2010, p. 500)

16. Calculating the stock performance and determine the most appropriate by using Sharpe, Treynor and Jensen Methods.

Research and Discussion

Calculation Results of Realized Total Return of Each Share (Ri)

The stock that had the highest realized return (Ri) in 2013 was Telekomunikasi Indonesia Tbk (TLKM) of 0.36899, while the lowest was Gudang Garam Tbk (GGRM) of -0.227787. The shares that had the highest Ri in 2014 were Lippo Karawaci Tbk (LPKR) of 0.87610, while the lowest was United Tractors Tbk (UNTR) of -0.04721. The stock that had the highest Ri in 2015 was AKR Corporindo Tbk (AKRA) of 0.60869 while the lowest was Bukit Asam Coal Mine (Persero) Tbk (PTBA) of -0.69426.

The stock that has the highest Ri in 2016 is Bukit Asam Coal Mine (Persero) Tbk (PTBA) of 0.137068 while the lowest is Indocement Tunggal Prakarsa Tbk (INTP) of -0.32536. The shares that had the highest Ri in 2017 were Bank Mandiri (Persero) Tbk (BMRI) of 1.02977 while the lowest was Perusahaan Gas Negara (Persero) Tbk (PGAS) of -0.338599. The stock that has the highest Ri in 2018 is Bukit Asam Coal Mine (Persero) Tbk (PTBA) of 0.76835 while the lowest is Gudang Garam Tbk (GGRM) of -0.96188.

Result of Calculation of Return of Each Stock's Expectations E(Ri)

The stock that had the highest expected return of E (Ri) in 2013 was Telekomunikasi Indonesia Tbk (TLKM) of 0.03074, while the lowest was Gudang Garam Tbk (GGRM) of -0.01899. The shares that had the highest E (Ri) in 2014 were Lippo Karawaci Tbk (LPKR) of 0.07301, while the lowest were United Tractors Tbk (UNTR) of -0.00393. The stock that has the highest E (Ri) in 2015 is AKR Corporindo Tbk (AKRA) of 0.5072 while the lowest is Bukit Asam Coal Mine (Persero) Tbk (PTBA) of -0.05785. The stock that has the highest E (Ri) in 2016 is Bukit Asam Coal Mine (Persero) Tbk (PTBA) of 0.11422, while the lowest is Indocement Tunggal Prakarsa Tbk (INTP) of -0.02712. The shares that had the highest E (Ri) in 2017 were Bank Mandiri (Persero) Tbk (BMRI) of 0.87851 while the lowest was Perusahaan Gas Negara (Persero) Tbk (PGAS) of -0.338599. The stock that has the highest E (Ri) in 2018 is Bukit Asam Coal Mine (Persero) Tbk (PTBA) of 0.10976, while the lowest is Gudang Garam Tbk (GGRM) of -0.13741.

Proportion (Wi) of Funds of Selected Shares

The proportion of funds for each share in 2013 was UNVR (28.32%), TLKM (65.32%), and ICBP (6.35%). The proportion of funds for each share in 2014 were ICBP (2.79%), LPKR (2.74%), BBCA (10.78%), BBNI (35.99%), KLBF (4.86%), GGRM (5.91%), PGAS (14.67%), TLKM (3.96%), BBRI (6.07%), and JSMR (2.24%).
The proportion of funds for each share in 2015 was AKRA (65.53%), UNVR (8.70%), ICBP (28.47), and BMRI (0.31%).

The proportion of funds for each share in 2016 was INTP (5.41%), ADRO (66.78%), PTBA (17.50%), UNTR (3.31%), GGRM (5.85%), TLKM (0.91%), and INDF (0.25%). The proportion of funds for each share in 2017 was BMRI (2.92%), UNTR (42.99%), BBCA (20.36%), BBNI (13.71%), BBRI (5.47%), and UNVR (14.54%). The proportion of funds for each share in 2018 are PTBA (30.51%), ICBP (49.87%), BBCA (5.19%), PGAS (10.13%), and SMGR (4.30%).

**Portfolio Expectation Return (E(Rp))**

The portfolio formed was able to provide expected returns of 0.04650 or 4.65% in 2013; 0.03805 or 3.805% in 2014; 0.07519 or 7.519% in 2015; 0.13108 or 13.108% in 2016; 0.04451 or 4.451% in 2017, and 0.04963 or 4.963% in 2018. Return of portfolio expectations E (Rp) will affect investors' decisions to invest in shares included in the portfolio because they have more portfolio expectations high compared to market expectation return E (Rm).

**Stock Portfolio Performance Analysis with the Sharpe Method (S)**

The portfolio performance that was formed with the calculation of the Sharpe method can see in Table 1. If the Sharpe method calculation results are positive and the greater, the portfolio performance is the better. On average from 2013-2018 the value of Sharpe experienced a fluctuating change, but in 2017 it decreased quite dramatically from the previous year from 0.60862 to 0.15321.

**Stock Portfolio Performance Analysis with the Treynor (T) Method**

The portfolio performance that was formed with the calculation of the Treynor method can see in Table 1. If the Treynor method calculation results are positive and the greater the portfolio performance is better. The average from 2013-2018 Treynor values have changed lucratively, but the last three years, namely in 2016-2018 has decreased from 0.14968; 0.04808 to 0.004360.

**Stock Portfolio Performance Analysis with the Jensen Method (J)**

The portfolio performance that was formed with the calculation of the Jensen method can see in Table 1. Jensen's value is positive, meaning that financial managers produce better performance than the market index; whereas if the value is negative, it means that financial managers have lower performance than the market index. Similar to the Sharpe value, at the end of 2018 the value of Jensen has increased from 0.02953 to 0.05720.

**Discussion**

Table 1 shows that the average Sharpe method each year shows figures above 0.1. For the Treynor and Jensen methods, there is only one year each, which indicates a figure above 0.1, which is in 2016. The results of Treynor and Jensen's calculations generally produce relatively unsubstantial figures for each year. But in general, the value Sharpe, Treynor, ad Jensen are almost the same movement (see figure 1). This is in line with statements Hartono (2013), Jones (2009), Jagric (2007) and Habib (2010) that performance measurement using total risk or systematic risk is all not wrong. But related to the ranking or fluctuation (each year) of the portfolio formed if the portfolio is well diversified it will produce the same order
(ranking) or change (ups and downs) each year. Meanwhile, if it is not well-diversified, it will produce a different sequence (ranking) or change (ups and downs) each year.

The number of samples is 22 consecutively listed companies that were listed during the 2013-2018 study period. From the samples, the authors develop portfolios by applying the Single Index Model. This method causes the formation of a portfolio will produce one portfolio each year. Because one of the problem formulations in this study is to compare the three methods of Sharpe, Treynor, and Jensen, while the three methods turned out to produce almost the same value movement, in determining the slope (linear curve) requires accuracy. Following Hartono's (2013) explanation, measuring Sharpe, Treynor, and Jensen is measuring the slope of a portfolio, the bigger the slope, the better the portfolio's performance. Therefore, the researcher decides to retest using the Robustness Test, namely by doing a Regression Test.

**Robustness Test**

The robustness test is the ability of the analytical method to validate the strength of a small method and continuously evaluate the analytical response to the effects of precision and accuracy and can provide indications in normal use. In this robustness test, check whether the core regression coefficient behaves when the regression specification is modified by adding or removing regressors. If the coefficient is reasonable and strong, this is usually interpreted as evidence of structural validation (Lu, 2014). The authors applied regression analysis for portfolios valued using Sharpe, Treynor, and Jensen. The general equation of linear regression is as follows:

\[ Y = a + bx \]

In which

\[ a = \frac{\sum y (\sum x^2) - (\sum x)(\sum x y)}{n(\sum x^2) - (\sum x)^2} \]

\[ b = \frac{n (\sum x y) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2} \]

**Information:**

- **Y** = Subject in the predicted dependent variable
- **a** = value Y if X = 0 (constant value)
- **b** = Number of directions or coefficient of regression or slope, which shows the number of increase or decrease in the dependent variable based on the independent variable. If b (+) then rises, and if (-) there is a decrease
- **X** = Subject of an independent variable that has a certain value

**Regression Analysis in the Sharpe Method**

To find out the magnitude of the slope from the Sharpe method calculation results, it is necessary to determine the regression equation of the Sharpe method component, namely portfolio expectation return (E (Rp)) as the dependent variable (Y) and portfolio standard deviation (σp) as the independent variable (X). note the equation is, \( y = 0.07448 - 0.04513x \).
Regression Analysis in the Treynor Method

To find out the magnitude of the slope from the Treynor method calculation results, it is necessary to determine the regression equation from the component of the Treynor method, namely the expected portfolio return (E (Rp)) as the dependent variable (Y) and portfolio beta (βp) as the independent variable (X). The equation is, \( y = 0.12890 - 0.07323x \).

Regression Analysis in the Jensen Method

To find out the magnitude of the slope from the calculation results of the Jensen method, it is necessary to determine the regression equation of the components of the Jensen method, namely premium risk portfolio (E (Rp) - Rf) as the dependent variable (Y) and market risk premium (E (Rm) - Rf) as variables independent (X) (Hartono, 2013). After calculating the equation is known, \( y = 0.05894 - 0.20538x \).

Comparative Interpretation Results of Regression Analysis of the Three Methods of Sharpe, Treynor, Jensen

Where the value of b is the size of the slope, so the greater the value of the slope, the better the performance of the portfolio. From the above equation it is known that the greatest value of b is in the Sharpe method (−0.04513) and the smallest value is in the Jensen method (−0.20538), bbbg g This result is in line with Hartono (2013) and Murphy's (2015) explanation which states that a more accurate or reliable measurement is to use the Sharpe method because it measures risk with total risk. While contrary to the results of research from Yasemin (1996) which states that Treynor produces the most important performance values, while the results of the calculation of researchers is Sharpe who has the greatest value (See Table 1).

Conclusion

Based on the Single-Index model, the stock portfolio consisting of 2013-2018 LQ-45 shares is as follows: in 2013 it was available under UNVR, TLKM, and, ICBP, in 2014 related to ICBP, LPKR, BBCA, BBNI shares, KLBF, GGRM, PGAS, TLKM, BBRI, and JSMR, in 2015 were AKRA, UNVR, ICBP, and BMRI shares, in 2016 containing INTP, ADRO, PTBA, UNTR, GGRM, and INDF shares, in 2017 shares of BMRI, UNTR, BBCA, BBNI, BBRI, and UNVR, in 2018 are shares of PTBA, ICBP, BBCA, PGAS, and SMGR.

The results of the Sharpe, Treynor, and Jensen methods show almost the same value movements, so in determining the slope (linear curve) requires accuracy. By Hartono's explanation (2013) measuring Sharpe, Treynor and Jensen are measuring the slope of a portfolio as large as the slope, to better the performance of the portfolio. Therefore, the researcher decides to retest using the Robustness Test, namely by doing a Regression Test.

From the results of the regression test showed that of the three methods, the value of b or the magnitude of the slope in the Sharpe method (−0.04513) showed the greatest results from Treynor (−0.07323) and Jensen (−0.20538). With the magnitude of the value of b, it shows that the Sharpe method is most appropriate to be used in measuring portfolio performance in this study. This result is in line with Hartono's (2013) and Murphy's (2015) explanation which states that more accurate or reliable measurement is to use the Sharpe method because it measures risk with its total risk. While contrary to the results of research from Yasemin (1996) which states that
Treynor produces the most important performance values, while the results of the calculation of researchers are Sharpe who has the greatest value (see Table 1).

As an expectation of further research analysis with better results, the researcher provides suggestions that it is expected that the formation of a portfolio can use other models, because this research in the formation of LQ-45 stock portfolios uses the single index model method, the portfolio formed is only one portfolio alone each year which causes less number of portfolios compared. In this research, there are academic benefits of a number of insights into the performance measurement of Sharpe, Treynor and Jensen portfolios, while the practical benefits are information for investors in investing in the capital market, especially with the use of the three methods. Besides the Sharpe, Treynor, and Jensen methods, researchers can then use other performance measurement methods for comparison, such as M2 (Modigliani-Modigliani) and Information Ratio (RI).

Table 1. Comparison of Portfolio Performance Results between Sharpe, Treynor and Jensen Methods

| No | Tahun | Portofolio                                    | S    | T    | J    | S    | T    | J    |
|----|-------|-----------------------------------------------|------|------|------|------|------|------|
| 1  | 2013  | UNVR, TLKM, ICBP                              | 0.30273 | 0.05005 | 0.04680 | -    | -    | -    |
| 2  | 2014  | ICBP, LPKR, BBCA, BBNI, KLBF, GGRM, PGAS, TLKM, BBRI, JSMR | 0.16076 | 0.03708 | 0.02013 | T    | T    | T    |
| 3  | 2015  | AKRA, UNVR, ICBP, BMRI                        | 0.28370 | 0.07699 | 0.08252 | N    | N    | N    |
| 4  | 2016  | INTP, ADRO, PTBA, UNTR, GGRM, TLKM, INDF      | 0.60862 | 0.14968 | 0.12202 | N    | N    | N    |
| 5  | 2017  | BMRI, UNTR, BBCA, BBNI, BBRI, UNVR            | 0.15321 | 0.04808 | 0.02953 | T    | T    | T    |
| 6  | 2018  | PTBA, ICBP, BBCA, PGAS, SMGR                  | 0.14092 | 0.04360 | 0.05720 | T    | T    | N    |

Information: N: Up, T: Down
Source: Processed Data by the Researchers (2019)

Figure 1. Comparison of Portfolio Performance Results between Sharpe, Treynor, and Jensen Method

Source: Processed Data by the Authors (2019)
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