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PERFORMANCE ANALYSIS AND OPTIMAL PORTFOLIO DIVERSIFICATION OF FOURTEEN STOCKS OF LQ-45 INDEX PERIOD 2007 – 2012 USING MARKOWITZ MODERN PORTFOLIO THEORY

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Abstract-*The main theme of this research is Capital Market and focus on finding an Efficient and Optimal Portfolio based on the Markowitz Modern Portfolio Theory. Markowitz Modern Portfolio Theory explains that risk could be minimized by diverse the asset as a portfolio. It also explains than an optimal portfolio is a portfolio that gives highest return in a point of risk, or also meaning a portfolio with highest Sharpe ratio. To find an optimal portfolio, the author made a portfolio simulation. In that simulation, there were 25 portfolios that made from stocks which were established in Jakarta Composite Index. 14 stocks were chosen in the simulation, these stocks were a stock that listed in LQ-45 Index in the January 2nd 2007 up to January 2nd 2012 period. The author uses Solver Add-ins in the process of making the portfolio. From the portfolios that were made, the author compares the portfolios performance with the Jakarta Composite Index performance. The compartment includes risk, return, beta, Sharpe ratio, and Treynor ratio. The portfolio number 3 which had highest Sharpe ratio shows a better performance than the JCI, while had higher risk. The weight proportion of the Portfolio number 3 was 50.95% ASII, 33.42% BBCA, 9.06% PGAS, 3.98% BBRI and 2.59% PTBA. The result of the Sharpe ratio is 147.49%, the beta was 1.2 and the Treynor ratio is 60.31%. Expected return of this portfolio was 79.34% while giving 48.95% risk.*

Keywords: Stocks, LQ-45 Index, Risk and Return, Portfolio, Sharpe Ratio, Treynor Ratio, Solver, Efficient Frontier, Markowitz Modern Portfolio Theory

Introduction

Investment has become an important things, investor put their asset in investment product and expect a future benefit that will they get from the investment. For a long term period a high risk high return investment product, equity mutual fund or stock, is the best instrument to be used. Equity mutual fund and stock are depends on the condition of capital market, a place for a public company and government to raise their long term fund by selling their stocks and bonds. In Indonesia, the capital market is known as Indonesia Stock Exchange (IDX).

Figure 1 below shows that IDX have a rising trend for the period January 2007 until January 2012, but from early January 2008 it has a fallen trend and has the bottomed out in the end of October 2008. The falling trend in 2008 is caused by the global crisis that occurred in the United States which effect many foreign investors in Indonesia to take out their investment from Indonesian capital market.

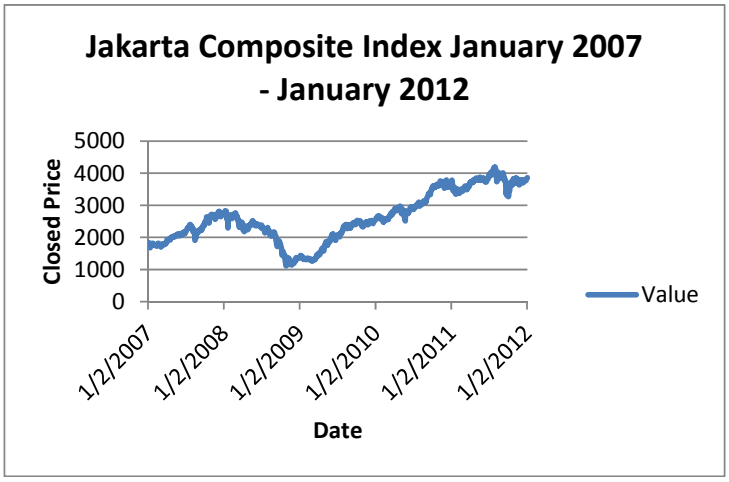

Figure 1 Indonesia Stock Exchange for the Period January 2007 - January 2012

From all of the stock that listed in the IDX, 45 stocks of them were known as LQ-45. LQ-45 is a stock market index which consist of 45 companies that fulfill certain criteria such as having the highest market capitalization and transaction value in the last 12 months, having been listed for at least 3 months, and having a good financial condition. IDX publish the list of LQ-45 twice a year, for February until July and August until January.

LQ-45 is believed as the 45 most liquid stocks in IDX, which is why in this research the author only uses stocks that belong to LQ-45 in the last 5 year. Beside by using stocks that listed in LQ-45 in last 5 years to reduce the risk of investment, author also diverse or creating a portfolio in the investment. Portfolio investment is a collection of investment assets that owned by investors. Actually portfolio can contain many kind of investment instrument, but in this research the portfolio will only contains stocks.

Literature Review

Portfolio Return

Portfolio return is the aggregated expected return on the securities and other assets in a portfolio, where the return on each security or asset is weighted for the proportion of its representation in the portfolio. Portfolio returns which also known as expected return on a portfolio is computed as the weighted average of the returns on the stocks which comprise the portfolio. The weights reflect the proportion of the portfolio invested in the stocks.

The general formula of expected return on a portfolio is:

$$E(r_p) = \sum_{i=1}^{n} w_i E(r_i)$$

Portfolio Risk

Portfolio risk can be calculated by the used of standard deviation, which is equals to the positive square root of the variance. That is why to calculate the portfolio risk, the author also calculate the portfolio covariance, portfolio correlation, and calculate the portfolio variance.

Portfolio Covariance

The covariance between the returns on two stocks can be calculated using this equation:

$$Cov\,(R_1,R_2) = \sigma_{1,2} = \sum_{i=1}^{n} p_i\,(R_{1i} - E\,(R_1))(R_{2i} - E\,(R_2))$$

Portfolio Correlation

Portfolio correlation is a statistical measure of how two securities move in relation to each other. The result of the portfolio correlation is known as correlation coefficient, which ranges between -1 and +1. Positive correlation defines that as one security moves, up or down, the other security will move in the same direction. A negative correlation means that if one security moves in either direction the security that is perfectly negatively correlated will move in the opposite direction. If the correlation is 0, there will be no correlation.

The correlation coefficient between the returns on two stocks can be calculated using the following formula:

$$Corr\,(R_1,R_2) = \rho_{12} = \frac{\sigma_{12}}{\sigma_1\sigma_2} = \frac{Cov\,(R_1,R_2)}{SD\,(R_1)\,SD\,(R_2)}$$

Portfolio Variance

Portfolio variance show how actual returns of a group of securities making up a portfolio fluctuate. In fact, the lower the correlation between securities in a portfolio means the lower the portfolio variance.

The variance on a portfolio can be calculated as follows:

$$Var\,(r_p) = \sigma_p^2 = (w_1)^2\,\sigma_1^2 + (1 - w_1)^2\,\sigma_2^2 + 2\,w_1\,(1 - w_1)\,\rho_{12}\,\sigma_1\sigma_2 = \sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j p_{ij}\sigma_i\sigma_j$$

$$= \sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j Cov\,(R_1\,R_2)$$

Portfolio Standard Deviation

Standard deviation on the portfolio equals to the positive square root of the variance. The formula is:

$$\sigma_p = \sqrt{\sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j p_{ij}\sigma_i\sigma_j}$$

Portfolio Performance Measurement

Portfolio performance measurement is a tool to calculate the performance of portfolio, which is good or bad. Sharpe and Treynor measurement is used in this research as a risk-adjusted performance method that not only focused on the return but also focus on the portfolio risk.

Sharpe Measurement

Sharpe Measurement that develops by William F Sharpe and also known as reward-to-variability ratio id used to evaluate the performance of investment managers. This ratio measures the return earned is excess of the risk free rate on a portfolio to the portfolio's total risk as measured by the standard deviation in its returns over the measurement period. The higher a portfolio's Sharpe ratio, the better its risk-adjusted performance has been. The equation of Sharpe measurement is:

$$S_{p=} \frac{(\overline{r_p} - \overline{\overline{r_f}})}{\sigma_p}$$

Treynor Measure

Treynor measurement is found by Jack L. Treynor and known as the Reward to Volatility Ratio. The different of Treynor Measurement to Sharpe measurement is by the uses of beta instead of standard deviation. This ratio is calculated by subtracting the risk-free rate from the rate of return for a portfolio and dividing the result by the standard deviation of the portfolio returns. Same like Sharpe measurement, in Treynor measurement the higher a portfolio's Treynor ratio, the better its performance has been.

The equation of Treynor measurement is:

$$T_{p=} \frac{(\overline{r_p} - \overline{\overline{r_f}})}{\beta_p}$$

Methodology

In this research, the author uses five steps of process to bring out a good result of research

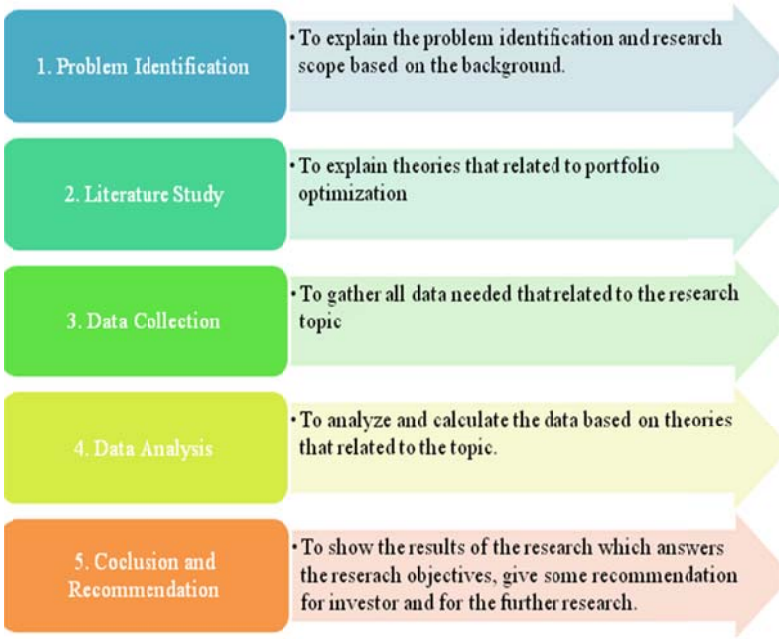

Figure 2. Research Methodology

Data Collection and Analysis

In this research, the author used the adjusted price of stocks in Indonesia that was listed in LQ-45 index during the early January 2007 until early January 2012 period. From a total of 45 stocks active in each semester, there are 17 stocks that consistently listed in LQ-45 Index during that period. The 17 stocks are AALI, ASII, BBCA, BBRI, BDMN, BLTA, BMRI, INCO, INDF, ISAT, MEDC, PGAS, PTBA, SMCB, TOTL, UNSP, and UNTR.

However, the INDF and UNSP were not chosen as the single asset that will be used in the portfolio because they had a suspended price in some days on that period. Suspended of the single asset is a temporary suspension of trading in the stock exchange. The suspension can be caused due to the issuers own request, the decision of the stock exchange in order to protect the invertors, or may also be due to the imposition of sanctions by the stock exchange to an issuer. Beside INDF and

UNSP, INCO also were not chosen because in that time period this stocks have a stock split and the adjusted historical data were not available

In calculating the return, the author used Geometric Average Return calculation in order to achieved an accurate result to the daily return data, and because this formula has a continuous compounding value. The formula that is used in Microsoft Excel to calculate the Geometrics Average Return is Natural Logarithm (LN) Function. For standard deviation, the author used Standard Deviation (STDEV) Function in Microsoft Excel. The data that used in the calculation is the daily return of the single asset data.

Table 1 .Return and Risk performance of Single Asset and JCI

No	Stock Code	Yearly Average Log Return	No	Stock Code	Yearly Standard Deviation
1	ASII	86.01%	**1**	**JCI**	**32.67%**
2	PGAS	78.38%	2	ISAT	53.07%
3	BBCA	72.40%	3	BMRI	57.33%
4	BBRI	65.49%	4	ASII	60.51%
5	PTBA	62.15%	5	BBCA	61.13%
6	UNTR	51.20%	6	BDMN	61.90%
7	SMCB	39.79%	7	AALI	62.12%
8	BMRI	28.82%	8	MEDC	62.47%
9	**JCI**	**24.64%**	9	SMCB	63.73%
10	AALI	18.51%	10	PTBA	66.71%
11	ISAT	-4.46%	11	UNTR	67.00%
12	MEDC	-10.13%	12	BLTA	67.32%
13	BDMN	-13.43%	13	TOTL	67.81%
14	TOTL	-19.45%	14	BBRI	70.90%
15	BLTA	-48.81%	15	PGAS	102.96%

In this research, the author calculated the beta by using slope function of linear regression line (SLOPE) in Microsoft Excel. In the function, the market return was put in the x-axis, and the stock return was in the y-axis. This following table shows the stock beta that was calculated based on the daily closing price data.

Table 2 .Beta of Single Asset and JCI

Rank	Stock Code	Beta
1	ISAT	0.837108
2	BLTA	0.928123
3	BBCA	0.952183
4	**JCI**	**1**
5	TOTL	1.197612
6	BDMN	1.209125
7	PGAS	1.231625
8	SMCB	1.240679
9	MEDC	1.267339
10	BBRI	1.303464
11	ASII	1.326496
12	AALI	1.335896
13	BMRI	1.352742
14	UNTR	1.438081
15	PTBA	1.532304

An optimal portfolio in investment based on the Markowitz Modern Portfolio theory is a portfolio that gives highest return in a given amount of risk. In this research, after using the Excel Solver Add-ins the author makes a portfolio simulation. The simulation is done by creating some efficient portfolio, which is having return higher than the return in the portfolio in Minimum Variance condition up to the portfolio that having highest return portfolio.

In using the Excel Solver Add-Ins to get the efficient portfolio, the author does some step of calculation: first, set target cell in solver parameter with the standard deviation ad it is equal to Min. This condition will give a portfolio with lowest standard deviation or minimum risk. Second, fill the changing cells with the range of the weight portfolio. This range of cell will be automatically filled by the solver add-ins. Then put some constraints of the condition: each weight of stocks must be equal or greater than zero, the total weight of the portfolio must be equal to 1 or 100%, and expected return must be higher than zero. Forth, run the Solver add-ins and each time the solver giving solution, copy the result as a new portfolio and repeated the step, until get 25 new portfolios. The last is creating an efficient frontier that contains those 25's new portfolios.

In using the Excel Solver Add-Ins to get the efficient portfolio, the author does some step of calculation:

1. For getting a Portfolio with highest return and weight of single asset ≤ 90%
   a. Set target cell in solver parameter with the expected return cell and made it equal to Maximum. This condition will give a portfolio with highest expected return.
   b. Fill the changing cells with the range of the weight portfolio. This range of cell will be automatically filled by the solver add-ins
   c. Put some constraints of the condition:
      i. Each weight of stocks must be equal or smaller than 0.9
      ii. Each weight of stocks must be equal or greater than zero.
      iii. The total weight of the portfolio must be equal to 1 or 100%.
   d. Run the Solver add-ins to get a result. Copy the result as a new portfolio with highest return and weight of single asset ≤ 90%. Made this portfolio as portfolio no 1.

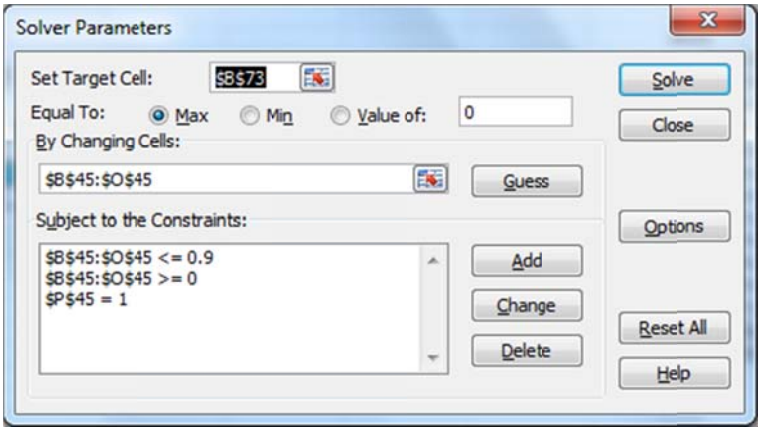

Figure 3. Step in using Solver Add-Ins for calculating a portfolio with highest return and weight of single asset ≤ 90%

2. For getting a Portfolio with Maximum Sharper Ratio
   a. Set target cell in solver parameter with the Sharpe ratio cell and made it equal to Maximum. This condition will give a portfolio with highest Sharpe ratio.
   b. Fill the changing cells with the range of the weight portfolio. This range of cell will be automatically filled by the solver add-ins
   c. Put some constraints of the condition:
      i. Each weight of stocks must be equal or greater than zero.

ii. The total weight of the portfolio must be equal to 1 or 100%.

d. Run the Solver add-ins to get a new result. Copy the result as a new portfolio with highest sharper ratio.

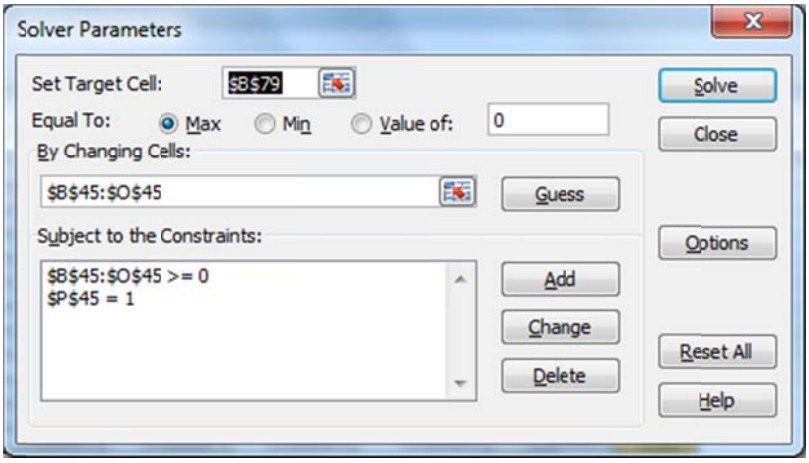

Figure 4. Step in using Solver Add-Ins for create a portfolio with highest Sharpe ratio.

3. For getting a Portfolio with Minimum Standard deviation
   a. Set target cell in solver parameter with the standard deviation and set it equal to Minimum. This condition will give a portfolio with lowest standard deviation or minimum risk.
   b. Fill the changing cells with the range of the weight portfolio. This range of cell will be automatically filled by the solver add-ins
   c. Put some constraints of the condition:
      i. Each weight of stocks must be equal or greater than zero.
      ii. The total weight of the portfolio must be equal to 1 or 100%.
   d. Run the Solver add-ins to get a new result. Copy the result as a new portfolio with minimum standard deviation.

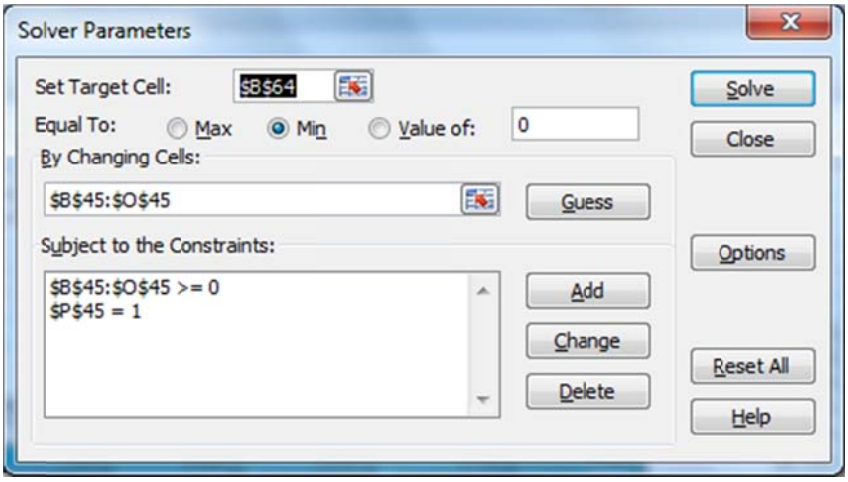

Figure 5 Step in using Solver Add-Ins for create a portfolio with minimum standard deviation.

4. For getting others Portfolios
   a. Made a rank of portfolios, where the portfolio with highest return and weight of single asset $\leq$ 99% in the 1st rank, and portfolio with minimum standard deviation in the 25th rank.
   b. Made others 22 ranks based on the expected return, which is bellow the expected return of the 1st rank but above the expected return of the 25th rank.

c. Set target cell in solver parameter with the standard deviation and set it equal to Minimum. This condition will give a portfolio with lowest standard deviation or minimum risk in an amount of expected return that already decided in part b.
d. Fill the changing cells with the range of the weight portfolio. This range of cell will be automatically filled by the solver add-ins
e. Put some constraints of the condition:
   i. Each weight of stocks must be equal or greater than zero.
   ii. The total weight of the portfolio must be equal to 1 or 100%.
   iii. Set the expected return equal to other expected return that already decided in part b.
f. Creating an efficient frontier that contains those 22's new portfolios.

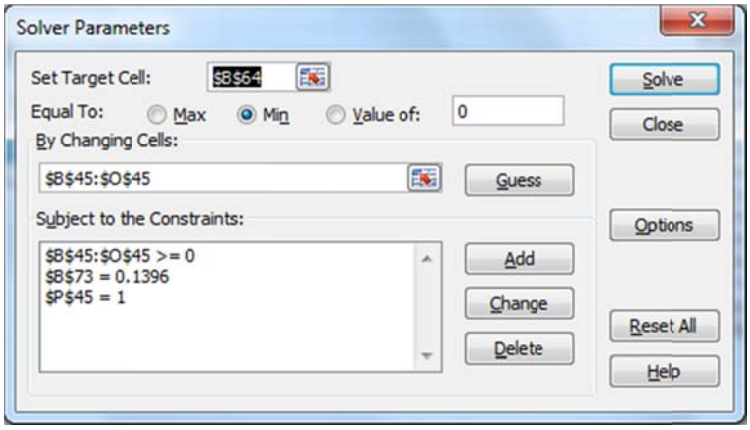

Figure 6. Step in using Solver Add-Ins

The simulation was started from finding the portfolio that gave highest return. To make this portfolio, author put constrain in the solver which give a limit to the weight of single assets to be lower or equal to 90%. The result after running Solver Add-In was this portfolio was containing 2 single assets, ASII and PGAS. PGAS which is the single asset with highest return had the biggest proportion in this portfolio in amount of 90%. The other single asset that belongs to this portfolio is ASII in amount of the other 10%. The expected return of this portfolio is 85.25% and the risk is 58.10% per year.

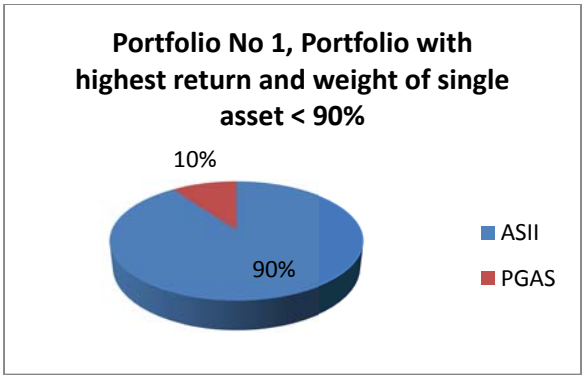

Figure 7 .Portfolio no 1, Portfolio with highest return and weight of single asset < 90%

For the last boundary of the efficient portfolio, the author calculated the portfolio that has smallest standard deviation. The standard deviation or risk for this portfolio was 38.70% and gave return for 10.84%. The Sharpe ratio for this portfolio is 9.58%. The proportion of asset in this portfolio was 4.5% for AALI, 2.7 % for ASII, 2.29% for BBRI, 7.09% BDMN, 3.73% BMRI, 7.39% MEDC, 1.14% PGAS, 3.70% SMCB, 5.14% TOTL, and the last three asset with largest proportion was BBCA for 18.57%, BLTA for 13.64%, and ISAT for 30.10%

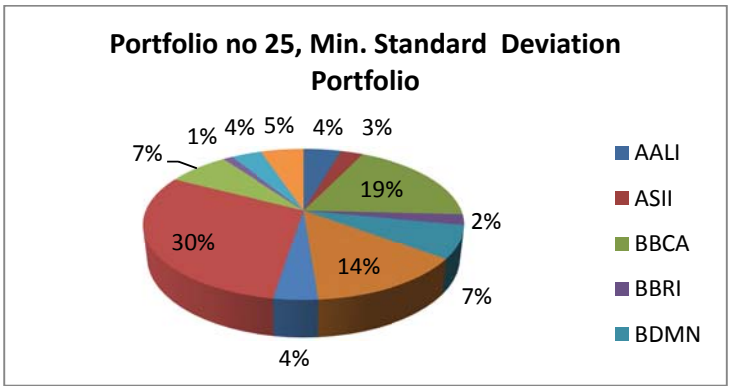

Figure 8 .Portfolio no 25, Min Standard Deviation

Based on the modern portfolio theory, the optimal portfolio provided highest return while considering its risk, or could be said the portfolio with highest Sharpe ratio. In this research, the portfolio with highest Sharpe ratio is portfolio number 3 which had 79.34% return and 48.95% risk. The proportion of the single asset on the portfolio was 50.95% ASII, 33.42% BBCA, 9.06% PGAS, 3.98% BBRI and 2.59% PTBA. The Sharpe ratio for this portfolio is 147.49%

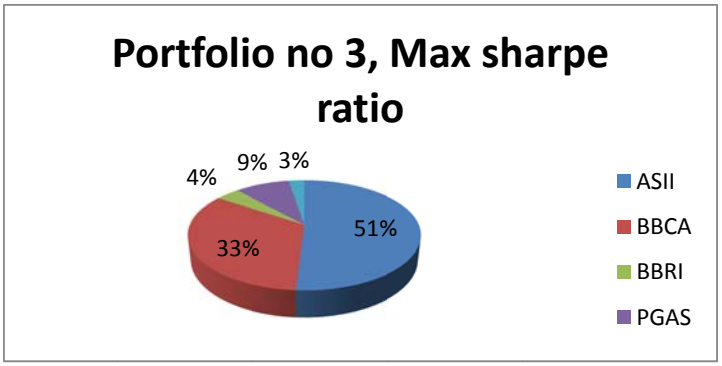

Figure 9 .Portfolio no 3, Max Sharpe Ratio Portfolio

Based on the simulation of Solver add-in, an efficient portfolio frontier was made to show that the curve is efficient. The efficient portfolio was start from the Minimum Standard Deviation Portfolio up until the Maximum Return portfolio. The Maximum Return portfolio show that a higher return will offering higher risk. Bellow was the frontier that constructed based on 25 portfolios that made in the research, for more specific calculation please looks in the APPENDIX.

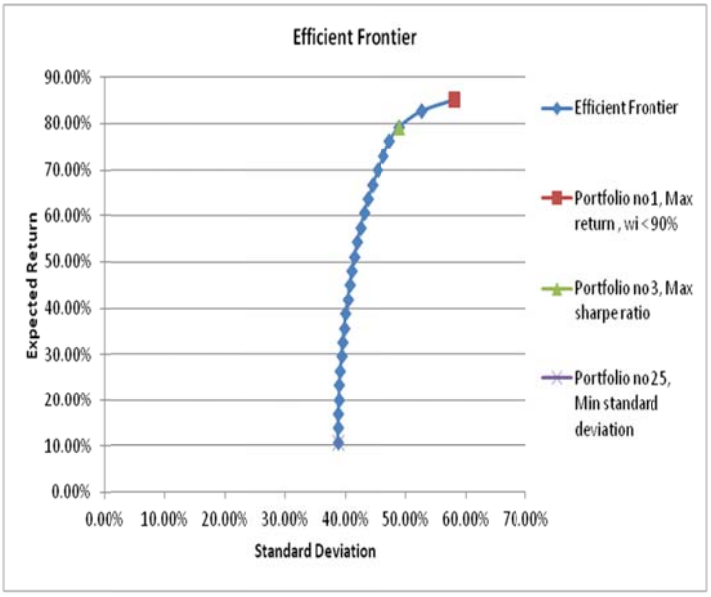

Figure 10. Efficient Frontier

Author is also combining the optimal portfolio that has been made with the Sertifikat Bank Indonesia (SBI) which in the theory had 0% risk. This combination will make the investor had new mutual funds that could be chose. More over the risk of the new mutual will be smaller than the optimal portfolio.

Table 3 Combination between Portfolio no 3 (Max Sharpe Ratio) and SBI

No	Name	Weight		Return		Risk		New	
		Portfolio no 3, Max Sharpe Ratio	SBI	Portfolio no 3, Max Sharpe Ratio	SBI	Portfolio no 3, Max Sharpe Ratio	SBI	Return	Risk
1	New Mutual Fund 1	0%	100%	79.34%	7.13%	48.95%	0.00%	7.13%	0.00%
2	New Mutual Fund 2	10%	90%	79.34%	7.13%	48.95%	0.00%	14.35%	4.90%
3	New Mutual Fund 3	20%	80%	79.34%	7.13%	48.95%	0.00%	21.57%	9.79%
4	New Mutual Fund 4	30%	70%	79.34%	7.13%	48.95%	0.00%	28.79%	14.69%
5	New Mutual Fund 5	40%	60%	79.34%	7.13%	48.95%	0.00%	36.01%	19.58%
6	New Mutual Fund 6	50%	50%	79.34%	7.13%	48.95%	0.00%	43.23%	24.48%
7	New Mutual Fund 7	60%	40%	79.34%	7.13%	48.95%	0.00%	50.45%	29.37%
8	New Mutual Fund 8	70%	30%	79.34%	7.13%	48.95%	0.00%	57.67%	34.27%
9	New Mutual Fund 9	80%	20%	79.34%	7.13%	48.95%	0.00%	64.90%	39.16%
10	New Mutual Fund 10	90%	10%	79.34%	7.13%	48.95%	0.00%	72.12%	44.06%
11	New Mutual Fund 11	100%	0%	79.34%	7.13%	48.95%	0.00%	79.34%	48.95%

In the figure 10, the author shows the capital allocation line of the combination of SBI and the max Sharpe ratio portfolio. If the investor are a risk taker investor, they could chose higher return mutual fund that give higher risk. In other hand if the investor is a risk averse, the higher proportion of SBI in the mutual fund, so they will get lower risk but also lower return.

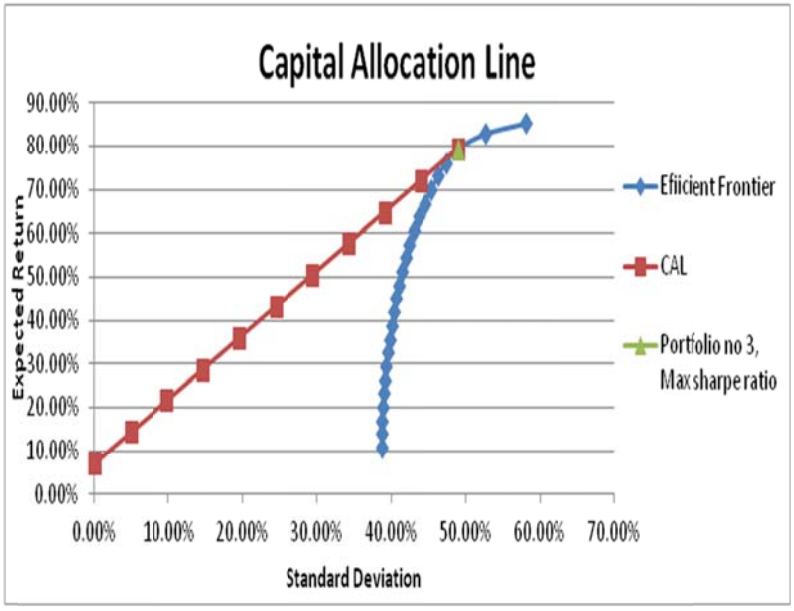

Figure 11 Capital Allocation Line

Conclusion and Recommedation

Conclusion

Each portfolio that made in the simulation had different portfolio performance. Comparing to the Jakarta Composite Index, there were 20 portfolios that have return higher than JCI return. The comparison result of the portfolios and the JCI show that higher risk will give higher return. The table below shows the comparison of portfolios which had max Sharpe ratio, max return, and min standard deviation with the JCI.

Table 4. Comparison Performance of Efficient Portfolios and Jakarta Composite Index

No	Number of Portfolio	Portfolio Expected Return, E(rp)	Portfolio Risk, σp	Sharpe Ratio
1	Portfolio no 1, Max return , wi ≤ 90%	85.25%	58.10%	134.45%
2	Portfolio no 3, Max sharpe ratio	79.34%	48.95%	147.49%
3	JCI	24.64%	32.67%	53.57%
4	Portfolio no 25, Min standard deviation	10.84%	38.70%	9.58%

From 3 portfolios, there were 2 portfolios that had higher Sharpe ratio than the Jakarta Composite Index. The portfolio that had higher Sharpe ratio than JCI also had higher return and risk. The portfolios with Sharpe ratio lower than JCI are the portfolio with min. standard deviation. Lower standard deviation of portfolio indicated that portfolio also has lower beta coefficient.

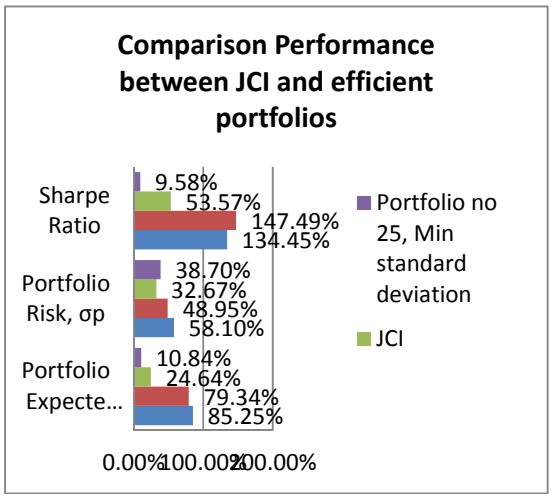

Figure 12. Comparison performance between efficient portfolios and JCI

Based the Markowitz Modern portfolio theory, the optimal portfolio are the portfolio with highest Sharpe ratio. So author made another comparison between portfolios no 3 which had highest Sharpe ratio with JCI. The Portfolio 3 had a higher return and a higher standard deviation than the JCI. As author know, higher return higher risk. Beta of portfolio no 3 is 1.2 or 0.2 higher than the JCI's beta means that the portfolio movement is more aggressive than the JCI. The higher Sharpe and Treynor ratio of the Optimal Portfolio had show that this portfolio has a superior risk-adjusted return compared to the market. So overall the performance of portfolio no 3 is good to be invested.

Table 5 .Data Comparison JCI and Portfolio no 3, Max Sharpe Ratio

Name	Return	Standard Deviation	Beta	Sharpe Ratio	Treynor Ratio
Portfolio no 3, Max Sharpe Ratio	79.34%	48.95%	1.20	147.49%	60.311%
JCI	24.635%	32.67%	1.00	53.57%	17.50%

Recommedation

Recommendation for Investor :

1. For a risk taker investor, they can invest in the Optimal Portfolio that were made in this research, but the author did not guarantee that the portfolio will give a satisfy return in the future.
2. For a risk averse investor, the author recommend to mix the optimal portfolio that made in this research with another financial product like Bank Indonesia certificate or deposit. By mixing it with another product with lower risk, the risk of the portfolio could be decrease. In the end, investors must keep to remember that high risk product will give them high return.
3. If investors want to calculate or make their own portfolio, they can use the Markowitz Modern Portfolio Theory and use Solver add-ins tools. This method can make investors made the portfolio easier.

Recommendation for Further Studies :

1. Using another measurement to measure the portfolio performance. Jensen's alpha was another measurement that could be used.
2. Combining the portfolio with another finance product such as bond, mutual fund, or foreign currency. By this step, maybe the weight of asset in the portfolio will be more complicated.
3. Beside using Markowitz Modern Portfolio Theory, the further studies can use Capital Asset Pricing Model (CAPM), Single Index Model, and Arbitrage Pricing Theory (APT)
4. In this research, the author used stock that belongs to the LQ-45 Index, next research could use stocks that are in another index such as Jakarta Islamic Index and Kompas 100, or make portfolio from stock based on the stock sector so the result can be different and can be compared with this research result.

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APPENDIX

Efficient Portfolio

Number of Portfolio	Portfolio Expected Return, E(rp)	Portfolio Risk, σp	Sharpe Ratio	AALI	ASII	BBCA	BBRI	BDMN	BLTA	BMRI	ISAT	MEDC	PGAS	PTBA	SMCB	TOTL	UNTR	Total Weight
Portfolio no 1, Max return, wi≤ 90%	85.25%	58.10%	134.45%	0.00%	90.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	10.00%	0.00%	0.00%	0.00%	0.00%	100%
Portfolio 2	82.82%	52.78%	143.02%	0.00%	72.83%	11.65%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	15.53%	0.00%	0.00%	0.00%	0.00%	100%
Portfolio no 3, Max sharpe ratio	79.34%	48.95%	147.49%	0.00%	50.95%	33.42%	3.98%	0.00%	0.00%	0.00%	0.00%	0.00%	9.06%	2.59%	0.00%	0.00%	0.00%	100%
Portfolio 4	76.22%	47.35%	[illegible]	0.00%	38.23%	[illegible]	[illegible]	0.00%	0.00%	0.00%	0.00%	0.00%	[illegible]	[illegible]	1.37%	0.00%	0.00%	100%
Portfolio 5	73.11%	46.30%	142.50%	0.00%	34.77%	32.88%	9.11%	0.00%	0.00%	0.00%	1.44%	0.00%	7.12%	9.30%	5.38%	0.00%	0.00%	100%
Portfolio 6	[illegible]	45.37%	[illegible]	0.00%	[illegible]	31.94%	[illegible]	0.00%	0.00%	0.00%	[illegible]	0.00%	[illegible]	[illegible]	[illegible]	0.00%	0.00%	100%
Portfolio 7	66.88%	44.52%	134.22%	0.00%	30.46%	31.01%	8.85%	0.00%	0.00%	0.00%	8.23%	0.00%	6.30%	8.21%	6.94%	0.00%	0.00%	100%
Portfolio 8	63.77%	43.74%	[illegible]	0.00%	28.32%	[illegible]	[illegible]	0.00%	0.00%	0.00%	11.62%	0.00%	[illegible]	7.66%	7.72%	0.00%	0.00%	100%
Portfolio 9	60.66%	43.05%	124.34%	0.00%	26.17%	29.14%	8.58%	0.00%	0.00%	0.00%	15.01%	0.00%	5.47%	7.12%	8.51%	0.00%	0.00%	100%
Portfolio 10	57.54%	42.44%	118.78%	0.00%	24.02%	28.21%	[illegible]	0.00%	0.00%	0.00%	18.46%	0.00%	[illegible]	6.57%	9.30%	0.00%	0.00%	100%
Portfolio 11	54.43%	41.93%	112.80%	0.00%	22.19%	27.38%	8.28%	0.00%	0.60%	0.00%	21.04%	0.00%	4.73%	6.02%	9.76%	0.00%	0.00%	100%
Portfolio 12	51.32%	41.47%	105.53%	[illegible]	20.85%	26.75%	[illegible]	0.00%	2.22%	0.00%	22.37%	0.00%	4.46%	5.48%	[illegible]	0.00%	0.00%	100%
Portfolio 13	48.20%	41.05%	100.04%	1.03%	19.52%	26.10%	7.83%	0.00%	3.67%	0.00%	23.43%	0.00%	4.29%	4.65%	9.47%	0.00%	0.00%	100%
Portfolio 14	[illegible]	40.67%	93.32%	1.77%	18.15%	25.54%	7.58%	0.00%	4.94%	0.00%	24.38%	0.54%	[illegible]	[illegible]	9.24%	0.00%	0.00%	100%
Portfolio 15	41.98%	40.34%	86.39%	2.34%	16.94%	24.99%	7.28%	0.00%	6.02%	0.00%	25.12%	1.56%	3.80%	2.91%	8.93%	0.09%	0.00%	100%
Portfolio 16	[illegible]	40.03%	78.26%	[illegible]	15.73%	24.43%	[illegible]	0.00%	[illegible]	0.42%	25.72%	2.32%	3.57%	[illegible]	8.53%	0.75%	0.00%	100%
Portfolio 17	35.75%	39.75%	71.99%	3.22%	14.34%	23.88%	6.43%	0.00%	7.73%	1.15%	26.28%	3.07%	3.32%	1.07%	8.15%	1.36%	0.00%	100%
Portfolio 18	[illegible]	39.50%	64.58%	[illegible]	13.03%	23.31%	[illegible]	0.25%	8.54%	1.70%	[illegible]	3.70%	[illegible]	0.23%	7.78%	1.95%	0.00%	100%
Portfolio 19	29.52%	39.30%	56.97%	3.78%	11.61%	22.65%	5.48%	1.23%	9.26%	1.97%	27.29%	4.28%	2.83%	0.00%	7.21%	2.41%	0.00%	100%
Portfolio 20	26.43%	39.12%	48.28%	[illegible]	10.13%	21.97%	4.95%	2.21%	[illegible]	2.25%	27.78%	[illegible]	2.55%	0.00%	[illegible]	2.87%	0.00%	100%
Portfolio 21	23.30%	38.97%	41.49%	4.02%	8.65%	21.29%	4.42%	3.19%	10.72%	2.54%	28.23%	5.32%	2.27%	0.00%	6.04%	3.32%	0.00%	100%
Portfolio 22	20.18%	38.85%	33.58%	4.14%	7.17%	20.63%	[illegible]	4.17%	11.45%	[illegible]	28.78%	[illegible]	[illegible]	0.00%	5.45%	3.78%	0.00%	100%
Portfolio 23	17.07%	38.77%	25.63%	4.26%	5.69%	19.93%	3.35%	5.14%	12.18%	3.11%	29.17%	6.36%	1.71%	0.00%	4.86%	4.23%	0.00%	100%
Portfolio 24	13.98%	38.72%	17.83%	4.38%	4.21%	19.25%	[illegible]	6.12%	12.93%	3.39%	[illegible]	[illegible]	1.43%	0.00%	4.28%	[illegible]	0.00%	100%
Portfolio no 25, Min standard deviation	10.84%	38.70%	9.58%	4.50%	2.70%	18.57%	2.29%	7.09%	13.64%	3.73%	30.10%	7.39%	1.14%	0.00%	3.70%	5.14%	0.00%	100%