

Comparison Analysis of Optimal Portfolio Formation on Jakarta Islamic Index 70 (JII70) (Markowitz Model and Single Index Model Approach)

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ABSTRACT

This study analyzes the optimal portfolio formation of Islamic stocks on Jakarta Islamic Index 70 (JII70) with the Markowitz and Single Index models. The analysis then compares the proportion of funds, return, and portfolio risk. The subsequent analysis compares the two models' optimal and non-optimal returns and risks. This study uses data on stock prices, dividends, BI-7 Day Reverse Repo Rate, and Composite Stock Price Index for May 2018-September 2021. The research sample is 37 JII70 stock issuers obtained by the purposive sampling technique. The Markowitz model produces 12 combinations, a certain expected return of 0.66% and the best portfolio risk of 3.22%. In comparison, the Single Index Model produces nine stock combinations, the best-expected return of 2.28%, and a certain portfolio risk of 7.53%. Analysis with the Markowitz Model shows no significant difference between stock returns included in the optimal and non-optimal portfolio. However, there is a significant difference between stock risk. In addition, in the Single Index Model, it was found that there was a significant difference between stock returns, including optimal and non-optimal portfolios. However, there was no significant difference between stock risk. The study results can be an essential reference for JII70 investors and stakeholders before and during the Covid-19 pandemic in Indonesia.

Keywords: JII70, Markowitz Model, Single Index Model, and Optimal Portfolio.

INTRODUCTION

The spread of the coronavirus, initially identified in Wuhan, China, in December 2019, to the rest of the world has caused significant changes in various sectors. The accommodation, entertainment, and transportation industries experienced substantial effects and declined market value. However, education, professional and financial services did not show a significant

impact because of the possibility of having more excellent abilities with online activities. In addition, there is a more substantial decline in sectors that are more capital intensive, more debt, and less profitable firms (Alfaro et al., 2020 ;Ramelli & Wagner, 2020;Albuquerque et al., 2020).

On March 2, 2020, the first Covid-19 case was detected in Indonesia after two people were confirmed positive in Depok, West Java. The government has imposed restrictions on the movement of people to suppress the increase of Covid-19 cases. The government has several movement restrictions starting with four levels: PSBB (Large-Scale Social Restrictions), Transitional PSBB, Emergency PPKM (Enforcement of Community Activity Restrictions), and PPKM.

Several stock indexes in Indonesia have decreased since discovering the virus. Throughout 2020, JII70 (Jakarta Islamic Index 70) decreased by 14.13%, ISSI (Indonesia *Shari'a* Stock Index) by 14.60%, and JII (Jakarta Islamic Index) by 15.83%, while the JCI (Jakarta Composite Index) fell by 12.77% and year to date (YTD), the *shari'a* index showed lower performance than JCI (Kompas.com, 2020). Nevertheless, the *Shari'a* Capital Market in Indonesia has made progress over the last ten years. The increase in the *Shari'a* capital market is an exciting study for Muslim investors in Indonesia who want to invest according to Islamic law. *Shari'a* financial products depend on the avoidance of usury (*usury*), uncertainty (*gharar*), gambling (*maysir*), and exploitation (Amaroh & Nasichah, 2021). According to data from September 2021 Financial Services Authority (2021), the total number of issuers listed in the capital market is 750. A total of 453 are also *shari'a* issuers. The developments of *shari'a* shares in 2018-September 2021 are as follows:

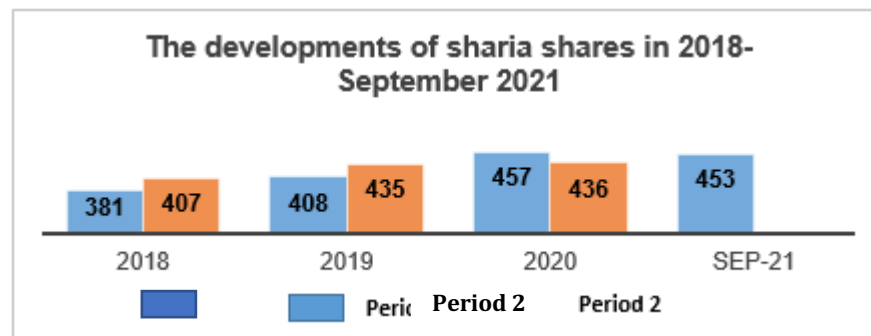


Figure 1. The developments of *shari'a* shares in 2018-September 2021 (Financial Services Authority, 2021)

The quantity of *shari'a* stock investors increased significantly from 531 in 2011 to 1,060,704 in September 2021 (Antaranews.com, 2021). Currently, there are four *shari'a* stock indexes listed on the Indonesia Stock Exchange, namely the Indonesia *Shari'a* Stock Index (ISSI), Jakarta Islamic Index (JII), Jakarta Islamic Index 70 (JII70), and IDX-MES BUMN 17. This study focuses on JII70 because this index is one of the stock indexes listed on the Indonesia Stock Exchange and contains 70 of the most liquid company stocks and includes investment criteria based on Islamic law. So that investors who are interested in investing in Islamic stocks can form more optimal combinations of stocks and consider the level of investment return and risk (Indonesia stock exchange).

In this regard, Figure 2 implies historical stock price data for JII70 during May 2018-September 2021.

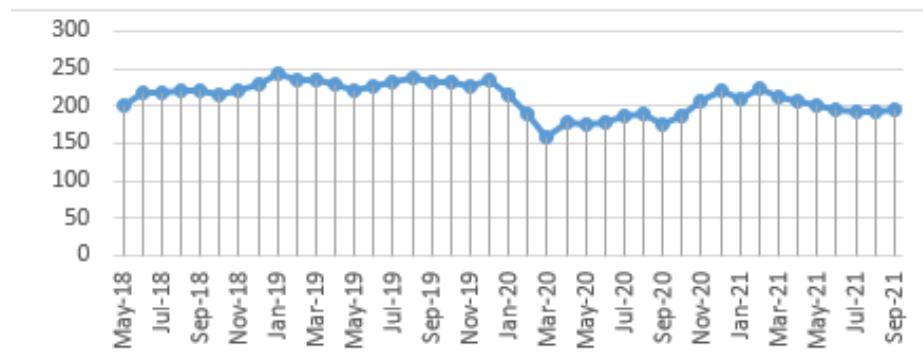


Figure 2. JII70 stock price chart during May 2018-September 2021
Source: (Investing.com)

Based on Figure 2, there was a decline in the JII70 stock price in March 2020, reaching 158.20. This number is the lowest level since the presence of JII70 on the Indonesia Stock Exchange. The stock price chart observed that the price of share JII70 tends to fluctuate, so the capitalization value market also fluctuates. The market capitalization data for JII70 on the Indonesia Stock Exchange before and during the widespread pandemic in Indonesia are as follows:

Table 1. JII70 Market Capitalization (Rp Billion)	
Year	Jakarta Islamic Index 70 (JII70)
2018	2.715.851,74
2019	2.800.001,49
2020	2.527.421,72
2021 January	2.415.553,10
February	2.634.883,88
March	2.507.884,98
April	2.456.004,52
May	2.369.452,15
June	2.295.593,60
July	2.270.364,06
Augst	2.378.737,73
September	2.527.978,48

Source: Financial Services Authority (2021)

This data shows a downward trend in market capitalization values, especially during the covid-19 pandemic. It could indicate that investor interest in investing in JII70 is decreasing. The returns from JII70 may be related to the general market reaction (common response) to changes in market value (Hartono, 2017).

The pandemic condition has also raised concerns for Islamic investors regarding which stocks to buy at JII70. Investors must be wise in analyzing the shares to find out the various risks and the level of return that will be received because shares are financial instruments that fluctuate and vary widely (Putra & Dana, 2020) to align the capabilities of investors in buying shares. Therefore, investors need to invest in various shares because company shares from other sectors will cover the investor's losses and even provide good profits.

According to Tambunan (2020), Investors in this case, also need to consider the average price from different times to evaluate the relative strengths and weaknesses of the market. Investors should also be careful in compiling a comprehensive and varied portfolio because stock markets in various parts of the world generally experience depreciation. Investor needs to consider the characteristics of assets, including the level of expected return, portfolio risk, and industry categorization of an asset, so that investors will be more selective through the most optimal diversification.

A few optimal portfolio formation models use, namely the Markowitz Model. The Markowitz model is a conventional model to solve portfolio selection issues accepting that future stock market situations can be described by past asset data information (Bekhet & Matar, 2012). Also, a Single Index Model compares the ERB ratio, namely the contrast among returns and risk-free assets, with point C* (cut-off point) (Sari & Suryawati, 2020). According to Varghese & Joseph (2018); Amaroh & Nasichah (2021), the difference between the Markowitz Model and the Single Index Model lies in the model's capacity to anticipate risk. The Markowitz model shows that assuming the relationship between the securities in the portfolio is entirely negative and can diminish to zero. Conversely, the Single Index Model's risk can diminish through diversification except for market risk.

In connection with various previous studies conducted by Singh & Gautam (2014), Bekhet & Matar (2012), Mulya & Herdiyana (2018), Sari & Suryawati (2020), Tjahjawati & Amalia (2021), and Yuliani & Achsani (2017) There are differences in the results of research regards to the Markowitz Model and the Single Index Model so that the distinction between this research with previous research is this research will present the results of the comparison of the optimal portfolio of the Markowitz Model and Single Index Model with a focus on recommendations for the proportion of funds, returns, and portfolio risk to become an additional reference for investors in making investment decisions on Jakarta Islamic Index 70 (JII70) stocks with two optimal portfolio formation models. This research continued by discussing the significant difference between return and risk of stocks included in optimal and non-optimal portfolios using the Markowitz and Single Index models. Likewise, this research takes an alternate object of study from previous research and the more recent research period.

Thus, this research contributes to helping investors by comparing the most profitable models according to their needs in forming a JII70 stock portfolio. The results of this study are usable as a source of perspective in making investment decisions by looking at the stocks included in the JII70 optimal portfolio utilizing the Markowitz Model and Single Index Model in conditions before and during the Covid-19 pandemic in Indonesia.

OPTIMAL PORTFOLIO FORMATION

Markowitz Model

Several models of optimal portfolio formation are the Markowitz Model (1952 and 1959), which is a pioneer work in portfolio analysis that examines the relationship between return and investment risk (Bekhet & Matar, 2012). According to Markowitz (1952), a standard proposes that the investors should diversify and maximize expected returns. The standard expresses that the investor does (or should) diversify his funds among those securities which give the maximum expected return. It accepts that there is a portfolio that provides both maxima with expected return and minimum variance, and it commends this portfolio to the investor. Diversification can't eliminate all variance. The portfolio with the maximum expected return isn't the one with minimum variance. There is a rate at which the investor can acquire an expected return by taking on variance or less variance by surrendering the expected return. In Markowitz diversification, Hartono (2017) states that the Markowitz model that uses the mean-variance method can reduce the level of portfolio risk if the securities have a correlation less than +1. The more securities included in the portfolio, the lower the level of portfolio risk, so a well-diversified portfolio consists of many assets—the advantages of the model. The advantage of the Markowitz Model is considered the maximum point of stock diversification to minimize the level of risk (Sari & Suryawati, 2020).

According to Tandelilin (2010), there are three aspects of the Markowitz Model that are important, namely as follows:

1. All portfolio points that focus on efficient surfaces are in the same position.
2. The Markowitz model does not exclude investors from borrowing funds for portfolio investment activities in risky assets. Moreover, the Markowitz Model also does not consider the opportunity for investors to invest in risk-free assets.
3. The realized efficient line is different for each investor.

Single Index Model

Varian (1993), in his research, found that the execution of the Markowitz Model takes more time and is more intricate with the number of estimates required. The two weaknesses of the Markowitz model are as follows Singh & Gautam (2014):

1. The Markowitz model requires many approximations to fill in the covariance matrix.
2. The Markowitz model does not provide a guideline for forecasting the security risk premium, which is essential for forming the efficient frontier of risky assets.

In the view of the weaknesses of the Markowitz Model, William Sharpe (1963) describes the Single-Index Model as a simplification of Markowitz's theory and compares the ERB ratio, namely the difference between return and risk-free assets with point C* (cut off point) (Sari & Suryawati, 2020). According to Bekhet & Matar (2012), The Single Index Model can handle large stock populations and is a simplified alternative to the total covariance approach for portfolio optimization. The Single Index Model formula's precision of portfolio variance is equally good as the accuracy of its assumptions. This model indicates that the returns from securities may be connected that there is a general market reaction (common response) to changes in market value. The price of a security fluctuates in the direction of the market price index (Hartono, 2017). The arrangement of an optimal portfolio using the Single Index Model consists of three steps. First, rating the shares by determining the Excess Return to Beta (ERB) Ratio, setting the

cut-off rate, and deciding the proportion of each selected stock in allocating funds (Azhar, 2016).

LITERATURE REVIEW

Singh & Gautam (2014) examines Single Index Model & optimal portfolio formation in NSE India listed banks. Their research concluded that from 10 companies as samples, two companies were selected as investment targets. Studies by Bekhet & Matar (2012) have seen that the Single Index model is similar to the Markowitz Model in the formed portfolio. Furthermore, the number of shares in the built portfolio doesn't influence the consequences of comparing the two portfolio formation models.

Mulya & Herdiyana (2018) analysis results uncover the optimal portfolio on the primary market capitalization, the greater part in the property and real estate sector of 40.76% and only consists of 1 share. Meanwhile, the most active trading volume portfolio comes from various sectors, namely cement, mining, property, the real estate sector, toll roads, airports, ports, and similar products. The weight of the majority is in the range above 10% to 15% by 47.42%.

Sari & Suryawati (2020) identified that the model that builds the optimal portfolio is the Markowitz model with the optimal Sharpe ratio and creates the best combination of expected return and portfolio risk than the single index model. These studies also related to the paper Tjahjawati & Amalia (2021) that the Markowitz Model better informs the optimal portfolio for LQ45 stocks for August 2019 – February 2021 than the Single Index Model because it has a lower risk. Contrary to these studies, Yuliani & Achsan (2017) shows that an efficient portfolio is computing utilizing the Single Index Model because it delivers the biggest expected return with a certain risk or produces the smallest risk with a certain expected return. The study results also align with a study by Pratama (2019) and Setyantho & Wibowo (2019).

METHODOLOGY

This study led to company shares being listed on the Jakarta Islamic Index 70 (JII70) for May 2018-September 2021 on the Indonesia Stock Exchange to obtain an optimal portfolio for investors. This research's optimal portfolio formation model is the Markowitz and the Single Index models. The formation of this optimal portfolio can be analyzed through a quantitative approach with a descriptive research type. The following are the computational stages in forming the optimal portfolio of the Markowitz Model and Single Index Model on JII70 and processed using Microsoft Excel (Hartono, 2014):

Model Markowitz

1. Calculate the realized return (R_{it}) shares listed on the Jakarta Islamic Index 70 (JII70) for May 2018-September 2021.

$$Return = \frac{P_t - P_{t-1} + D_t}{P_{t-1}} \quad (1)$$

R_{it} is a return at the expected time (realized returns) for May 2018-September 2021, P_{t-1} is the share price (closing price) in the previous period, P_t is the stock price (closing price) for the current period and D_t is the allocated dividend.

2. Calculate the expected return $E(R_i)$ on the Jakarta Islamic Index 70 (JII70) for May 2018-September 2021.

$$E(R_i) = \frac{\sum_{t=1}^n R_{it}}{N} \quad (2)$$

3. Calculate the risk (standard deviation) each share of the Jakarta Islamic Index 70 (JII70) company for May 2018-September 2021.

$$\sigma_i^2 = \frac{\sum_{t=1}^n [(R_{it} - E(R_i))^2]}{n} \quad (3)$$

$$\sigma_i = \sqrt{\sigma_i^2} \quad (4)$$

4. Calculate the covariance of two stocks in the portfolio ($\sigma_{RA, RB}$).

$$\sigma_{RA, RB} = \sum_{i=1}^n \frac{[(R_{At} - E(R_A)) \cdot (R_{Bt} - E(R_B))]}{n-1} \quad (5)$$

5. Calculate the correlation coefficient ($r_{AB} = \rho_{AB}$).

$$r_{AB} = \rho_{AB} = \frac{\sigma_{RA, RB}}{\sigma_A \cdot \sigma_B} \quad (6)$$

atau

$$r_{AB} = \frac{\sum_{i=1}^n (R_{A,i} - R_{B,i}) - n \cdot E(R_A) \cdot E(R_B)}{\sqrt{[\sum_{i=1}^n R_{A,i}^2 - n \cdot E(R_A)^2][\sum_{i=1}^n R_{B,i}^2 - n \cdot E(R_B)^2]}} \quad (7)$$

6. Determine the proportion of funds for each share (W_i).

The proportion of funds for each share of the company is obtained using a solver program from the Microsoft excel.

7. Determine the expected return of the portfolio $E(R_p)$.

$$E(R_p) = \sum_{i=1}^n (w_i \cdot E(R_i)) \quad (8)$$

8. Determine the portfolio risk (σ_p) (variance and standard deviation) of the portfolio.

For n-assets, the formula for assets is as follows:

$$\sigma_p^2 = [\text{proportion of variance}] + [\text{proportion of covariance}] \quad (9)$$

Or

$$\sigma_p^2 = \sum_{i=1}^n w_i^2 \cdot \sigma_i^2 + \sum_{i=1}^n \sum_{j=1}^n w_i \cdot w_j \cdot \sigma_{ij} \quad (10)$$

Single Index Model

1. Collect the stock price data recorded in the Jakarta Islamic Index 70 (JII70) for May 2018-September 2021 by looking at the closing price.
2. Calculate the realized return (R_{it}) and expected return $E(R_i)$ for each company on the Jakarta Islamic Index 70 (JII70) for May 2018-September 2021.
3. Calculate the market realized return (R_m).

$$R_{M, t} = \frac{IHSgt - IHSgt-1}{IHSgt-1} \quad (11)$$

R_m is the market index profit rate which is a random variable, $IHSgt$ is the current period of the Composite Stock Price index and $IHSgt-1$ is the previous period of the Composite Stock Price index.

4. Calculate the expected market return $E(R_m)$.

$$E(R_M) = \frac{\sum_{t=1}^n R_{Mt}}{N} \quad (12)$$

5. Calculate the Risk (Variance) of each share (σ_i^2) dan market (σ_m^2)

The standard deviation is the measurement applied to calculate risk, while the variance is the square of the standard deviation. The calculations are the same as in the Markowitz Model.

6. Calculate the Beta (β) value which indicates systematic risk.

$$\beta_i = \frac{\sigma_{iM}}{\sigma^2_M} \quad (13)$$

$$\beta_i = \frac{\sum_{t=1}^n (R_{it} - E(R_i)) \cdot (R_{mt} - E(R_m))}{\sum_{t=1}^n (R_{mt} - E(R_m))^2} \quad (14)$$

7. Calculate the Alpha value (α)

$$\alpha_i = E(R_i) - \beta_i \cdot E(R_m) \quad (15)$$

8. Calculate the Variance of the residual error (σ_{ei}^2).

$$\sigma_{ei}^2 = \sigma_i^2 - \beta_i^2 \cdot \sigma_m^2 \quad (16)$$

9. The Risk-free rate of return (RBR)

This study uses the BI-7 Day Reverse Repo Rate (BI7DRR) as the risk-free rate of return data.

10. Calculate the ERB (*Exces Return to Beta*).

Determination of Optimal Portfolio with determining the highest to lowest stock rating on ERB (*Exces Return to Beta*) which can be determined utilizing the following formula:

$$ERB_i = \frac{E(R_i) - RBR}{\beta_i} \quad (17)$$

11. Calculate the cut-off point (C^*). The restricting point calculates through the following steps:

a. Sort the securities from the largest ERB value to the smallest ERB value.

b. Determine the value of A_i and B_i for each security with the following formula:

$$A_i = \frac{[E(R_i) - RBR] \cdot \beta_i}{\sigma_{ei}^2} \quad (18)$$

$$B_i = \frac{\beta_i^2}{\sigma_{ei}^2} \quad (19)$$

c. Determine the value of C_i utilizing the following formula:

$$C_i = \frac{\sigma_M^2 \sum_{j=1}^i A_j}{1 + \sigma_M^2 \sum_{j=1}^i B_j} \quad (20)$$

12. Determine the proportion of funds (w_i).

The total proportion of every security on the optimal portfolio to be invested.

$$W_i = \frac{Z_i}{\sum_{j=1}^k Z_j} \quad (21)$$

$$Z_i = \frac{\beta_i}{\sigma_{ei}^2} (ERB_i - C^*) \quad (22)$$

13. Determine the beta of the portfolio (β_p).

$$\beta_p = \sum_{i=1}^n w_i \cdot \beta_i \quad (23)$$

14. Determine the alpha of the portfolio (α_p).

$$\alpha_p = \sum_{i=1}^n w_i \cdot \alpha_i \quad (24)$$

15. Determine expected return portfolio $E(R_p)$.

$$E(R_p) = \alpha_p + \beta_p \cdot E(R_m) \quad (25)$$

16. Determining portfolio risk (variant of portfolio) (σ_p^2)

$$\sigma_p^2 = (\sum_{i=1}^n w_i \cdot \beta_i)^2 \cdot \sigma_M^2 + (\sum_{i=1}^n w_i \cdot \sigma_{ei})^2 \quad (26)$$

$$\sigma_p^2 = \beta_p^2 \cdot \sigma_m^2 + (\sum_{i=1}^n w_i \cdot \sigma_{ei})^2 \quad (27)$$

DATA COLLECTION

Data Sources

This study uses a secondary data of historical data, namely stock price (closing price) in monthly, JII70 stock dividend data, BI-7 Day Reverse Repo Rate (BI7DRR) (Bank Indonesia) as a reference for risk-free assets, the Jakarta Composite Stock Price Index (JCI) as the market reference index for May 2018-September 2021. The data can be accessed on the official website of the Indonesia Stock Exchange (Indonesia stock exchange) and Yahoo Finance (Yahoo! finance).

Sample Selection

The population in this study are all company shares registered on the Jakarta Islamic Index 70 (JII70) in the period May 2018-September 2021, and there are 115 issuers of JII70 (Indonesia stock exchange). This study took samples through purposive sampling based on considerations that issuers whose shares were consistently included in the Jakarta Islamic Index 70 (JII70) during May 2018-September 2021. Based on these categories, the selected research sample is 37 JII70 issuers in table 2

Table 2. The research sample

No	Code	Stock Name	No	Code	Stock Name
1	AALI	Astra Agro Lestari Tbk.	20	KLBF	Kalbe Farma Tbk.
2	ACES	Ace Hardware Indonesia Tbk.	21	LINK	Link Net Tbk.
3	ADHI	Adhi Karya (Persero) Tbk.	22	LPPF	Matahari Department Store Tbk.
4	ADRO	Adaro Energy Tbk.	23	LSIP	PP London Sumatra Indonesia Tbk.
5	AKRA	AKR Corporindo Tbk.	24	MAPI	Mitra Adiperkasa Tbk.
6	ANTM	Aneka Tambang Tbk.	25	MIKA	Mitra Keluarga Karyasehat Tbk.
7	BMTR	Global Mediacom Tbk.	26	MNCN	Media Nusantara Citra Tbk.
8	BRPT	Barito Pacific Tbk.	27	PTBA	Bukit Asam Tbk.
9	CPIN	Charoen Pokphand Indonesia Tbk.	28	PTPP	PP (Persero) Tbk.
10	CTRA	Ciputra Development Tbk.	29	PWON	Pakuwon Jati Tbk.
11	DMAS	Puradelta Lestari Tbk.	30	SCMA	Surya Citra Media Tbk.
12	EXCL	XL Axiata Tbk.	31	SMRA	Summarecon Agung Tbk.
13	ICBP	Indofood CBP Sukses Makmur Tbk.	32	TLKM	Telekomunikasi Indonesia (Persero) Tbk.
14	INCO	Vale Indonesia Tbk.	33	TPIA	Chandra Asri Petrochemical Tbk.
15	INDF	Indofood Sukses Makmur Tbk.	34	UNTR	United Tractors Tbk.
16	INTP	Indocement Tunggal Prakarsa Tbk.	35	UNVR	Unilever Indonesia Tbk.
17	ITMG	Indo Tambangraya Megah Tbk.	36	WIKA	Wijaya Karya (Persero) Tbk.
18	JPFA	Japfa Comfeed Indonesia Tbk.	37	WTON	Wijaya Karya Beton Tbk.
19	KAEF	Kimia Farma Tbk.			

Source: Data processed by researchers (2021)

EMPIRICAL RESULTS AND DISCUSSION

Return dan Risk of Single Securities

Based on table 3, the expected return on the Jakarta Islamic Index 70 (JII70) stock for the May 2018-September 2021 period.

Table 3. Rate of return and risk of Single Securities

No	Stock Code	E(Ri)	σ_i	No	Stock Code	E(Ri)	σ_i	No	Stock Code	E(Ri)	σ_i
1	AALI	0.0039	0.1277	14	INCO	0.0182	0.1314	27	PTBA	0.0083	0.1049
2	ACES	0.0044	0.0809	15	INDF	0.0041	0.0734	28	PTPP	0.0026	0.1962
3	ADHI	0.0039	0.2125	16	INTP	-0.0029	0.1064	29	PWON	0.0029	0.1152
4	ADRO	0.0118	0.1184	17	ITMG	0.0164	0.1586	30	SCMA	0.0053	0.1404
5	AKRA	0.0080	0.1154	18	JPFA	0.0198	0.1456	31	SMRA	0.0124	0.1576
6	ANTM	0.0402	0.1845	19	KAEF	0.0362	0.2983	32	TLKM	0.0043	0.0677
7	BMTR	-0.0068	0.1566	20	KLBF	0.0030	0.0697	33	TPIA	0.0185	0.1759
8	BRPT	0.0351	0.2127	21	LINK	0.0019	0.1039	34	UNTR	0.0017	0.1017
9	CPIN	0.0203	0.1001	22	LPPF	-0.0074	0.1946	35	UNVR	-0.0163	0.0640
10	CTRA	0.0095	0.1479	23	LSIP	0.0092	0.1271	36	WIKA	0.0112	0.1682
11	DMAS	0.0273	0.1410	24	MAPI	0.0078	0.1298	37	WTON	-0.0027	0.1419
12	EXCL	0.0159	0.1146	25	MIKA	0.0097	0.0981				
13	ICBP	0.0035	0.0613	26	MNCN	0.0005	0.1485				

Source: Data processed with Microsoft Excel (2022)

Tabel 3 summarises that of the 37 sample stocks, it is indicated that 32 stocks have a positive expected return. There is a possibility that the issuer's shares can benefit investors in the future. In addition, five stocks have negative expected returns, which means that there is a possibility that these stocks will not be able to provide benefits to investors in the future. The stock with the largest expected return rate is PT Aneka Tambang Tbk. (ANTM) which is 0.0402 or 4.02%. In addition, the stock with the smallest expected return is the issuer of PT Unilever Indonesia Tbk. (UNVR) of -0.163 or -16.3%. Subsequently, the quantity of 4.02% to -16.3% indicates the rate of return that investors will get per month.

After knowing the level of return of each stock, investors must also observe the level of risk of each stock in JII70 to find out the deviation value between the realized return and the expected return of each stock. The stock that has the lowest risk indication is PT. Indofood CBP Sukses Makmur Tbk (ICBP) which is 0.0613. Meanwhile, the stock with the highest risk value indication is PT. Kimia Farma (Persero) Tbk. (KAEF). When connecting the return and risk, KAEF's stock has the second-largest return after ANTM's stock. It proves that stock returns and risk are positively related.

Covariance and Correlation Coefficient

Based on 1024 stock combinations, 905 stock combinations have positive covariance values, meaning that the values of the two variables move in the same direction. Furthermore, three pairs of issuers are independent or have a zero covariance value, namely ACES-ITMG, CPIN-ICBP, and ICBP-UNTR, meaning that the number of the two variables is independent or the mobility of one variable has nothing to do with the mobility of the other variables. In addition, there are 116 stock combinations with negative covariance, which indicates that the values of the two variables move in different directions.

The results of data analysis, the issuer pair PT. Pembangunan Perumahan (Persero) Tbk (PTPP) and PT. Wijaya Karya (Persero) Tbk (WIKA) has a positive correlation coefficient of 0.9153. In addition, the issuer pair PT. Kimia Farma Tbk (KAEF) and PT. Mitra Adiperkasa Tbk (MAPI) has the weakest correlation coefficient value of -0.3574. Both stocks are effective in reducing risk.

Overall, the correlation coefficient of all pairs of JII70 issuers is between +1 and -1. Therefore there will be a decrease in portfolio risk but does not eliminate the risk.

Markowitz Model Optimal Portfolio

This study focuses on the Markowitz Model's smallest optimal risk portfolio, the minimum variance portfolio or MVP (Minimal Variance Portfolio) (Hartono, 2017). This behavior of investors is referred to as risk-averse or investors who tend to avoid risk. After identifying the expected return and standard deviation of each stock in table 3, covariance and correlation coefficient between stocks, so the proportion of funds using the Markowitz model is calculated using the solver feature in Microsoft excel.

Based on table 4, the Markowitz Model on the smallest risk preference forms 12 stock combinations and the largest proportion of funds in PT. Indofood CBP Sukses Makmur Tbk (ICBP) by 31.30%. This number is identified as giving greater profit potential than other stocks. ICBP shares have demonstrated in table 3 that these shares have the smallest level of risk with a certain rate of return. Moreover, the smallest proportion of funds is found in PT. XL Axiata Tbk(EXCL) stocks which is only 0.30%. The mix of stocks that make up the optimal portfolio in table 4 produces the best return and risk based on a portfolio with the lowest risk level with a certain return.

Table 4. The proportion of funds, expected return, and portfolio risk using the Markowitz Model based on the smallest risk preference

No	Assets	Proportion	Expected Return of Portfolio	Portfolio Risk
1	ACES	12.56%		
2	ADRO	7.25%		
3	CPIN	4.49%		
4	EXCL	0.30%		
5	ICBP	31.30%		
6	KAEF	2.37%	0.66%	3.22%
7	KLBF	3.66%		
8	LINK	14.12%		
9	MIKA	13.03%		
10	PTBA	6.06%		
11	TLKM	2.90%		
12	UNTR	1.97%		
Total		100%		

Source: Data processed with solver program in Microsoft excel (2022)

The expected return on the portfolio obtained by investors based on the combination of stocks in table 4 is 0.66%, with a portfolio risk level of 3.22%. The portfolio risk level is smaller than the risk of every stock in the research sample. Overall, the Markowitz Model's optimal portfolio supposition of the smallest risk preference has been demonstrated to deliver the smallest level of risk with a certain return.

Single Index Model Optimal Portfolio

The market expected return value in this study is 0.0022 or 0.22%. with this market risk of 0.0456 or 4.56%

Value of Beta (β), Alpha (α), and Residual Error Variant (σ_{ei}^2)

Beta (β) measures the sensitivity of a security's return at JII70 to its market return (JCI). In addition, Alpha (α) is the expected rate of return of JII70 securities which is independent of the market rate of return (JCI) (Hartono, 2017). Table 5 summarises that the highest beta value is in PTPP shares, which is 3.5473, actually intending to assume the market return increases by one unit and the stock return increases by 3.5473. The variance of residual error (σ_{ei}^2) is a unique risk that shows the magnitude of the unsystematic risk in the company (Hartono, 2017).

Table 5. Beta (β), Alpha (α) Residual Error Variant (σ_{ei}^2) JII70 stocks

No	Stock Code	β_i	α_i	σ_{ei}^2	No	Stock Code	β_i	α_i	σ_{ei}^2
1	AALI	1.9744	-0.0005	0.0082	20	KLBF	0.6033	0.0016	0.0041
2	ACES	0.5918	0.0031	0.0058	21	LINK	0.8635	0.0000	0.0092
3	ADHI	3.2171	-0.0034	0.0236	22	LPPF	2.2092	-0.0123	0.0277
4	ADRO	1.0294	0.0095	0.0118	23	LSIP	1.4146	0.0061	0.0120
5	AKRA	2.0244	0.0035	0.0048	24	MAPI	1.9408	0.0034	0.0090
6	ANTM	2.7284	0.0341	0.0186	25	MIKA	0.4337	0.0087	0.0092
7	BMTR	1.9050	-0.0110	0.0170	26	MNCN	1.8269	-0.0036	0.0151
8	BRPT	1.7769	0.0311	0.0387	27	PTBA	0.8446	0.0064	0.0095
9	CPIN	0.7786	0.0186	0.0088	28	PTPP	3.5473	-0.0053	0.0123
10	CTRA	2.3349	0.0042	0.0105	29	PWON	1.8810	-0.0013	0.0059
11	DMAS	2.1331	0.0225	0.0104	30	SCMA	2.0156	0.0008	0.0112
12	EXCL	1.1704	0.0133	0.0103	31	SMRA	2.3588	0.0071	0.0132
13	ICBP	0.1284	0.0032	0.0037	32	TLKM	0.8293	0.0025	0.0031
14	INCO	1.8001	0.0142	0.0105	33	TPIA	1.4123	0.0153	0.0268
15	INDF	0.4966	0.0030	0.0049	34	UNTR	0.6967	0.0001	0.0093
16	INTP	1.1633	-0.0055	0.0085	35	UNVR	0.2251	-0.0168	0.0040
17	ITMG	1.8158	0.0123	0.0183	36	WIKA	2.7876	0.0049	0.0121
18	JPFA	1.5974	0.0162	0.0159	37	WTON	2.2154	-0.0077	0.0099
19	KAEF	-0.6190	0.0376	0.0882					

Source: Data processed with Microsoft Excel (2022)

ERB (Exces Return to Beta)

The ERB ratio implies measuring the relative excess return of one unit of risk that can't be diversified and is estimated utilizing Beta. The RBR value used is BI-7 Day Reverse Repo Rate data, which is 0.0012 per month during May 2018-September 2021. Therefore, the $E(R_i)$ value must be greater than the RBR value to be selected in the optimal portfolio. Thus, investors will be more profitable than investing in banks if investors invest in stocks. The ERB JII70 values in this study, arranged from the largest ERB value to the smallest ERB value, are observed in table 7. The determination of the optimal portfolio with a single index model continued by calculating the cut-off point (C^*).

Determine the Cut-Off Point (C^*) value

The cut-off point (C^*) is calculated by calculating the variables A_i and B_i and then determining the value of C_i . The values of A_j and B_j can be observed in table 6 as follows:

Table 6. A_j , B_j , and C_i Values of Individual Stocks

No	Stock Code	ΣA_j	ΣB_j	C_i	No	Stock Code	ΣA_j	ΣB_j	C_i
1	CPIN	1.7035	69.2613	0.003099	20	CTRA	33.8937	4110.7479	0.007382
2	MIKA	2.1048	89.6281	0.003692	21	MAPI	35.3243	4529.2866	0.007051
3	BRPT	3.6646	171.2447	0.005623	22	AKRA	38.2355	5384.7024	0.006519
4	ICBP	3.7450	175.6753	0.005708	23	KLBF	38.5062	5473.4461	0.006467
5	ANTM	9.4898	576.7110	0.008977	24	SCMA	39.2565	5834.6686	0.006216
6	EXCL	11.1729	709.9515	0.009386	25	AALI	39.9276	6311.0693	0.005879
7	TPIA	12.0881	784.4007	0.009557	26	PWON	40.4959	6910.4948	0.005479
8	DMAS	17.4574	1222.0389	0.010254	27	LINK	40.5644	6991.2474	0.005429
9	JPFA	19.3338	1382.5313	0.010378	28	ADHI	40.9322	7429.7612	0.005175
10	ADRO	20.2588	1472.1732	0.010375	29	UNTR	40.9720	7481.7156	0.005146
11	INCO	23.1800	1780.0701	0.010254	30	PTPP	41.3987	8505.7228	0.004607
12	PTBA	23.8142	1855.0649	0.010197	31	MNCN	41.3232	8726.6325	0.004488
13	ITMG	25.3233	2035.3908	0.010066	32	WTON	40.4578	9221.6449	0.004170
14	INDF	25.6273	2085.9589	0.009986	33	INTP	39.9022	9380.9513	0.004046
15	LSIP	26.5803	2252.8615	0.009725	34	LPPF	39.2233	9557.0649	0.003908
16	ACES	26.9096	2313.0220	0.009633	35	BMTR	38.3342	9770.7207	0.003740
17	SMRA	28.9043	2733.1893	0.008994	36	KAEF	38.0883	9775.0658	0.003714
18	TLKM	29.7397	2951.7055	0.008665	37	UNVR	37.1037	9787.7560	0.003613
19	WIKA	32.0448	3592.1416	0.007868					

Source: Processed data (2022)

Tabel 6 presents that the largest value of C_i is in stocks PTJapfa Comfeed Indonesia Tbk (JPFA), which is 0.010378 or 1.038%. The cut-off point (C^*) indicates the limit for the value of the ERB, which is sorted as high and deserves to be included in the optimal portfolio stock. Therefore, stocks with ERB values greater than or equal to the cut-off point (C^*) or ERB values C^* values are the stocks chosen in the optimal portfolio of the Single Index Model.

Table 7. Selection of optimal portfolio stocks

No	Stock Code	ERBi	C_i	Decision	No	Stock Code	ERBi	C_i	Decision
1	CPIN	0.02459	0.01038	Selected	20	CTRA	0.00357	0.01038	No
2	MIKA	0.01970	0.01038	Selected	21	MAPI	0.00342	0.01038	No
3	BRPT	0.01911	0.01038	Selected	22	AKRA	0.00340	0.01038	No
4	ICBP	0.01814	0.01038	Selected	23	KLBF	0.00305	0.01038	No
5	ANTM	0.01432	0.01038	Selected	24	SCMA	0.00208	0.01038	No
6	EXCL	0.01263	0.01038	Selected	25	AALI	0.00141	0.01038	No
7	TPIA	0.01229	0.01038	Selected	26	PWON	0.00095	0.01038	No
8	DMAS	0.01227	0.01038	Selected	27	LINK	0.00085	0.01038	No
9	JPFA	0.01169	0.01038	Selected	28	ADHI	0.00084	0.01038	No
10	ADRO	0.01032	0.01038	No	29	UNTR	0.00077	0.01038	No
11	INCO	0.00949	0.01038	No	30	PTPP	0.00042	0.01038	No
12	PTBA	0.00846	0.01038	No	31	MNCN	-0.00034	0.01038	No
13	ITMG	0.00837	0.01038	No	32	WTON	-0.00175	0.01038	No
14	INDF	0.00601	0.01038	No	33	INTP	-0.00349	0.01038	No
15	LSIP	0.00571	0.01038	No	34	LPPF	-0.00386	0.01038	No
16	ACES	0.00547	0.01038	No	35	BMTR	-0.00416	0.01038	No
17	SMRA	0.00475	0.01038	No	36	KAEF	-0.05660	0.01038	No
18	TLKM	0.00382	0.01038	No	37	UNVR	-0.07759	0.01038	No
19	WIKA	0.00360	0.01038	No					

Source: Processed data (2022)

The largest ERB value is in stocks PT. Charoen Pokphand Indonesia Tbk (CPIN) of 0.0246 or 2.46% based on the ERB value. Thus, CPIN shares will ensure to be one of the stocks in the optimal portfolio with the Single Index Model. In addition, the smallest ERB value is in stocks

PT. Unilever Indonesia Tbk (UNVR) of (- 0.0776) or (-7.76%), so UNVR shares can ascertain not to be included in the optimal portfolio.

Table 7 presents 37 stocks that were consistent in JII70 for the May 2018-September 2021 period, and there were only 9 stocks selected to be the optimal portfolio stocks with the Single Index Model. The selected shares are shares of PT Charoen Pokphand Indonesia Tbk. (CPIN), PT. Mitra Keluarga Karya Sehat Tbk. (MIKA), PT Barito Pacific Tbk. (BRPT), PT Indofood CBP Sukses Makmur Tbk. (ICBP), PT. Aneka Tambang Tbk. (ANTM), PT. XL Axiata Tbk. (EXCL), PT Chandra Asri Petrochemical Tbk. (TPIA), PT. Puradelta Lestari Tbk. (DMAS), and PT. Japfa Comfeed Indonesia Tbk. (JPFA).

Proportion of funds

The funds proportion for each share in this optimal portfolio shows as follows:

Table 8 The values of Zi and Wi (proportion of funds)

No	Stock Code	Company Name	Zi	Wi (%)
1	CPIN	Charoen Pokphand Indonesia Tbk.	1.264673	33.03%
2	MIKA	Mitra Keluarga Karyasehat Tbk.	0.437938	11.44%
3	BRPT	Barito Pacific Tbk.	0.401153	10.48%
4	ICBP	Indofood CBP Sukses Makmur Tbk.	0.268033	7.00%
5	ANTM	Aneka Tambang Tbk.	0.580138	15.15%
6	EXCL	XL Axiata Tbk.	0.256679	6.70%
7	TPIA	Chandra Asri Petrochemical Tbk.	0.100941	2.64%
8	DMAS	Puradelta Lestari Tbk.	0.387902	10.13%
9	JPFA	Japfa Comfeed Indonesia Tbk.	0.131955	3.45%
Total				100%

Source: Processed data (2022)

Table 8 shows that the stock with the largest proportion in the Single Index Model is the stock of PT Charoen Pokphand Indonesia Tbk. (CPIN) with the proportion of funds of 33.03%. This figure identifies to provide greater profit potential than other stocks. In addition, the smallest proportion of funds is PT Chandra Asri Petrochemical Tbk. (TPIA) with the proportion of funds of 2.64%. Table 9 presents the level of expected return and optimal portfolio risk with the Single Index Model based on the proportion of these funds.

Table 9. Expected Return and Optimal Portfolio Risk

No	Optimal Portfolio of Single Index Model	
1	Alpha Portfolio (α_p)	0.0199
2	Beta Portfolio β_p	1.3020
3	Systematic Risk ($\beta_p^2 \sigma_M^2$)	0.0035
4	Unique risk (σ_{ep}^2)	0.0021
5	Total Portfolio Risk (σ_p)	0.0753
6	The Portfolio's Expected return $E(R_p)$	0.0228
7	Portfolio corner	0.2882

Source: Processed data (2022)

Table 9 presents that the expected return on the optimal portfolio of stocks with the Single Index Model is 0.0228 or 2.28%, and a portfolio risk level of 0.0753 or 7.53%. The portfolio's

expected return rate of 2.28% identify as exceeding the rate of return on risk-free assets represented by the Bi-7 Day Reverse Repo Rate of 0.12% per month. In addition, the portfolio's expected return provides a higher level of return and risk than the expected return and market risk. The portfolio beta is 1.3020. It demonstrates that investors will receive a lower rate of return than the market rate of return.

With the analysis obtained, it is essential to compare each optimal and non-optimal expected return and stock risk on the Markowitz and Single Index models. The purpose is to strengthen the research argument that diversification needs to be carried out to obtain the best-expected return and portfolio risk and understand statistical differences between optimal stocks and not optimal portfolios utilizing the Markowitz Model and Single Index Model.

A Normality Test

Before performing the comparison test, a normality test will do utilizing the Shapiro-Wilk test using SPSS (Statistical Product and Service Solutions) software. The normality test results on the Markowitz model found that the P-value (Sig). The optimal stock return and risk data are 0.009, and 0.000 is less than 0.05, meaning that the data distribution is not normally distributed. In addition, the non-optimal stock return and risk data of 0.472 and 0.643 are greater than 0.05. Moreover, the data distribution shows a normal distribution. The optimal and non-optimal expected return and stock risk in the Single Index Model with normality test found that the P-value (Sig). The optimal stock return and risk data are 0.883, and 0.943 are more than 0.05. Overall the data distribution is normal. Besides that, the non-optimal stock return and risk data of 0.032 and 0.024 are smaller than 0.05. In this manner, the data distribution does not show a normal distribution and cannot accept the assumption of data normality. Thus, the Mann-Whitney test can be utilized as an option to the t-test when the data are not normally distributed (Hart, 2001).

Comparative Hypothesis Test Results (Mann-Whitney U Test)

Table 10. Comparison of optimal and non-optimal portfolios based on stock returns and risks

	Markowitz Model (Asymp. Sig. (2-tailed))	Single Index Model (Asymp. Sig. (2-tailed))	Test result	Decision
H1	0.721	–	$0.721 > 0.025$	Rejected
H2	0.001	–	$0.001 < 0.025$	Accepted
H3	–	0.001	$0.001 < 0.025$	Accepted
H4	–	0.915	$0.915 > 0.025$	Rejected

Source: Data processed with SPSS 21 (2022)

H1 : There is a significant difference between the return of stocks included in the optimal and non-optimal portfolio utilizing the Markowitz model

The different test results in table 10 between the optimal and non-optimal expected return and stock risk on the Markowitz Model with the Mann-Whitney U-Test show the Asymp value. Sig. (2-tailed) returns 0.721, which means it is greater than 0.025, so the stock returns included in the optimal and non-optimal portfolios utilizing the Markowitz model have no significant difference and reject H1. This result was influenced by the combination of stocks selected in the Markowitz Model and individual stock returns. It is found that 6 stocks tend to have high expected returns and 6 stocks tend to have low expected returns.

H2 : There is a significant difference between the risk of stocks included in the optimal and non-optimal portfolio utilizing the Markowitz model

The different test results in table 10 show the Asymp value. Sig. (2-tailed) at risk is 0.001, meaning this value is less than 0.025. Consequently, the risk of stocks included in the optimal and non-optimal portfolios utilizing the Markowitz model has a significant difference so that H2 can be accepted. It indicates that the difference between optimal and non-optimal stocks with the Markowitz Model affects stock risk. The risk level of stocks in the optimal portfolio combination of the Markowitz Model tends to form stock combinations with low risk.

H3 : There is a significant difference between the return of stocks included in the optimal and non-optimal portfolio utilizing the Single Index Model

The difference test results in table 10 between the optimal and non-optimal expected return and stock risk on the Single Index Model with the Mann-Whitney U-Test show the Asymp value. Sig. (2-tailed) on the return is 0.000, implying smaller than 0.025. In this way, the stock returns included in the optimal and non-optimal portfolios utilizing the Single Index Model have a significant difference so that H3 can be accepted. The combination of stocks selected with the Single Index Model tends to have a high expected return so that, stock returns influence the difference between optimal and non-optimal stocks with the Single Index Model.

H4 : There is a significant difference between the risk of stocks included in the optimal and non-optimal portfolio utilizing the Single Index Model

The different test results in table 10 show the Asymp value. Sig. (2-tailed) at risk is 0.931, indicating that this value is greater than 0.025. Thus, the risk of stocks included in the optimal and non-optimal portfolios using the Single Index Model has no significant difference. At this point, this strongly rejects H4. Because of 9 stock issuers in Single Index Model, there are 4 stock issuers with low risk and 5 stock issuers with a high risk.

The research results show that the Markowitz Model and the Single Index Model have built an optimal portfolio on JII70 with different assumptions. Subsequently, the Markowitz Model and the Single Index Model have no significant difference. The results of this study related to Bekhet & Matar, (2012) research, which found no significant difference between the Markowitz Model and the Single Index Model. There was no more between the Markowitz Model and the Single Index Model. besides, Yuwono & Ramdhani, (2017) likewise found that the Markowitz Model and the Single Index Model did not significantly differ in optimal portfolio performance.

Managerial Implications

This study indicates that a certain expected return level and the smallest portfolio risk stocks are obtained through the Markowitz Model for the smallest risk preference. The Markowitz Model will be suitable for more risk-averse investors. However, investors tend to like to take risks (risk seekers) and prefer that the security price moves in a similar direction as the market price index to observe or take a portfolio with the Single Index Model. This model delivers a combination of stocks with the biggest expected return with certain portfolio risk. Investors can adjust the percentage of the portfolio assigned to every stock according to the proportion of funds in this study. These results imply a reference and a variety of different stock investment options for *shari'a* stock investors who tend to still hesitate in choosing which shares to choose in JII70 shares, managers, policymakers, and JII70 issuers in conditions before and during the Covid-19 pandemic in Indonesia.

CONCLUSIONS

Based on the study analysis results, there are 12 stock combinations of the Markowitz Model, the portfolio's expected 'return rate is 0.0066 or 0.66%, and the portfolio risk is 0322 or 3.22%. Meanwhile, in the Single Index Model, 9 stock combinations are formed, the expected rate of return is 0.0228 or 2.28%, and the optimal portfolio risk is 0.0753 or 7.53%. Thus, investors can observe suitable stocks' combination, return, and risk for their investment decisions. Our study reveals that no significant difference between stock returns included in optimal and non-optimal portfolios utilizing the Markowitz model. However, the risk of stocks included in the optimal and non-optimal portfolios utilizing the Markowitz model has a significant difference. In addition, it was observed that stock returns included in the optimal and non-optimal portfolios using the Single Index Model have a significant difference. However, the risk of stocks included in the optimal and non-optimal portfolios using the Single Index Model has no significant difference.

RESEARCH LIMITATIONS

This study only focuses on one *Shari'a* stock index in Indonesia, namely JII70. This study also focuses on using technical analysis. The data used is historical data that can calculate stock betas but can change if market conditions also change. However, this study applies two models of optimal portfolio formation on more *Shari'a* stocks to be one of the latest research in the period before and during the Covid-19 pandemic in Indonesia. After knowing the combination of stocks, expected return, and portfolio risk, this study examines the differences in stocks included in the optimal and non-optimal portfolios through the Markowitz Model and Single Index Model.

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