

Markowitz Model in The Analysis of Optimal Portfolio Establishment on Jakarta Islamic Index (JII) in Indonesian Stock Exchange

Anwar Ramli

Management Department, Faculty of Economics,
State University of Makassar. Indonesia.

Anwar

Management Department, Faculty of Economics,
State University of Makassar. Indonesia.

Indah Lestari Anwar

Management Department, Faculty of Economics,
State University of Makassar. Indonesia.

ABSTRACT

This study aims to know the optimal portfolio establishment using Markowitz model on Jakarta Islamic Index (JII) stocks in the period of December 2013-May 2019. The population of this study consisted of the company stocks on Jakarta Islamic Index (JII) in the period of December 2013-May 2019, and there were 59 stocks. While the study sample consisted of 14 company stocks and selected based on purposive sampling method. Data collection used in this study using documentation. Data analysis used in this study using the stages of Markowitz model and started collecting the close price until an optimal portfolio establishment. The result of this study showed that there were 8 company stocks included in the optimal portfolio. Namely AKRA (5,01%), ICBP (9,92%), INDF (3,75%), SMGR (8,61%), TLKM (29,01%), UNTR (20,30%), UNVR (20,88%), WIKA (2,53%). The expected return of the portfolio of 0,84%. Therefore, portfolio risk of 3,16% and smaller than the risk of individual stocks in the research sample.

Keywords: Markowitz, Optimal Portfolio, Jakarta Islamic Index (JII).

INTRODUCTION

Every individual is likely to think about current needs, but also for future needs that are full of uncertainty. Generally, each individual also thinks about their economic needs with investment activities, which is expected to generate greater profits for the future through some funds or other resources that have been invested. Investment is the activity of delaying current consumption to be incorporated into productive assets for a certain period (Hartono, 2017: 5). The several objectives of investment activities are the creation of sustainability, maximum profit, prosperity for investors, and contributing to the nation's development (Fahmi, 2012: 3). Related to it, the place to conduct investment activities is through the capital market. According to Hartono (2017), a capital market is a place between buyers and sellers with the possibility of profit and loss risk to increase long-term needs by selling stocks or issuing bonds. Along with the time, the investment's awareness of Indonesian society in particular types of stocks has increased. According to data from the Indonesia Stock Exchange (2019) a stock is a proof of ownership or ownership certificates about capital participation in a company or limited liability company. In this way, investors will have several claims to the company. Although the interest of the Indonesian society in investing has increased, on the other hand,

the investment's awareness and literacy of sharia stocks in Indonesia are still minimal. According to data from the Indonesia Stock Exchange (2018) sharia stocks does not against Islamic principles or Islamic principles in the capital market in terms of capital participation.

One of the famous Islamic stock indexes in Indonesia is Jakarta Islamic Index (JII). According to Hartono (2017) Jakarta Islamic Index (JII) is one of Indonesia's sharia stock indexes which contains 30 stocks syariah with an average value of the largest capitalization. Table 1 will show the development of the index and market capitalization of Jakarta Islamic Index (JII) in the period of December 2013-May 2019.

Table 1.
The Development of Index and Market Capitalization in Jakarta Islamic Index (JII) Stocks in the period of December 2013-May 2019

Period	The Development of Index	Market Capitalization (in trillion)
2013	585,11	1.672,10
2014	898,58	1.944,53
2015	792,03	1.737,29
2016	884,62	2.035,19
2017	1.079,39	2.288,02
2018	982,73	2.239,51
2019	982,88	2.160,11

Source: The Financial Services Authority of Indonesia (2016)(data processed)

Based on table 1, can be seen the development of index and market capitalization on Jakarta Islamic Index (JII) in the period of December 2013-Mei 2019 is fluctuate. Generally, almost all stocks on Jakarta Islamic Index (JII) are included in large-capitalization or blue chip in Indonesia Stock Exchange and relatively safe, but the price of blue-chip stocks is also relatively expensive. The price of Jakarta Islamic Index (JII) stocks tends to fluctuate and because of that, market capitalization also fluctuates. In addition, stock risks are also uncertain so that an optimal portfolio establishment is important to help the investors for making good investment decisions. One of the optimal portfolio establishment models to predict good returns with low risks is Markowitz model.

Markowitz in his article entitled *The Journal of Finance* (1952) states that there is a portfolio that provides maximum expected return and minimum variance. In addition, diversification cannot eliminate all variance. The Portfolio with the maximum expected return is not to be with minimum variance. There is a rate that is an investor can obtain expected return by taking the variance and also reduce the variance with a certain return. In addition, Lee et al., (2015) stated that Markowitz model tries to reduce the total variance of portfolio returns by combining different assets (diversification) whose returns are not perfectly positively correlated. According to Boangmanalu and Komalasari (2015) Markowitz's theory has an advantage that investors can use information maximally in choosing portfolios through efficient set observations from the calculation of risk, correlation and covariance of stocks.

Yunita (2018) conducted a study determining the optimal stock portfolio with Markowitz model (case studies on Jakarta Islamic Index (JII) in the period of May 2013-March 2018) and the total sample consisted of 29 stocks. That study also used non-purposive sampling. The results of this study showed that there were 10 stocks included in the optimal portfolio, namely AKRA, ADRO, ICBP, INCO, MYRX, PTPP, PWON, TPIA, UNTR, UNVR. In addition, Yuana, et al., (2016) also conducted a study determining the optimal stock portfolio with Markowitz model (studies on Jakarta Islamic Index (JII) in Indonesia Stock Exchange in the period of June 2013-November 2015). A total sample of that research consisted of 19 stocks from 40 stocks.

The results of the study showed that there were 7 stocks included in the optimal portfolio. Namely, WIKA, AALI, AKRA, ICBP, KLBF, UNTR, and UNVR.

The previous research has a difference with the research that will be developed at this time that is the previous research has a shorter time. Yunita's (2018) research conducted for 59 months and Yuana's et al. (2016) research conducted for 30 months, while the research that will be developed at this time is conducted for 66 months and starting from the period of December 2013-May 2019. In addition, the technical sampling in Yunita's research (2018) was different from the research that will be developed at this time by using a purposive sampling method. Based on the background and various previous studies, then the optimal portfolio establishment with Markowitzmodel is important to develop and can help investors to maximize the level of return for certain risks, or minimize risk for certain levels of return.

RESEARCH METHODS

The method that used in this study is Markowitz model with descriptive analysis and explains about the optimal portfolio establishment with Markowitz model on Jakarta Islamic Index stocks in the period of December 2013-May 2019. The data collection technique used is documentation. The study used secondary data of closing stock prices (closing price) from the research sample in the period of December 2013-May 2019. Data analysis used in this study is the stages of Markowitz model and started collecting the close price of Jakarta Islamic Index (JII) in Indonesia Stock Exchange in the period of December 2013-May 2019 until an optimal portfolio establishment with the Microsoft Excel program.

The population in this study used is all company stocks which are registered on Jakarta Islamic Index in the period of December 2013-May 2019 and there were 59 stocks. The technical sampling used in this study is the purposive sampling technique. Then the criteria of the sample used are companies that consistently registered on Jakarta Islamic Index in the period of December 2013-May 2019. Based on these criteria, table 2 showed a list of company stocks that included research samples.

Table 2.
List of Company Stocks which Included Research Samples

No	Code	Stock Name
1	ADRO	Adaro Energy Tbk.
2	AKRA	AKR Corporindo Tbk.
3	ASII	Astra International Tbk.
4	BSDE	Bumi Serpong Damai Tbk.
5	ICBP	Indofood CBP Sukses Makmur Tbk.
6	INDF	Indofood Sukses Makmur Tbk.
7	KLBF	Kalbe Farma Tbk.
8	PGAS	Perusahaan Gas Negara (Persero) Tbk.
9	SMGR	Semen Indonesia (Persero) Tbk.
10	SMRA	Summarecon Agung Tbk.
11	TLKM	Telekomunikasi Indonesia (Persero) Tbk.
12	UNTR	United Tractors Tbk.
13	UNVR	Unilever Indonesia Tbk.
14	WIKA	Wijaya Karya (Persero) Tbk.

Source: Indonesia Stock Exchange(2018)(data processed)

The variable used in this study is Markowitz model in optimal portfolio establishment. The operational definitions and measurement variables as follows:

Realized return is the level of profit of each company stock on Jakarta Islamic Index (JII) or actual return earned in the period of December 2013-May 2019. According to Hartono (2017), the realized return can be calculated with the total return and the formula as follows: Stock Returns =
$$\frac{P_t - P_{t-1} + D_t}{P_{t-1}}$$

Information:

R_{it} : Return at the expected time
 P_{t-1} : Stock price in the previous investment
 P_t : Stock price in the current investment
 D_t : Dividends shared

The expected return (expected return) of the stock is the level of return or profits that investors expect on Jakarta Islamic Index (JII) in the future. According to Hartono (2017), expected return formula as follows:

$$E(R_i) = \frac{\sum_{t=1}^n R_{it}}{N}$$

Information:

$E(R_i)$: Expected return in the future
 R_{it} : Return at the expected time
 N : Number of observation periods

Stock risk (variance and standard deviation) of investment on Jakarta Islamic Index (JII) is a measure of spread to determine the possibility of a deviation between the realized return and expected return on Jakarta Islamic Index (JII) during December 2013-May 2019 period. According to Hartono (2017), The formula of variance and standard deviation as follows:

$$\sigma_i^2 = \frac{\sum_{t=1}^n [(R_{it} - E(R_i))]^2}{n}$$

$$\sigma_i = \sqrt{\sigma_i^2}$$

Information:

σ_i^2 : Variance of stocks
 σ_i : Standard deviation of stocks
 n : Number of historical data observations for large samples with n (at least 30 observations) and for small samples used ($n-1$).

Covariance is a measure that can show the directional between two variables. According to Hartono (2017), the formula for calculating covariance as follows:

$$\sigma_{RA, RB} = \frac{\sum_{i=1}^n [(R_{At} - E(R_A)) \cdot (R_{Bt} - E(R_B))]}{n}$$

Information:

$\sigma_{RA, RB}$: Covariance between two stocks in a portfolio
 R_{At} : Return at the expected time of stock A
 R_{Bt} : Return at the expected time stock B
 $E(R_A)$: Expected return stock A
 $E(R_B)$: Expected return stock B
 n : Number of historical data observations for large samples with n (at least 30 observations) and for small samples used ($n-1$).

The correlation coefficient shows the relationship between two variables with each deviation on Jakarta Islamic Index (JII). According to Hartono (2017), the correlation coefficient formula as follows:

$$r_{AB} = \rho_{AB} = \frac{\sigma_{RA,RB}}{\sigma_A \cdot \sigma_B}$$

The expected Return of Portfolio is the weighted average level of the expected returns of every single security on Jakarta Islamic Index (JII). According to Hartono (2017), the formula of the expected return of the portfolio as follows:

$$E(R_P) = \sum_{i=1}^n (w_i \cdot E(R_i))$$

Information:

$E(R_P)$: Expected return of the portfolio

w_i : The portion of securities i to all securities in the portfolio

$E(R_i)$: Expected return of the i -th security

n : Number of single securities

The Portfolio risk is a return variance of securities on Jakarta Islamic Index (JII) that can establish the portfolio. According to Hartono (2017), the formula for variance and standard deviations as follows:

$$\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 \cdot w_1 \cdot w_2 \cdot \sigma_{12}$$

variance-covariance matrix for n -assets as follows:

$$\sigma_p^2 = [w_1 \dots w_n] \begin{bmatrix} \sigma_{11} & \sigma_{1n} \\ \dots & \dots \\ \sigma_{n1} & \sigma_{nn} \end{bmatrix} \begin{bmatrix} w_1 \\ \dots \\ w_n \end{bmatrix}$$

$$\sigma_p = \sqrt{\sigma_p^2}$$

Information:

σ_p^2 = Portfolio variance

σ_p = Standard deviation of the portfolio

RESULTS AND DISCUSSION

Realized Return and Expected Return of Each Company

Table3.
Realized Return and Expected Return

No	Code	Stock Name	ΣRit	$E(R_i)$
1	ADRO	Adaro Energy Tbk.	0,49118	0,00744
2	AKRA	AKR Corporindo Tbk.	0,07133	0,00108
3	ASII	Astra International Tbk.	0,32066	0,00486
4	BSDE	Bumi Serpong Damai Tbk.	0,19619	0,00297
5	ICBP	Indofood CBP Sukses Makmur Tbk.	0,77924	0,01181
6	INDF	Indofood Sukses Makmur Tbk.	0,13687	0,00207
7	KLBF	Kalbe Farma Tbk.	0,25583	0,00388
8	PGAS	Perusahaan Gas Negara (Persero) Tbk.	-0,32590	-0,00494
9	SMGR	Semen Indonesia (Persero) Tbk.	0,14158	0,00215
10	SMRA	Summarecon Agung Tbk.	0,63138	0,00957
11	TLKM	Telekomunikasi Indonesia (Persero) Tbk.	0,68907	0,01044
12	UNTR	United Tractors Tbk.	0,50025	0,00758
13	UNVR	Unilever Indonesia Tbk.	0,63474	0,00962
14	WIKA	Wijaya Karya (Persero) Tbk.	0,87332	0,01323

**Source: Indonesia stock exchange (2018), yahoo finance and Seputar Forex (2013)
(data processed)**

Based on the calculation of realized return and expected return of each company stock in table 3, Wijaya Karya (Persero) Tbk. (WIKA) obtain the highest return, which is a realized return of 0.87332 or 87.332% and an expected return of 0.01323 or 1.32%. Thus, WIKA obtains capital gains or profits from these stocks. That was because of the increase of WIKA stock price is greater than the decline of the stock price. The highest decline of WIKA stock price of -0.2066 or -20.66% on 29 June 2018. In addition, WIKA stock price also had the highest increase than other companies' stock on 30 November 2018, the increase of WIKA stock price of 0.36818 or 36.818%. Other than that, WIKA also gave dividends to investors on April 30, 2014, and April 30, 2015.

The lowest return obtained by Perusahaan Gas Negara (Persero) Tbk. (PGAS) with the realized return of -0.32590 or -32.59% and the expected return of -0.00494 or -0.449%. Based on table 3, Perusahaan Gas Negara (Persero) Tbk stock (PGAS) had a negative realized return and expected return which is the company obtain capital loss (loss) and Perusahaan Gas Negara (Persero) Tbk (PGAS) stock is not included in the next calculation because it will produce a negative portfolio expectations.

Stock Risk (Variance and Standard Deviation)

Table4.
Variance and Standard Deviation

No	Code	Stock Name	σ^2	σ
1	ADRO	Adaro Energy Tbk.	0,01118	0,10575
2	AKRA	AKR Corporindo Tbk.	0,00707	0,08407
3	ASII	Astra International Tbk.	0,00426	0,06526
4	BSDE	Bumi Serpong Damai Tbk.	0,00591	0,07688
5	ICBP	Indofood CBP Sukses Makmur Tbk.	0,00316	0,05625
6	INDF	Indofood Sukses Makmur Tbk.	0,00445	0,06668
7	KLBF	Kalbe Farma Tbk.	0,00339	0,05823
8	SMGR	Semen Indonesia (Persero) Tbk.	0,00767	0,08757
9	SMRA	Summarecon Agung Tbk.	0,01498	0,12240
10	TLKM	Telekomunikasi Indonesia (Persero) Tbk.	0,00307	0,05544
11	UNTR	United Tractors Tbk.	0,00526	0,07255
12	UNVR	Unilever Indonesia Tbk.	0,00290	0,05387
13	WIKA	Wijaya Karya (Persero) Tbk.	0,01455	0,12063

Source: The Results of data analysis by using Microsoft Excel

Table 4 shows that the highest risk obtained by the stock of Summarecon Agung Tbk. (SMRA) that is 0.12240 or 12.24%. It was because the value of realized return and expected return of SMRA stock is far proportional. In addition, the lowest risk is the stock of Unilever Indonesia Tbk. (UNVR) which is 0.05387 or 5.387%. That was because the increase in stock prices is also relatively stable. The stock of UNVR also gave the highest dividends among other companies including research samples that is 410 on 30 November 2017 and 775 on 31 May 2019.

Covariance between two stocks in a portfolio

Based on the covariance matrix that obtained 161 stock combinations with a positive value from 169 stock combinations and which is the combination of the two stocks in a portfolio tends to move in the same direction. In addition, the covariance matrix also obtained eight negative stock combinations, namely AKRA-TLKM, ICBP-UNTR, INDF-UNTR, SMGR-TLKM, SMRA-UNTR, TLKM-UNTR, TLKM-WIKA, and UNTR-UNVR. Thus, these stocks move in the opposite direction and if one stock has an increase in return, then the other stock has a decrease in return. The covariance matrix between the two shares is shown in table 5:

Table 5
Covariance Matrix Between Two Stocks

	ADRO	AKRA	ASII	BSDE	ICBP	INDF	KLBF	SMGR	SMRA	TLKM	UNTR	UNVR	WIKA
ADRO	0,01118	0,00120	0,00195	0,00070	0,00015	0,00113	0,00116	0,00095	0,00115	0,00023	0,00323	0,00082	0,00206
AKRA	0,00120	0,00707	0,00019	0,00116	0,00089	0,00172	0,00032	0,00087	0,00260	0,00028	0,00052	0,00175	0,00106
ASII	0,00195	0,00019	0,00426	0,00214	0,00145	0,00202	0,00202	0,00230	0,00287	0,00084	0,00106	0,00039	0,00261
BSDE	0,00070	0,00116	0,00214	0,00591	0,00150	0,00172	0,00209	0,00286	0,00711	0,00110	0,00017	0,00100	0,00485
ICBP	0,00015	0,00089	0,00145	0,00150	0,00316	0,00182	0,00131	0,00078	0,00289	0,00094	0,00027	0,00113	0,00208
INDF	0,00113	0,00172	0,00202	0,00172	0,00182	0,00445	0,00127	0,00143	0,00239	0,00060	0,00005	0,00110	0,00203
KLBF	0,00116	0,00032	0,00202	0,00209	0,00131	0,00127	0,00339	0,00215	0,00284	0,00095	0,00109	0,00089	0,00276
SMGR	0,00095	0,00087	0,00230	0,00286	0,00078	0,00143	0,00215	0,00767	0,00422	0,00020	0,00023	0,00019	0,00544
SMRA	0,00115	0,00260	0,00287	0,00711	0,00289	0,00239	0,00284	0,00422	0,01498	0,00102	0,00058	0,00231	0,00838
TLKM	0,00023	0,00028	0,00084	0,00110	0,00094	0,00060	0,00095	-0,00020	0,00102	0,00307	0,00026	0,00051	-0,00113
UNTR	0,00323	0,00052	0,00106	0,00017	0,00027	0,00005	0,00109	0,00023	0,00058	0,00026	0,00526	0,00010	0,00043
UNVR	0,00082	0,00175	0,00039	0,00100	0,00113	0,00110	0,00089	0,00019	0,00231	0,00051	0,00010	0,00290	0,00033
WIKA	0,00206	0,00106	0,00261	0,00485	0,00208	0,00203	0,00276	0,00544	0,00838	0,00113	0,00043	0,00033	0,01455

Source: The Results of data analysis using Microsoft Excel

Correlation Coefficient Between Company Stock Prices

Based on the correlation coefficient matrix that the correlation between the same stock is +1. Which means that all the risks cannot be diversified. In addition, the correlation between the different stock is between +1 and -1. This means that all stocks of a company that are included in the research sample can be diversified or will reduce the risk by forming various types of stocks in a portfolio. It can be seen that the portfolio will reduce the risk, but not eliminate all the risks. The correlation coefficient matrix is shown in table 6.

Table 6.
Correlation Coefficient Between Company Stock Prices

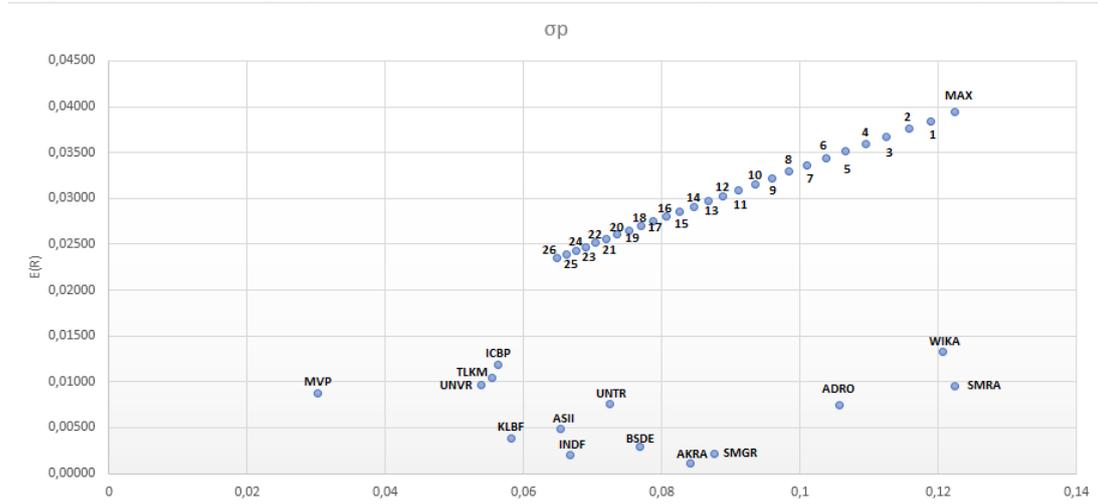
	ADRO	AKRA	ASII	BSDE	ICBP	INDF	KLBF	SMGR	SMRA	TLKM	UNTR	UNVR	WIKA
ADRO	0,01118	0,00120	0,00195	0,00070	0,00015	0,00113	0,00116	0,00095	0,00115	0,00023	0,00323	0,00082	0,00206
AKRA	0,00120	0,00707	0,00019	0,00116	0,00089	0,00172	0,00032	0,00087	0,00260	0,00028	0,00052	0,00175	0,00106
ASII	0,00195	0,00019	0,00426	0,00214	0,00145	0,00202	0,00202	0,00230	0,00287	0,00084	0,00106	0,00039	0,00261
BSDE	0,00070	0,00116	0,00214	0,00591	0,00150	0,00172	0,00209	0,00286	0,00711	0,00110	0,00017	0,00100	0,00485
ICBP	0,00015	0,00089	0,00145	0,00150	0,00316	0,00182	0,00131	0,00078	0,00289	0,00094	0,00027	0,00113	0,00208
INDF	0,00113	0,00172	0,00202	0,00172	0,00182	0,00445	0,00127	0,00143	0,00239	0,00060	0,00005	0,00110	0,00203
KLBF	0,00116	0,00032	0,00202	0,00209	0,00131	0,00127	0,00339	0,00215	0,00284	0,00095	0,00109	0,00089	0,00276
SMGR	0,00095	0,00087	0,00230	0,00286	0,00078	0,00143	0,00215	0,00767	0,00422	0,00020	0,00023	0,00019	0,00544
SMRA	0,00115	0,00260	0,00287	0,00711	0,00289	0,00239	0,00284	0,00422	0,01498	0,00102	0,00058	0,00231	0,00838
TLKM	0,00023	0,00028	0,00084	0,00110	0,00094	0,00060	0,00095	-0,00020	0,00102	0,00307	0,00026	0,00051	-0,00113
UNTR	0,00323	0,00052	0,00106	0,00017	0,00027	0,00005	0,00109	0,00023	0,00058	0,00026	0,00526	0,00010	0,00043
UNVR	0,00082	0,00175	0,00039	0,00100	0,00113	0,00110	0,00089	0,00019	0,00231	0,00051	0,00010	0,00290	0,00033
WIKA	0,00206	0,00106	0,00261	0,00485	0,00208	0,00203	0,00276	0,00544	0,00838	0,00113	0,00043	0,00033	0,01455

Source: The Results of data analysis using Microsoft Excel

Determine the Proportion of Funds for Each Stock, Expected Return and Risk of the Portfolio

Before looking for an optimal portfolio, it is necessary to know the combinations of efficient portfolios in the research sample to provide an overview of efficient portfolio combinations, so that investors can make these combinations as a reference in investment decisions. Based on the efficient set graph in figure 1, the MAX, MVP points, and point 1 to point 26 are the efficient sets of Jakarta Islamic Index (JII) stocks which are the research sample. The MAX value indicates the highest standard deviation and expected returns on an efficient set for the highest deviation assets. The MVP (minimum variance portfolio) value is the smallest standard deviation value and expected returns on an efficient set for the smallest deviation asset. Next will be made 26 portfolios from 13 research sample stocks by forming the efficient set from the smallest standard deviation to the highest standard deviation with the same interval. Thus points 1 to point 26 show the efficient set of standard deviation values and the efficient expected return of portfolio values. The efficient graph set that forms an efficient portfolio on the research sample shown in figure 1.

Figure 1. Efficient graph set that forms an efficient portfolio on the study sample.



Source: The Results of data analysis using Microsoft Excel

After looking for an efficient graph set, the next step is to calculate the optimal portfolio formation by using the solver program on Microsoft Excel.

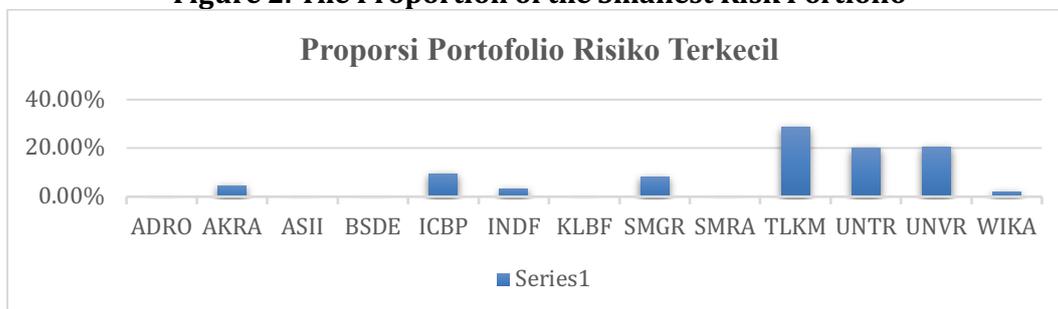
Table 7.
The Funds Proportion for Each Stock

No	Code	Stock Name	Proportion
1	ADRO	Adaro Energy Tbk.	0,00 %
2	AKRA	AKR Corporindo Tbk.	5,01 %
3	ASII	Astra International Tbk.	0,00 %
4	BSDE	Bumi Serpong Damai Tbk.	0,00 %
5	ICBP	Indofood CBP Sukses Makmur Tbk.	9,92 %
6	INDF	Indofood Sukses Makmur Tbk.	3,75 %
7	KLBF	Kalbe Farma Tbk.	0,00 %
8	SMGR	Semen Indonesia (Persero) Tbk.	8,61 %
9	SMRA	Summarecon Agung Tbk.	0,00 %
10	TLKM	Telekomunikasi Indonesia (Persero) Tbk.	29,01 %
11	UNTR	United Tractors Tbk.	20,30 %
12	UNVR	Unilever Indonesia Tbk.	20,88 %
13	WIKA	Wijaya Karya (Persero) Tbk.	2,53 %
Total			100 %

Source: The Results of data analysis using Microsoft Excelwith solverprogram

Table 7 shows that from 13 stocks which are included in the category of an optimal portfolio, only 8 stocks that included in an optimal portfolio with the smallest proportion of portfolio risk. This is influenced by various factors such as realized return, expected return, standard deviation, covariance, and the correlation coefficient between stocks.

Figure 2. The Proportion of the Smallest Risk Portfolio



Source: The Results of data analysis using Microsoft Excel

Based on figure 2, it can be seen that TLKM stocks have the largest proportion of 29.01%. This is because TLKM stocks occupy the third position of all research samples for the largest expected returns and expected returns of 0.68907 and 0.01044. In addition, TLKM stocks occupy the 12th position of all study samples with the smallest stock risk of 0.05544.

In addition, in figure 2 it can be known that WIKA stocks have the smallest proportion of 2.53%. This is because based on the calculations obtained that WIKA stocks occupy the highest expected return and expected return from 14 stocks the research sample of 0.87332 and 0.01323. In addition, WIKA stocks also occupy the second position with the biggest risk that is 0.12063.

Based on the proportion of funds from company stocks obtained that the expected return of a portfolio of 0.84% with a portfolio risk of 3.16%. The portfolio risk is smaller than the individual risk of Jakarta Islamic Index (JII) stocks which are included in the research sample. For more details can be seen in table 8.

Table8.
The Comparison of Individual Stock Risk and Portfolio Risk

No	Kode	Nama Saham	σ	σ_p
1	ADRO	Adaro Energy Tbk.	10,58%	
2	AKRA	AKR Corporindo Tbk.	8,41%	
3	ASII	Astra International Tbk.	6,53%	
4	BSDE	Bumi Serpong Damai Tbk.	7,69%	
5	ICBP	Indofood CBP Sukses Makmur Tbk.	5,63%	
6	INDF	Indofood Sukses Makmur Tbk.	6,67%	
7	KLBF	Kalbe Farma Tbk.	5,82%	3,16%
8	SMGR	Semen Indonesia (Persero) Tbk.	8,76%	
9	SMRA	Summarecon Agung Tbk.	12,24%	
10	TLKM	Telekomunikasi Indonesia (Persero) Tbk.	5,54%	
11	UNTR	United Tractors Tbk.	7,26%	
12	UNVR	Unilever Indonesia Tbk.	5,39%	
13	WIKA	Wijaya Karya (Persero) Tbk.	12,06%	

Source: The Results of data analysis using Microsoft Excel

The results of the study can prove that diversification in Markowitz model can reduce the variance with certain returns. Thus, the proportion of funds, expected return of portfolio and portfolio risk are the best projection based on results obtained and can be used by investors in choosing optimal stocks for investment. Based on the results, Markowitz model is very suitable for novice investors who are likely to want a certain profit with the smallest risk. In addition, Markowitz model is very suitable for investors who are not likely a risk (risk-averse).

CONCLUSIONS AND SUGGESTIONS

Conclusions

Based on the optimal portfolio analysis by using Markowitz model on Jakarta Islamic Index (JII) stocks in the period of December 2013-May 2019 obtained 8 stocks that included in the optimal portfolio. The proportion of the stocks on an optimal portfolio which consists of AKRA of 5.01%, ICBP of 9.92%, INDF of 3.75%, SMGR of 8.61%, TLKM of 29.01%, UNTR of 20.30%, UNVR of 20.88%, and WIKA of 2.53%.

The proportions of each stock are different because of different stock prices, expected returns, risks, and covariance between stocks. Based on the proportion of funds from each stock on optimal portfolio obtained expected return of a portfolio of 0.84% with a portfolio risk of 3.16%. The amount of portfolio risk was smaller than all the risk of individual stocks that were included in the sample observation. In addition, the expected return of the portfolio was not too different from the expected return of an individual stock. Thus, Markowitz model can be proven that diversification can reduce the investment risk of stocks with a certain rate of return.

Suggestions

Based on the calculation of the results, the advice that can be given for further study is to further develop this study by providing an analysis of the latest period investment stocks with a longer observation period. In addition, the next researcher is also expected will be able to analyze Markowitz model with optimal portfolios based on investor risk preferences and will explain other sharia stock indices.

Investors who are likely to invest in Jakarta Islamic Index (JII), especially investors who are not likely a risk, should be chosen optimal stocks with the proportions that already exist in this

study. In addition, four stocks are consistently included in the optimal portfolio based on three studies, namely the research of Yunita (2018), Yuana et al., (2016), and this study. The four stocks are AKRA, ICBP, UNTR, and UNVR, thus it will be stock recommendations and a reference that makes it easy for investors to determine their investment decisions by getting a small level of investment risk and with a certain level of return.

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