OPTIMAL PORTFOLIO ANALYSIS USING THE MARKOWITZ MODEL AND SINGLE INDEX MODEL ON JAKARTA ISLAMIC INDEX (JII) STOCKS: HISTORICAL DATA 2022–2025

Cahaya Ningsih[1]
Universitas Paramadina, Jakarta, Indonesia
cahayaningsih.students@paramadina.ac.id

Pipit Yunianingsih[2]
Universitas Paramadina, Jakarta, Indonesia
pipit.yunianingsih@students.paramadina.ac.id

Abstract

This study analyzes and compares the construction of optimal Islamic stock portfolios using the Markowitz Model and the Single Index Model for stocks listed in the Jakarta Islamic Index (JII). The dataset consists of monthly closing prices of 30 JII constituent stocks from January 2022 to December 2025. A quantitative approach with purposive sampling is applied, in which only stocks with positive expected returns and positive excess returns are selected. The Sukuk Ritel SR023T3 rate of 5.8% per year is used as the risk-free benchmark. Data processing and portfolio optimization are conducted using Microsoft Excel Solver. Using the Markowitz Model with minimum risk preference, the optimal portfolio comprises nine stocks ASII, BRIS, JPFA, PGAS, ANTM, TPIA, MEDC, DSSA, and INKP producing an expected annual return of 16.29% with a minimum risk level of 51.94%. When optimized using the Sharpe Ratio, the model generates a portfolio of eleven stocks with a higher expected return of 33.21% and a corresponding risk of 64.04%. Under the Single Index Model, the optimal portfolio consists of PANI, TPIA, and BRMS, with respective weights of 66.08%, 25.82%, and 8.09%. This portfolio yields a significantly higher expected annual return of 144.97% with a beta of 1.8945, indicating greater systematic risk.

Keywords: Optimal Portfolio, Markowitz Model, Single Index Model, Jakarta Islamic Index

INTRODUCTION

Investment in the capital market is one of the key pillars of the modern economy, serving as a mechanism for mobilizing and channeling funds between parties with surplus capital (investors) and those in need of financing (issuers). Through the capital market, the public can directly participate in economic growth while obtaining returns from productive activities. In this context, stocks are considered the most attractive investment instruments because they offer relatively higher return potential compared to other financial instruments (Sukatin et al., 2022). However, this high return potential is accompanied by substantial risk due to price volatility influenced by economic, political, and psychological factors (Nurhidayat & Susetyo, 2022). The development of investment in Indonesia is closely related to the growing public awareness of ethical and Sharia-compliant financial principles. In line with this, the Islamic capital market has emerged as a halal investment alternative, free from elements of riba (interest), gharar (uncertainty), and maysir (excessive speculation). Its operations are supervised by the National Sharia Board – Indonesian Ulema Council (DSN–MUI) and the Financial Services Authority (OJK), ensuring that every product and transaction complies with Islamic principles.

One of the key milestones in the development of Indonesia's Islamic capital market was the launch of the Jakarta Islamic Index (JII) in 2000 by the Indonesia Stock Exchange in collaboration with PT Danareksa Investment Management. The index consists of 30 highly liquid Sharia-compliant stocks with large market capitalization that meet DSN-MUI criteria. Its main objective is to provide a performance benchmark for Sharia investors in evaluating Islamic stock investments (Fitriana et al., 2016). The JII plays a strategic role as a primary reference for Sharia investors in constructing halal compliant portfolios. The constituent stocks come from various sectors permitted under Islamic law, such as energy, telecommunications, consumer goods, and infrastructure. With a rigorous screening process, JII reflects the performance of leading Sharia stocks in Indonesia and serves as a key indicator of the Islamic capital market's growth.

Historical performance shows that the Islamic stock market demonstrates relatively strong resilience to economic shocks. Based on the Indonesia Stock Exchange factsheet (2021), JII recorded a cumulative return of 26.02% during 2011–2021, with a significant recovery trend following the sharp downturn during the COVID-19 pandemic. This indicates that JII stocks not only exhibit resilience but also offer attractive investment opportunities. Nevertheless, market volatility and global economic dynamics continue to pose challenges in forming efficient and well managed portfolios. In investment practice, the ability to manage risk and determine the optimal asset mix is crucial. Modern Portfolio Theory introduced by Harry Markowitz (1952) provides an important foundation through mean–variance optimization, emphasizing the balance between expected returns and risk. Diversification enables investors to reduce total risk without sacrificing return potential. However, the application of the Markowitz model to portfolios with many assets often encounters computational constraints due to covariance estimation (Aditya et al., 2018).

To simplify this process, William Sharpe (1963) developed the Single Index Model (SIM), which assumes that stock returns are primarily influenced by a single factor—market return. The model introduces beta (β) as a measure of stock sensitivity to market movements, simplifying risk estimation without requiring full covariance calculations (Maringga et al., 2015). In the context of Sharia stock markets such as JII, SIM allows investors to assess the responsiveness of Sharia-compliant stocks to market dynamics, thereby supporting the

formation of optimal portfolios. The period 2022–2025 presents an important empirical setting, reflecting post-pandemic economic recovery, global geopolitical tensions, and tight monetary policy adjustments worldwide. These factors influence Sharia stock performance in Indonesia, including JII constituents, which face volatility pressures but also growth opportunities in sectors such as energy and basic consumption (Harahap et al., 2021). During this period, JII reflects the resilience of Indonesia's Islamic capital market amid global uncertainty while serving as a stability barometer for Sharia investment.

Within this context, analyzing optimal portfolios of JII stocks becomes highly relevant. By applying the Markowitz model and the Single Index Model, Sharia investors can determine efficient portfolios that provide the highest expected return for a given level of risk while adhering to Islamic principles. This analysis is not only practically useful but also academically significant as empirical evidence of modern portfolio theory within Islamic markets. This study makes two key contributions. First, theoretically, it enriches Islamic finance literature by examining the application of modern portfolio techniques to Sharia capital markets, particularly JII, which remains underexplored in Indonesia. Second, practically, it is expected to assist investors and fund managers in formulating efficient Sharia investment strategies aligned with Islamic law amid market fluctuations.

Accordingly, the main objective of this study is to analyze and compare the effectiveness of the Markowitz model and the Single Index Model in constructing optimal portfolios of Jakarta Islamic Index stocks. The findings are expected to contribute to the development of Sharia portfolio management and provide strategic insights for policymakers and market participants in strengthening Indonesia's Islamic capital market ecosystem.

REVIEW OF LITERATURE

Investment and Risk

Investment is defined as a commitment of a certain amount of funds at present in order to obtain future benefits (Tandelilin, 2017). Risk is the deviation between the actual return and the expected return. The fundamental principle of investment is high risk–high return, meaning that the greater the risk, the higher the potential return (Paramata, 2022). Diversification is used to reduce portfolio risk by allocating funds across assets with low correlation.

Islamic Capital Market

The Islamic capital market is a market segment in which transactions are conducted based on Islamic principles, avoiding riba (interest), gharar (uncertainty), and maysir (excessive speculation) (Puspitarini, 2024). In Indonesia, the development of the Islamic capital market began with the launch of the JII (2000) and ISSI (2011). All Sharia-compliant securities are listed in the Sharia Securities List (DES) issued by the Financial Services Authority (OJK) twice a year. The Islamic capital market emphasizes not only financial returns but also sustainability and ethical economic practices. Research by Harahap et al. (2021) shows that Islamic financial literacy has a positive influence on investment interest in JII stocks. Meanwhile, Sari and Fadli (2021) confirm that diversification in Sharia stocks can reduce risk without compromising the halal principles of transactions.

Islamic Stocks

Islamic stocks are shares of companies whose business activities comply with Islamic principles. The Indonesia Stock Exchange (IDX), through the Jakarta Islamic Index (JII), screens Sharia-compliant stocks based on the criteria set by the National Sharia Council

(DSN–MUI). These criteria include: (1) the company must not operate in prohibited sectors; (2) interest-based debt must not exceed 45% of total assets; (3) non-halal income must not exceed 5% of total revenue; and (4) supervision must be conducted by a Sharia Supervisory Board (Nurhidayat & Susetyo, 2022). The concept of a Sharia portfolio emphasizes not only risk–return efficiency but also compliance with halal principles, fairness, and sustainability. Islamic investment is only permitted in halal business sectors and must avoid speculative transactions. According to Mulyono (2022), diversification strategies in Sharia portfolios must consider sector suitability and Sharia financial ratios in order to avoid elements of riba and gharar.

Expected Return

Expected return is the level of return anticipated by investors from a stock in a future period based on historical data. It reflects the average return expected and serves as a key basis for investment decision-making. Jogiyanto (2013) states that expected return is the expected value of returns calculated from past realized returns. Mathematically, the expected return of a stock can be expressed as follows:

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

where:
$E(R_i)$ = expected return of stock *i*
R_{it} = return of stock *i* in period *t*
n = number of observation periods

Risk-Free Rate

The risk-free rate is the rate of return on an investment that is considered to have no risk, either default risk or return fluctuation risk. Bodie et al. (2018) explain that the risk-free rate is generally represented by government securities because they have a very high level of security. According to Tandelilin (2017), the risk free rate serves as the minimum benchmark return expected by investors before they are willing to bear risk. It is also used as a comparison in calculating excess return and in measuring portfolio performance, such as through the Sharpe Ratio. In the context of the Islamic capital market, Hartono (2017) states that government sukuk can be used as a proxy for the risk-free rate because they comply with Sharia principles and are free from elements of riba. Therefore, the risk-free rate becomes an essential component in Sharia portfolio analysis using the Markowitz Model and the Single Index Model.

Excess Return

Excess return is the difference between the expected return of a stock and the risk-free rate. It reflects the additional return earned by investors as compensation for bearing risk. Bodie, Kane, and Marcus (2018) state that excess return is used to evaluate the performance of an investment relative to a risk-free investment. The formula for excess return is expressed as follows:

$$ER_i = E(R_i) - R_f$$

where:
ER_i = excess return of stock *i*
$E(R_i)$ = expected return of stock *i*
R_f = risk-free rate of return

According to Jogiyanto (2013), a stock with a positive excess return indicates that its return is higher than the risk-free return, making it worthy of consideration in a portfolio. Conversely, a negative excess return shows that the stock underperforms compared to a risk-free investment.

Markowitz Model

The Markowitz Model is the foundation of modern portfolio theory introduced by Markowitz (1952). This model emphasizes that investment decisions should not be based solely on returns, but must also consider the risk inherent in the investment. In the Markowitz Model, risk is measured using the variance or standard deviation of returns, while profitability is measured using expected return. According to Markowitz (1952), investors are rational and risk-averse, meaning they tend to avoid risk and therefore choose portfolios that provide the highest expected return for a given level of risk, or the lowest risk for a given expected return. The core principle of the Markowitz Model is diversification, whereby portfolio risk can be reduced by combining assets that have low or negative correlation.

The expected return of a portfolio in the Markowitz Model is formulated as follows:

$$E(R_p) = \sum_{i=1}^{n} w_i \, E(R_i)$$

where:

ER_i = expected return of the portfolio
$E(R_i)$ = proportion of funds invested in asset *i*
R_f= t = expected return of asset *i*
(n) = number of assets in the portfolio

Portfolio risk is measured using portfolio variance, which is formulated as follows:

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

where:

R_i = return of stock i
R_m = remarket return
α_i = alpha of stock i
β_i = beta of stock i
e_i = error term

According to Elton and Gruber (1995), the use of covariance between assets is the main strength of the Markowitz Model because it is able to describe the relationship between stock movements more accurately. By incorporating covariance, overall portfolio risk can be reduced even when the individual risks of the constituent stocks are relatively high.

Single Index Model

The Single Index Model is a portfolio formation model developed by Sharpe (1963) as a simplification of the Markowitz Model. This model assumes that the return of a stock is primarily influenced by a single dominant factor, namely the market return. Based on this assumption, the relationship between stock returns and market returns can be explained through a single market index, thereby simplifying portfolio risk measurement.

The relationship between stock returns and market returns is expressed as follows:

$$R_i = \alpha_i + \beta_i R_m + e_i$$

where:
R_i = return of stock *i*
R_m = market return
α_i = alpha of stock *i*
β_i = beta of stock *i*
e_i = error term

Alpha (α) and Beta (β)

Alpha is the component of a stock's return that is not influenced by market movements. It reflects the ability of a stock to generate returns beyond what would be expected based on overall market performance. Sharpe (1963) explains that alpha represents firm-specific performance driven by internal factors. Alpha is calculated as the intercept of the regression of stock returns against market returns, using the following formula:

$$\alpha_i = E(R_i) - \beta_i E(R_m)$$

According to Elton and Gruber (1995), a positive alpha indicates that a stock is able to generate better performance than the market, whereas a negative alpha shows that its performance is inferior to the market. Beta is a measure of systematic risk that reflects the sensitivity of a stock's return to changes in the market return. Bodie, Kane, and Marcus (2018) state that beta represents the level of a stock's volatility relative to the market. Beta is formulated as follows:

$$\beta_i = \frac{\text{Cov}(R_i, R_m)}{\sigma_m^2}$$

where:
$\text{Cov}(R_i, R_m)$ = covariance between the stock return and the market return
σ_m^2 = variance of the market return

According to Jogiyanto (2013), a stock with a beta greater than one has a higher level of systematic risk compared to the market, while a beta of less than one indicates a lower level of systematic risk.

Residual Variance

Residual variance is a measure of unsystematic risk that arises from firm-specific factors and is unrelated to market movements. This type of risk can be reduced through diversification. According to Sharpe (1963), residual variance represents the portion of a stock's total risk that cannot be explained by market returns. Elton and Gruber (1995) state that the smaller the residual variance of a stock, the lower the unsystematic risk borne by investors.

The total risk of a stock in the Single Index Model is formulated as follows:

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_{e_i}^2$$

where:
σ_i^2 = variance of the stock return
$\sigma_{e_i}^2$ = residual variance

Excess Return to Beta (ERB)

Excess Return to Beta (ERB) is a ratio used in the Single Index Model to select stocks that will be included in the optimal portfolio. ERB indicates the magnitude of excess return generated per unit of systematic risk. Jogiyanto (2013) states that stocks with a higher ERB value are more efficient and more feasible to be included in the portfolio.

ERB is formulated as follows:

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

where:

$E(R_i)$ = expected return of stock i

R_f = risk-free rate

β_i = beta of stock i

The stocks are then ranked based on their ERB values from the highest to the lowest as the initial stage in forming the optimal portfolio.

Cut-Off Point (C*)

The cut-off point (C*) is a threshold value used to determine which stocks are eligible to be included in the optimal portfolio. Stocks with ERB values greater than or equal to C* will be selected as portfolio members. Sharpe (1963) explains that the cut-off point is obtained from cumulative calculations involving excess return, beta, and residual variance. According to Jogiyanto (2013), the calculation of the cut-off point is carried out using the components A_i, B_i, and C_i, and the value of C* is the largest C_i. Stocks with $ERB_i \geq C^*$ are included in the optimal portfolio, while stocks with $ERB_i < C^*$ are excluded from the portfolio. The use of the cut-off point aims to ensure that only stocks that contribute optimally to portfolio performance are selected.

RESEARCH METHOD

In the analysis of the optimal Islamic stock portfolio, secondary data are used, namely the monthly closing stock prices of 30 (thirty) companies listed in the Jakarta Islamic Index (JII) that are included in the Effective Constituent Period from December 1, 2025 to May 29, 2026 (Decree No. Peng-00218/BEI.POP/11-2025 dated November 28, 2025), over the period 2022 to 2025. In addition, monthly closing index values of the Jakarta Islamic Index (JII) for the Effective Constituent Period from December 1, 2025 to May 29, 2026 over the period 2021 to 2025 are also used. The data were obtained from the Indonesia Stock Exchange website: http://www.idx.co.id and the Investing website: www.investing.com. The risk-free rate reference used is the Retail Sovereign Sukuk SR023T3 with an annual yield of 5.8%.

This study employs a purposive sampling method (non-probability sampling), in which the determination of the research objects is based on criteria that include all stocks listed in the Jakarta Islamic Index (JII) for the Effective Constituent Period from December 1, 2025, to May 29, 2026, with the list of companies presented in Table 1.

Table 1.
List of Stocks Included in the Jakarta Islamic Index (JII) for the Effective Constituent Period December 1, 2025 – May 29, 2026

No.	Code	Company Name	Index Weight (Pre-Evaluation)	Index Weight (Post-Evaluation)	Remarks
1	AADI	Adaro Andalan Indonesia Tbk	–	1.07%	New

No.	Code	Company Name	Index Weight (Pre-Evaluation)	Index Weight (Post-Evaluation)	Remarks
2	ADRO	Alamtri Resources Indonesia Tbk	1.72%	1.51%	Decrease
3	ANTM	Aneka Tambang Tbk	2.61%	2.35%	Decrease
4	ASII	Astra International Tbk	12.22%	11.02%	Decrease
5	BRIS	Bank Syariah Indonesia Tbk	1.08%	0.98%	Decrease
6	BRMS	Bumi Resources Minerals Tbk	5.10%	5.48%	Increase
7	BRPT	Barito Pacific Tbk	9.24%	8.34%	Decrease
8	BUMI	Bumi Resources Tbk	–	2.34%	New
9	CPIN	Charoen Pokphand Indonesia Tbk	2.77%	2.50%	Decrease
10	DSSA	Dian Swastatika Sentosa Tbk	–	14.76%	New
11	EXCL	XLSMART Telecom Sejahtera Tbk	1.25%	1.42%	Increase
12	ICBP	Indofood CBP Sukses Makmur Tbk	1.97%	1.78%	Decrease
13	INCO	Vale Indonesia Tbk	0.86%	0.77%	Decrease
14	INDF	Indofood Sukses Makmur Tbk	3.13%	2.82%	Decrease
15	INKP	Indah Kiat Pulp & Paper Tbk	1.68%	1.52%	Decrease
16	ISAT	Indosat Tbk	1.18%	1.06%	Decrease
17	JPFA	Japfa Comfeed Indonesia Tbk	–	1.10%	New
18	KLBF	Kalbe Farma Tbk	2.27%	2.05%	Decrease
19	MBMA	Merdeka Battery Materials Tbk	1.72%	1.56%	Decrease
20	MDKA	Merdeka Copper Gold Tbk	2.58%	2.39%	Decrease
21	MEDC	Medco Energi Internasional Tbk	0.79%	0.71%	Decrease
22	PANI	Pantai Indah Kapuk Dua Tbk	2.47%	2.71%	Increase
23	PGAS	Perusahaan Gas Negara Tbk	1.91%	1.72%	Decrease
24	PGEO	Pertamina Geothermal Energy Tbk	0.53%	0.52%	Decrease
25	PTBA	Bukit Asam Tbk	0.92%	0.83%	Decrease
26	RATU	Raharja Energi Cepu Tbk	–	0.79%	New
27	TLKM	Telkom Indonesia (Persero) Tbk	15.94%	15.00%	Decrease
28	TPIA	Chandra Asri Pacific Tbk	6.94%	6.26%	Decrease
29	UNTR	United Tractors Tbk	3.70%	3.34%	Decrease
30	UNVR	Unilever Indonesia Tbk	1.50%	1.31%	Decrease

The formation of the optimal portfolio in this study uses the Markowitz Model and the Single Index Model, where the Markowitz Model is based on two assumptions, namely the lowest risk preference and the optimal Sharpe ratio. Data processing is carried out using Microsoft Office Excel. This study is structured based on the research framework presented in Figure 1.

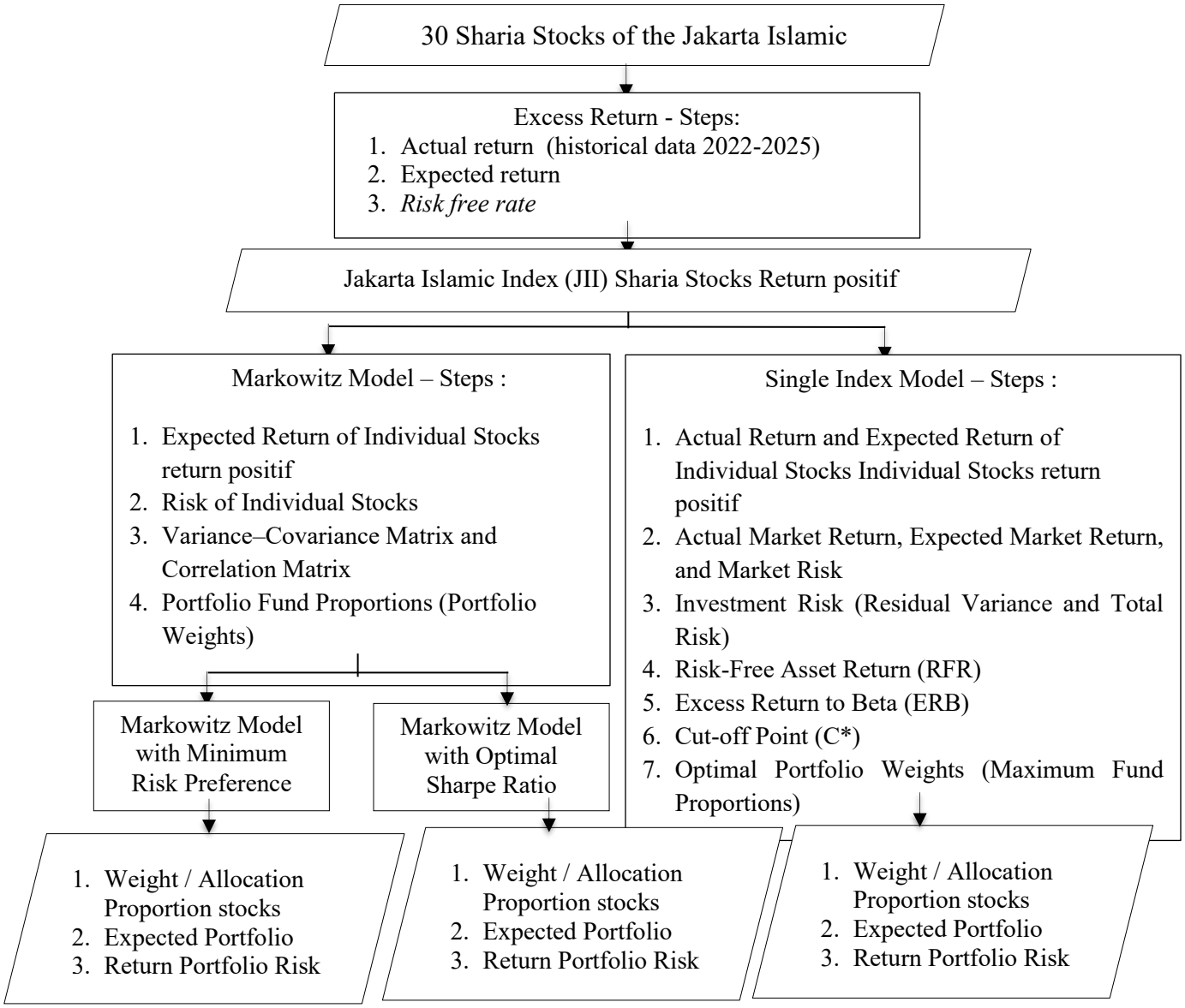

Figure 1.
Research Framework

The research process begins by arranging the initial stock prices at the start of the study period and the final stock prices at the end of the period from January 2022 to December 2025 for all stocks listed in the Jakarta Islamic Index (JII). Then, the average rate of return for each individual company stock (expected return) and the stock risk level are calculated. In addition, a comparison is made between the expected return and the risk-free rate benchmark, as well as the calculation of excess return using the Retail Sovereign Sukuk SR023T3 with an annual yield of 5.8% to select stocks that have the potential to generate higher returns as consideration in forming an optimal stock portfolio.

Next, after identifying the potential stocks with better return performance, the optimal portfolio is constructed using the Markowitz Model based on two assumptions, namely the lowest risk preference and optimal Sharpe ratio, through the Solver tool in Microsoft Office

Excel. The optimal portfolio is then also calculated using the Single Index Model. The results of both models are compared to determine the expected rate of return and portfolio risk. Thus, this study produces an optimal portfolio recommendation that offers the best combination of expected return and portfolio risk. The results may be used as a basis for investment decision-making in JII sharia stocks.

RESULTS AND DISCUSSION

The formation of an optimal Islamic stock portfolio in this study is carried out using the Markowitz Model and the Single Index Model for 30 companies listed in the Jakarta Islamic Index (JII) during the Constituent Effective Period from December 1, 2025 to May 29, 2026 (Decree No. Peng-00218/BEI.POP/11-2025 dated November 28, 2025). The analysis is based on monthly closing stock prices for the period January 2022 to December 2025, as described below:

Performance of Individual Stocks Based on Return and Risk

Investors generally prefer to invest in stocks with strong performance. The performance of a stock can be assessed from its condition during the observation period. A stock in good condition is one that generates a positive actual return at the end of the study period, whereas a stock in poor condition records a negative actual return at the end of the period. Table 2 presents the condition of the companies' stocks listed in the JII, based on the comparison between prices at the beginning and the end of the study period.

Table 2.
Stock Conditions of Companies Listed on the Jakarta Islamic Index

No.	Code	Initial Price (Jan 2022) (Rupiah)	Final Price (Dec 2025) (Rupiah)	(%)	Condition	No.	Code	Initial Price (Jan 2022) (Rupiah)	Final Price (Dec 2025) (Rupiah)	(%)	Condition
1	AADI*)	-	7,550	-	-	16	ISAT	5,725	2,340	-59%	Poor
2	ADRO	2,240	1,850	-17%	Poor	17	JPFA	1,665	2,730	64%	Good
3	ANTM	1,770	2,930	66%	Good	18	KLBF	1,640	1,175	-28%	Poor
4	ASII	5,475	6,600	21%	Good	19	MBMA*)	-	535	-	-
5	BRIS	1,507	2,350	56%	Good	20	MDKA	3,551	2,250	-37%	Poor
6	BRMS	139	1,010	627%	Good	21	MEDC	555	1,320	138%	Good
7	BRPT	885	3,490	294%	Good	22	PANI	125	13,800	10,940%	Good
8	BUMI	76	248	226%	Good	23	PGAS	1,380	1,855	34%	Good
9	CPIN	6,300	4,790	-24%	Poor	24	PGEO*)	-	1,180	-	-
10	DSSA	46,000	115,925	152%	Good	25	PTBA	2,850	2,300	-19%	Poor
11	EXCL	3,320	2,800	-16%	Poor	26	RATU*)	-	11,900	-	-
12	ICBP	8,725	8,150	-7%	Poor	27	TLKM	4,190	3,630	-13%	Good
13	INCO	4,643	3,910	-16%	Poor	28	TPIA	2,206	7,675	248%	Good
14	INDF	6,325	7,125	13%	Good	29	UNTR	23,125	28,650	24%	Good
15	INKP	7,600	8,625	13%	Good	30	UNVR	4,030	2,740	-32%	Poor

Source: Processed Data (2025)

Notes: *) The company was not yet listed on the Indonesia Stock Exchange during the January 2022 period.

In the Islamic stocks listed on the Jakarta Islamic Index (JII), it can be observed that out of 30 company stocks, 16 stocks are categorized as Good, 10 stocks are categorized as Poor, and 4 stocks cannot yet be determined because these companies were not listed on the Indonesia Stock Exchange during the January 2022 period and therefore do not meet the time range requirements of this research method. As a result, these stocks cannot be included in the portfolio calculation. In addition to comparing the initial and final stock prices over the research period, stock performance can also be assessed from the average value of return and risk. Return and risk in investment are two inseparable aspects, as both serve as important considerations for investors in making investment decisions. Stock returns consist of realized return, which has already occurred and is calculated using historical stock data, and expected return, which represents the return expected by investors and is calculated as the average of the realized return. Table 3 presents the calculation of these values.

Table 3.
Calculation Results of Expected Return and Risk (Standard Deviation) for Each Company Stock in the Jakarta Islamic Index (JII)

No.	Code	Expected Return E(Ri)	Standard Deviation (Risk)	No.	Code	Expected Return E(Ri)	Standard Deviation (Risk)
1	ADRO	0.0049	0.1261	14	INKP	0.0083	0.1064
2	ANTM	0.0174	0.1196	15	ISAT	0.0011	0.1647
3	ASII	0.0063	0.0694	16	JPFA	0.0154	0.1020
4	BRIS	0.0141	0.0996	17	KLBF*)	-0.0050	0.0662
5	BRMS	0.0605	0.1999	18	MDKA*)	-0.0017	0.1251
6	BRPT	0.0458	0.2038	19	MEDC	0.0274	0.1433
7	BUMI	0.0447	0.2159	20	PANI	0.1619	0.4454
8	CPIN*)	-0.0036	0.0662	21	PGAS	0.0094	0.0811
9	DSSA	0.0692	0.2661	22	PTBA*)	-0.0003	0.0913
10	EXCL*)	-0.0002	0.0844	23	TLKM*)	-0.0013	0.0601
11	ICBP	0.0008	0.0680	24	TPIA	0.0361	0.1522
12	INCO	0.0041	0.1262	25	UNTR	0.0083	0.0867
13	INDF	0.0039	0.0526	26	UNVR	0.0004	0.1349

Source: Processed Data (2025)
Notes:*) Companies with negative expected stock returns.

The expected return is calculated by averaging the realized return over the data period from January 2022 to December 2025. Based on the calculation results in Table 2, this calculation produces 20 stocks with positive expected returns and 6 stocks with negative expected returns. The stock with the highest positive expected return is PANI (0.1619), while the stock with the lowest positive expected return is UNVR (0.0004). Furthermore, the level of risk for each individual stock can be identified based on the calculated standard deviation values. The stock with the lowest level of risk is INDF (0.0526), and the stock with the highest level of risk is PANI (0.4454). The stocks that recorded negative expected returns

include CPIN (-0.0036), EXCL (-0.0002), KLBF (-0.0050), MDKA (-0.0017), PTBA (-0.0003), and TLKM (-0.0013). This indicates that these stocks do not provide returns to investors; therefore, they will not be included in the portfolio calculation.

Risk-Free Return (RFR) Calculation

In the calculation of the Markowitz Model and the Single Index Model, government sukuk data are used as the benchmark for the risk-free rate, forming the excess return value in the analysis of individual stock performance. Excess return is the return generated by an investment that exceeds the return of a benchmark or the risk-free rate. It represents the profit obtained from an investment after deducting the return earned from a risk free investment. The risk-free rate used as a reference in this study is the yield on Government Securities in the form of Retail Sukuk SR023T3, with an annual yield of 5.8%, or 0.0048 per month. This reference is used to select stocks whose expected return is greater than the risk-free rate, resulting in a positive excess return. The selection of stocks based on the risk-free return is presented in Table 4.

Table 4.
Excess Return Values of Each Stock

No.	Code	Expected Return	Risk-Free Rate	Description	Excess Return
1	ADRO	0.0049	0.0048	E(Ri) > RFR	0.0000
2	ANTM	0.0174	0.0048	E(Ri) > RFR	0.0125
3	ASII	0.0063	0.0048	E(Ri) > RFR	0.0015
4	BRIS	0.0141	0.0048	E(Ri) > RFR	0.0092
5	BRMS	0.0605	0.0048	E(Ri) > RFR	0.0557
6	BRPT	0.0458	0.0048	E(Ri) > RFR	0.0410
7	BUMI	0.0447	0.0048	E(Ri) > RFR	0.0398
8	DSSA	0.0692	0.0048	E(Ri) > RFR	0.0643
9	ICBP*)	0.0008	0.0048	E(Ri) < RFR	-0.0040
10	INCO*)	0.0041	0.0048	E(Ri) < RFR	-0.0007
11	INDF*)	0.0039	0.0048	E(Ri) < RFR	-0.0009
12	INKP	0.0083	0.0048	E(Ri) > RFR	0.0034
13	ISAT*)	0.0011	0.0048	E(Ri) < RFR	-0.0037
14	JPFA	0.0154	0.0048	E(Ri) > RFR	0.0106
15	MEDC	0.0274	0.0048	E(Ri) > RFR	0.0226
16	PANI	0.1619	0.0048	E(Ri) > RFR	0.1571
17	PGAS	0.0094	0.0048	E(Ri) > RFR	0.0046
18	TPIA	0.0361	0.0048	E(Ri) > RFR	0.0313
19	UNTR	0.0083	0.0048	E(Ri) > RFR	0.0035
20	UNVR*)	0.0004	0.0048	E(Ri) < RFR	-0.0044

Source: Processed Data (2025)

Notes: *) Companies with negative excess stock returns, meaning the return is lower than the risk-free rate of the Retail Sukuk SR023T3.

Based on the performance calculation of the 20 stocks, there are 15 stocks that meet the criteria of having an expected return greater than the risk-free rate (E(Ri) > RFR), and 5 stocks that have expected returns lower than the risk-free rate, namely ICBP (-0.0040), INCO (-0.0007), INDF (-0.0009), ISAT (-0.0037), and UNVR (-0.0044). The rationale behind selecting stocks based on the risk-free rate is to enable investors to compare the expected return of individual stocks which inherently carry risk with investments in risk-free assets, in this case represented by the government Retail Sukuk SR023T3. Therefore, the stocks that meet the criterion of E(Ri) > RFR will be included in the calculation of the optimal portfolio using both the Markowitz Model and the Single Index Model.

Markowitz Portfolio Model

One of the strategies that investors may implement in investment activities is portfolio optimization (Ivanova & Dostpaliev, 2017). Portfolio optimization can be carried out using the Markowitz Model, which measures stock performance based on its return and risk. In the portfolio formation process, an asset allocation decision is required, namely determining which assets will be included in the portfolio. A collection of various asset combinations produces a range of efficient portfolios, and only the portfolio with the best performance can be referred to as the optimal portfolio. An optimal portfolio is one that provides the best combination of expected return and risk (Hartono, 2017).

Variance–Covariance and Correlation Between Stocks

In forming the Markowitz Portfolio Model, calculations of variance–covariance (var-covar) and correlation among stocks are carried out based on the monthly returns of the Jakarta Islamic Index (JII) stocks for the 2022–2025 period. This calculation aims to measure the overall portfolio risk, as risk is influenced not only by the individual risks of each stock, but also by the relationship between their movements. The results of the variance-covariance calculations for the JII stocks are presented in Table 5.

Table 5. Variance–Covariance Matrix of JII Stocks

	ADRO	ANTM	ASII	BRIS	BRMS	BRPT	BUMI	DSSA	INKP	JPFA	MEDC	PANI	PGAS	TPIA	UNTR
ADRO	0.0159	0.0051	0.0021	0.0026	0.0016	0.0048	0.0040	-0.0036	0.0054	-0.0005	0.0031	0.0106	0.0032	0.0036	0.0056
ANTM	0.0051	0.0146	0.0019	0.0021	0.0065	0.0072	0.0016	-0.0040	0.0025	-0.0026	0.0026	0.0158	0.0021	0.0032	0.0015
ASII	0.0021	0.0019	0.0049	0.0003	0.0036	0.0022	0.0023	-0.0030	0.0025	0.0008	0.0013	0.0027	0.0008	-0.0003	0.0035
BRIS	0.0026	0.0021	0.0003	0.0101	0.0005	0.0002	0.0019	0.0050	0.0010	-0.0029	-0.0013	0.0120	0.0004	0.0004	0.0016
BRMS	0.0016	0.0065	0.0036	0.0005	0.0437	0.0139	0.0206	-0.0024	0.0033	0.0052	0.0098	0.0308	0.0022	-0.0046	0.0058
BRPT	0.0048	0.0072	0.0022	0.0002	0.0139	0.0437	0.0096	0.0057	0.0066	0.0014	0.0091	0.0189	0.0018	0.0095	0.0051
BUMI	0.0040	0.0016	0.0023	0.0019	0.0206	0.0096	0.0487	0.0055	0.0079	-0.0006	0.0093	0.0213	0.0039	-0.0014	0.0059
DSSA	-0.0036	-0.0040	-0.0030	0.0050	-0.0024	0.0057	0.0055	0.0757	0.0069	0.0003	0.0040	0.0034	0.0034	0.0145	-0.0035
INKP	0.0054	0.0025	0.0025	0.0010	0.0033	0.0066	0.0079	0.0069	0.0114	-0.0001	0.0071	0.0069	0.0030	0.0007	0.0037
JPFA	-0.0005	-0.0026	0.0008	-0.0029	0.0052	0.0014	-0.0006	0.0003	-0.0001	0.0107	0.0018	-0.0004	0.0011	-0.0006	-0.0001

	ADRO	ANTM	ASII	BRIS	BRMS	BRPT	BUMI	DSSA	INKP	JPFA	MEDC	PANI	PGAS	TPIA	UNTR
MEDC	0.0031	0.0026	0.0013	-0.0013	0.0098	0.0091	0.0093	0.0040	0.0071	0.0018	0.0213	0.0134	0.0028	0.0019	0.0032
PANI	0.0106	0.0158	0.0027	0.0120	0.0308	0.0189	0.0213	0.0034	0.0069	-0.0004	0.0134	0.2251	0.0068	0.0023	0.0086
PGAS	0.0032	0.0021	0.0008	0.0004	0.0022	0.0018	0.0039	0.0034	0.0030	0.0011	0.0028	0.0068	0.0067	0.0041	0.0022
TPIA	0.0036	0.0032	-0.0003	0.0004	-0.0046	0.0095	-0.0014	0.0145	0.0007	-0.0006	0.0019	0.0023	0.0041	0.0245	0.0013
UNTR	0.0056	0.0015	0.0035	0.0016	0.0058	0.0051	0.0059	-0.0035	0.0037	-0.0001	0.0032	0.0086	0.0022	0.0013	0.0076

Source: Processed Data (2025)

Meanwhile, the results of the correlation calculations for the stocks in the JII are presented in Table 6.

Table 6.

Results of Correlation Calculation for Stocks in the JII

	ADRO	ANTM	ASII	BRIS	BRMS	BRPT	BUMI	DSSA	INKP	JPFA	MEDC	PANI	PGAS	TPIA	UNTR
ADRO	1.0015	0.3357	0.2387	0.2069	0.0655	0.1873	0.1476	-0.1084	0.4058	-0.0391	0.1740	0.1893	0.3157	0.1890	0.5120
ANTM	0.3357	1.0215	0.2307	0.1801	0.2699	0.2934	0.0606	-0.1244	0.2000	-0.2141	0.1504	0.2960	0.2117	0.1757	0.1414
ASII	0.2387	0.2307	1.0085	0.0394	0.2589	0.1531	0.1554	-0.1610	0.3376	0.1111	0.1311	0.0886	0.1412	-0.0296	0.5795
BRIS	0.2069	0.1801	0.0394	1.0204	0.0265	0.0104	0.0884	0.1897	0.0984	-0.2812	-0.0888	0.2703	0.0549	0.0264	0.1905
BRMS	0.0655	0.2699	0.2589	0.0265	1.0937	0.3401	0.4764	-0.0443	0.1540	0.2563	0.3418	0.3461	0.1346	-0.1504	0.3326
BRPT	0.1873	0.2934	0.1531	0.0104	0.3401	1.0516	0.2192	0.1047	0.3058	0.0688	0.3119	0.2081	0.1075	0.3055	0.2899
BUMI	0.1476	0.0606	0.1554	0.0884	0.4764	0.2192	1.0437	0.0957	0.3442	-0.0254	0.3003	0.2210	0.2208	-0.0423	0.3143
DSSA	-0.1084	-0.1244	-0.1610	0.1897	-0.0443	0.1047	0.0957	1.0690	0.2427	0.0129	0.1049	0.0283	0.1569	0.3571	-0.1538
INKP	0.4058	0.2000	0.3376	0.0984	0.1540	0.3058	0.3442	0.2427	1.0061	-0.0096	0.4665	0.1449	0.3468	0.0420	0.4064
JPFA	-0.0391	-0.2141	0.1111	-0.2812	0.2563	0.0688	-0.0254	0.0129	-0.0096	1.0233	0.1233	-0.0094	0.1335	-0.0408	-0.0061
MEDC	0.1740	0.1504	0.1311	-0.0888	0.3418	0.3119	0.3003	0.1049	0.4665	0.1233	1.0374	0.2101	0.2429	0.0854	0.2541
PANI	0.1893	0.2960	0.0886	0.2703	0.3461	0.2081	0.2210	0.0283	0.1449	-0.0094	0.2101	1.1350	0.1894	0.0342	0.2225
PGAS	0.3157	0.2117	0.1412	0.0549	0.1346	0.1075	0.2208	0.1569	0.3468	0.1335	0.2429	0.1894	1.0138	0.3314	0.3112
TPIA	0.1890	0.1757	-0.0296	0.0264	-0.1504	0.3055	-0.0423	0.3571	0.0420	-0.0408	0.0854	0.0342	0.3314	1.0574	0.0981
UNTR	0.5120	0.1414	0.5795	0.1905	0.3326	0.2899	0.3143	-0.1538	0.4064	-0.0061	0.2541	0.2225	0.3112	0.0981	1.0093

Source: Processed Data (2025)

Optimal Portfolio Calculation Using Solver

After the variance covariance matrix and expected return were obtained, the portfolio optimization process was carried out using Solver in Microsoft Excel. Solver was used to determine the proportion of funds allocated to each stock in order to produce the optimal portfolio. The optimization was conducted using two approaches, namely minimizing

portfolio risk and maximizing the Sharpe Ratio, with the constraints that the total stock weights must equal one and the weights must be non-negative.

Based on the calculation results, the combination of stocks and the proportion of investment funds that form the Markowitz Portfolio Model based on the lowest risk preference are presented in Table 7.

Table 7.
Stock Combination and Fund Allocation in the Markowitz Portfolio Model Based on the Lowest Risk Preference

No.	Code	Company Name	Expected Return	Risk	Weight / Allocation Proportion (%)
1	ADRO	Adaro Energy Indonesia Tbk	0.0049	0.0400	–
2	ANTM	Aneka Tambang Tbk	0.0174	0.1261	6.38
3	ASII	Astra International Tbk	0.0063	0.1196	29.01
4	BRIS	Bank Syariah Indonesia Tbk	0.0141	0.0694	21.58
5	BRMS	Bumi Resources Minerals Tbk	0.0605	0.0996	–
6	BRPT	Barito Pacific Tbk	0.0458	0.1999	–
7	BUMI	Bumi Resources Tbk	0.0447	0.2038	–
8	DSSA	Dian Swastatika Sentosa Tbk	0.0692	0.2159	0.78
9	INKP	Indah Kiat Pulp & Paper Tbk	0.0083	0.2661	0.19
10	JPFA	Japfa Comfeed Indonesia Tbk	0.0154	0.1064	21.10
11	MEDC	Medco Energi Internasional Tbk	0.0274	0.1020	3.43
12	PANI	Pantai Indah Kapuk Dua Tbk	0.1619	0.1433	–
13	PGAS	Perusahaan Gas Negara Tbk	0.0094	0.4454	12.04
14	TPIA	Chandra Asri Pacific Tbk	0.0361	0.0811	4.49
15	UNTR	United Tractors Tbk	0.0083	0.1522	–

Portfolio Performance

Description	Monthly (%)	Annual (%)
Expected Return	1.36	16.29
Minimum Risk	4.33	51.94
Risk-Free Rate	0.48	5.80
Sharpe Ratio	31.36	–

Source: Processed Data (2025)

The Markowitz model with the lowest risk preference produces a combination of 9 stocks, namely ASII (29.01%), BRIS (21.58%), JPFA (21.10%), PGAS (12.04%), ANTM (6.38%), TPIA (4.49%), MEDC (3.43%), DSSA (0.78%), and INKP (0.19%). The largest fund allocation is in ASII (29.01%), while the smallest allocation is in INKP (0.19%). This combination of stocks and allocation proportions generates an expected total investment return of 16.29% per year, with a minimum portfolio risk of 51.94%, and portfolio performance measured using the Sharpe Ratio of 31.36%. Therefore, if an investor has funds amounting to IDR 1 billion, based on the information in Table 7, the expected portfolio return or profit would be IDR 162,900,000 per year. This combination represents an efficient portfolio based on the preference of a risk-averse (conservative) investor.

The next stage in constructing the Markowitz portfolio model is to optimize portfolio performance measured using the Sharpe Ratio. The combination of stocks and their proportions forming the Markowitz portfolio model with the optimal Sharpe Ratio is presented in Table 8.

Table 8.
Stock Combination and Fund Allocation of the Markowitz Portfolio Model Based on Optimal Sharpe Ratio

No.	Code	Company Name	Expected Return	Risk	Weight / Allocation Proportion (%)
1	ADRO	Adaro Energy Indonesia Tbk	0.0049	0.0400	–
2	ANTM	Aneka Tambang Tbk	0.0174	0.1261	2.19
3	ASII	Astra International Tbk	0.0063	0.1196	3.92
4	BRIS	Bank Syariah Indonesia Tbk	0.0141	0.0694	6.98
5	BRMS	Bumi Resources Minerals Tbk	0.0605	0.0996	8.19
6	BRPT	Barito Pacific Tbk	0.0458	0.1999	0.60
7	BUMI	Bumi Resources Tbk	0.0447	0.2038	2.61
8	DSSA	Dian Swastatika Sentosa Tbk	0.0692	0.2159	6.53
9	INKP	Indah Kiat Pulp & Paper Tbk	0.0083	0.2661	–
10	JPFA	Japfa Comfeed Indonesia Tbk	0.0154	0.1064	13.48
11	MEDC	Medco Energi Internasional Tbk	0.0274	0.1020	1.34
12	PANI	Pantai Indah Kapuk Dua Tbk	0.1619	0.1433	5.14
13	PGAS	Perusahaan Gas Negara Tbk	0.0094	0.4454	–
14	TPIA	Chandra Asri Pacific Tbk	0.0361	0.0811	12.19
15	UNTR	United Tractors Tbk	0.0083	0.1522	–

Portfolio Performance

Description	Monthly (%)	Annual (%)
Expected Return	2.77	33.21
Standard Deviation (Risk)	5.34	64.04
Risk-Free Rate	0.48	5.80
Sharpe Ratio	—	51.86

Source: Processed Data (2025)

The formation of the Markowitz Model portfolio by optimizing portfolio performance measured using the Sharpe Ratio, based on the information in Table 8, results in 11 stock combinations, namely JPFA (13.48%), TPIA (12.19%), BRMS (8.19%), BRIS (6.98%), DSSA (6.53%), PANI (5.14%), ASII (3.92%), BUMI (2.61%), ANTM (2.19%), MEDC (1.34%), and BRPT (0.60%). The largest fund allocation is in JPFA (13.48%), while the smallest allocation is in BRPT (0.60%). This stock combination and allocation proportion produce an expected return on total investment of 33.21% per year with a portfolio risk of 64.04% and portfolio performance measured using the Sharpe Ratio of 51.86%. Thus, for example, if an investor has funds amounting to IDR 1 billion, then based on the information from Table 6, the expected portfolio return or profit would be IDR 332,100,000 per year. A

portfolio with this combination is suitable for risk taker investors, while still considering the risk and performance of their portfolio.

Single Index Model Portfolio

The formation of an optimal portfolio using the single index model is based on the movement of the market index, where the price of a company's stock moves in the same direction as its market price index. When the composite stock price index increases, the prices of the stock assets as a whole also increase. This parallel movement indicates that the returns of the stock assets tend to be positively correlated with market returns. The reference for the single index model in this study uses monthly historical data from the Jakarta Islamic Index (JII) over the period January 2022 to December 2025, with historical data, expected return, and JII index risk information presented in Table 9.

Table 9.
Historical Data Information, Expected Return, and Risk Level of the JII

No.	Index Code	Beginning Price (Jan 2022) (Rupiah)	Ending Price (Dec 2025) (Rupiah)	(%)	Expected Return	Standard Deviation (Risk)	Excess Return
1	JII	557	587	-5.36	0.0019	0.0400	-0.0029

Source: Processed Data (2025)

Beta (β) and Alpha (α)

Beta (β) is a measure of the systematic risk of a stock or portfolio relative to market risk and functions as an indicator of the volatility of stock or portfolio returns against market returns. In this study, Beta was calculated using Microsoft Excel with the slope formula, namely by measuring the slope between the realized stock returns and the market returns over a certain period. Meanwhile, Alpha (α) represents the expected value of an asset's return that is independent of market returns, calculated using the intercept formula. The stocks analyzed using the Single Index Model consist of 15 stocks that meet the criterion of having an expected return greater than the risk-free rate, as presented in Table 4. The Beta (β) and Alpha (α) values for these stocks are shown in Table 10.

Table 10.
Beta (β) and Alpha (α) Values of JII Stocks

No.	Code	Beta (β)	Alpha (α)	No.	Code	Beta (β)	Alpha (α)	No.	Code	Beta (β)	Alpha (α)
1	ADRO	1.7587	0.0052	6	BRPT	2.9407	0.0496	11	MEDC	1.1186	0.0259
2	ANTM	1.4450	0.0168	7	BUMI	2.2160	0.0464	12	PANI	2.2551	0.1637
3	ASII	0.7939	0.0038	8	DSSA	-0.0241	0.0643	13	PGAS	0.6787	0.0066
4	BRIS	0.6490	0.0111	9	INKP	1.4520	0.0077	14	TPIA	0.9745	0.0341
5	BRMS	1.8858	0.0612	10	JPFA	-0.1777	0.0100	15	UNTR	1.3422	0.0074

Source: Processed Data (2025)

Residual Variance

Residual variance is a measure of unsystematic risk that originates from firm specific factors and is not influenced by market movements. In the Single Index Model, residual variance represents the portion of a stock's risk that cannot be explained by market returns and can generally be reduced through portfolio diversification. In the process of constructing

a portfolio using the Single Index Model, residual variance plays an important role in determining which stocks are included in the optimal portfolio. Stocks with lower residual variance tend to be more stable and contribute less risk to the portfolio. Therefore, stocks with lower residual variance are more likely to be selected for the optimal portfolio compared to those with higher residual variance. The results of the residual variance calculations for these stocks are presented in Table 11.

Table 11.
Results of Residual Variance Calculation for JII Stocks

No.	Code	Residual Variance	No.	Code	Residual Variance	No.	Code	Residual Variance
1	ADRO	0.0109	6	BRPT	0.0277	11	MEDC	0.0185
2	ANTM	0.0110	7	BUMI	0.0388	12	PANI	0.1902
3	ASII	0.0038	8	DSSA	0.0708	13	PGAS	0.0058
4	BRIS	0.0093	9	INKP	0.0079	14	TPIA	0.0217
5	BRMS	0.0343	10	JPFA	0.0104	15	UNTR	0.0046

Source: Processed Data (2025)

Excess Return Beta

The difference between the expected rate of return and the risk-free asset return is referred to as excess return beta. An optimal portfolio will consist of assets that have high ERB ratio values. Assets with low ratio values will not be included in the portfolio. Therefore, a cut-off point is required to determine the minimum ERB value. The following are the results of the Excess Return Beta (ERB) calculation. In addition, in the analysis of the optimal portfolio, the list of stocks needs to be ranked from the highest to the lowest ERB value. This is because the Single Index Model constructs the portfolio gradually, starting from the most efficient to the least efficient stocks.

Table 12.
Excess Return Beta (ERB) Values

No.	Code	ERB (%)	No.	Code	ERB (%)	No.	Code	ERB (%)
1	PANI	0.0696	6	BRIS	0.0142	11	INKP	0.0024
2	TPIA	0.0321	7	BRPT	0.0139	12	ASII	0.0019
3	BRMS	0.0297	8	ANTM	0.0087	13	ADRO	0.0000
4	MEDC	0.0202	9	PGAS	0.0068	14	JPFA	-0.0594
5	BUMI	0.0180	10	UNTR	0.0026	15	DSSA	-2.6652

Source: Processed Data (2025)

Based on the calculations in Table 12, the stock with the highest ERB value is PANI (0.0696%), while the stock with the lowest ERB value is DSSA (-2.6652%). These ERB values will then be screened using the cut-off point value.

Calculating the Cut-Off Point

The cut-off point (C*) is used to limit the ERB values of the stocks that will be included in the portfolio. To simplify the complex C* formula, it is broken down into the components Ai, Bi, and Ci. The results of the Ai, Bi, and Ci calculations for the JII stocks are presented in Table 13.

Table 13.
Ai, Bi, and Ci Values of Each JII Stock

No.	Code	Ai	Bi	Ci	No.	Code	Ai	Bi	Ci
1	PANI	0.2677	26.7364	0.0097	9	PGAS	18.2550	78.8852	0.0283
2	TPIA	0.2064	43.8592	0.0066	10	UNTR	9.0586	388.9722	0.0269
3	BRMS	0.5082	103.8285	0.0056	11	INKP	11.7650	265.5137	0.0297
4	MEDC	0.6378	67.5369	0.0067	12	ASII	2.6103	165.3815	0.0284
5	BUMI	2.3434	126.6860	0.0107	13	ADRO	-0.4719	282.7195	0.0244
6	BRIS	0.1052	45.5131	0.0098	14	JPFA	-0.0586	3.0482	0.0243
7	BRPT	5.9137	312.3107	0.0137	15	DSSA	-0.0136	0.0082	0.0243
8	ANTM	0.0063	190.3894	0.0109					
C* = 0.297									

Source: Processed Data (2025)

After obtaining the Ai and Bi calculation results, the Ci values can also be calculated, as shown in Table 11. In addition, the largest Ci value from the research results represents the cut-off point (C*), which is used to screen the ERB values. The stock with the largest Ci value is INKP (0.0297), which serves as the cut-off point for the ERB value. Therefore, stocks that meet the criterion of having an ERB value greater than or equal to C* (ERB ≥ C*) can be included in the selection of optimal portfolio stocks. The results of the optimal portfolio stock selection are presented in Table 14.

Table 14.
Selection of Optimal Portfolio Stocks Based on the Cut-Off Point

No.	Stock Code	C*	ERB	Description
1	PANI	0.297	0.0696	Selected
2	TPIA	0.297	0.0321	Selected
3	BRMS	0.297	0.0297	Selected
4	MEDC	0.297	0.0202	Not Selected
5	BUMI	0.297	0.0180	Not Selected
6	BRIS	0.297	0.0142	Not Selected
7	BRPT	0.297	0.0139	Not Selected
8	ANTM	0.297	0.0087	Not Selected
9	PGAS	0.297	0.0068	Not Selected
10	UNTR	0.297	0.0026	Not Selected
11	INKP	0.297	0.0024	Not Selected
12	ASII	0.297	0.0019	Not Selected
13	ADRO	0.297	0.0000	Not Selected
14	JPFA	0.297	-0.0594	Not Selected
15	DSSA	0.297	-2.6652	Not Selected

Source: Processed Data (2025)

Based on Table 14, there are three stocks selected for the Single Index Model portfolio and twelve stocks that are not included in the portfolio. The stocks selected for the optimal portfolio based on the Single Index Model are PANI, TPIA, and BRMS.

Fund Composition

The calculation of fund composition aims to determine the proportion of funds allocated for investment in each stock included in the Single Index Model portfolio. The composition of fund allocation forming the Single Index Model portfolio is presented in Table 15.

Table 15.
Zi and Weight Values (Fund Allocation Proportion), Expected Return, Risk, and Performance of Selected Stocks in the Single Index Model Portfolio

No.	Code	Company Name	Zi	Weight / Allocation Proportion (%)
1	PANI	Pantai Indah Kapuk Dua Tbk	1.1597	66.08
2	TPIA	Chandra Asri Pacific Tbk	0.4532	25.82
3	BRMS	Bumi Resources Minerals Tbk	0.1420	8.09

	Monthly (%)	Annual (%)
Expected Return	12.08	144.97
Standard Deviation (Risk)	30.08	360.98
Risk-Free Rate	0.48	5.80
Portfolio Alpha	0.1219	—
Portfolio Beta	1.8945	—
Sharpe Ratio	30.08	—

Source: Processed Data (2025)

From the calculation results, three stock combinations were obtained using the Single Index Model. The largest fund allocation is assigned to PANI (66.08%), followed by TPIA (25.82%) and BRMS (8.09%). This combination of stocks and allocation proportions produces an expected return on the overall investment of 144.97% per year, with a minimum risk level of 360.98%, and portfolio performance measured using the Sharpe Ratio of 30.08%. If, for example, an investor wishes to invest Rp 1 billion, the expected return or profit would amount to Rp 1.44 billion, with a Portfolio Beta (βp) of 1.8945. This means that the investor would obtain a higher rate of return compared to the market return.

Comparison of the Results of the Markowitz Model and the Single Index Model

The comparison of portfolio calculation results using the Markowitz Model and the Single Index Model is presented in Table 16.

Table 16.
Comparison of Calculation Results Using the Markowitz Model and the Single Index Model

	Markowitz Model – Lowest Risk Preference	Markowitz Model – Optimal Sharpe Ratio	Single Index Model	Risk-Free Rate
Number of Stock Combinations	10	11	3	–

	Markowitz Model – Lowest Risk Preference	Markowitz Model – Optimal Sharpe Ratio	Single Index Model	Risk-Free Rate
Expected Return (%) per Year	16.29	33.21	144.97	5.80
Portfolio Risk (%)	51.94	64.04	360.98	–
Sharpe Ratio	31.36	51.86	30.08	–

Source: Processed Data (2025)

The comparison of portfolio calculation results using the Markowitz Model and the Single Index Model shows that the best combination of expected return and portfolio risk is obtained from the portfolio calculation using the Markowitz Model with the Optimal Sharpe Ratio.

CONCLUSION

Based on the research results and discussion presented, it can be concluded that nine stock combinations were obtained in the portfolio calculation using the Markowitz Model with the lowest risk preference, namely ASII (29.01%), BRIS (21.58%), JPFA (21.10%), PGAS (12.04%), ANTM (6.38%), TPIA (4.49%), MEDC (3.43%), DSSA (0.78%), and INKP (0.19%). This portfolio produces an expected return of 16.29% per year with a minimum portfolio risk of 51.94%. Furthermore, eleven stock combinations were obtained based on the Markowitz Model with the optimal Sharpe Ratio, namely JPFA (13.48%), TPIA (12.19%), BRMS (8.19%), BRIS (6.98%), DSSA (6.53%), PANI (5.14%), ASII (3.92%), BUMI (2.61%), ANTM (2.19%), MEDC (1.34%), and BRPT (0.60%). This portfolio produces an expected return on the overall investment of 33.21% per year with a portfolio risk of 64.04%. In addition, three stock combinations were obtained from the portfolio calculation using the Single Index Model, namely PANI (66.08%), TPIA (25.82%), and BRMS (8.09%). This combination produces an expected return on the overall investment of 144.97% per year with a minimum risk level of 360.98%. Investors may use the results of this study as a consideration when investing their funds in Jakarta Islamic Index (JII) sharia stocks.

REFERENCES

Aditya, A., Sinaga, B. M., & Maulana, T. A. (2018). Pengaruh Indeks Bursa Luar Negeri, Indikator Makroekonomi dan Krisis Ekonomi Global terhadap IHSG di Indonesia. Jurnal Aplikasi Bisnis dan Manajemen, 4(2), 284–295.

Bodie, Z., Kane, A., & Marcus, A. J. (2018). Investments (11th ed.). McGraw-Hill Education.

Elton, E. J., & Gruber, M. J. (1995). Modern Portfolio Theory and Investment Analysis (5th ed.). Wiley.

Harahap, S. B., Bustami, Y., & Syukrawati, S. (2021). Pengaruh Literasi Keuangan Terhadap Minat Investasi Saham Syariah. Al Fiddhoh Journal, 2(2), 75–82.

Hartono, J. (2017). Teori Portofolio dan Analisis Investasi (Edisi 10). Yogyakarta: BPFE.

Isbahi, M. B., Zuana, M. M. M., & Toha, M. (2024). The Multi-Social Relation of the Cattle Industry in the Plaosan Subdistrict Animal Market of Magetan Regency. *Malacca:*

Journal of Management and Business Development, *1*(1), 31–46. https://doi.org/10.69965/malacca.v1i1.51

Jogiyanto, H. M. (2013). Teori Portofolio dan Analisis Investasi (Edisi 10). Yogyakarta: BPFE.

Markowitz, H. M. (1952). Portfolio Selection. The Journal of Finance, 7(1), 77–91.

Mulyono, S. (2022). Pengaruh Diversifikasi Portofolio terhadap Risiko Saham pada Perusahaan Syariah. Jurnal Investasi dan Keuangan Islam, 3(2), 88–101.

Paramata, A. M. (2022). Analisis Hubungan Antara Indeks Harga Saham dan Nilai Tukar di Indonesia dan Singapura Menggunakan Analisis VECM. Aksara, 8(1), 621.

Puspitarini, R. (2024). Keabsahan Pengalihan Saham Perseroan Terbatas Tanpa Perjanjian Jual Beli. Universitas Islam Sultan Agung Semarang.

Rahmawati, A. F., & Prasetyo, D. (2022). Perbandingan Metode Markowitz dan Single Index Model dalam Pembentukan Portofolio Efisien. Jurnal Keuangan dan Investasi, 8(1), 33–47.

Sari, P. D., & Fadli, A. (2021). Analisis Diversifikasi Portofolio Saham Syariah di BEI. Jurnal Manajemen dan Akuntansi Islam, 8(1), 45–56.

Sharpe, W. F. (1963). A Simplified Model for Portfolio Analysis. Management Science, 9(2), 277–293.

Tandelilin, E. (2017). Pasar Modal: Manajemen Portofolio dan Investasi. Yogyakarta: Kanisius.

Vernanda, T., Paramita, P. D., & Andini, R. (2023). Pengaruh Skala Usaha dan Sistem Informasi Akuntansi terhadap Keberhasilan UMKM. Jurnal Akuntansi, 9(1).