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Optimization of Stock Portfolio Investment on the IDXHIDIV20 Index Using the Single Index Model and Markowitz Model Approach for Beginner Investors

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Abstract

Purpose - This study investigates the construction of optimal stock portfolios using the Single Index Model (SIM) and the Markowitz Mean-Variance Model (MM), applied to the IDX High Dividend 20 (IDXHIDIV20) index. With a growing number of novice investors in Indonesia, understanding which classical model offers better guidance for dividend-oriented investing is increasingly essential.

Design/methodology/approach - A descriptive quantitative approach was used, employing weekly secondary data of 20 IDXHIDIV20 constituents from 2019 to 2024. The SIM was applied through regression-based estimations and excess return-to-beta ranking, while the Markowitz Model utilized a full variance-covariance matrix with Excel Solver optimization.

Originality - This research contributes empirical evidence to modern portfolio theory by comparing the effectiveness of SIM and MM in the context of novice investors in emerging markets. It also incorporates the relevance of sustainability factors through dividend strategies.

Findings and Discussion - The Markowitz portfolio consistently outperforms the SIM portfolio in both return and risk dimensions, achieving an expected annual return of 23.56% with a standard deviation of 2.81%, compared to SIM's 22.96% return with 5.89% volatility. While the SIM offers practical simplicity for novice investors, the MM provides superior diversification through covariance-based optimization. These findings validate the importance of robust model selection in portfolio strategy.

Conclusion - The Markowitz Model is preferable for investors with access to analytical tools and data due to its superior risk-return performance, while SIM remains a valuable approach for those with limited resources. The study enhances financial education and supports informed investment decisions for dividend-focused strategies in emerging markets.

Keywords - Portfolio Optimization, Markowitz Model, Single Index Model, IDXHIDIV20, Beginner Investors, Risk-Return Efficiency

Introduction

The increasing participation of retail investors in Indonesia's capital market has altered the landscape of portfolio construction, particularly for novice investors seeking stable and sustainable income streams. One prominent instrument for such investors is the IDX High Dividend 20

(IDXHIDIV20) index, which comprises stocks with consistent dividend payouts and strong financial fundamentals. While classical portfolio theories—namely the Markowitz Mean-Variance Model and the Single Index Model (SIM)—have long been employed in various markets, their relevance to today's emerging markets and dividend-focused portfolios remains underexplored. Modern retail investors differ from traditional institutional investors in both behavior and goals. They are typically less experienced, more return-sensitive, and often gravitate toward dividend-paying assets due to their perceived safety and income stability. In this context, it becomes critical to reassess the applicability of classical optimization models to determine which better serves the needs of beginner investors navigating Indonesia's equity market.

The Markowitz Model, introduced in 1952, laid the foundation of modern portfolio theory by proposing that investors should select portfolios based on an efficient frontier of return and risk. A decade later, William Sharpe (1963) introduced the Single Index Model, simplifying computation by assuming that asset returns are influenced by a single market index. Although both models are still widely used, few studies have examined their comparative effectiveness when applied specifically to dividend-based indices like IDXHIDIV20, especially in developing markets. Despite their historical significance, the effectiveness of these classical models remains underexplored in the context of emerging markets like Indonesia—particularly among retail investors with limited financial literacy and different behavioral biases than institutional investors. Reassessing these models is necessary to validate their continued relevance, especially as the structure of modern investor profiles evolves.

Moreover, as sustainable investing gains momentum globally, it is also essential to consider the role of dividend strategies in promoting long-term portfolio resilience. Dividend-focused investing is increasingly associated with environmental, social, and governance (ESG) values, especially when companies prioritize stable dividend payouts over speculative growth. These shifts underscore the need to evaluate not only risk and return, but also the stability and sustainability of investments.

Literature Review

Historical Foundations of Portfolio Theory

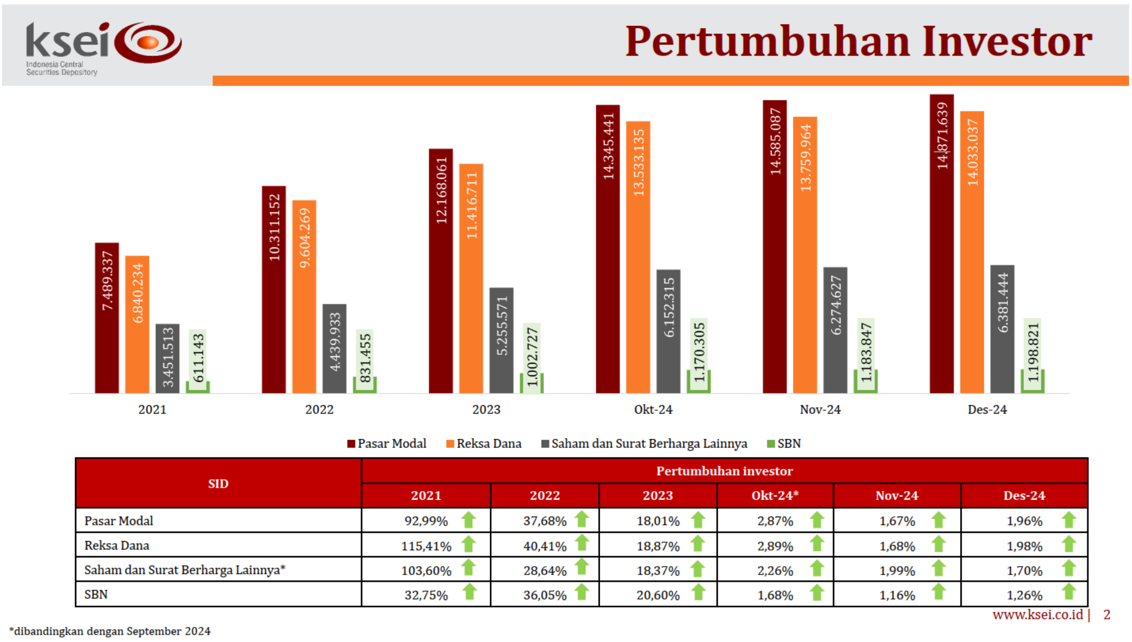
The origin of portfolio theory is traced back to Harry Markowitz's seminal work in 1952, which introduced the concept of mean-variance optimization. His model assumes that investors are rational and risk-averse, aiming to maximize returns while minimizing risk through diversification. This framework became the cornerstone of modern portfolio theory and led to further advancements, including the development of the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT) (Elton & Gruber, 2017; Fabozzi et al., 2014).

In 1963, William Sharpe proposed the Single Index Model (SIM) as a computationally simpler alternative, using a single market index to estimate covariance, reducing the complexity of portfolio construction especially when dealing with a large number of securities (Singh & Gautam, 2014).

Portfolio Theory in Emerging Markets and Novice Investors

Emerging markets such as Indonesia offer both challenges and opportunities for portfolio optimization, especially due to the increasing participation of novice retail investors. According to data from Kustodian Sentral Efek Indonesia (KSEI, 2024), the number of capital market investors (Single Investor Identification or SID) grew substantially from approximately 7.48 million in 2021 to over 14.87 million by the end of 2024, marking a cumulative growth of more than 50% within three years. Most of this growth is attributed to retail participation in mutual funds, stocks, and government securities (SBN), with equity-based instruments showing a particularly strong increase.

This growing trend suggests heightened interest in income-generating and dividend-oriented instruments among new market participants. The IDX High Dividend 20 (IDXHIDIV20) index, composed of financially solid, high-dividend-paying companies, provides an accessible and appealing option for these investors. Its construction aligns with the behavioral preferences of novice investors, who often seek investment products with relatively stable cash flows and lower perceived risk.



SID	Pertumbuhan investor					
	2021	2022	2023	Okt-24*	Nov-24	Des-24
Pasar Modal	92,99%	37,68%	18,01%	2,87%	1,67%	1,96%
Reksa Dana	115,41%	40,41%	18,87%	2,89%	1,68%	1,98%
Saham dan Surat Berharga Lainnya*	103,60%	28,64%	18,37%	2,26%	1,99%	1,70%
SBN	32,75%	36,05%	20,60%	1,68%	1,16%	1,26%

*dibandingkan dengan September 2024

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Figure 1. Investor Growth
Source: Kustodian Sentral Efek Indonesia, 2024

Studies by Prihatiningsih et al. (2025) and Zhang et al. (2024) emphasize that novice investors tend to prefer simple yet effective portfolio strategies—making SIM particularly attractive for its simplicity—while others may benefit from the risk efficiency offered by the Markowitz model.

Role of Dividend Investing in Sustainability and Resilience

Recent literature highlights how dividend investing contributes to long-term portfolio sustainability. Companies that consistently pay dividends are often more financially stable and better governed, making them suitable for ESG-aligned strategies (Cao, 2023; St. John's University, 2023). Moreover, during periods of economic uncertainty, dividend-paying stocks provide regular income and act as a cushion against volatility, enhancing resilience (Lee et al., 2024). In the context of IDXHIDIV20, which consists of financially robust and dividend-paying firms, this resilience factor becomes critical, especially for investors with lower risk tolerance. Therefore, it is imperative to assess whether classical portfolio optimization models can adequately capture both the financial and sustainable value of such portfolios.

Empirical Studies Comparing SIM and Markowitz

Multiple international studies have compared the performance of SIM and the Markowitz model across various markets. Singh & Gautam (2014) found that SIM is more efficient computationally, especially in large datasets. Zhang et al. (2024) and Prihatiningsih et al. (2025) demonstrated mixed outcomes: SIM often excels in terms of risk-adjusted returns, while Markowitz tends to generate higher absolute returns. These findings validate the importance of empirical testing in diverse contexts such as Indonesia, where market dynamics, investor behavior, and dividend culture differ significantly from developed economies.

Markowitz Mean-Variance Model

The Markowitz Model constructs optimal portfolios by solving a quadratic programming problem that minimizes portfolio variance for a given level of expected return, or vice versa. It requires estimation of expected returns, variances, and all pairwise covariances among assets. The model's strength lies in its ability to identify portfolios on the efficient frontier, offering the best possible risk-return combinations for rational investors. Despite its robustness, the Markowitz Model is computationally intensive, especially for large asset universes. However, with the availability of modern software tools like Excel Solver, the model is now more accessible for practical use—even by retail investors.

The Single Index Model

To simplify the computational complexity of Markowitz's full variance-covariance framework, Sharpe (1963) introduced the Single Index Model (SIM). The model assumes that asset returns are linearly related to market movements, and risk is decomposed into two components: systematic risk, measured by beta, and unsystematic risk, represented by the residual variance of the regression equation:

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

The SIM facilitates portfolio selection through ranking of stocks based on the excess return-to-beta ratio, allowing investors to identify securities that deliver high returns relative to their sensitivity to market risk.

Methods, Data, and Analysis

Research Design

This study employs a descriptive quantitative design aimed at determining and comparing optimal stock portfolios using two different portfolio construction techniques: the Single Index Model (SIM) and the

Markowitz Model (MM). The approach is suitable for examining historical price data, estimating risk and return, and determining efficient asset allocation based on statistical and mathematical procedures.

The choice of these models is motivated by their widespread application in modern portfolio theory, particularly in optimizing asset combinations under conditions of risk and return tradeoffs. While the Single Index Model emphasizes simplicity by relying on a market index (IHSG) as a proxy for systematic risk, the Markowitz Model incorporates a full covariance matrix to capture inter-asset dependencies.

Research Objectives and Model Logic

This study addresses three key objectives:

1. To identify high-performing stocks in IDXHIDIV20 based on expected return and risk profile.
2. To determine optimal asset allocation weights using SIM and MM.
3. To compare portfolio performance using risk-adjusted measures.

Each model follows a distinct theoretical and procedural logic:

- SIM relies on linear regression against market return to estimate α (alpha), β (beta), and residual variance, and selects stocks based on excess return-to-beta ratio.
- MM constructs the efficient frontier through mean-variance optimization, using all pairwise covariances to find the optimal risk-return combinations.

Population and Sampling Technique

The population of this research includes all 20 stocks listed in the IDX High Dividend 20 (IDXHIDIV20) index, selected by the Indonesia Stock Exchange for their consistent dividend performance and liquidity. This study applies census sampling, meaning all 20 constituent stocks are analyzed without omission. This approach ensures representativeness and avoids selection bias in the model application.

Operational Variables

The variables involved in this research are defined as follows:

Table 1. Operational Variables

Variable	Description
R_i	Return of individual stock i
R_m	Return of market index (IHSG)
R_f	Risk-free rate (7-Day Reverse Repo Rate from Bank Indonesia)
α_i	Stock-specific return unexplained by market movements
β_i	Stock's sensitivity to market movements
σ_i^2	Variance of stock i's return
Cov_{ij}	Covariance between stock i and stock j
$E(R_p)$	Expected return of portfolio
σ_p	Standard deviation of portfolio return

Source: Data Processed by the Author

Data Type and Sources

This study utilizes secondary, quantitative, time-series data to estimate return, risk, and portfolio composition using the Single Index and Markowitz Models. The data includes:

- Stock Price Data: Weekly closing prices of 20 constituent stocks of the IDX High Dividend 20 (IDXHIDIV20) index.
- Market Index Data: Weekly closing values of the Indonesia Composite Index (IHSG) as a market benchmark.
- Risk-Free Rate: 7-Day Reverse Repo Rate published by Bank Indonesia.

All price data were retrieved from Yahoo Finance and RTI Business, while macroeconomic data (risk-free rate) were obtained from Bank Indonesia's official website.

Observation Period

The observation period spans from January 2019 to December 2024, yielding 311 weekly observations per stock. This time frame ensures:

- A sufficiently long dataset to calculate return volatility,
- Coverage of both bullish and bearish market conditions,
- Validity for long-term portfolio simulations.
- Number of Stocks (n): 20
- Frequency: Weekly (closing price)
- Total Observations: 20 stocks × 311 weeks = 6,220 data points, excluding IHSG and risk-free rate series.

Sample Composition: IDX High Dividend 20 (IDXHIDIV20)

The IDXHIDIV20 is a thematic index introduced by the Indonesia Stock Exchange that includes 20 high-dividend-yield stocks selected based on:

1. High average dividend yield for the past three years,
2. Good liquidity (transaction frequency and trading value),
3. Sound fundamentals and profitability.

The stocks included in the sample are: ADRO, AMRT, ANTM, ASII, BBCA, BBNI, BBRI, BMRI, BRPT, ICBP, INDF, INKP, ITMG, KLBF, PTBA, SMGR, TLKM, TPIA, UNTR, and UNVR. These companies span multiple sectors, including finance, consumer goods, energy, and infrastructure—providing intrinsic diversification even before portfolio optimization.

Rationale for Using IDXHIDIV20

This index is chosen for the following reasons:

- Dividend-oriented investment is more suitable for beginner investors seeking stable income with moderate risk.
- Stocks in this index are typically fundamentally strong, with consistent profit performance and track records of dividend distribution.
- High-dividend stocks exhibit lower price volatility, reducing behavioral bias and emotional decision-making among inexperienced investors.

Hence, IDXHIDIV20 provides a relevant and practical universe for studying portfolio optimization using the Single Index and Markowitz frameworks in the context of entry-level investors.

Analysis

This study applies two quantitative portfolio optimization techniques: the Single Index Model (SIM) and the Markowitz Mean-Variance Model (MM). Both models aim to determine the optimal stock combinations that maximize expected return for a given level of risk, or equivalently, minimize risk for a target return. The analytical procedures are as follows:

Return Calculation

Weekly return for each stock and the market index (IHSG) was calculated using the logarithmic formula:

$$R_{i,t} = \frac{P_{i,t}}{P_{i,t-1}} - 1$$

Where:

- $R_{i,t}$ = Return of stock i at week t
- $P_{i,t-1}$ = Closing price of stock i at week t

Single Index Model (SIM) Procedure

The SIM, developed by Sharpe (1963), simplifies risk analysis by assuming that asset returns are linearly related to market return:

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

Where:

- α_i = Intercept (stock's abnormal return)
- β_i = Beta coefficient (systematic risk)
- R_m = Market return (IHSG)
- ϵ_i = Residual (unsystematic risk)

The following steps were implemented:

1. Beta Estimation: Linear regression was performed between stock return R_i and market return R_m to derive β_i and α_i.
2. Residual Variance: Calculated to measure unsystematic risk for each stock.
3. Excess Return to Beta Ratio:

$$ERB = \frac{R_i - R_f}{\beta_i}$$

This ratio ranks stocks based on risk-adjusted excess return.

1. Cut-off Point (C*) Determination:
   Based on Sharpe's algorithm, C* is the threshold beyond which stocks are eligible for inclusion in the portfolio.
2. Weight Calculation (Wi):
   Optimal asset weights were derived using:

$$Wi = \frac{Z_i}{\sum Z_i} \quad where \quad Z_i = \frac{\beta_i (ERB_i - C^*)}{\sigma^2{}_{\epsilon i}}$$

Markowitz Model (MM) Procedure

The Markowitz Model constructs the efficient frontier by considering each stock's expected return, variance, and pairwise covariances.

1. Expected Return Calculation:

$$E(R_i) = \frac{\sum R_i}{n}$$

2. Standard Deviation and Variance:

$$\sigma = \sqrt{\frac{\sum_{t=1}^{n}(R_{it} - E(R_i))^2}{n-1}}$$

3. Covariance Matrix (Cov(i,j)):
   All pairwise covariances between stocks were calculated to capture interdependencies.
4. Solver Optimization (Excel Solver):
   - Objective: Maximize Sharpe Ratio or Minimize Portfolio Variance
   - Constraints:
     - Sum of weights = 1
     - Weight bounds: $0 \leq Wi \leq 1$ (no short selling)

Portfolio Performance Evaluation

The final portfolios were evaluated using the following metrics:

- Expected Portfolio Return:

$$E_{(R_p)} = \sum_{i=1}^{n} W_i \times E_{(R_i)}$$

- Portfolio Standard Deviation:

$$\sigma_p = \sqrt{\sum_{i=1}^{n} \sum_{j=1}^{n} W_i W_j . Cov(i,j)}$$

These measures allow for a clear comparison between the two models in terms of risk-return efficiency, especially for beginner investors seeking high-dividend portfolios with manageable risk.

Results

This section presents the outcome of the portfolio optimization process using both the Single Index Model (SIM) and the Markowitz Model (MM), based on the weekly return data of IDXHIDIV20 constituent stocks during the period of January 2019 to December 2024. The focus is on comparing risk-return profiles and portfolio efficiency to determine the more suitable model for beginner investors.

Results of the Single Index Model

Using SIM methodology, the optimal portfolio was constructed based on excess return-to-beta ratio and the cut-off rate (C*). To identify the most efficient securities under the Single Index Model (SIM), stocks were ranked based on their excess return-to-beta (ERB) ratio. The cut-off point (C*) was then determined, acting as a threshold to select stocks for the optimal portfolio. Stocks with a Ci value greater than or equal to the cut-off point were included, while others were excluded or eliminated due to negative beta values. The summary of this selection process is presented in Table 2.

Table 2. Cut-off Point (C*) and Stock Selection Result Based on SIM

No.	Stock	ERB	Ci	C*	Decision
1	TPIA	0.011635	0.000317	0.000317	Included in Optimal Portfolio
2	AMRT	0.009376	0.000299	0.000317	Included in Optimal Portfolio
3	ANTM	0.008017	0.000153	0.000317	Included in Optimal Portfolio
4	BBCA	0.005232	0.000212	0.000317	Included in Optimal Portfolio
5	ADRO	0.004838	0.000216	0.000317	Included in Optimal Portfolio
6	BRPT	0.00472	0.000286	0.000317	Included in Optimal Portfolio
7	BMRI	0.003461	0.000127	0.000317	Included in Optimal Portfolio
8	ITMG	0.002444	0.000102	0.000317	Included in Optimal Portfolio
9	BBRI	0.000579	2.47E-05	0.000317	Included in Optimal Portfolio
10	BBNI	0.000544	2.56E-05	0.000317	Included in Optimal Portfolio
11	UNTR	-0.00111	-2.9E-05	0.000317	Excluded (Below Cut-off)
12	INKP	-0.00114	-1.2E-05	0.000317	Excluded (Below Cut-off)
13	PTBA	-0.00223	-8.8E-05	0.000317	Excluded (Below Cut-off)
14	KLBF	-0.00418	-4.5E-05	0.000317	Excluded (Below Cut-off)
15	SMGR	-0.00614	-0.00035	0.000317	Excluded (Below Cut-off)
16	TLKM	-0.00658	-8E-05	0.000317	Excluded (Below Cut-off)
17	ASII	-0.00672	-0.00015	0.000317	Excluded (Below Cut-off)
18	INDF	0.002408	2.75E-05	0.000317	Eliminated (Negative Beta)
19	ICBP	0.001063	2.04E-05	0.000317	Eliminated (Negative Beta)
20	UNVR	0.020857	0.00031	0.000317	Eliminated (Negative Beta)

Source: Author's Calculation (2025)

Following the selection, the optimal asset weights were calculated using Sharpe's SIM formulation, which considers the relative Zi values of the chosen stocks. The proportional allocation of each stock in the portfolio is shown in Table 3.

Table 3. Zi Parameters and Portfolio Weights (Wi) from Single Index Model

No.	Stock	Zi	Wi (%)
1	ADRO	0.68627	9.05%
2	AMRT	1.65694	21.85%
3	ANTM	0.70383	9.28%

No.	Stock	Zi	Wi (%)
4	BBCA	1.61227	21.26%
5	BBNI	0.05069	0.67%
6	BBRI	0.06406	0.84%
7	BMRI	0.70816	9.34%
8	BRPT	0.56386	7.44%
9	ITMG	0.35329	4.66%
10	TPIA	1.18421	15.62%
Total		7.58358	100%

Source: Author's Calculation (2025)

The aggregate performance of the portfolio is:
- Expected Portfolio Return: 22.96% per annum
- Portfolio Standard Deviation: 5.89%

This result suggests a moderately efficient portfolio with acceptable risk exposure for novice investors. However, asset correlation is not considered, limiting diversification benefits.

Results of the Markowitz Model

The Markowitz optimization utilized the variance-covariance matrix and Excel Solver to find the portfolio composition that maximizes the Sharpe ratio. To determine the optimal portfolio composition using the Markowitz Mean-Variance Model, it is essential to compute the variance and covariance between each pair of stocks. The covariance matrix captures the interdependencies of asset returns and serves as a crucial input in the quadratic programming process to optimize the risk-return profile. The matrix below presents the pairwise covariances among selected stocks considered for the Markowitz optimization:

Table 4. Covariance Matrix of Selected Stocks (Markowitz Portfolio) 1

	ADRO	AMRT	ANTM	ASII	BBCA	BBNI	BBRI	BMRI	BRPT	ICBP
ADRO	0.004613	0.000355	0.001554	0.000690	0.000602	0.000839	0.000863	0.000767	0.000977	0.000076
AMRT	0.000355	0.002203	0.000206	0.000197	0.000050	0.000210	0.000038	0.000199	0.000657	0.000017
ANTM	0.001554	0.000206	0.005165	0.001124	0.000759	0.001297	0.001019	0.000869	0.001277	0.000353
ASII	0.000690	0.000197	0.001124	0.001628	0.000700	0.000982	0.000892	0.000920	0.000420	0.000272
BBCA	0.000602	0.000050	0.000759	0.000700	0.000889	0.000928	0.000802	0.000839	0.000460	0.000267
BBNI	0.000839	0.000210	0.001297	0.000982	0.000928	0.002269	0.001402	0.001488	0.001047	0.000442
BBRI	0.000863	0.000038	0.001019	0.000892	0.000802	0.001402	0.001694	0.001153	0.000712	0.000261
BMRI	0.000767	0.000199	0.000869	0.000920	0.000839	0.001488	0.001153	0.001698	0.000676	0.000343
BRP	0.0009	0.0006	0.0012	0.0004	0.0004	0.0010	0.0007	0.0006	0.0090	0.0003

	ADRO	AMRT	ANTM	ASII	BBCA	BBNI	BBRI	BMRI	BRPT	ICBP
T	77	57	77	20	60	47	12	76	97	31
ICBP	0.000076	0.000017	0.000353	0.000272	0.000267	0.000442	0.000261	0.000343	0.000331	0.001146
INDF	0.000315	-0.000019	0.000609	0.000379	0.000357	0.000487	0.000394	0.000432	0.000333	0.000773
INKP	0.001527	0.000172	0.001968	0.001205	0.000877	0.001284	0.001011	0.001029	0.001008	0.000604
ITMG	0.002418	0.000157	0.001120	0.000622	0.000527	0.000843	0.000743	0.000745	0.000576	0.000078
KLBF	0.000364	0.000127	0.000636	0.000403	0.000340	0.000534	0.000347	0.000419	0.001038	0.000356
PTBA	0.002256	0.000146	0.001442	0.000603	0.000473	0.000834	0.000637	0.000636	0.000526	0.000078
SMGR	0.000713	0.000328	0.001117	0.001043	0.000651	0.001037	0.000803	0.000905	0.000932	0.000440
TLKM	0.000479	0.000341	0.000920	0.000531	0.000514	0.000859	0.000649	0.000642	0.000944	0.000314
TPIA	0.000131	0.000411	0.000216	0.000102	0.000102	0.000185	0.000140	0.000187	0.003805	0.000037
UNTR	0.001652	0.000022	0.000945	0.000597	0.000288	0.000520	0.000470	0.000527	0.000470	0.000071
UNVR	0.000057	0.000039	0.000282	0.000359	0.000293	0.000409	0.000217	0.000364	0.000593	0.000702

Source: Author's Calculation (2025)

Table 5. Covariance Matrix of Selected Stocks (Markowitz Portfolio) 2

	INDF	INKP	ITMG	KLBF	PTBA	SMGR	TLKM	TPIA	UNTR	UNVR
ADRO	0.000315	0.001527	0.002418	0.000364	0.002256	0.000713	0.000479	0.000131	0.001652	0.000057
AMRT	-0.000019	0.000172	0.000157	0.000127	0.000146	0.000328	0.000341	0.000411	0.000022	0.000039
ANTM	0.000609	0.001968	0.001120	0.000636	0.001442	0.001117	0.000920	0.000216	0.000945	0.000282
ASII	0.000379	0.001205	0.000622	0.000403	0.000603	0.001043	0.000531	0.000102	0.000597	0.000359
BBCA	0.000357	0.000877	0.000527	0.000340	0.000473	0.000651	0.000514	0.000102	0.000288	0.000293
BBNI	0.000487	0.001284	0.000843	0.000534	0.000834	0.001037	0.000859	0.000185	0.000520	0.000409
BBRI	0.000394	0.001011	0.000743	0.000347	0.000637	0.000803	0.000649	0.000140	0.000470	0.000217
BMRI	0.000432	0.001029	0.000745	0.000419	0.000636	0.000905	0.000642	0.000187	0.000527	0.000364
BRPT	0.000333	0.001008	0.000576	0.001038	0.000526	0.000932	0.000944	0.003805	0.000470	0.000593
ICBP	0.000773	0.000604	0.000078	0.000356	0.000078	0.000440	0.000314	0.000037	0.000071	0.000702
INDF	0.001152	0.000867	0.000175	0.000421	0.000229	0.000483	0.000385	-0.000035	0.000212	0.000597

	INDF	INKP	ITMG	KLBF	PTBA	SMGR	TLKM	TPIA	UNTR	UNVR
INKP	0.000867	0.004752	0.001113	0.000844	0.001303	0.001243	0.000723	0.000589	0.001145	0.000708
ITMG	0.000175	0.001113	0.003585	0.000188	0.001746	0.000561	0.000460	0.000063	0.001432	0.000294
KLBF	0.000421	0.000844	0.000188	0.001584	0.000305	0.000677	0.000419	0.000397	0.000293	0.000545
PTBA	0.000229	0.001303	0.001746	0.000305	0.002891	0.000630	0.000464	0.000093	0.001359	0.000083
SMGR	0.000483	0.001243	0.000561	0.000677	0.000630	0.002847	0.000746	-0.000076	0.000392	0.000490
TLKM	0.000385	0.000723	0.000460	0.000419	0.000464	0.000746	0.001444	0.000236	0.000407	0.000248
TPIA	-0.000035	0.000589	0.000063	0.000397	0.000093	-0.000076	0.000236	0.005702	0.000191	0.000110
UNTR	0.000212	0.001145	0.001432	0.000293	0.001359	0.000392	0.000407	0.000191	0.002138	-0.000075
UNVR	0.000597	0.000708	0.000294	0.000545	0.000083	0.000490	0.000248	0.000110	-0.000075	0.002096

Source: Author's Calculation (2025)

Based on the optimization process using the variance-covariance matrix and risk-free rate, the Markowitz Model produced an optimal allocation across six constituent stocks of the IDXHIDIV20. The stock weights were derived to maximize the Sharpe ratio while adhering to the constraints of full investment and no short-selling. The resulting portfolio weights are presented in the following table:

Table 6. Optimal Portfolio Weights from Markowitz Model

No	Stock	Weight
1	BBCA	34.66%
2	AMRT	30.90%
3	TPIA	20.58%
4	ANTM	6.92%
5	ADRO	6.35%
6	ICBP	0.59%

Source: Author's Calculation (2025)

The computed performance metrics are:

- Expected Portfolio Return: 23.56% per annum
- Portfolio Standard Deviation: 2.81%

These results demonstrate that the Markowitz portfolio achieves a higher return with significantly lower risk, driven by covariance optimization and diversification effects. The comparison clearly shows that the Markowitz Model outperforms the Single Index Model in all key performance indicators, particularly in risk minimization. The inclusion of covariance among assets allows the Markowitz Model to construct a portfolio closer to the efficient frontier.

Discussion

The comparative analysis between the Single Index Model (SIM) and the Markowitz Mean-Variance Model (MM) reveals meaningful insights into portfolio optimization for dividend-oriented beginner investors in emerging markets. While both models provide structured frameworks to balance return and risk, their computational complexity, input requirements, and resulting portfolio efficiency differ significantly. The Markowitz Model demonstrates superior performance by achieving a higher expected annual return (23.56%) with notably lower volatility (2.81%). This aligns with international studies (Zhang et al., 2024; Singh & Gautam, 2014), emphasizing that the inclusion of full variance-covariance relationships enhances diversification and risk control. The model's ability to construct portfolios along the efficient frontier is particularly valuable for investors aiming for long-term income stability through dividend strategies. Conversely, the Single Index Model—despite its simplicity—yields slightly lower performance (22.96% return, 5.89% volatility). Its dependence on beta as a sole measure of systematic risk omits asset-specific variance and asset interdependencies, limiting its precision. However, its ease of application, reduced data requirements, and interpretability make SIM a practical tool for novice investors with limited analytical resources (Sharpe, 1963; Elton & Gruber, 2017). From a sustainability perspective, this study affirms that dividend-paying stocks contribute to portfolio resilience during volatile market conditions, consistent with findings by Cao (2023) and Lee et al. (2024). The Markowitz Model, by enabling more precise risk allocation, further amplifies this resilience, positioning it as a preferable choice for long-term dividend-focused strategies. Ultimately, the trade-off between simplicity and precision emerges as a key consideration. While SIM may serve as an accessible entry point, MM offers a more comprehensive framework for investors seeking optimized, sustainable portfolio performance. These findings are especially relevant amid the rapid growth of retail participation and the increased importance of ESG-aligned investing in emerging economies like Indonesia.

Conclusion

This study provides a comparative analysis of two prominent portfolio optimization approaches—the Single Index Model (SIM) and the Markowitz Mean-Variance Model (MM)—applied to the IDX High Dividend 20 (IDXHIDIV20) index. The primary objective was to evaluate their effectiveness in constructing optimal portfolios for beginner investors seeking stable, dividend-oriented returns in an emerging market context. Empirical results show that while both models can produce portfolios with strong expected returns, the Markowitz Model outperforms SIM in all key performance metrics. It achieves a higher annual return (23.56%) and significantly lower volatility (2.81%) due to its full variance-covariance optimization and superior diversification capability. Conversely, the SIM delivers slightly lower performance (22.96% return; 5.89% volatility) but remains valuable for its simplicity, especially when computational or data constraints exist. Overall, the findings reinforce the relevance of classical portfolio theory in modern investment practice. The Markowitz Model is preferable for investors with access to optimization tools and data, while SIM serves as a practical starting point for novice investors. This research contributes to financial education and investment decision-making by offering evidence-based insights into model selection for dividend-based portfolios in emerging markets.

Limitation

This study is limited by the use of historical weekly data that may not fully capture market microstructure noise or real-time investor sentiment. The IDXHIDIV20 index represents a specific segment of the Indonesian market, limiting the generalizability of the findings to broader or international portfolios. In addition, the sustainability aspect was discussed conceptually without integrating specific ESG metrics into the optimization models. Lastly, the models assume normal distribution and rational investor behavior, which may not reflect real-world conditions. Future research could incorporate alternative indices, integrate ESG scoring, or apply machine learning models to improve forecasting accuracy and portfolio adaptability.

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