International Journal of Economic, Business, Accounting, Agriculture Management and Sharia Administration (IJEBAS)

International Journal of Economics, Business, Accounting, Agriculture Management and Sharia Administration (IJEBAS Journal) | ISSN(e): 2808-4713
Volumes 5 No. 1 (2025)

OPTIMAL STOCK PORTFOLIO USING SINGLE INDEX MODEL (Case Study: 50 Biggest Market Capitalization listed on the Indonesia Stock Exchange for the Period January 2023 – December 2023)

Ridho Jatmiko Utama[1]*, Bekman Siagian[2]
Perbanas Institute
Corresponding Author: ridho.jatmikoutama@yahoo.com

Received	: 31 December 2024	Published	: 25 February 2025
Revised	: 08 January 2025	DOI	: https://doi.org/10.54443/ijebas.v5i1.2490
Accepted	: 29 January 2025	Publish Link	: https://radjapublika.com/index.php/IJEBAS

Abstract

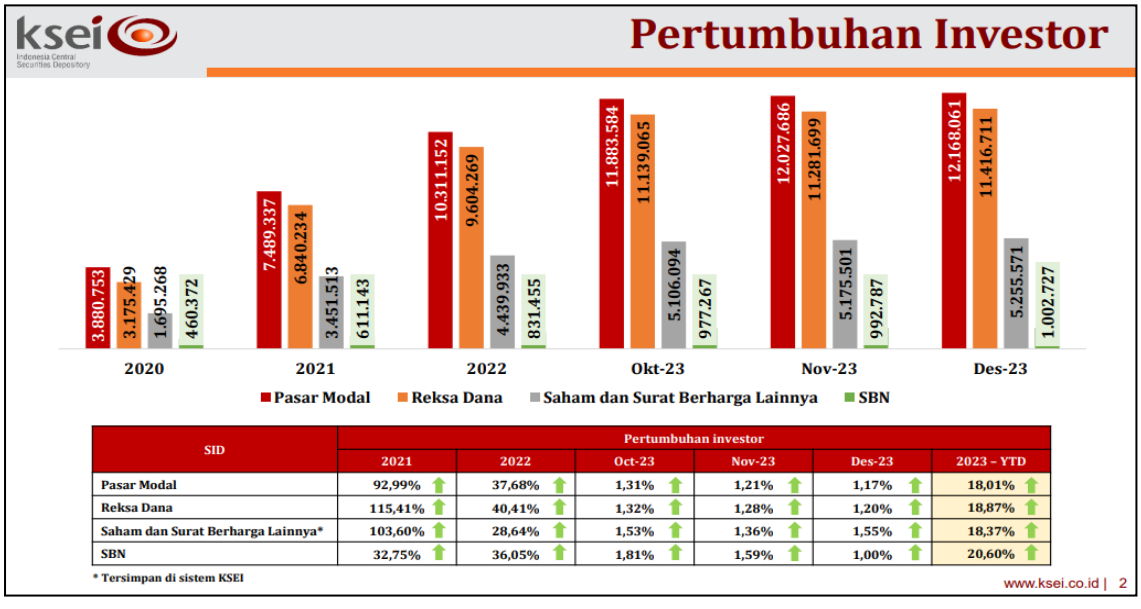
By using a single index model on companies included in the group of 50*Biggest Market Capitalization*which is listed on the Indonesia Stock Exchange from January 2023 to December 2023. This research aims to determine the ideal stock portfolio proportions. The analysis results show that two shares, PT. Chandra Asri Pacific Tbk (TPIA) and PT. Dian Swastika Sentosa Tbk (DSSA), can be included in an ideal stock portfolio.The proportion of the two issuers is 39.58% and 60.42%. From the two issuers, the return from the optimal stock portfolio is 7.37% with a risk to be borne of 20.42%.

Keywords: ***Stock Portfolio, Single Index Model, 50 Biggest Market Capitalization***

INTRODUCTION

In investment decisions, Investors who think logically will place their funds in stocks that perform well, which simply provide high returns but also have low risks. Distribution of funds to more than one stock is highly prioritized, which means that investors do not only rely on one stock.(Chanifah et al., 2020).In Indonesia, based on information published by PT. Kustodian Sentral Efek Indonesia (KSEI) from 2020 to December 2023, investor growth continues to increase based on the SID (Single Investor Identification) classification as follows:

Figure 1 Investor Growth



SID	Pertumbuhan investor					
	2021	2022	Oct-23	Nov-23	Des-23	2023 – YTD
Pasar Modal	92,99%	37,68%	1,31%	1,21%	1,17%	18,01%
Reksa Dana	115,41%	40,41%	1,32%	1,28%	1,20%	18,87%
Saham dan Surat Berharga Lainnya*	103,60%	28,64%	1,53%	1,36%	1,55%	18,37%
SBN	32,75%	36,05%	1,81%	1,59%	1,00%	20,60%

* Tersimpan di sistem KSEI

Data Source: www.ksei.co.id

As explained in the picture, there is a simple premise made by Nobel Prize winner Harry Markowitz stating that almost all investors want to invest in several securities rather than just one security. This premise emerged when a theory called modern portfolio theory was developed in the early 1950s. In his work, this theory emphasizes the importance of investment diversification to reduce portfolio risk. Furthermore, the single index model has limitations, namely the increasing complexity of calculations faced by the model along with the increasing number of securities in the portfolio. Technically, to determine portfolio variance, the covariance between each possible pair of securities must be calculated which is then represented in the covariance matrix. The existence of a model developed by Harry Markowitz is considered to have difficulties. So in 1963 a simpler model was found, namely the single index model developed by William F Sharpe(Mandal, 2013).

Although the single index model is considered as a model that simplifies the Markowitz model, previous studies have different results between the two models. According to a case study conducted for 5 years (2006-2011), the optimal portfolio analysis includes 13 issuers: BBCA, ASII, AALI, ANTM, BBRI, BDMN, BMRI, INCO, INDF, UNTR, PGAS, SMCB, and PTBA with a return rate of 0.109% and a risk of 0.048%. Using a single index model, ten issuers: TLKM, BBCA, ASII, AALI, BMRI, INDF, ISAT, MEDC, UNTR, and PTBA. The results of the study indicate that more issuers enter the optimal portfolio with the Markowitz model. However, with a single index model, only ten issuers enter the ideal portfolio. If based on the level of return and risk, the single index model is said to be recommended in forming an optimal portfolio compared to the Markowitz model because it can provide results at a higher return rate and lower risk.(Bangun et al., 2012).

Based on the background of the problem above, the purpose of this study is to analyze and determine which issuer has the best portfolio shares. To achieve this goal, this problem can be formulated as follows:

1. What percentage of each issuer's shares can form an ideal portfolio?
2. Using a single index model to calculate the ideal portfolio, which stocks are most suitable for investors?

LITERATURE REVIEW

Teori Investasi

Investing is making a commitment and sacrificing money or other resources in the hope of gaining future benefits, such as stocks. Stocks purchased by an investor simply have the equivalent of time sacrificed along with the investment risk inherent in the purchase of stocks or investment activities obtained today (Bodie et al., 2024). In investing there is a proverb "Don't put all your eggs in one basket". This proverb means that if the egg basket falls, all the eggs will break. To avoid breaking, it is better to put the eggs in different containers. The context of this proverb is the same as investment, where investors can invest their funds in various types of investments, such as stocks, bonds, deposits, and property, among others. Investment instruments must be investment options that have both aspects of risk (*risk*) and benefits (*return*).(Rahardja, 2018).

Return dan Risiko

Profit (return) and risk (risk) in investing have a linear relationship. This shows that the expected rate of return o*expected return*positively correlated with the level of risk borne by investors. Therefore, investors must not only pay attention to the expected returns, but also the level of risk they will bear (Lubis, 2016). It should also be noted that a linear relationship between return and risk can occur in normal market conditions. However, when market conditions are abnormal, everything can change or not be as expected.(Silalahi et al., 2022).

Teori Portofolio

Harry Max Markowitz first developed portfolio theory, also known as mean-variance theory, in 1952. To select and create an ideal portfolio, this theory emphasizes how to maximize the expected return in the form of the average (mean) and minimize the risk, namely variance, in the form of the average. Diversification, the main principle of portfolio formation, emphasizes the level of return and risk. The purpose of portfolio formation is to reduce risk by providing diversification in various investment choices that have a negative relationship with each other. If investment choices are not related to each other, then the loss of one choice will not affect the other choice. This is known as negative correlation (Mulya et al., 2020).

A portfolio includes a list of different portfolios selected to maximize expected returns according to an individual's risk level. In forming a portfolio, an investor needs to be careful and make accurate calculations, which means that not all securities that have been formed through the portfolio should experience losses simultaneously.

A portfolio is a collection of investments from various assets that are combined to achieve the lowest level of risk while obtaining the greatest profit (Bangun et al., 2012).

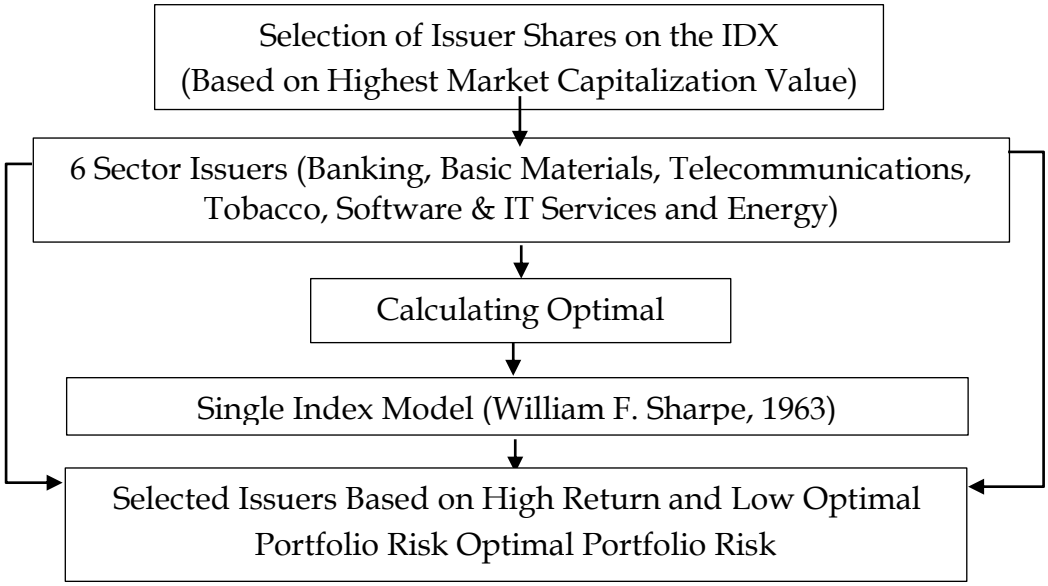
Portofolio Optimal

One type of portfolio that investors choose and is included in the group of successful portfolios is known as an optimal portfolio. The investors concerned must like the return and risk they want from this portfolio.(Tandelilin, 2001). The best portfolio is the one that has the smallest risk and provides the largest expected return.(Hartono, 2015). Although the ideal portfolio is also included in the effective portfolio, the best factor distinguishes the two. An efficient portfolio is a good portfolio, but not the best because it only has one most important factor, namely the expected return factor or the risk factor. However, an ideal portfolio can provide both at once, which is significant as a combination of the best expected return and risk (Mulya et al., 2020). Investors like optimal portfolios because their analysis techniques help them in decision making. They can find efficient and optimal portfolios with a high expected return and a certain risk or with the lowest risk and a certain expected return(Santoso et al., 2023).

KERANGKA PEMIKIRAN MODEL INDEKS TUNGGAL

To calculate the return and risk of stocks and portfolios, there is a single index model.(Zubir, 2011). The single index model describes the relationship between*return*which is based on each security with*return*market. This model compares ERB (excess return to beta) with Ci (*cut off rate*), which is an advantage*return*stocks on the return of the risk-free asset, which is the return premium per unit of risk measured by beta. Market variations and*return premium*determine*cut off rate* (Bangun et al., 2012).

Figure 2 Framework of Thought



METHODOLOGY

Jenis dan Desain Peneltian

This research is a quantitative descriptive research. By using quantitative methods, the type of technique used is quantitative data analysis techniques which means changing data into information so that its characteristics are easy to understand and useful for solving problems, especially research problems,(Karimuddin et al., 2022).

Populasi, Sampel dan Teknik Sampling

Companies listed on the Indonesia Stock Exchange (IDX) from January 2023 to December 2023 and included in the group of 50 Companies with the Largest Market Capitalization are the subjects of this study. This study uses 6 (six) issuers from various industries. The following criteria are used to determine purposive sampling:

1. Listed and has active shares to be traded on the IDX (Indonesia Stock Exchange).
2. Have a market capitalization value*(market capitalization)*the big one.

3. Shares traded using the rupiah currency.

Analisis Data

The following single index model is used to analyze the step data to determine the best portfolio for this study:

Menghitung *Return* Realisasi Masing-Masing Saham Individual (R_i)

*Realized Return*a stock's current price, or t, minus the stock's closing price in the previous month, or t-1, and then the result is divided by the stock's closing price in the previous month, or t-1..(Hartono, 2015):

$$R_i \frac{P_{t(i)} - P_{t-1(i)}}{P_{t-1(i)}}$$

Keterangan:
R_{ti} = *Return* Realisasi Saham ke-i
P_t = Harga Penutupan Saham i
P_{t-1} = Harga Penutupan Saham i Periode Lalu

Menghitung tingkat keuntungan yang diharapkan *(expected return)* atau E(R_i), Standar Deviasi (σ) dan Varian Saham Individual (σei^2)

a)

***(Expected Return)*or E(Ri)**

*Expected Return*expected for each stock consists of the average percentage return of stock i divided by the number of returns of stock i. (Hartono, 2015).

$$E(Ri) = \frac{\sum R_{t(i)}}{n}$$

Keterangan:
$E(R_i)$ = *Expected Return*
R_t = Return Realisasi Saham i
n = Jumlah Data

b) Standard Deviation (σ)

Standard deviation is a way to measure the risk of realized returns which is calculated using the following formula:(Hartono, 2015):

$$SD = \sqrt{\sum_{i=1}^{n} \frac{x_i - \bar{x}^2}{n-1}}$$

Keterangan:
σ = Standar Deviasi
x_i = *realized return* ke-i saham i
$\bar{x}^2$ = rata-rata *realized return* saham
n = Jumlah Data

c) Individual Stock Variants ($\sigma^2 i$)

The variance or $\sigma^2 i$ is used to change the risk level of the expected stock return i. The variance can be calculated by squaring the standard deviation.(Hartono, 2015).

$$Var = \sigma^2_i$$

atau

$$\sigma^2 i = \sum_{i=1}^{n} \frac{x_i - \bar{x}^2}{n-1}$$

Menghitung *Actual Return* Pasar atau IHSG (R_M), *Expected Return Market* $E(R_M)$ Standar Deviasi (σm) dan Varian Pasar (σei^2)

a) *Actual Return*Market (RM)

To calculate Actual Return, you must use the IHSG (Composite Stock Price Index) calculated every day at the closing price of the stock, or close price. This is the formula.(Husnan, 2005):

$$R_M \frac{IHSG_t - IHSG_{t-1}}{IHSG_{t-1}}$$

Keterangan:

R_M = *Return Market*

$IHSG_t$ = IHSG pada saat ini atau periode t

$IHSG_{t-1}$ = IHSG pada periode lalu t-1

b) *Expected Return*E(RM) Market

*Expected Return*The total market can be divided by period. The formula (Husnan, 2005):

$$E(R_M) = \Sigma_{i=1}^{n} \frac{R_M}{N}$$

Keterangan:

$E(R_M)$ = *Expected Return* Pasar

R_M = *Return* Pasar

N = Jumlah Periode

c) Market Standard Deviation (σm)

The market standard deviation can be calculated using the following formula(Husnan, 2005):

$$\Sigma_{j=1}^{M} \frac{[(R_M - E(R_M)]^2}{N}$$

Keterangan:

σ_m = Standar Deviasi Pasar

R_M = Return Pasar

$E(R_M)$ = *Expected Return Pasar*

d) Market Variants (σm2)

to calculate the market variable by squaring the market standard deviation result or by using the following formula.(Hartono, 2015):

$$\sigma m^2 = \Sigma_{t=1}^{M} \frac{[(R_M - E(R_M)]^2}{N}$$

Keterangan:

σ_m^2 = Varian Pasar

R_M = Return Pasar

$E(R_M)$ = *Expected Return Pasar*

N = Jumlah Periode

Menghitung Beta (β_i) dan Alpha (α_i)

a) Beta (βi)

Beta (βi) is a metric that shows the level of stock risk compared to the level of market risk. Investors can find out the sensitivity of stocks to market risk by knowing the beta value. In the excel program, beta can be calculated using the slope function or with the following other formulas(Husnan, 2005):

$$\beta_i = \frac{\sigma im}{\sigma m^2}$$

atau

$$\beta_i = \frac{\sum_{t=1}^{N}(R_i - \bar{R}_i) * (R_M - \bar{R}_M)}{\sum_{t=1}^{N}((R_M - \bar{R}_M))}$$

Keterangan:
β_i = Beta Sekuritas ke-i
σim = Kovarian antara sekuritas I dan pasar
σm^2 = Varian Pasar

b) Alpha (αi)

Alpha (αi) is a unique part of the return where the return is not affected by market risk. Alpha can be calculated with an excel program using the intercept function or can also use the following formula(Husnan, 2005):

$$\alpha_i = E(R_{it}) - \beta_i * E(R_{mt})$$

Keterangan:
α_i = Kovarian antara sekuritas I dan pasar
$E(R_{it})$ = *Expected Return* Saham i periode t
β_i = Beta Saham
$E(R_{mt})$ = *Expected Return* Pasar

Menghitung Varian Error Residual (σei^2)

Residual error variance is a special type of unsystematic risk that only occurs in a company. Residual error variance can be calculated as follows(Rahardja, 2018):

$$\sigma ei^2 = \sigma i^2 - (\sigma m^2 - (\alpha i^2))$$

Keterangan:
σei^2 = Varian Residual Error
σi^2 = Varian Saham i
α_i = Alpha Saham i
σm^2 = Varian Pasar

Menghitung *Excess Return to Beta* (ERB)

*Excess return*to beta is a measure of the additional return calculated against a unit of non-diversifiable risk, which is calculated by beta. It is the difference between*return*risk-free assets and estimates*return*. ERB also shows how*return*and risk affect investment. To calculate the extra amount returned to beta, the following formula is used: (Hartono, 2015):

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

Keterangan:
ERB_i = *Excess Return to Beta* Saham i
$E(R_i)$ = *Expected Return* Saham i
Rf = *Risk Free Rate of Return*
β_i = Beta Saham

Menghitung Nilai A_i dan B_i

The following method is used to calculate the Ai and Bi values: the Ai value is calculated to obtain the Aj value, and the Bi value is calculated to obtain the Bj value. The results of both calculations are used to calculate Ci.(Hartono, 2015):

$$A_i = \frac{[E(R_i) - Rf]\beta_i}{\sigma ei^2}$$

Dan

$$B_i = \frac{\beta_i{}^2}{\sigma ei^2}$$

Keterangan:
$E(R_i)$ = *Expected Return* Saham i
R_f = *Risk Free Rate*
β_i = Beta
σei^2 = varian saham

Menghitung Nilai C_i dan Menentukan C*

Ci or the cut-off point is the C value for stock i, which is calculated by combining the values of A1 to Ai and the values of B1 to Bi. The Ci value can be considered as the result of market variation and return to stock error variation with market variation, as well as the sensitivity of individual stocks to stock error variation. After knowing the Ci value, next, find C* or Cut-off Point by finding the Ci value where the ERB (Excess Return to Beta) value is still greater than the Ci value. The Ci value can be calculated using the following formula.(Hartono, 2015).

$$C_i \frac{\sigma m^2 \sum_{j=1}^{i} A\rho_j}{1 + \sum_{j=i}^{i} B_j}$$

Keterangan:
σm^2 = Varian Realisasi Return Pasar

Menentukkan Saham Yang Masuk Kedalam Pembentukan Portofolio Optimal

With the C* value already known, the ERB value can then be analyzed and compared with C*. If the ERB value > C*, then it will be included in the formation of the optimal portfolio. Meanwhile, if the ERB value < C* then it will not be included(Hartono, 2015).

Menentukan Besarnya Proporsi Dana Yang Harus Diinvestasikan Pada Masing-Masing Saham

After obtaining stocks from issuers that can be formed into an ideal portfolio, the weighted scale of each stock (Zi) and the proportion of funds for each stock (Wi) are calculated. The formula for calculating Zi and Wi is as follows.(Hartono, 2015):

a) Calculating Z_i

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

Keterangan:
β_i = Beta
σei^2 = Varian Residual Error
ERB_i = *Excess Return to Beta* Saham i
C^* = *Cut Off Point*
(Hartono, 2015)

b) Calculating W_i

$$W_i \frac{Z_i}{\sum Z_i}$$

Keterangan:
W_i = Persentase Dana Saham i
Z_i = Proporsi Dana Saham i
$\sum Z_i$ = Jumlah Z_i
(Hartono, 2015)

Menghitung Beta Portofolio (β_p) dan Alpha Portofolio (α_p)

The following is a formula for calculating portfolio beta (βp) and portfolio alpha (αp)(Hartono, 2015):

a) Beta Portfolio

$$\beta\rho = \sum_{t=1}^{N} W_i * \beta_i$$

b) Alpha Portfolio

$$\alpha\rho = \sum_{t=1}^{N} W_i * \alpha i$$

Menghitung *Expected Return* Portofolio E(R_p)

To calculate the expected return of a portfolio, the formula is as follows:(Hartono, 2015):

$$E(R_p) = \alpha_\rho + \beta_\rho * E(R_M)$$

Menghitung Risiko Portofolio (σp^2)

To calculate portfolio risk, the formula is as follows(Hartono, 2015):

$$\sigma\rho^2 = \beta\rho^2 * \sigma M^2 + (\sum_{i-1}^{n} W_i * \sigma_{ei})^2$$

RESEARCH RESULT

Before presenting the research results,The following is stock price data (Close Price) and IHSG (Close Price) for the period January 2023-December 2023:

Tabel 1. Data Harga Saham Emiten Periode Januari 2023-Desember 2023

No	Periode (Bulanan)	Kode Emiten					
		BBCA	TPIA	TLKM	HMSP	GOTO	DSSA
0	Dec-22	8.550	2.570	3.750	840	91	3.980
1	Jan-23	8.475	2.310	3.850	975	112	3.800
2	Feb-23	8.750	2.310	3.880	1.185	118	3.750
3	Mar-23	8.750	2.340	4.060	1.125	109	3.475
4	Apr-23	9.050	2.360	4.250	1.015	104	3.395
5	Mei-23	9.050	2.140	4.040	980	147	3.730
6	Jun-23	9.150	2.100	4.000	945	110	3.800
7	Jul-23	9.125	2.120	3.720	910	113	4.500
8	Agt-23	9.175	2.180	3.730	880	96	4.800
9	Sep-23	8.825	2.530	3.750	865	85	5.120
10	Okt-23	8.750	2.980	3.490	910	60	5.100
11	Nov-23	8.975	2.950	3.760	955	97	5.150
12	Des-23	9.400	5.250	3.950	895	86	8.000

Sumber: www.yahoofinance.com

Tabel 2. IHSG *(Close Price)* Periode Januari 2023-Desember 2023

Periode (Bulanan)	IHSG	Periode (Bulanan)	IHSG
Dec-22	6.850,62	Jul-23	6.931,36
Jan-23	6.839,34	Agt-23	6.953,26
Feb-23	6.843,24	Sep-23	6.939,89
Mar-23	6.805,28	Okt-23	6.752,21
Apr-23	6.915,72	Nov-23	7.080,74
Mei-23	6.633,26	Des-23	7.272,80
Jun-23	6.661,88		

Sumber: www.yahoofinance.com

In addition to stock price data on the issuer concerned and the IHSG that will be used Risk-free interest rates, are also needed to analyze the ideal portfolio. To calculate additional profits to the beta risk-free rate used, which can be accessed through the official website of Bank Indonesia, which is located at www.bi.go.id. The following data is from January 2023 to December 2023:

Tabel 3. Risk Free Rate BI

Periode	BI-7 Day Repo Rate			Jumlah	Perbulan	E(Rf) = ΣRf/n
Des-22	5.75%	0.004583	Perbulan			
Jan-23	5.75%	0.004792	Perbulan			
Feb-23	5.75%	0.004792	Perbulan			
Mar-23	5.75%	0.004792	Perbulan			
Apr-23	5.75%	0.004792	Perbulan			
Mei-23	5.75%	0.004792	Perbulan			
Jun-23	5.75%	0.004792	Perbulan	75.25%	0.062708	0.008958
Jul-23	5.75%	0.004792	Perbulan			
Agt-23	5.75%	0.004792	Perbulan			
Sep-23	5.75%	0.004792	Perbulan			
Okt-23	6.00%	0.005000	Perbulan			
Nov-23	6.00%	0.005000	Perbulan			
Des-23	6.00%	0.005000	Perbulan			

Sumber: www.bi.go.id

Based on the data in tables 1, 2 and 3, the ideal portfolio analysis can be carried out using a single index model as follows:

1. Count*actual return*each individual share (Ri)

Tabel 4. Actual Return Saham Individual (R_i)

No	Periode (Bulanan)	Kode Emiten					
		BBCA	TPIA	TLKM	HMSP	GOTO	DSSA
0	Dec-22						
1	Jan-23	-0.00877	-0.10117	0.02667	0.16071	0.23077	-0.04523
2	Feb-23	0.03245	0.00000	0.00779	0.21538	0.05357	-0.01316
3	Mar-23	0.00000	0.01299	0.04639	-0.05063	-0.07627	-0.07333
4	Apr-23	0.03429	0.00855	0.04680	-0.09778	-0.04587	-0.02302
5	Mei-23	0.00000	-0.09322	-0.04941	-0.03448	0.41346	0.09867
6	Jun-23	0.01105	-0.01869	-0.00990	-0.03571	-0.25170	0.01877
7	Jul-23	-0.00273	0.00952	-0.07000	-0.03704	0.02727	0.18421
8	Agt-23	0.00548	0.02830	0.00269	-0.03297	-0.15044	0.06667
9	Sep-23	-0.03815	0.16055	0.00536	-0.01705	-0.11458	0.06667
10	Okt-23	-0.00850	0.17787	-0.06933	0.05202	-0.29412	-0.00391
11	Nov-23	0.02571	-0.01007	0.07736	0.04945	0.61667	0.00980
12	Des-23	0.04735	0.77966	0.05053	-0.06283	-0.11340	0.55340
Jumlah		**0.098181**	**0.954290**	**0.064948**	**0.109088**	**0.295353**	**0.839542**

Sumber: Data Diolah

2. Count*expected return*E(Ri), standard deviation (σ2) andvariant (σ^2i)each individual stock

Tabel 5. *Expected Return* $E(R_i)$, Standar Deviasi (σ) dan Varian Saham Individual (σ^2_i)

No	Nama Emiten	$E(R_i)$	σ	σ^2_i
1	PT. Bank Central Asia Tbk	0.008182	0.023535	0.0006
2	PT. Chandra Asri Pacific Tbk	0.079524	0.235469	0.0554
3	PT. Telkom Indonesia (Persero) Tbk	0.005412	0.048227	0.0023
4	PT. H.M Sampoerna Tbk	0.009091	0.094226	0.0089
5	PT. GoTo Gojek Tokopedia Tbk	0.024613	0.270896	0.0734
6	PT. Dian Swastatika Sentosa Tbk	0.069962	0.167512	0.0281

Sumber: Data Diolah

3. Count*actual return*market or IHSG (RM), expected market return E(RM), standard deviation (σm) andVariantsmarket(σm2)

Tabel 6. Actual Return Pasar (R_M), Expected Return Pasar $E(R_M)$, Standar Deviasi (σ_m) dan Varian Pasar (σ_m^2)

No	Periode (Bulanan)	(R_M)	∑	$E(R_M)$	σ_m	σ_m^2
0	Dec-22					
1	Jan-23	-0.001647				
2	Feb-23	0.000570				
3	Mar-23	-0.005547				
4	Apr-23	0.016229				
5	Mei-23	-0.040843				
6	Jun-23	0.004315	0.063500	0.005292	0.0255	0.00065
7	Jul-23	0.040451				
8	Agt-23	0.003160				
9	Sep-23	-0.001923				
10	Okt-23	-0.027044				
11	Nov-23	0.048655				
12	Des-23	0.027124				

Sumber: Data Diolah

4. Calculating Alpha (αi) and Beta (βi)

Tabel 7. Alpha (α_i) dan Beta (β_i)

No	Nama Emiten	α_i	β_i
1	PT. Bank Central Asia Tbk	0.006058	0.401417
2	PT. Chandra Asri Pacific Tbk	0.068452	2.092444
3	PT. Telkom Indonesia (Persero) Tbk	0.000760	0.879213
4	PT. H.M Sampoerna Tbk	0.011350	-0.426971
5	PT. GoTo Gojek Tokopedia Tbk	0.013095	2.176508
6	PT. Dian Swastatika Sentosa Tbk	0.058955	2.080038

Sumber: Data Diolah

5. CountResidual Error Variance (σei2)

Tabel 8. Varian Error Residual (σei^2)

No.	Kode Emiten	(α_i)	(σi^2)	(σm^2)	σei^2
1	BBCA	0.006058	0.0006	0.000648	0.0006
2	TPIA	0.068452	0.0554	0.000648	0.0554
3	TLKM	0.000760	0.0023	0.000648	0.0023
4	HMSP	0.011350	0.0089	0.000648	0.0089
5	GOTO	0.013095	0.0734	0.000648	0.0734
6	DSSA	0.058955	0.0281	0.000648	0.0281

Sumber: Data Diolah

6. Calculating Excess Return To Beta (ERB)

Tabel 9. Excess Return to Beta (ERB)

No.	Kode Emiten	$E(R_i)$	Risk Free Rate-BI	Excess Return $E(R_i)$-Rf	β_i	ERB
1	TPIA	0.079524	0.008958	0.070566	2.092444	0.033724
2	DSSA	0.069962	0.008958	0.061003	2.080038	0.029328
3	GOTO	0.024613	0.008958	0.015654	2.176508	0.007192
4	HMSP	0.009091	0.008958	0.000132	-0.426971	-0.000310
5	BBCA	0.008182	0.008958	-0.000777	0.401417	-0.001935
6	TLKM	0.005412	0.008958	-0.003546	0.879213	-0.004033

Sumber: Data Diolah

7. Counting A_i, Bi, Ci and Determining the Cut-Off Point (C*)

Tabel 10. Ai, Bi, Ci dan Cut-Off Point (C*)

No.	Kode Emiten	Ai	Bi	Ci	ERB	C*
1	TPIA	2.663200	78.970125	0.001643	0.033724	
2	DSSA	4.522408	154.20066	0.002666	0.029328	0.002666
3	GOTO	0.464294	64.553099	0.000289	0.007192	
4	HMSP	-0.006364	20.533138	-0.000004	-0.000310	
5	BBCA	-0.562817	290.93403	-0.000307	-0.001935	
6	TLKM	-1.340464	332.36514	-0.000715	-0.004033	

Sumber: Data Diolah

8. Determining Which Stocks Are Included in the Formation of an Optimal Portfolio

Tabel 11. Saham yang masuk dalam Portofolio Optimal

No.	Kode Emiten	ERB		C*	Keterangan
1	TPIA	0.033724	>	0.002666	Optimal
2	DSSA	0.029328	>	0.002666	Optimal
3	GOTO	0.007192	>	0.002666	Optimal
4	HMSP	-0.000310	<	0.002666	Tidak Optimal
5	BBCA	-0.001935	<	0.002666	Tidak Optimal
6	TLKM	-0.004033	<	0.002666	Tidak Optimal

Sumber: Data Diolah

9. Determining the amount of funds that must be invested in each share (Zi) and calculating the percentage of the fund proportion (Wi)

Tabel 12. Proporsi Dana Masing-Masing Saham

No.	Kode	β_i	σei^2	ERB	C_i	C*	Zi	Wi
1	TPIA	2.092444	0.0554	0.033724	0.001643	0.001643	0.3461	39.58%
2	DSSA	2.080038	0.0281	0.029328	0.002666	0.001643	0.5284	60.42%
						∑	**0.8744**	**100%**

Sumber: Data Diolah

10. Calculating Alpha (αp) and Optimal Portfolio Beta (βp)

Tabel 13. Alpha dan Beta Portofolio Optimal

No.	Kode Emiten	W_i	β_i	α_i	$\alpha_p=W_i.\alpha_i$	$\beta_p=W_i.\beta_i$
1	TPIA	0.395774	2.092444	0.068452	0.027091	0.828134
2	DSSA	0.604226	2.080038	0.058955	0.035622	1.256813
				∑	**0.062713**	**2.084948**

Sumber: Data Diolah

11. Calculating the Expected Optimal Portfolio E(Rp)

Tabel 14. *Expected* Portofolio Optimal $E(R_p)$

No.	Kode Emiten	$\alpha_p=W_i.\alpha_i$	$\beta_p=W_i.\beta_i$	$E(R_M)$	$E(R_p)$
1	TPIA	0.027091	0.828134	0.005292	0.031474
2	DSSA	0.035622	1.256813	0.005292	0.042273
				∑	0.073746

Sumber: Data Diolah

12. Calculating Optimal Portfolio Risk (σp^2)

Tabel 15. Risiko Portofolio Optimal

No.	Kode Emiten	W_i	σei^2	$\sigma ep^2=W_i.\sigma ei^2$	β_p^2	σm^2
1	TPIA	0.395774	0.0554	0.021943		
2	DSSA	0.604226	0.0281	0.016953		
	∑			0.038896	4.347007	0.000648
Varian Portofolio $\sigma p^2 = \beta p^2.\sigma m^2 + \sigma ep^2$				0.041715		
Standar Deviasi				0.204242		

Sumber: Data Diolah

DISCUSSION

1. ***Actual return*each individual share (Ri)**

   Based on table 4, the largest actual return obtained by PT. Bank Central Asia Tbk in the period of December 2023 was 0.047354 or 4.74%, PT. Chandra Asri Pacific Tbk (TPIA) in the period of December 2023 was 0.779661 or 77.97%, PT. Telkom Indonesia (Persero) Tbk (TLKM) in the period of November was 0.077364 or 7.74%, PT. HM Sampoerna Tbk (HMSP) in the period of February 2023 was 0.215385 or 21.54% and PT. Dian Swastatika Sentosa Tbk (DSSA) in the period was 0.553398 or 55.34%.

   The largest actual return results obtained by each issuer have a greater value compared to the previous period or last month, which means that the issuer's performance is better than the previous period.

2. ***Expected return*E(Ri), standard deviation (σ2) andvariant ($\sigma^2 i$)each individual stock**

   Based on table 5, the expected return of the six stocks in the issuer are all positive, which means that it is feasible for investors to invest their funds. and from all the stocks in the five issuers, the next stage calculation will be carried out. In this study, the issuer with the highest expected return value and has the possibility of providing the highest profit for investors is PT. Chandra Asri Pacific Tbk of 0.079524 or 7.95% with a standard deviation or what is called a risk of 0.235469 or 23.55% and a variance or what is called a deviation rate of 0.0554 or 5.5%. While the lowest expected return was obtained by PT. Telkom Indonesia (Persero) Tbk of 0.005412 or 0.54% with a standard deviation of 0.048227 or 4.82% and a variance of 0.0023 or 0.23%. If we compare the two based on the expected return perspective, the one that can be recommended is the stock in the issuer PT. Chandra Asri Pacific Tbk with larger standards and variants compared to PT. Telkom Indonesia (Persero) Tbk. Rationally, investors will certainly choose stocks with the lowest level of deviation and risk, but this goes back to the investor's preferences.

3. ***Actual return*market or IHSG (RM), expected market return E(RM), standard deviation (σm) andVariantsmarket(σm2)**

   Based on table 6, the highest actual market return was obtained in the December 2023 period of 0.048655 or 4.87%. When compared to the November 2023 period which obtained 0.027124 or 2.71%, it can be interpreted that the actual market return obtained in the December 2023 period showed better performance compared to the November 2023 period. The expected market return value was obtained at 0.005292 or 0.53% with a standard deviation or risk of 0.025464 or 2.55% and a variance or deviation rate of 0.000648 or 0.06%.

4. **Alpha (αi) and Beta (βi)**

   Based on table 7, the alpha values obtained all positive results. With positive alpha, each stock has better performance than the IHSG.(Rahardja, 2018). The largest alpha value is PT. Chandra Asri Pacific Tbk at 0.068452 or 6.84%. The lowest alpha value isPT. Telkom Indonesia (Persero) Tbkof 0.000760 or 0.076%. The

level of individual stock volatility (Ri) with the IHSG is explained by beta. If beta > 1, the stock is more volatile than the IHSG. Conversely, if beta < 1, the stock is considered less liquid or passive.(Rahardja, 2018). Beta shares of four issuers (PT. Chandra Asri Pacific Tbk, PT. Telkom Indonesia (Persero) Tbk, PT. GoTo Gojek Tokopedia Tbk and PT Dian Swastatika Sentosa Tbk)have positive results or > 1. While the two shares from the issuerPT. Bank Central Asia Tbk and PT. HM Sampoerna Tbk have < 1.

5. **Residual Error Variance (σei2)**

   Based on table 8, the largest residual error variant was obtained by PT. GoTo Gojek Tokopedia Tbk at 0.0734 or 7.34%. While the lowest was obtained by PT. Bank Central Asia Tbk at 0.06%.

6. **Excess Return To Beta (ERB)**

   Table 9 shows that the shares of three issuers, PT Chandra Asri Pacific Tbk, PT Dian Swastatika Sentosa Tbk and PT GoTo Gojek Tokopedia Tbk, have a value*excess return*to beta which is positive. On the other hand, three other issuer stocks, PT HM Sampoerna Tbk, PT Bank Central Asia Tbk, and PT Telkom Indonesia (Persero) have negative excess return to beta values. To form an optimal portfolio, excess return to beta (ERB) is important because it shows the profits that are very likely to be achieved. The ideal portfolio candidate is an issuer with a positive excess return to beta (ERB) result, but an issuer with a negative ERB result cannot be an ideal portfolio candidate because it will harm investors (Rahardja, 2018).

7. **Determine*Cut Off Point*(C*)**

   Based on table 10, in determining the cut-off point (C*), the values of Ai, Bi, Ci must first be calculated. With the values of Ai, Bi, Ci already known, it can be continued by determining the cut-off point (C*) which is the largest Ci value of the issuer PT Dian Swastatika Sentosa Tbk of0.002666.

8. **Stocks That Are Included in the Formation of an Optimal Portfolio**

   Table 11 shows that two issuers, PT Chandra Asri Pacific Tbk (TPIA), PT Dian Swastatika Sentosa Tbk (DSSA), and PT GoTo Gojek Tokopedia Tbk (GOTO), are included in the optimal portfolio formation. This is due to the fact that each has an excess return to beta value that is greater than the cut-off point (C*).

9. **Proportion of Funds to be Invested in Each Stock $(Z)_i$) and Calculating the Percentage of Fund Proportion (Wi)**

   Based on table 12, the proportion of funds from each stock that forms the largest optimal stock portfolio is PT Dian Swastatika Sentosa Tbk (DSSA) at 60.42%. While for PT. Chandra Asri Pacific Tbk (TPIA) has a low proportion of 0.3958 or 39.58%. With the proportion of funds from each stock, which can be chosen by investors tends to be with the highest proportion of funds. Not only that, it can be seen from the excess return to beta value which also has a greater result than the Ci value.(Yunus, 2016).

10. **Optimal Portfolio Alpha and Beta**

    Based on table 13, the total alpha of the optimal portfolio is0.062713 andthe optimal portfolio total beta is2.084948. With the known alpha and beta values of the optimal portfolio, we can continue by calculating the expected optimal portfolio.

11. ***Expected Return*Optimal Portfolio**

    In the study that also uses a single index model to determine the ideal stock portfolio, the first result of the ideal portfolio prediction must be compared with the market Expected Return and the risk-free Expected Return. This will affect how investors will later invest in the predicted value of the ideal portfolio return.

    Based on table 14, the expected return of the optimal portfolio of the issuer PT. Chandra Asri Pacific Tbk (TPIA) is 0.031474 and PT. Dian Swastatika Sentosa Tbk (DSSA) is 0.042273. So if added up, the total expected return of the optimal portfolio is 0.073746. When compared to the expected market return of 0.005292 and the expected risk free of 0.008958, investors will invest in both stocks of the issuer PT. Chandra Asri Pacific Tbk (TPIA) and PT. Dian Swastatika Sentosa Tbk (DSSA) because they have good prospects.

12. **Optimal Portfolio Risk**

    Based on table 15, the optimal portfolio risk which is the variance and standard deviation obtained results of0.041715 and 0.204242. The standard deviation results are lower than the individual stock returns owned by PT.Chandra Asri Pacific Tbk is 0.235469 and PT. GoTo Gojek Tokopedia Tbk is 0.270896. While the standard deviation of the optimal portfolio is greater than that of PT. Bank Central Asia Tbk is 0.023535, PT. Telkom Indonesia (Persero) Tbk is 0.094226 and PT. Dian Swastatika Sentosa Tbk is 0.167512. A lower standard deviation indicates that portfolio diversification can minimize the risk of loss.(Rahardja, 2018).

CONCLUSION AND RECOMMENDATIONS

Conclusion

Based on the results of the analysis and discussion conducted to determine the ideal portfolio using a single index model on companies included in the category of 50 companies with the largest market capitalization and listed on the Indonesia Stock Exchange (IDX) from January 2023 to December 2023,then it can be concluded as follows:

1. The ideal portfolio consists of two stocks: PT. Chandra Asri Pacific Tbk (TPIA) and PT. Dian Swastatika Sentosa Tbk (DSSA), which each have a fund proportion of 39.58% and 60.42%, respectively.
2. It is expected that these two stocks will generate a monthly return of 0.073746 or 7.37% with a risk faced of 0.204242 or.

Recommendation

Investors are strongly advised to choose the best portfolio when choosing stocks that will provide the best returns, low risk, and low deviation rates. With an optimal portfolio, investors will know and consider which stocks will be the most profitable in the future based on the portfolio formed.

FURTHER RESEARCH

For further researchers who will conduct research on similar topics, it is suggested to add to the list of companies, so that after being formed into an optimal portfolio, there will be more alternatives in selecting investments from selected companies that meet the requirements to form an optimal portfolio with the best returns and low risk.

REFERENCES

Bangun, D. H., Anantadjaya, S. P., & Lahindah, L. (2012). Portofolio Optimal Menurut Markowitz Model Dan Single Index Model : Studi Kasus Pada Indeks Lq45. JAMS - Journal of Management Studies, 01(01), 70–93.

Chanifah, S., Hamdani, & Gunawan, A. (2020). THE COMPARISON OF APPLYING SINGLE INDEX MODEL AND CAPITAL ASSET PRICING MODEL BY MEANS ACHIEVING OPTIMAL PORTFOLIO. AGREGAT: Jurnal Ekonomi Dan Bisnis, 4(1), 8–24. https://doi.org/10.22236/agregat

Hartono, J. (2015). Teori Portofolio dan Analisis Investasi (Edisi 10). BPFE Yogyakarta.

Husnan, S. (2005). Dasar-Dasar Teori Portofolio dan Analisis Sekuritas (Edisi Ke-4). UPP AMP YKPN.

Karimuddin, A., Jannah, M., Aiman, U., Hasda, S., Fadilla, Z., Taqwin, Masita, Ardiawan, K. N., & Sari, M. E. (2022). Metodologi Penelitian Kuantitatif (N. Saputra (ed.)). Yayasan Penerbit Muhammad Zaini.

Lubis, T. A. (2016). MANAJEMEN INVESTASI DAN PERILAKU KEUANGAN (PENDEKATAN TEORITIS DAN EMPIRIS) (Pertama). Salim Media Indonesia.

Mandal, N. (2013). Sharpe's Single Index Model a nd Its Application to Construct Optimal Portfolio: An Empirical Study. Great Lakes Herald, 7(1), 1–22.

Mulya, S. A., Aziz, A., & Permadhy, T. (2020). Pembentukan Portofolio Optimal Dengan Model Markowitz Sebagai Dasar Keputusan Investasi. PROSIDING BIEMA Business Management, Economic, and Accounting National Seminar, 1, 1242–1256.

Rahardja, I. R. (2018). Pembentukan Portofolio Optimal Dengan Single Index Model Dan Menganalisis Pengaruh Fama-French Three Factor Model Terhadap Return Saham (Studi pada Indeks SRI-KEHATI Periode 2013-2017).

Santoso, A., Syahputri, A., Puspita, G., Nurhikmat, M., Susana, D., Arisandy, M., Nugraha, A., Anggraeni, I. S. K., Azizi, E., Yulaikah, Novyarni, N., Nurlia, Zahara, V. M., & Samiyati, R. Y. (2023). MANAJEMEN INVESTASI DAN PORTOFOLIO. In Fachrurazi (Ed.), Penambahan Natrium Benzoat Dan Kalium Sorbat (Antiinversi) Dan Kecepatan Pengadukan Sebagai Upaya Penghambatan Reaksi Inversi Pada Nira Tebu (Cetakan Pe). Eureka Media Aksara.

Silalahi, I. V., Nugraha, N., Sari, M., & Ningrum, H. F. (2022). Analisis Single Index Model dalam Membentuk Portofolio Optimal pada Saham Perusahaan Jakarta Islamic Index (JII) Periode 2016 - 2020. Sains: Jurnal Manajemen Dan Bisnis, 14(2), 203. https://doi.org/10.35448/jmb.v14i2.13876

Tandelilin, E. (2001). Analisis Investasi dan Manajemen Portofolio. BPFE Yogyakarta.

Yunus, M. (2016). ANALISIS PEMBENTUKAN PORTOFOLIO OPTIMAL SAHAM MENGGUNAKAN MODELINDEKS TUNGGAL DI BURSA EFEK INDONESIAUNTUK PENGAMBILAN KEPUTUSAN INVESTASI.

Zubir, Z. (2011). Manajemen Portofolio: Penerapannya dalam Investasi Saham. Salemba Empat.