Available online at http://www.iorajournal.org/index.php/ijgor/index

International Journal of Global Operations Research

e-ISSN: 2722-1016
p-ISSN: 2723-1739

Vol. 5, No. 3, pp. 204-210, 2024

Optimization of Portfolio Performance on the Jakarta Islam Index (JII) Stock in December 2023 – May 204 Using the Markowitz Model

Aletta Divna Valensia Rohman [1*], Siti Fatimah [2]

[1.2] *Undergraduate Program in Mathematics, Faculty of Mathematics and Natural Science, Padjadjaran University, Sumedang, Indonesia*

Corresponding author email: aletta21001@mail.unpad.ac.id , siti21039@mail.unpad.ac.id

Abstract

This research aims to optimize the performance of a stock investment portfolio on the Jakarta Islamic Index (JII) during the period from December 2023 to May 2024, using the Markowitz model. This model minimizes portfolio risk by considering expected returns and covariance between stocks. Historical data on stock returns in the JII during the research period will be used to calculate expected returns and covariance. Furthermore, the Markowitz model will be used to determine the optimal investment proportion for each stock in the portfolio. The results of this research are expected to provide information to JII stock investors about the optimal combination of stocks to achieve maximum returns with controlled risk.

Keywords: Optimal portfolio, Markowitz model, JII stocks, Jakarta Islamic Index, performance optimization

1. Introduction

In recent years, investment in the Indonesian capital market has increased and investors need effective strategies to optimize their investment returns. One way that can be done in investing is by optimizing the portfolio. Portfolio optimization is a strategy that aims to obtain optimal returns with minimal risk.

The portfolio determination model that emphasizes the relationship between optimal returns and minimal risk is the Markowitz model. This model believes that continuously adding shares to a portfolio will, at a certain point, further reduce the benefits of diversification and will actually increase the level of risk (Tandelilin, 2010: 116). This model is an improvement on the previous diversification, random diversification, and allows investors to determine the optimal portfolio by calculating the average return and risk variance for each stock. Determining an efficient portfolio is the most important thing that must be considered in determining the optimal portfolio. The Markowitz model shows that the variance of portfolio returns on financial securities depends not only on how risky the individual assets in the portfolio are but rather on the relationship of that risk to the securities (Suqaier and Ziyud, 2011).

This research uses the Markowitz model to determine the optimal portfolio for shares in the Jakarta Islam Index JII) listed on the Indonesia Stock Exchange for the period December 2023-May 2024. This research aims to find out what shares can be included in the optimal portfolio category and can be used as a consideration. on decision making by investors.

2. Literature review

2.1. Investment

Investment is an activity of placing funds in one or more types of assets over a certain period with the hope of obtaining income and/or increasing the value of the investment in the future. (Hidayati, 2017)**.** Investment can also be

defined as postponing current consumption to be included in productive assets over a certain period of time (Livingston, 2013).

2.2. Share

Shares can be defined as a sign of capital participation of a person or party (business entity) in a company or limited liability company. By including this capital, the party has a claim on the company's income, a claim on the company's assets, and has the right to attend the General Meeting of Shareholders (GMS) (PT. Indonesian Stock Exchange, 2018). according to Fahmi (2012) "Shares are one of the capital market instruments that are most in demand by investors, because they are able to provide attractive rates of return (Riyantini, 2022)

2.3. Portfolio

A portfolio is a collection of assets or a combination of investments in several assets at once with the aim of obtaining optimal profits with a certain level of risk (Elton and Gruber, 2003; Gitman, 2009). A portfolio is defined as a series of combinations of several assets invested and held by investors, both individuals and institutions (Sunder, 2002).

2.4. Optimal Portfolio

An optimal portfolio (Reilly and Brown, 2003) is a portfolio on the efficient frontier that has the highest utility for a particular investor (PT. Indonesian Stock Exchange, 2022).

2.5. Jakarta Islamic Index

The Jakarta Islamic Index (JII) is a sharia stock index which was first launched on the Indonesian capital market on July 3 2000. The JII constituents only consist of the 30 most liquid sharia stocks listed on the IDX. Just like ISSI, reviews of sharia shares that are JII constituents are carried out twice a year, in May and November, following the OJK's DES review schedule.

2.6. Markowitz

The Markowitz model is a model used in portfolio analysis. The Markowitz model allows investors to determine the optimal portfolio by calculating the average return and risk variance of each stock.

Portfolio theory is a theory used to discuss rates of return and risk. This theory was introduced by Harry Max Markowitz (1952), an American economist through his article in the Journal of Finance and continued in a book he wrote in 1959.

3. Materials and methods

3.1. Material

There is one data used in this research, namely the Jakarta Islam Index (JII) closing price data obtained from https://finance.yahoo.com/ . The data is 30 pieces of stock data taken from the latest data, namely the period December 2023 – May 2024.

3.2. Methods

3.2.1. Types of research

The approach used in this research is a descriptive approach based on existing facts and data to determine the optimal portfolio model. According to Whiteney (1960:55). The descriptive method is a search for facts with appropriate interpretation.

3.2.2. Markowitz Portfolio

First, we input the Jakarta Islamic Index stock data for December 2023 - May 2024

Table 1: Jakarta Islamic Index shares in December 2023-May 2024

Stock code	Closing Price					
	12/29/2023	1/31/2024	2/29/2024	3/28/2024	4/30/2024	5/31/2024
ACES	720	850	835	910	935	820
ADRO	2380	2400	2420	2720	2670	2770
AKRA	1475	1620	1700	1700	1650	1600
ANTM	1705	1550	1460	1635	1615	1465
BRIS	1740	2330	2470	2720	2510	2200
BRMS	170	155	144	151	152	155
BRPT	1330	1060	975	945	955	1065
CPIN	5025	4480	4840	5175	5000	5200
EXCL	2000	2320	2380	2280	2440	2310
HEAL	1490	1305	1265	1255	1285	1280
HRUM	1335	1175	1250	1380	1390	1400
ICBP	10575	11775	11550	11000	10675	9750
INCO	4310	3870	4050	4070	4180	4970
INDF	6450	6375	6625	6325	6175	5875
INKP	8325	7825	8725	9775	9475	9100
INTP	9400	9025	9075	8750	7625	6475
ITMG	25650	27050	26200	28425	24950	24975
KLBF	1610	1510	1490	1460	1405	1490
MICA	2850	2690	2580	2710	2900	2890
MTEL	705	680	635	615	580	610
PGAS	1130	1165	1090	1355	1320	1580
PTBA	2440	2610	2560	2950	3000	2490
SCMA	170	154	149	144	125	150
SIDO	525	510	615	625	725	710
SMGR	6400	6200	6100	5925	4620	3490
TINS	645	575	570	805	885	895
TLKM	3950	3960	4000	3490	3080	2900
TPIA	5250	5400	4580	5725	7500	9175
UNTR	22625	22950	23525	24600	24875	22075
UNVR	3530	3100	2730	2730	2590	3120

Next, we carry out calculations on the Markowitz model to obtain optimal portfolio analysis, where the steps that must be taken include:

Calculating the gross return of a stock portfolio which can be formulated by:

$$1 + R_t = \frac{P_t}{P_{t-1}} \text{ or } P_t = P_{t-1}(1 + R_t)$$

Where:

P_t : stock price in the t-th period

P_{t-1} : stock price in period t-1

D_i : dividends distributed

Calculate the expected return for each stock portfolio sample using the formula:

$$E(R_i) = \frac{\sum_{t=1}^{n} Ri_t}{n}$$

Where:

$E(R_i)$: the average expected return on company i's shares

R_{ij} : rate of return on investment i

N : the number of events that may occur

Calculate the variance of each stock with the formula:

$$\sigma_p^2 = \mathrm{Var}(r_p) = \frac{\sum_{t=1}^{n}(R_{jt} - R_j)^2}{(n-1)}$$

Find the covariance value between two stocks in the portfolio:

$$\mathrm{Cov}(RA \cdot RB) = \sigma_{RA \cdot RB} = \sum_{i=1}^{n} \frac{[(R_{Ai} - E(R_A) \cdot (R_{Ai} - E(R_A)]}{n}$$

Calculate the expected return of the portfolio that has been formed using the formula:

$$E(R_p) = \sum_{t=1}^{n} W_i E(R_i)$$

Where:

E(Rp) : Expected portfolio return

W_i : Allocation of funds to each share

$E(R_i)$: The expected return from shares

n : The number of shares in the portfolio

Calculating portfolio variance using the formula:

$$\mathrm{Var}(R_p) = \sigma p^2 = E[R_p - E(R_p)]^2$$

Calculating the investment proportion (W_i) by minimizing the objective function:

$\sigma_p^2 = \sum_{i=1}^{n} W_1^2 \sigma_i^2 + \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j \sigma_{ij}$

Calculate the optimal portfolio expected return as in the previous equation.

Determining the optimal portfolio variant uses the same formula as calculating portfolio variance plus the use of final proportions or late weights calculated previously with the formulation:

$$\sigma_p^2 = \sum_{i=1}^{n} W_1^2 \sigma_i^2 + \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j \sigma_{ij}$$

4. Results and Discussion

4.1. Returns and Expected Stock Returns

Table 2: Stock Returns and Expected Return (%)

Stock code	Total Stock Return						Expected Return E(Ri)
ACES	0.180556	-0.01765	0.08982	0.027473	-0.12299	0.157207	0.026201122
ADRO	0.008403	0.008333	0.123967	-0.01838	0.037453	0.159774	0.026629078
AKRA	0.098305	0.049383	0	-0.02941	-0.0303	0.087973	0.014662168
ANTM	-0.09091	-0.05806	0.119863	-0.01223	-0.09288	-0.13422	-0.022370378
BRIS	0.33908	0.060086	0.101215	-0.07721	-0.12351	0.299669	0.049944836
BRMS	-0.08824	-0.07097	0.048611	0.006623	0.019737	-0.08423	-0.014038761
BRPT	-0.20301	-0.08019	-0.03077	0.010582	0.115183	-0.1882	-0.031366695
CPIN	-0.10846	0.080357	0.069215	-0.03382	0.04	0.047298	0.00788298
EXCL	0.16	0.025862	-0.04202	0.070175	-0.05328	0.160742	0.026790335
HEAL	-0.12416	-0.03065	-0.00791	0.023904	-0.00389	-0.1427	-0.023784037
HRUM	-0.11985	0.06383	0.104	0.007246	0.007194	0.06242	0.01040337
ICBP	0.113475	-0.01911	-0.04762	-0.02955	-0.08665	-0.06945	-0.011574776
INCO	-0.10209	0.046512	0.004938	0.027027	0.188995	0.165384	0.027563996
INDF	-0.01163	0.039216	-0.04528	-0.02372	-0.04858	-0.08999	-0.014998942
INKP	-0.06006	0.115016	0.120344	-0.03069	-0.03958	0.105031	0.01750523
INTP	-0.03989	0.00554	-0.03581	-0.12857	-0.15082	-0.34956	-0.058259537

ITMG	0.054581	-0.03142	0.084924	-0.12225	0.001002	-0.01317	-0.002194711
KLBF	-0.06211	-0.01325	-0.02013	-0.03767	0.060498	-0.07266	-0.012110679
MICA	-0.05614	-0.04089	0.050388	0.070111	-0.00345	0.020017	0.003336246
MTEL	-0.03546	-0.06618	-0.0315	-0.05691	0.051724	-0.13832	-0.023053326
PGAS	0.030973	-0.06438	0.243119	-0.02583	0.19697	0.380854	0.063475746
PTBA	0.069672	-0.01916	0.152344	0.016949	-0.17	0.049808	0.008301324
SCMA	-0.09412	-0.03247	-0.03356	-0.13194	0.2	-0.09209	-0.015347778
SIDO	-0.02857	0.205882	0.01626	0.16	-0.02069	0.332881	0.055480239
SMGR	-0.03125	-0.01613	-0.02869	-0.22025	-0.24459	-0.54091	-0.090151578
TINS	-0.10853	-0.0087	0.412281	0.099379	0.011299	0.405736	0.067622706
TLKM	0.002532	0.010101	-0.1275	-0.11748	-0.05844	-0.29079	-0.048464569
TPIA	0.028571	-0.15185	0.25	0.310044	0.223333	0.660097	0.110016096
UNTR	0.014365	0.025054	0.045696	0.011179	-0.11256	-0.01627	-0.002711463
UNVR	-0.12181	-0.11935	0	-0.05128	0.204633	-0.08782	-0.014636119

From the calculations in the table above, it can be seen that the shares with the highest expected return value are owned by PT shares. Chandra Asri Petrochemical Tbk (TPIA) amounted to 0.110016096 percent and the shares with the lowest expected return value were owned by PT shares. Semen Indonesia (Persero) Tbk (SMGR) was -0.090151578 percent. These results indicate that the shares of PT. Chandra Asri Petrochemical Tbk (TPIA) is estimated to be able to provide the largest expected profit among the 30 other stocks.

4.2. Stock Variants at Positive and Highest Expected Returns

Stock variance measures the difference that occurs between stock returns and their average returns during the research period. From Table 3, it can be proven that the shares that have the highest variance value correspond to those that have the highest expected return value, namely PT shares. Chandra Asri Petrochemical Tbk (TPIA) amounted to 0.1320193 percent and the shares with the lowest variance were PT shares. Semen Indonesia (Persero) Tbk (SMGR) was -0.10818 percent.

Table 3: Stock Variants

Stock code	Stock Variant	Stock code	Stock Variant
ACES	0.031441	INTP	-0.06991
ADRO	0.031955	ITMG	-0.00263
AKRA	0.017595	KLBF	-0.01453
ANTM	-0.02684	MICA	0.004003
BRIS	0.059934	MTEL	-0.02766
BRMS	-0.01685	PGAS	0.076171
BRPT	-0.03764	PTBA	0.009962
CPIN	0.00946	SCMA	-0.01842
EXCL	0.032148	SIDO	0.066576
HEAL	-0.02854	SMGR	-0.10818
HRUM	0.012484	TINS	0.081147
ICBP	-0.01389	TLKM	-0.05816
INCO	0.033077	TPIA	0.132019
INDF	-0.018	UNTR	-0.00325
INKP	0.021006	UNVR	-0.01756

Selection of stock standard deviation can be calculated by selecting the highest and positive expected return, the standard deviation can be seen in Table 4

Table 4: Stock Variants at Positive and Highest Expected Returns

Stock code	Stock Variant
TPIA	0.1320193
TINS	0.0811472
PGAS	0.0761709
SIDO	0.0665763
BRIS	0.0599338
INCO	0.0330768
EXCL	0.0321484
ADRO	0.0319549
ACES	0.0314413
INKP	0.0210063
TPIA	0.1320193
TINS	0.0811472

If you adjust based on stock variants with positive and highest expected returns, then the shares that have the highest variance value are PT shares. Chandra Asri Petrochemical Tbk (TPIA) amounted to 0.1320193 percent and the lowest variance was owned by PT shares. Timah Tbk (TINS) amounted to 0.0811472 percent.

4.3. Inter-Stock Covariance

Covariance is a value that indicates the degree to which two variables or securities tend to move together. If the covariance is positive, it indicates that both securities tend to move in the same direction. Conversely, if the covariance is negative, it means the two securities tend to move in opposite directions. Meanwhile, a covariance value of zero indicates that the movements of the two securities are not related to each other or that the movement of one security does not affect the movement of the other security so that it is independent of the other security.

Table 5: Covariance between Shares

Covariance between Stocks					
Stock code	TPIA	TINS	PGAS	SIDO	BRIS
TPIA	0.029046933	0.016212	0.011428	-0.005395077	-0.013043
TINS	0.016212033	0.031782	0.013237	-0.000666265	-0.0057957
PGAS	0.011428377	0.013237	0.014933	-0.008749996	-0.0027834
SIDO	-0.005395077	-0.000666	-0.00875	0.009466863	-0.005084
BRIS	-0.013042957	-0.005796	-0.00278	-0.005084026	0.0264169
INCO	0.004001899	0.000822	0.003795	0.000395291	-0.0133325
EXCL	-0.004244497	-0.008317	-0.0063	0.000339739	0.0086165
ADRO	0.002307659	0.007151	0.005109	-0.00217239	0.000623
ACES	-0.001882378	0.001235	-0.00167	-0.002171475	0.0145802
INKP	-0.004263212	0.008623	0.000998	0.003253668	-6.223E-05

Table 6: Covariance between Shares

Covariance between Stocks					
Stock code	INCO	EXCL	ADRO	ACES	INKP

TPIA	0.004002	-0.00424	0.002308	-0.00188	-0.00426
TINS	0.000822	-0.00832	0.007151	0.001235	0.008623
PGAS	0.003795	-0.0063	0.005109	-0.00167	0.000998
SIDO	0.000395	0.00034	-0.00217	-0.00217	0.003254
BRIS	-0.01333	0.008617	0.000623	0.01458	-6.2E-05
INCO	0.008718	-0.00577	0.000288	-0.0093	5.83E-05
EXCL	-0.00577	0.006126	-0.00241	0.005617	-0.00302
ADRO	0.000288	-0.00241	0.002429	0.000474	0.00222
ACES	-0.0093	0.005617	0.000474	0.010384	-0.00027
INKP	5.83E-05	-0.00302	0.00222	-0.00027	0.006324

4.4. Expected Return and Portfolio Risk with Optimal Proportions (in%)

The optimal portfolio is formed using the Microsoft Excel application which shows the portfolio results with optimal proportions and endings for each stock. The calculation results are presented in Table 7. below:

Table 7: Expected Return and Portfolio Risk with Optimal Proportions (in%)

Portfolio Weight or Fund Proportion	
TPIA	1.22738E+15
TINS	2.82113E+15
PGAS	9.70236E+15
SIDO	1.11514E+16
BRIS	3.85297E+15
INCO	4.61386E+15
EXCL	6.78973E+15
ADRO	7.28412E+15
ACES	1.17283E+15
INKP	3.25239E+15
Expected Return	5.18681E+16
Variant	5.18681E+15

From the table it is known that the total expected return is 5.187E+16 percent and the variance is 5.18681E+15 percent.

5. Conclusion

The world of investment in the Indonesian capital market is now starting to experience changes in a positive direction. One method used to maximize the potential of investment is investing by forming a portfolio. This investment focuses on analyzing the opportunity rate of return (return) where the return value is related in the same direction as risk so that the portfolio model that can be used is the Markowitz model.

The results of the analysis and calculation of the Jakarta Islam Index (JII) shares in December 2023 – May 2024 show that the optimal portfolio formed using the Markowitz model consists of ten shares, namely PT. Chandra Asri Petrochemical Tbk (TPIA), PT. Timah Tbk (TINS), PT. Perusahaan Gas Negara Tbk (PGAS), PT. Sido Muncul Herbal Medicine and Pharmaceutical Industry Tbk (SIDO), PT. Bank Syariah Indonesia Tbk (BRIS), PT. Vale Indonesia Tbk (INCO), PT. XL Axiata Tbk (EXCL), PT. Adaro Energy Indonesia Tbk (ADRO), PT. Ace Hardware Indonesia Tbk (ACES), and PT. Indah Kiat Pulp & Paper Tbk (INKP). The calculation shows the balance between return and risk level. Apart from that, by using Microsoft Excel, optimal portfolio weights or proportions were obtained with a total expected portfolio return of 5.187E+16 percent and a variance of 5.18681E+15 percent.

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