



Original Article

Implementation of the Markowitz Model in Efficient Portfolio Construction: Analysis of the Investor33 Index After the Major Evaluation of 2025

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Abstract:

This study aims to create an optimal portfolio of stocks included in the Investor33 index, an index created and managed by the Indonesia Stock Exchange in collaboration with the media company PT Media Investor Indonesia, using the Markowitz model approach. The portfolio optimization aims to provide an alternative for rational investment decision-making based on a balance between stock returns and risk. The data used for portfolio construction is monthly return data from May 2022 to May 2025 for 33 stocks in the Investor33 index, which were evaluated by the Indonesia Stock Exchange in May 2025 and effective from June 2 to November 28, 2025. Based on the calculations, nine stocks form the optimal portfolio: BNGA, INDF, ICBP, PGAS, AKRA, BRIS, ANTM, AMRT and MYOR. This portfolio provides an estimated return of 1.316% per month with a risk level (variance) of 0.151%. These results indicate that the mean-variance approach in the Markowitz Model remains relevant for forming efficient portfolios for the leading stock groups in the Indonesian capital market.

Keywords: Markowitz Model, optimal portfolio, stocks, Indonesian Stock Exchange Investor33.

Introduction

Stock investment has become one of the primary instruments for long-term wealth development for investors in global capital markets. In the context of the Indonesian capital market, the development of the Indonesia Stock Exchange (IDX) shows significant growth, with the number of listed companies reaching 943 by December 2024, while the number of investors has rapidly expanded to 15 million investors ([Bursa Efek Indonesia, 2025a](#)). The complex dynamics of the market and the inherent volatility in stock investment require investors to adopt a systematic and measured approach in managing their investment portfolios.

The Modern Portfolio Theory, developed by Harry Markowitz in 1952, was a groundbreaking development in finance that introduced a quantitative approach to optimize portfolios based on the trade-off between risk and return ([Markowitz, 2008](#)). Markowitz's contribution, which earned him the Nobel Prize in Economics in 1990,



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transformed the investment paradigm from an intuitive approach to a mathematically-based methodology. This theory introduced the concept of the efficient frontier, allowing investors to construct a portfolio that maximizes expected return at a certain level of risk or minimizes risk at a given expected return ([Brown, 2021](#)). Implementing this theory requires an understanding of the statistical characteristics of the assets within the portfolio, including expected returns and variances among assets over a given time horizon.

The Investor33 Index is an index created and managed by the Indonesia Stock Exchange in collaboration with PT Media Investor Indonesia to measure the price performance of 33 selected stocks from the top 100 listed companies as rated by Investor Magazine, based on market capitalization, transaction liquidity, fundamentals, and financial ratios ([Bursa Efek Indonesia, 2025b](#)). The unique characteristics of this index provide an interesting research opportunity to apply modern portfolio theory, considering the diverse sectors it represents, including banking, mining, telecommunications, consumer goods, and infrastructure. The volatility of the Investor33 index has shown dynamic movements, with its all-time high reaching 516,951 in February 2024 and its lowest record at 288,630 in September 2015.



Figure 1. Investor33 Index Price Chart (May 2014 - June 2025)

The application of the Markowitz model to various stock indices in Indonesia has become the focus of extensive academic research, with results showing the effectiveness of the model in diverse market conditions. A study of the LQ45 index using data from the period 2006-2011 successfully identified an optimal portfolio consisting of 13 stocks, with a daily return of 0.109% and a risk of 0.048% ([Bangun et al., 2012](#)). A study applying the Markowitz model along with the K-Means method on the LQ45 stocks from 2016-2021 also confirmed the model's ability to optimize the trade-off between risk and return ([Siregar & Pangruruk, 2021](#)). Research on the IDX30 index showed similar results, where the optimal portfolio generated an expected return of 0.02% per month with a daily risk of 0.002%, with stock compositions including ADRO, AASI, and PGAS ([Sirait et al., 2022](#)).

Although the Markowitz model has been widely applied to major indices such as LQ45 and IDX30, its application to the Investor33 Index is still limited in the academic literature. The unique characteristics of Investor33, which combine fundamental analysis and other factors in selecting its constituents, offer a new dimension in evaluating the effectiveness of portfolio optimization models. Previous research shows

that the implementation of Markowitz Portfolio Theory in popular indices such as LQ45 and IDX30 can provide significant added value in portfolio construction. However, there has been no specific study focusing on the dynamics of stocks in the Investor33. This research gap is relevant, given the differences in stock selection methodologies between Investor33 and other conventional indices, as well as the diversification potential offered by the more balanced sectoral composition within the index.

Literature Review

Stocks

A stock is a security that represents ownership of an individual or entity in a corporation or limited liability company, granting the shareholder the right to receive a portion of the company's earnings, assets, and to attend the General Shareholders Meeting ([Tandelilin, 2010](#)). The unique characteristics of the Indonesian stock market show a behavior where high volatility and domestic and global macroeconomic factors significantly impact stock price movements ([Oktavian & Prasetyo, 2023](#)).

Investor33 Index

The Investor33 Index is a stock index developed through a collaboration between Beritasatu Media Holdings and the Indonesia Stock Exchange, launched in 2014. It consists of 33 public companies selected based on strict fundamental and technical criteria ([Indonesia Investments, 2025](#)). Investor33 conducts two major evaluations every year in May and November, along with two minor evaluations in February and August ([Bursa Efek Indonesia, 2025b](#)).

Risk

Investment risk is defined as the possibility of deviation between actual returns and expected returns, which can be categorized into systematic risk, which cannot be eliminated through diversification, and unsystematic risk, which can be minimized through portfolio diversification ([Fabozzi et al., 2006](#)). A comprehensive understanding of these two types of risk is key to developing effective risk management strategies to optimize portfolio returns in uncertain market conditions.

Return

Investment return is the reward received by an investor for investing in an asset or portfolio, which can consist of income yield and capital gain/loss ([Sharpe, 1999](#)). Expected return is the weighted average of all possible returns that could occur, which in practice is often estimated using historical average returns under the assumption that past return patterns will continue in the future ([Campbell & Viceira, 2002](#)).

Portfolio and Markowitz Model

A portfolio is defined as a combination of two or more investment assets arranged to achieve specific investment objectives, where the total risk of the portfolio is not simply the sum of the individual asset risks but depends on the correlation between the assets ([Elton et al., 2009](#)). The Markowitz Model, or Modern Portfolio Theory, introduced in 1952, is a mathematical framework for constructing an optimal portfolio

based on the trade-off between risk and return, assuming that investors are risk-averse and seek to maximize returns for a given level of risk ([Markowitz, 2008](#)).

Methods

This study uses a quantitative approach with a descriptive-analytical research design, applying the Markowitz optimization model to construct an optimal portfolio of stocks from the Investor33 Index. The research sample includes 34 stocks that have consistently been listed in the Investor33 during the observation period. The analysis period uses monthly return data from May 2022 to May 2025 (three years). This period considers the major evaluation conducted by the Indonesia Stock Exchange in May 2025, which may change the composition of the index list, effective from June 2, 2025, to November 28, 2025.

Table 1. List of Stocks in the Investor33 Index (After Major Evaluation in May 2025)

Ticker	Company name
AALI	PT Astra Agro Lestari Tbk
ADMR	PT Adaro Minerals Indonesia Tbk
ADRO	PT Adaro Energy Indonesia Tbk
AKRA	PT AKR Corporindo Tbk
AMRT	PT Sumber Alfaria Trijaya Tbk
ANTM	PT Aneka Tambang Tbk
ASII	PT Astra International Tbk
BBCA	PT Bank Central Asia Tbk
BBNI	PT Bank Negara Indonesia (Persero) Tbk
BBRI	PT Bank Rakyat Indonesia (Persero) Tbk
BBTN	PT Bank Tabungan Negara (Persero) Tbk
BMRI	PT Bank Mandiri (Persero) Tbk
BNGA	PT Bank CIMB Niaga Tbk
BRIS	PT Bank Syariah Indonesia Tbk
CPIN	PT Charoen Pokphand Indonesia Tbk
EXCL	PT XL Axiata Tbk
ICBP	PT Indofood CBP Sukses Makmur Tbk
INCO	PT Vale Indonesia Tbk
INDF	PT Indofood Sukses Makmur Tbk
INTP	PT Indocement Tunggul Prakarsa Tbk
ITMG	PT Indo Tambangraya Megah Tbk
JSMR	PT Jasa Marga (Persero) Tbk
KLBF	PT Kalbe Farma Tbk
MYOR	PT Mayora Indah Tbk
PGAS	PT Perusahaan Gas Negara Tbk
PTBA	PT Bukit Asam Tbk

SIDO	PT Industri Jamu dan Farmasi Sido Muncul Tbk
SMGR	PT Semen Indonesia (Persero) Tbk
TBIG	PT Tower Bersama Infrastructure Tbk
TLKM	PT Telkom Indonesia (Persero) Tbk
TOWR	PT Sarana Menara Nusantara Tbk
UNTR	PT United Tractors Tbk
UNVR	PT Unilever Indonesia Tbk

The research data consists of the monthly closing prices of the Investor33 stocks, obtained using the STOCKHISTORY formula in Microsoft Excel, which automatically downloads historical data from the financial data provider LSEG Data & Analytics ([Microsoft, 2025](#)). The data used is the adjusted closing price at the end of each month, which has been adjusted for corporate actions to ensure consistency in return calculations.

The variables used include: individual stock monthly returns, expected return and variance of individual stocks taken from data during the period from May 2022 to May 2025, portfolio weight of each stock to find the optimal point (w_i), monthly risk-free return (R_f), portfolio return (R_p), and portfolio risk (σ_p).

Table 2. Monthly Average and Variance of Stocks in the Investor33 Index (After May 2025 Major Evaluation)

Time:	May 2022 - May 2025	
Share	Average Monthly Return	Variance
AALI	-1.78%	0.37%
ADMR	-1.48%	2.33%
ADRO	-0.15%	1.69%
AKRA	0.84%	0.76%
AMRT	1.34%	0.76%
ANTM	1.21%	1.59%
ASII	-1.01%	0.38%
BBCA	0.49%	0.20%
BBNI	0.21%	0.56%
BBRI	0.12%	0.73%
BBTN	-0.68%	0.72%
BMRI	0.75%	0.58%
BNGA	1.57%	0.35%
BRIS	2.26%	1.13%
CPIN	0.05%	0.44%
EXCL	-0.70%	0.62%
ICBP	1.19%	0.45%
INCO	-1.21%	1.56%

INDF	0.74%	0.27%
INTP	-1.31%	0.71%
ITMG	-0.05%	1.12%
JSMR	0.11%	0.52%
KLBF	-0.02%	0.42%
MYOR	1.11%	0.85%
PGAS	0.98%	0.78%
PTBA	-0.30%	0.89%
SIDO	-1.24%	0.77%
SMGR	-1.71%	0.96%
TBIG	-0.69%	0.30%
TLKM	-1.14%	0.38%
TOWR	-1.18%	0.58%
UNTR	-0.42%	0.77%
UNVR	-1.40%	1.53%

The analysis was performed using Microsoft Excel with the following steps: (1) calculation of descriptive statistics for the monthly return data; (2) calculation of input parameters including expected return and variance for the portfolio; (3) construction of the efficient frontier by finding variance for various target returns, with the objective function where the total weighted portfolio of all 33 stocks does not exceed 100%, and each weight of the individual stocks must be greater than or equal to 0%; (4) portfolio optimization using the Solver add-in to find the optimal portfolio point, referred to as point M, determined through a numerical approach using the Solver GRG Linear feature in Microsoft Excel. In this case, optimization is performed by maximizing the slope of the Capital Market Line (CML), which is calculated using the formula:

$$Slope = \frac{Rp - Rf}{\sigma p}$$

Where Rp is the expected return of the portfolio, Rf is the risk-free return rate, which in this study is taken as 0.51%, based on the yield of the Indonesian government bond with a 3-year tenor as of July 9, 2025, from the PT. Penilai Harga Efek Indonesia website (6.115%) divided by 12. σp is the standard deviation (square root of variance) of the portfolio. This procedure aims to find the combination of stock weights in the Investor33 index that generates the highest return-to-risk ratio, while maintaining the constraint that the total portfolio weight is 100% and all weights remain within the non-negative range (without short-selling).

Results

Based on the implementation of the Markowitz Model on the 33 stocks included in the Investor33 Index from May 2022 to May 2025, the optimal portfolio was obtained, consisting of eight stocks with the following composition:

Table 3. Optimal Portfolio Composition of Investor Index33

Ticker	Company name	Weight	Sector
BNGA	PT Bank CIMB Niaga Tbk	35.93%	Banking
INDF	PT Indofood Sukses Makmur Tbk	11.94%	Consumer Goods
ICBP	PT Indofood CBP Sukses Makmur Tbk	10.09%	Consumer Goods
PGAS	PT Perusahaan Gas Negara Tbk	9.98%	Energy
AKRA	PT AKR Corporindo Tbk	8.69%	Trade & Distribution
BRIS	PT Bank Syariah Indonesia Tbk	8.30%	Banking
ANTM	PT Aneka Tambang Tbk	5.97%	Mining
AMRT	PT Sumber Alfaria Trijaya Tbk	5.68%	Consumer Goods
MYOR	PT Mayora Indah Tbk	3.41%	Consumer Goods
TOTAL		100.00%	

This optimal portfolio generates an expected return of 1.316% per month with a risk level (variance) of 0.151%.

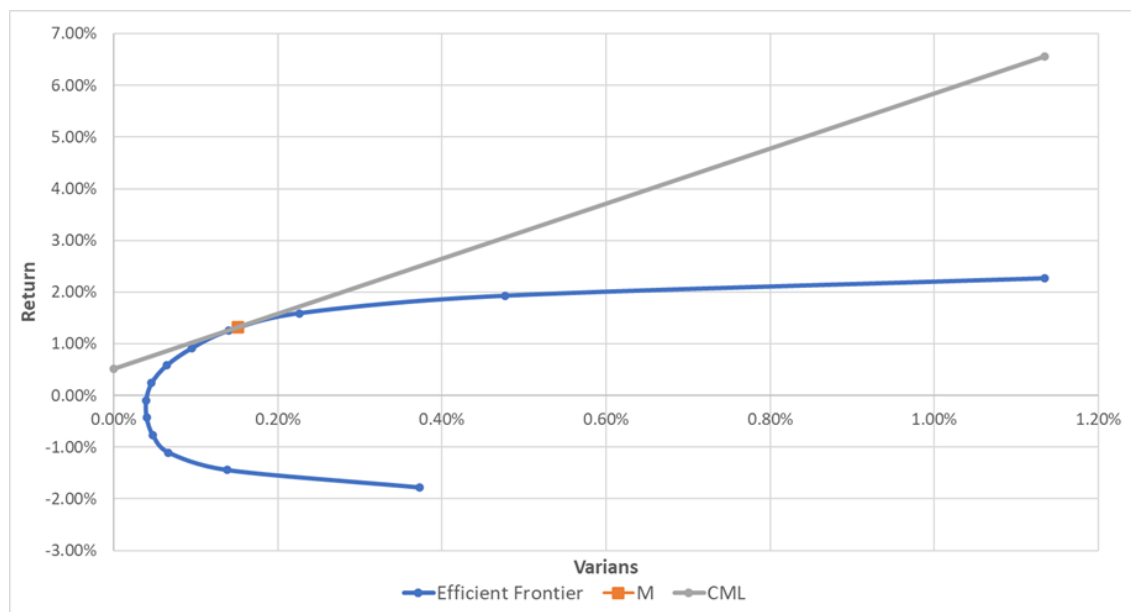


Figure 2. Efficient Frontier Line and Optimum Portfolio Point

Sectoral Diversification Analysis

The optimal portfolio shows good diversification with representation from five key sectors:

1. **Banking Sector (44.23%):** The banking sector dominates, with BNGA as the largest component (35.93%) and BRIS (8.30%), reflecting the Markowitz model's preference for stocks with relatively stable volatility and consistent returns. BNGA, with an average monthly return of 1.57% and a variance of 0.35%, provides an optimal combination of return and risk.
2. **Consumer Goods Sector (31.12%):** Comprising INDF (11.94%), ICBP (10.09%), AMRT (5.68%), and MYOR (3.41%), this sector represents defensive stocks with stable growth characteristics. The inclusion of two subsidiaries of Indofood (INDF

and ICBP) in the portfolio highlights the strong fundamentals of consumer goods companies in Indonesia.

3. Energy Sector (9.98%): PGAS represents the energy sector with a significant contribution, reflecting the growth potential of Indonesia's energy infrastructure sector, supported by government policies promoting gas as a transition energy source.
4. Trade and Distribution Sector (8.69%): AKRA, a company involved in the distribution of fuel and chemicals, provides exposure to the downstream energy sector, which has a low correlation with other sectors.
5. Mining Sector (5.97%): ANTM represents the mining sector with a relatively small allocation, indicating that the Markowitz model tends to reduce exposure to sectors with high volatility.

Although specific data on the portfolio's return and risk are not provided in the results, based on the individual characteristics of the stocks in the optimal portfolio, it can be analyzed that stocks with the highest expected returns, such as BRIS (2.26%), BNGA (1.57%), and AMRT (1.34%), received significant allocations in the portfolio, while stocks with negative returns, such as AALI (-1.78%), ADMR (-1.48%), and SMGR (-1.71%), were excluded from the optimal portfolio.

From a risk perspective, stocks with high variances, such as ADMR (2.33%) and ADRO (1.69%), were not included in the optimal portfolio, demonstrating the effectiveness of the Markowitz model in minimizing portfolio risk through the selection of appropriate assets.

Conclusion

The implementation of the Markowitz Model in constructing the optimal portfolio from the Investor33 Index stocks successfully identified 9 optimal stocks with an expected return of 1.316% per month and a risk level (variance) of 0.151%. This optimal portfolio also exhibits good sectoral diversification characteristics, with the banking sector (44.23%) and consumer goods sector (31.12%) dominating. The optimal portfolio formed shows the model's preference for stocks with a combination of high expected returns and controlled volatility, with BNGA as the dominant component (35.93%) due to its optimal risk-return characteristics. The results confirm the relevance and effectiveness of the mean-variance optimization approach in the context of the Indonesian capital market, particularly for leading stocks included in the Investor33 Index.

For practical implementation, investors are advised to allocate the portfolio gradually with periodic monitoring and rebalancing at least every semester to maintain optimal risk-return, while also considering macroeconomic factors and applying additional risk management, given the concentration in the banking sector. Further research should use a longer observation period, consider ESG factors, and conduct comparative studies with other major indices to evaluate the value-added of the unique characteristics of Investor33 in the context of modern portfolio optimization.

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