OPTIMAL PORTFOLIO FORMATION USING A SINGLE INDEX MODEL ON THE IDX80 INDEX FOR THE PERIOD FEBRUARY 2021–MAY 2022

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Abstrak

Kebijakan Bank Sentral Amerika Serikat (AS) yaitu *The Fed* dalam menaikkan suku bunga acuannya telah meningkatkan risiko volatilitas di pasar global dan memicu sentimen negatif bagi investor asing di Indonesia. Investor asing mulai melepaskan kepemilikannya hingga mencapai Rp3,19 triliun. Hal tersebut menyebabkan adanya risiko penurunan harga. Investor perlu melakukan diversifikasi melalui pembentukan portofolio optimal untuk meminimumkan risiko dan memaksimumkan return. Tujuan dari penelitian ini adalah untuk menganalisis pembentukan portofolio optimal pada indeks IDX80 periode Februari 2021–Mei 2022. Jenis penelitian ini adalah deskriptif dengan menggunakan metode kuantitatif. Sampel penelitian ini menggunakan teknik *purposive sampling.* Penelitian ini menggunakan data sekunder dengan metode pengumpulan data yaitu dokumentasi dan studi pustaka. Metode analisis data dalam penelitian ini adalah model indeks tunggal. Hasil penelitian menunjukkan bahwa dari 53 sampel saham terdapat 19 saham yang optimal. Tingkat *expected return* portofolio sebesar 0,20% secara harian sedangkan risiko portofolio sebesar 0,05%.

Kata Kunci: Suku Bunga, Portofolio Optimal, Indeks IDX80, Model Indeks Tunggal
JEL Code: E27, F45, G11

Abstract

The policy of the Central Bank of the United States (US), namely the Fed, in raising its benchmark interest rate, has increased the risk of volatility in global markets and triggered negative sentiment for foreign investors in Indonesia. Foreign investors began to relinquish their ownership up to Rp 3.19 trillion. This caused the risk of falling prices. Therefore, investors must diversify by forming an optimal portfolio to minimize risk and maximize return. This study aims to analyze the formation of the optimal portfolio on the IDX80 index for the period February 2021–May 2022. This type of research is descriptive, using quantitative methods. The sample of this research used a purposive sampling technique. This study uses secondary data with data collection methods, namely documentation, and literature study. The data analysis method in this study is a single index model. The results showed that of the 53 stock samples, there were 19 optimal stocks. The expected return portfolio level is 0.20% in one day, while the portfolio risk level is 0.05%.

Keywords: Interest Rate, Optimal Portfolio, IDX80 Index, Single Index Model
JEL Code: E27, F45, G11

INTRODUCTION

Since 2021, high inflation rates have hit various countries worldwide due to supply chain disruptions, energy constraints, and efforts to recover the economy after the COVID-19 pandemic (Bank Indonesia, 2021). One of the efforts to suppress the high rate of inflation, the US Central Bank, known as the Fed as the most powerful financial institution in the world, has officially raised its benchmark interest rate to maintain the stability of the currency value to maintain it (Malik, 2022).

Based on data from CNN Indonesia (www.cnnindonesia.com, 2022), the Fed announced on Wednesday (5/4/2022) an increase in its benchmark interest rate by 50 basis points or 0.5% as an effort to control high inflation. The US benchmark interest rate increase is the largest in the last 22 years. Based on CNBC Indonesia (CNCB INDONESIA, 2022) data, the US inflation rate increased by 8.4% year on year (YoY) as of March 2022. This inflation rate is the highest in the last 41 years since December 1981.

The United States experienced high inflationary pressures along with rising food and commodity prices, one of which was triggered by the conflict between Russia and Ukraine, so the Fed became aggressive in raising its benchmark interest rate. However, this poses a risk of volatility in global financial markets, including Indonesia (Kusnandar, 2022).

The increase in US central bank interest rates became a separate sentiment for the Indonesian capital market, where foreign investors sold up to Rp 3.19 trillion in all markets. In line with a large number of foreign investors selling, the Jakarta Composite Index (JCI) on Monday (9/5/2022) was corrected by 4.42% to 6,909.75, and on Tuesday (5/10/2022), it was also updated until it closed lower to the level of 6,819 (Ariesta, 2022). The decline in the JCI was due to the market's response to the Fed's policy of raising its benchmark interest rate.

An increase in interest rates will directly impact investment instruments, especially stocks. In the macroeconomic sphere, there is a relationship between interest rates and investment. If interest rates rise, investment will decrease (Wakidah, 2022).

The global sentiment caused by the Fed triggered the market to experience a correction and caused high volatility (Hema, 2022). Volatility due to global macroeconomic factors is an unavoidable market risk. This fluctuating market encourages investors to be careful in managing funds to invest.

Along with the fluctuating capital market conditions, investors must be careful in managing funds to invest. One strategy to respond to situations amid high volatility is to diversify in the form of a portfolio so that investors can minimize risk and maximize returns (Dirgantara, 2022). In line with the portfolio theory proposed by Harry Markowitz in 1952, namely "Don't Put All Your Eggs in One Basket," investors can reduce risk in investing by forming an optimal portfolio.

One method that can be used to form an optimal portfolio is the single index model developed by William Sharpe in 1963 (Hartono, 2017). The calculation on the single index model simplifies the Markowitz model, which is considered very complex (Oktaviani & Wijayanto, 2015). The single index model also has the advantage of paying attention to market aspects and the company's uniqueness to show the relationship between securities and changes in market prices.

The two relationships can be seen when market conditions improve. The stock price will rise, whereas when market conditions worsen, the stock price will fall (Prasetyo & Suarjaya, 2020). Hartono (2017) argues that returns from securities have a unidirectional correlation because there is a typical response to market values changes, so portfolio results using a single index model will better reflect current market conditions.

Furthermore, the problem is that investors often need more certainty in choosing the stocks that make up the optimal portfolio. The Indonesia Stock Exchange (IDX), as of May 2022, has 40 stock indices that can be used as the basis for investment decisions. One of the indexes owned by the IDX is IDX80 which measures the price performance of 80 leading stocks on the IDX.

Previous studies on forming an optimal portfolio with a single index model showed different samples and research periods. For example, research conducted by Febrianti, Marjono, and Apriani (2021) on the JII index for the 2017-2019 period resulted in an expected return smaller than the portfolio risk, namely a return of 1.04% with a portfolio risk of 9.9% because the research period was a bearish condition for the Indonesian capital market. Furthermore, Iryani's (2019) research on the LQ45 index for the 2017-2018 period resulted in an expected return of 4.37% and portfolio risk of 1.54%. The LQ45 index was chosen because this index occupies the highest position in the largest market capitalization, mostly traded on the IDX during the specified timeframe.

Based on previous research, there are differences in the observation period and the research sample. This research will develop existing research with novelty during the observation period and research samples by adjusting to the current fluctuating conditions of the Indonesian capital market. The gap from previous research is that no researchers use the IDX80 index research object. The IDX80 Index was chosen because this index has high liquidity, large market capitalization, and supporting by fundamentally strong stocks. Large market capitalization indicates that investors can use the company as an investment destination. High liquidity can attract investors because only companies can maintain their share circulation to remain active and consistent with being in the index (Nurlaeli & Artati, 2020). Based on some of the advantages of 80 stock options, it expects to provide more opportunities for investors to optimize their profits.

Another difference is that this research was conducted from February 2021–May 2022. The reason for this period was chosen because, based on data from Bank Indonesia, since 2021, the global economy has faced various challenges, such as rising energy prices and commodity prices. The period for May 2022 was chosen because that month, the US officially raised its benchmark interest rate to suppress the high inflation rate. Some of these things can disrupt the stability of the Indonesian capital market and pose a risk to investors in investing, so this research uses daily closing price data to get closer to the actual stock price.

Furthermore, this study uses a single index model because the model pays attention to aspects of market movements so that the portfolio results will better reflect the actual conditions that are currently happening. The results of this study will contribute to the development of existing research related to the formation of an optimal portfolio with a single index model for stocks on the IDX80 index, especially for the Indonesian capital market, which is currently in an unstable condition due to the global economic situation.

LITERATURE REVIEW

Optimal Portfolio

The optimal portfolio is a portfolio that combines the level of expected return with the best level of risk (Hartono, 2017). Optimal portfolio formation can be done by two methods, namely Markowitz and Single Index. William F. Sharpe, in 1963 introduced the single index model as a simplification of the Markowitz model. Investors use the single index model more widely because the calculations are considered easier to understand.

The difference between the two models is that the Markowitz model is known as the "Mean-Variance Model," where the mean is a measurement of expected return by calculating the average, and Variance is a measurement of the level of risk. In contrast, the single index model is calculated by comparing excess return to Beta (ERB) with a cut-off point (C*).

ERB is the difference in expected return that exceeds the risk-free asset return as measured by Beta, while the cut-off point (C*) is the limiting point to determine the highest ERB value. Therefore, stocks with an ERB value more significant than the cut-off point value are optimal stocks (Tandelilin, 2017).

IDX80 Index

The IDX80 index consists of 80 leading stocks with a large market capitalization, high liquidity, and good financial performance (IDX, 2022). Dwipradnyana, Gusti, and Diatmika (2021) state that stocks listed on the IDX80 index must pass the selection, including the following:

1. Filtering 150 stocks from all stocks listed on the IDX based on the total transaction value in the stock market for the last 12 months.

2. Based on the 150 stocks, 80 stocks will be re-selected with the criteria of high transaction frequency, several trading days in the stock market, and large market capitalization.

RESEARCH METHODOLOGY

This research describes and analyzes related to forming an optimal portfolio on the IDX80 index for February 2021–May 2022 with a single index model. The type of data used in this research is quantitative. Sekaran & Bougie (2016) define quantitative as a type of data in numbers.

Population and Sample

The population used in this study were stocks listed on the IDX80 index from February 2021 – May 2022. Furthermore, sampling will be conducted because the population is only partially used as the research object. The sample in this study used a purposive sampling technique. Sugiyono (2017) defines purposive sampling as a technique with specific criteria. The criteria set out in this study are as follows:

1. Companies listed in the IDX80 index for February 2021–May 2022.

2. Companies that publish complete financial statements. This criterion is determined so investors can see the company's financial performance through financial statements.

3. Companies consistently listed on the IDX80 index consecutively on the IDX in February 2021–May 2022. This criterion indicates that the consistent stocks are actively traded by investors and have high liquidity.

4. Never do corporate actions such as stock splits and reverse stock splits. This criterion is determined so there is no bias in stock price changes after the corporate action.

Types of Data

The data types in this study are quantitative, using secondary data required for this study. Secondary data is sourced from several official websites, including:

1. Financial report data obtained from the websites www.idx.co.id

2. List of IDX80 index stocks for the period February 2021–May 2022 obtained from the official IDX website on the www.idx.co.id

3. Daily adjusted close prices of IDX80 index stocks included in the research sample obtained from the websites www.finance.yahoo.com

4. The daily adjusted close price of the Jakarta Composite Index (JCI) for the period February 2021–May 2022, obtained from the websites www.finance.yahoo.com

5. Bank Indonesia interest rate data (BI 7-Day Reverse Repo Rate) for the period February 2021–May 2022 obtained from the websites www.bi.go.id

Method of Data Analysis

The data analysis technique is a single index model to determine the optimal portfolio set. Hartono (2017) divides the steps for forming an optimal portfolio with a single index model, including:

1. Calculating the Realized Return and Expected Return of Individual Stock

$$Rit = \frac{P_i - P_{t-1}}{P_{t-1}}$$

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

Annotation:

Rit = Realized return of the stock
P_i = Closing price of the stock
P_{t-1} = Closing price of the stock t-1
$E(Ri)$= Expected return of the stock
n = Number of samples

2. Calculating the Realized Return and Expected Return of Market

$$Rmt = \frac{IHSG_t - IHSG_{t-1}}{IHSG_{t-1}}$$

$$E(Rm) = \frac{\sum_{t=1}^{n} R_{mt}}{n}$$

Annotation:

Rmt = Realized return of market
$IHSG_t$ = Closing price of market
$IHSG_{t-1}$ = Closing price of market t-1
$E(Rm)$ = Expected return of market

3. Calculating the Standard Deviation and Variance of Individual Stock and Market

$$\sigma_i = \sqrt{\sum_{t=1}^{n} \frac{\{(Ri - E(Ri)\}^2}{n-1}}$$

$$\sigma_m = \sqrt{\sum_{t=1}^{n} \frac{\{(Rm - E(Rm)\}^2}{n-1}}$$

Annotation:

σi = Standard deviation of the stock
R_{it} = Realized return of the stock
$E_{(Ri)}$ = Expected return of the stock
σm = Standard deviation of market
R_m = Realized return of market
$E_{(Rm)}$= Expected return of market

4. Calculating Beta and Alpha of a Stock

$$\beta i = \frac{\sigma im}{\sigma m^2}$$

$$\alpha i = E(Ri) - \beta i \,.\, E(Rm)$$

Annotation:

βi = Beta of the stock

σim = Covariance stock return with market return

σm^2 = Variance of market

αi = Alpha of the stock

$E_{(Ri)}$ = Expected return of the stock

$E_{(Rm)}$ = Expected return of market

5. Calculating Residual Error

$$\sigma_{ei^2} = \sigma_i{}^2 - \beta_i{}^2 \; x \; \sigma_m{}^2$$

Annotation:

σ_{ei^2} = Variance of residual error

$\sigma_i{}^2$ = Variance of the stock

βi = Beta of the stock

$\sigma_m{}^2$ = Variance of market

6. Calculating Risk-Free Asset Return

Risk-Free Assets in this study used the Bank Indonesia Reference Interest Rate, namely the BI 7-Day Reverse Repo Rate (BI7DRR) for the period February 2021–May 2022.

7. Calculating Excess Return to Beta

$$ERBi = \frac{E(Ri) - R_f}{\beta i}$$

Annotation:

$ERBi$ = Excess return to Beta the stock

$E(Ri)$ = Expected return of the stock

R_f = Return risk-free asset

βi = Beta of the stock

8. Calculating Ai, Bi, and Ci

$$Ai = \frac{[E(Ri) - R_f].\beta i}{\sigma_{ei^2}}$$

$$Bi = \frac{\beta_i^2}{\sigma_{ei^2}}$$

Annotation:

$E(Ri)$ = Expected return of the stock

R_f = Return risk-free asset

βi = Beta of the stock

σ_{ei^2} = Variance of residual error

9. Calculating Cut-off Point ($C*$)

$$C* = \frac{\sigma_{M^2} \cdot Ai}{1 + \sigma_{M^2} \cdot Bi}$$

Annotation:

Ai = Auxiliary variable

Bi = Auxiliary variable

$C*$ = Cut off point

σ_{m^2} = Variance of market

10. Calculating the Amount of Proportion of Funds

$$Wi = \frac{Z_i}{\sum_j^k Z_j}$$

$$Zi = \frac{\beta_i}{\sigma ei^2} \times (ERB_i - C*)$$

Annotation:

Wi = Proportion of the stock

Zi = Scale of stock proportion

Zj = Total value of Zi

β_i = Beta of the stock

σ_{ei^2} = Variance of residual error

ERB_i = Excess return to Beta the stock

$C*$ = Cut off point of the largest Ci

11. Calculating Beta and Alpha Portfolio

$$\beta_p = \sum_{i=1}^{n} Wi \cdot \beta i$$

$$\alpha_p = \sum_{i=1}^{n} Wi \cdot \alpha i$$

Annotation:

β_p = Beta of portfolio

α_p = Alpha of portfolio

Wi = Proportion of the stock

αi = Alpha of the stock

βi = Beta of the stock

12. Calculating Expected Return Portfolio

$$E(R_p) = \alpha_p + \beta_p . E(R_m)$$

Annotation:

$E(R_p)$ = Expected return portfolio

α_p = Alpha of portfolio

β_p = Beta of portfolio

$E(R_m)$ = Expected return of market

13. Calculating Portfolio Risk

$$\sigma p^2 = \beta_{p^2} . \sigma m^2 + \left(\sum_{i=1}^{n} Wi . \sigma_{ei}{}^2\right)$$

Annotation:

σp^2 = Portfolio risk

βp = Beta of portfolio

σ_{m^2} = Variance of market

W_i = Proportion of the stock

σ_{ei^2} = Variance of residual error

RESULTS AND DISCUSSION

Result of Sample Selection

The IDX80 index that was selected as the object of the research consisted of 80 stocks. In essence, stocks listed on the IDX80 index are inconsistent because the IDX80 index will be subject to significant selection and evaluation every six months in February and August. If stocks do not meet the criteria for the IDX80 index, these stocks will be removed from the index and replaced with other stocks. The following is a sample selection process based on the researcher's criteria using a purposive sampling technique:

Table 1. Sample Selection Process

No	Criteria	Number
1	Companies listed on the IDX80 index for the period February 2021–May 2022	80
2	Companies that do not publish complete financial statements for the period February 2021–May 2022	(0)
3	Inconsistent companies are listed on the IDX80 index for the period February 2021–May 2022	(22)
4	Companies that carry out corporate actions for the period February 2021–May 2022	(5)
Number of Final Samples		**53**

Source: Processed Data (2022)

Table 1 shows the sample selection process using the purposive sampling technique. 53 selected stocks from the IDX80 index for February 2021–May 2022 meet the research sample criteria.

Table 2. Expected Return and Standard Deviation of Individual Stock

No	Stock Ticker	Expected Return	Standard Deviation (σi)
1	AALI	0,0006	0,0209
2	ACES	-0,0011	0,0234
3	ADRO	0,0038	0,0287
4	ANTM	0,0004	0,0310
5	ASII	0,0009	0,0196
6	BBNI	0,0017	0,0203
7	BBRI	0,0004	0,0185
8	BBTN	0,0003	0,0219
9	BJBR	0,2005	0,0143
10	BJTM	0,0006	0,0142
11	BMRI	0,0010	0,0173
12	BSDE	-0,0006	0,0204
13	BTPS	0,0001	0,0305
14	CPIN	-0,0003	0,0209
15	CTRA	0,0004	0,0263
16	DMAS	-0,0003	0,0162
17	ELSA	-0,0002	0,0238
18	EXCL	0,0008	0,0229
19	GGRM	-0,0003	0,0175
20	HMSP	-0,0003	0,0169
21	ICBP	0,0000	0,0166
22	INCO	0,0012	0,0275
23	INDF	0,0003	0,0149
24	INKP	-0,0013	0,0290
25	INTP	-0,0006	0,0218
26	ITMG	0,0040	0,0290
27	JPFA	0,0006	0,0249
28	JSMR	-0,0002	0,0204
29	KAEF	-0,0016	0,0345
30	KLBF	0,0005	0,0178
31	LSIP	0,0004	0,0238
32	MAPI	0,0008	0,0262
33	MDKA	0,0024	0,0309
34	MEDC	0,0001	0,0309
35	MIKA	0,0000	0,0232
36	MNCN	-0,0001	0,0211
37	MYOR	-0,0013	0,0190
38	PGAS	0,0009	0,0240
39	PTBA	0,0020	0,0222
40	PTPP	-0,0016	0,0278
41	PWON	0,0001	0,0230
42	SIDO	0,0011	0,0145
43	SMGR	-0,0010	0,0243
44	SMRA	0,0003	0,0286
45	TBIG	0,0004	0,0247
46	TINS	0,0001	0,0307
47	TKIM	-0,0020	0,0298
48	TLKM	0,0012	0,0172
49	TOWR	0,0003	0,0218
50	TPIA	0,0002	0,0225
51	UNTR	0,0012	0,0237
52	UNVR	-0,0009	0,0229
53	WIKA	-0,0019	0,0281

Source: Processed Data (2022)

Based on table 2 shows that the highest expected return is owned by BJBR of 0,2005, and the lowest expected return is owned by TKIM of -0,0020. KAEF has the highest standard deviation of 0,0345, and BJTM has the lowest standard deviation of 0,0142.

Table 3. Expected Return and Standard Deviation of Market

No	Index	Expected Return	Standard Deviation (σí)	Variance
1	IHSG	0,0005	0,0082	0,0001

Source: Processed Data (2022)

Based on table 3 shows that the expected return market during the observation period is 0,0005 or 0,05%, with a standard deviation of 0,0082 and a market variance of 0,0001.

Table 4. Beta, Alpha, and Variance Residual of Stock

No	Stock Ticker	Beta(β)	Alpha(α)	Variance Residual Error
1	AALI	1,0098	0,0001	0,00037
2	ACES	0,7671	-0,0015	0,00051
3	ADRO	1,1986	0,0032	0,00072
4	ANTM	1,3473	-0,0002	0,00084
5	ASII	1,2714	0,0003	0,00028
6	BBNI	1,5579	0,0009	0,00025
7	BBRI	1,2544	-0,0002	0,00023
8	BBTN	1,3714	-0,0004	0,00035
9	BJBR	0,6639	0,0000	0,00018
10	BJTM	0,6157	0,0003	0,00018
11	BMRI	1,2849	0,0004	0,00019
12	BSDE	1,2529	-0,0012	0,00031
13	BTPS	1,4907	-0,0007	0,00078
14	CPIN	0,7837	-0,0007	0,00039
15	CTRA	1,5040	-0,0003	0,00054
16	DMAS	0,5044	-0,0006	0,00024
17	ELSA	0,7238	-0,0006	0,00053
18	EXCL	1,2073	0,0002	0,00043
19	GGRM	0,5046	-0,0005	0,00029
20	HMSP	0,7634	-0,0007	0,00024
21	ICBP	0,6798	-0,0004	0,00025
22	INCO	1,0262	0,0007	0,00069
23	INDF	0,5276	0,0001	0,00020
24	INKP	1,6225	-0,0021	0,00066
25	INTP	0,9780	-0,0011	0,00041
26	ITMG	0,6996	0,0037	0,00081
27	JPFA	1,0718	0,0001	0,00054
28	JSMR	1,0427	-0,0007	0,00034
29	KAEF	0,9903	-0,0021	0,00112
30	KLBF	0,6121	0,0002	0,00029
31	LSIP	0,9477	-0,0001	0,00051
32	MAPI	0,9155	0,0004	0,00063
33	MDKA	1,5438	0,0016	0,00079
34	MEDC	0,9920	-0,0004	0,00089
35	MIKA	0,2316	-0,0001	0,00053
36	MNCN	1,1140	-0,0006	0,00036
37	MYOR	0,7688	-0,0017	0,00032
38	PGAS	1,1736	0,0003	0,00048
39	PTBA	1,0371	0,0015	0,00042
40	PTPP	1,5231	-0,0024	0,00062
41	PWON	1,3843	-0,0006	0,00040
42	SIDO	0,2424	0,0010	0,00021
43	SMGR	1,4250	-0,0018	0,00045
44	SMRA	1,7611	-0,0006	0,00061
45	TBIG	0,8447	0,0000	0,00056
46	TINS	1,3463	-0,0006	0,00082
47	TKIM	1,5064	-0,0027	0,00073
48	TLKM	0,9071	0,0007	0,00024
49	TOWR	0,8239	-0,0002	0,00043
50	TPIA	0,9373	-0,0003	0,00045
51	UNTR	1,0045	0,0007	0,00050
52	UNVR	0,7223	-0,0013	0,00049
53	WIKA	1,4980	-0,0026	0,00064

Source: Processed Data (2022)

Table 4 shows that the highest Beta is owned by SMRA stock of 1,7611, and the lowest Beta is owned by MIKA stock of 0,2316. At the highest beta value, the fluctuating stock return moves more significantly than the market return. Furthermore, the highest Alpha is owned by ITMG stock of 0,0037, and the lowest is owned by TKIM stock of -0,0027. The higher the alpha value, the better the stock because the resulting return can exceed the market return. Furthermore, the highest residual Variance is owned by KAEF stock of 0,00112, and the lowest residual Variance is owned by BJBR stock of 0,00018. The higher the residual variance value, the higher the unsystematic risk of the stock.

Table 5. Excess Return to Beta (ERB)

No	Stock Ticker	ERB	No	Stock Ticker	ERB
1	AALI	0,0005	28	JSMR	-0,0003
2	ACES	-0,0016	29	KAEF	-0,0017
3	ADRO	0,0031	30	KLBF	0,0007
4	ANTM	0,0003	31	LSIP	0,0003
5	ASII	0,0007	32	MAPI	0,0008
6	BBNI	0,0010	33	MDKA	0,0015
7	BBRI	0,0002	34	MEDC	0,0000
8	BBTN	0,0001	35	MIKA	-0,0002
9	BJBR	0,0003	36	MNCN	-0,0002
10	BJTM	0,0008	37	MYOR	-0,0018
11	BMRI	0,0007	38	PGAS	0,0007
12	BSDE	-0,0005	39	PTBA	0,0018
13	BTPS	0,0000	40	PTPP	-0,0011
14	CPIN	-0,0005	41	PWON	0,0000
15	CTRA	0,0002	42	SIDO	0,0042
16	DMAS	-0,0009	43	SMGR	-0,0008
17	ELSA	-0,0004	44	SMRA	0,0001
18	EXCL	0,0006	45	TBIG	0,0004
19	GGRM	-0,0008	46	TINS	0,0000
20	HMSP	-0,0006	47	TKIM	-0,0014
21	ICBP	-0,0002	48	TLKM	0,0012
22	INCO	0,0011	49	TOWR	0,0002
23	INDF	0,0005	50	TPIA	0,0001
24	INKP	-0,0008	51	UNTR	0,0011
25	INTP	-0,0007	52	UNVR	-0,0014
26	ITMG	0,0056	53	WIKA	-0,0013
27	JPFA	0,0005			

Source: Processed Data (2022)

Table 5 shows that the highest ERB is owned by ITMG stock of 0,0056, and the lowest ERB is owned by MYOR stock of -0,0018. Stocks that have a negative ERB ratio are 20 out of 53 samples. These stocks include MYOR, KAEF, ACES, UNVR, TKIM, WIKA, PTPP, DMAS, INKP, SMGR, GGRM, INTP, HMSP, BSDE, CPIN, ELSA, JSMR, MIKA, ICBP, and MNCN. Stocks with a negative ERB value mean that the return on these stocks is still lower than the return on risk-free assets, so these stocks cannot be included in the optimal portfolio candidate.

Furthermore, stocks with high and positive ERB ratio numbers will be included in the optimal portfolio candidate to determine the ERB value limit. A limiting point is needed starting from the cut-off point (C*). Therefore, stocks with a negative ERB cannot be used as stocks to form an optimal portfolio.

Table 6. Values of Ai, Bi, and Ci

No	Stock Ticker	Ai	Bi	Ci	C*
1	AALI	1,4089	2779,1778	0,0001	
2	ACES	-1,8553	1158,8396	-0,0001	
3	ADRO	6,1093	1981,9709	0,0004	
4	ANTM	0,5630	2171,7520	0,0000	
5	ASII	3,8234	5860,3123	0,0002	
6	BBNI	10,1431	9843,6486	0,0004	
7	BBRI	1,5268	6717,4920	0,0001	
8	BBTN	0,7116	5351,0195	0,0000	
9	BJBR	0,8352	2510,2026	0,0000	
10	BJTM	1,6574	2150,2059	0,0001	
11	BMRI	6,3542	8726,5450	0,0003	
12	BSDE	-2,6144	5062,6727	-0,0001	
13	BTPS	-0,0165	2848,9182	0,0000	
14	CPIN	-0,7591	1557,0585	0,0000	
15	CTRA	0,9055	4199,6377	0,0000	
16	DMAS	-0,9055	1039,1661	-0,0001	
17	ELSA	-0,4184	987,1256	0,0000	
18	EXCL	2,1043	3424,9597	0,0001	
19	GGRM	-0,6808	881,6773	0,0000	
20	HMSP	-1,3764	2381,4436	-0,0001	
21	ICBP	-0,3216	1885,2340	0,0000	
22	INCO	1,6312	1536,0331	0,0001	
23	INDF	0,6522	1375,0482	0,0000	
24	INKP	-3,3014	3977,3983	-0,0002	
25	INTP	-1,6932	2320,4425	-0,0001	
26	ITMG	3,3767	604,6632	0,0002	
27	JPFA	0,9916	2126,0957	0,0001	0,0004
28	JSMR	-0,9376	3154,6253	-0,0001	
29	KAEF	-1,4775	874,4620	-0,0001	
30	KLBF	0,8418	1282,7144	0,0001	
31	LSIP	0,5389	1771,2591	0,0000	
32	MAPI	1,0359	1334,3955	0,0001	
33	MDKA	4,4740	3013,3142	0,0003	
34	MEDC	0,0281	1106,2031	0,0000	
35	MIKA	-0,0208	100,4344	0,0000	
36	MNCN	-0,5756	3419,5634	0,0000	
37	MYOR	-3,3427	1836,0514	-0,0002	
38	PGAS	1,9956	2859,3088	0,0001	
39	PTBA	4,6771	2553,6928	0,0003	
40	PTPP	-4,2761	3762,2936	-0,0002	
41	PWON	0,0523	4777,6095	0,0000	
42	SIDO	1,1930	285,9699	0,0001	
43	SMGR	-3,5977	4477,7155	-0,0002	
44	SMRA	0,6590	5092,2511	0,0000	
45	TBIG	0,5191	1274,9902	0,0000	
46	TINS	-0,0363	2217,1889	0,0000	
47	TKIM	-4,2543	3095,9528	-0,0002	
48	TLKM	3,9998	3413,7401	0,0002	
49	TOWR	0,3056	1580,5715	0,0000	
50	TPIA	0,1679	1967,2741	0,0000	
51	UNTR	2,2944	2035,5645	0,0001	
52	UNVR	-1,5108	1063,0275	-0,0001	
53	WIKA	-4,6452	3514,5340	-0,0003	

Source: Processed Data (2022)

Table 6 shows that the highest Ai, Bi, and Ci are owned by BBNI stock. The Ci value of BBNI stock is 0,0004, so this value becomes the most significant value to be used as the highest ERB limiting point, namely the cut-off point.

Table 7. Optimal Portfolio Results

No	Stock Ticker	ERB	C*	Results
1	ITMG	0,0056	0,0004	Optimal
2	SIDO	0,0042	0,0004	Optimal
3	ADRO	0,0031	0,0004	Optimal
4	PTBA	0,0018	0,0004	Optimal
5	MDKA	0,0015	0,0004	Optimal
6	TLKM	0,0012	0,0004	Optimal
7	UNTR	0,0011	0,0004	Optimal
8	INCO	0,0011	0,0004	Optimal
9	BBNI	0,0010	0,0004	Optimal
10	MAPI	0,0008	0,0004	Optimal
11	BJTM	0,0008	0,0004	Optimal
12	BMRI	0,0007	0,0004	Optimal
13	PGAS	0,0007	0,0004	Optimal
14	KLBF	0,0007	0,0004	Optimal
15	ASII	0,0007	0,0004	Optimal
16	EXCL	0,0006	0,0004	Optimal
17	AALI	0,0005	0,0004	Optimal
18	INDF	0,0005	0,0004	Optimal
19	JPFA	0,0005	0,0004	Optimal
20	TBIG	0,0004	0,0004	-
21	BJBR	0,0003	0,0004	-
22	LSIP	0,0003	0,0004	-
23	ANTM	0,0003	0,0004	-
24	BBRI	0,0002	0,0004	-
25	CTRA	0,0002	0,0004	-
26	TOWR	0,0002	0,0004	-
27	BBTN	0,0001	0,0004	-
28	SMRA	0,0001	0,0004	-
29	TPIA	0,0001	0,0004	-
30	MEDC	0,0000	0,0004	-
31	PWON	0,0000	0,0004	-
32	BTPS	0,0000	0,0004	-
33	TINS	0,0000	0,0004	-
34	MNCN	-0,0002	0,0004	-
35	ICBP	-0,0002	0,0004	-
36	MIKA	-0,0002	0,0004	-
37	JSMR	-0,0003	0,0004	-
38	ELSA	-0,0004	0,0004	-
39	CPIN	-0,0005	0,0004	-
40	BSDE	-0,0005	0,0004	-
41	HMSP	-0,0006	0,0004	-
42	INTP	-0,0007	0,0004	-
43	GGRM	-0,0008	0,0004	-
44	SMGR	-0,0008	0,0004	-
45	INKP	-0,0008	0,0004	-
46	DMAS	-0,0009	0,0004	-
47	PTPP	-0,0011	0,0004	-
48	WIKA	-0,0013	0,0004	-
49	TKIM	-0,0014	0,0004	-
50	UNVR	-0,0014	0,0004	-
51	ACES	-0,0016	0,0004	-
52	KAEF	-0,0017	0,0004	-
53	MYOR	-0,0018	0,0004	-

Source: Processed Data (2022)

Based on table 7 shows that 19 optimal stocks have an ERB value more significant than the cut-off point (C*). The stocks are ITMG, SIDO, ADRO, PTBA, MDKA, TLKM, UNTR, INCO, BBNI, MAPI, BJTM, BMRI, PGAS, KLBF, ASII, EXCL, AALI, INDF, and JPFA. Therefore, the selected stocks can be used as recommendations for investors in making investment decisions.

Table 8. Proportion of Stock Fund

No	Stock Ticker	Zi	Wi	Proportion
1	ITMG	4,4710	0,1261	12,61%
2	SIDO	4,4366	0,1251	12,51%
3	ADRO	4,4160	0,1245	12,45%
4	PTBA	3,4959	0,0986	9,86%
5	MDKA	2,0943	0,0591	5,91%
6	TLKM	2,8598	0,0806	8,06%
7	UNTR	1,4497	0,0409	4,09%
8	INCO	0,9732	0,0274	2,74%
9	BBNI	3,9089	0,1102	11,02%
10	MAPI	0,5313	0,0150	1,50%
11	BJTM	1,2537	0,0353	3,53%
12	BMRI	2,1487	0,0606	6,06%
13	PGAS	0,6972	0,0197	1,97%
14	KLBF	0,5123	0,0144	1,44%
15	ASII	1,1092	0,0313	3,13%
16	EXCL	0,5748	0,0162	1,62%
17	AALI	0,2619	0,0074	0,74%
18	INDF	0,1629	0,0046	0,46%
19	JPFA	0,1083	0,0031	0,31%
	Jumlah	**35,4657**	**1**	**100%**

Source: Processed Data (2022)

Table 8 shows that the largest Proportion of funds is shown by ITMG, which is 12,61%, while the smallest Proportion of funds is shown by JPFA, which is 0,31%.

Table 9. Optimal Portfolio Results Summary

Beta of Portfolio	0,9929
Alpha of Portfolio	0,0015
Expected Return Portfolio / E(Rp)	0,0019
Expected Return Market / E(Rm)	0,0005
Return Risk-Free Asset / Rf	0,0001
Portfolio Risk / σp^2	0,0005
Market Risk / σm^2	0,0001

Source: Processed Data (2022)

Table 9 shows that the portfolio's expected return is 0,20% daily. This value is greater than the expected market return of 0,05% and the risk-free asset return of 0,01%. This study's expected return comparison of the portfolio shows a higher number than market returns and risk-free asset returns.

Furthermore, the level of portfolio risk that investors will bear is 0,05% daily, while the market risk is 0,01% in one day. The level of portfolio risk shows a higher number than market risk, but the return generated by the portfolio is also higher than the market return.

Based on the results of calculations and analysis, it can be concluded that the expected return of the portfolio in this study is higher than the level of portfolio risk. The results of this study align with Markowitz's theory by Harry Markowitz to diversify stocks through the formation of an optimal portfolio to minimize the risk of loss and maximize the return on investment.

Implications

Table 10. Estimated Gain or Loss

Stock Ticker	Stock Price (9 May 2022)	Stock Price (29 July 2022)	Gain or Loss (Rp)	Gain or Loss (%)
ITMG	28.550	39.600	Rp 11.050	39
ADRO	3.021	3.250	Rp 229	8
PTBA	3.209	4.300	Rp 1.091	34
TLKM	4.157	4.230	Rp 73	2
UNTR	29.225	32.300	Rp 3.075	11
PGAS	1.348	1.680	Rp 332	25
KLBF	1.497	1.620	Rp 123	8
INDF	6.125	6.800	Rp 675	11
JPFA	1.375	1.445	Rp 70	5

Source: Processed Data (2022)

Table 10 shows that the nine stocks formed in the portfolio provided a positive return rate within three months after the study's observation period was completed. The stocks that are formed in the portfolio have the potential to provide benefits for investors who want to invest in these stocks. Based on the selected stocks, one of the bases for determining investment strategies, investors can study the movement of the industrial sector in each economic cycle and the phenomena that are happening.

Recommendations for industrial sectors that investors can choose by looking at current phenomena such as rising US interest rates, the threat of a global economic recession, and rising commodity prices triggered by the conflict between Russia and Ukraine, including the energy and raw goods sector, the financial sector, the primary consumer goods sector. And basic needs, the infrastructure sector, the health sector, and the industrial sector. The eight industrial sectors are obtained based on the analysis carried out by adjusting the phenomena that occur.

CONCLUSION

Based on the results and discussion that have been described regarding the formation of an optimal portfolio using a single index model on the IDX80 index for the period February 2021–May 2022, there are several conclusions:

1. There are 19 stocks formed in the optimal portfolio along with the Proportion of funds for each stock, including ITMG (12,61%), SIDO (12,51%), ADRO (12,45%), PTBA (9,86%), MDKA (5,91%), TLKM (8,06%), UNTR (4,09%), INCO (2,74%), BBNI (11,02%), MAPI (1,50%), BJTM (3,53%), BMRI (6,06%), PGAS (1,97%), KLBF (1,44%), ASII (3,13%), EXCL (1,62%), AALI (0,74%), INDF (0,46%), and JPFA (0,31%). The results of this study in line with Markowitz theory by Harry Markowitz with the term "Do Not Put All Your Eggs In One Basket" which encourages investors not to put all their investment funds in just one asset. So the goal of investors to diversify by placing their funds in various stocks to minimize the risk of loss will achieve.

2. The expected return portfolio value is 0.20% in one day, while the portfolio risk level is 0.05%. The portfolio's expected return is higher than the risk, so the objectives of minimizing risk and maximizing return can be achieved.

3. For risk takers, there are seven stocks with a Beta value of more than one, such as BBNI (1,5579), MDKA (1,5438), BMRI (1,2849), ASII (1,2714), EXCL (1,2073), ADRO (1,1986), and PGAS (1,1736). For risk-neutral, there are five stocks with a Beta value of one such as JPFA (1,0781), PTBA (1,0371), INCO (1,0262), AALI (1,0098), dan UNTR (1,0045). For risk-averse,

there are 7 stocks with beta value less than one such as MAPI (0,9155), TLKM (0,9071), ITMG (0,6996), BJTM (0,6157), KLBF (0,6121), INDF (0,5276), dan SIDO (0,2424). Based on the results of the beta calculation of 19 optimal stocks, the highest average of the selected stocks has a Beta value of more than one and less than one, so the optimal portfolio on the IDX80 index in this study is recommended for types of investors who have the characteristics of risk takers and risk-averse.

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