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-RESEARCH ARTICLE-

OPTIMIZATION OF THE LQ45 INDEX STOCK PORTFOLIO ON THE INDONESIAN STOCK EXCHANGE USING THE SINGLE INDEX MODEL

Dudi Rudianto

Universitas Bakrie,Jakarta, Indonesia
Email: dudi.rudianto@bakrie.ac.id

─Abstract─

The objective of this research is to ascertain the optimal stock portfolio employing the Single Index Model within the context of the LQ45 Index, which is listed on the Indonesia Stock Exchange (IDX), during the period spanning from 2018 to 2021. This investigation employs quantitative descriptive methodologies alongside purposive sampling. The research findings reveal that, among the 28 stocks consistently included as subjects of study, seven stocks have been identified as falling within the category of an optimal portfolio. These stocks encompass Bank Central Asia Tbk. (BBCA), Aneka Tambang (Persero) Tbk. (ANTM), Bukit Asam Coal Mine Tbk. (PTBA), Adaro Energy Tbk. (ADRO), Vale Indonesia Tbk. (INCO), Bank Rakyat Indonesia (Persero) Tbk. (BBRI), and Telekomunikasi Indonesia (Persero) Tbk. (TLKM), all of which demonstrate the highest values of Excess Return to Beta (ERB). Notably, BBCA shares, predominantly engaged in the domain of banking and related financial services, represent the most substantial proportion of the investment portfolio. These shares, distinguished by their considerable asset value and share capitalization, claim a prominent position. The composite portfolio comprised of these seven stocks yields the highest anticipated return while upholding a specific risk level, thereby classifying it as the optimal portfolio category. These outcomes substantiate that the optimal portfolio emerges from a diversified amalgamation of stocks spanning distinct sectors, specifically encompassing financial services, mining, and infrastructure (telecommunications).

Keywords: Optimal Portfolio, Single Index Model, LQ45 Index

INTRODUCTION

The Indonesian Stock Exchange (IDX) fulfils two primary roles. Firstly, it serves as a

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channel for enterprises to secure funding for purposes like business expansion, development, and augmenting working capital. Secondly, it functions as a platform for the general public to engage in investments in various financial instruments, including shares, bonds, mutual funds, and other similar options. Consequently, individuals have the opportunity to allocate their funds based on the profit potential and risk attributes associated with each investment instrument (Darmawan, 2022).

In accordance with Halim (2018), investment involves allocating funds in the present with the anticipation of generating future profits. The annual upsurge in the number of investors can be attributed to the diverse array of investment instruments available within the capital market. Among these instruments, one prevalent choice is the investment in equities. These certificates signify ownership stakes in a company, granting shareholders the entitlement to claim a portion of the company's profits and assets. Shares, as an investment vehicle, hold significant appeal for many investors due to their capacity to deliver compelling profit returns. An illustrative example of such shares can be found in those listed on the LQ45 index (Indriana, 2020).

The LQ 45 Index functions as a market gauge devised to evaluate the performance of 45 equities listed on the Indonesia Stock Exchange. These particular stocks are meticulously selected based on their substantial liquidity, noteworthy market capitalization, and robust fundamental performance. The composition of the LQ45 Index encompasses shares of companies that exhibit promising growth trajectories and sound financial prospects. The inception of this index was conceived to complement the Indonesia Composite Index (IHSG), with the primary objective of providing a reliable and impartial instrument for financial analysis, investors, investment managers, and capital market observers. The presence of this index is poised to significantly assist investors in making judicious selections among shares as an investment avenue, a decision intrinsically tied to the ebbs and flows of returns and associated risks (Suroto, 2016).

The connection between risk and expected return is linear: higher risk typically yields higher returns, and vice versa. Therefore, prudent investors aim for optimal returns while managing specific risk levels, necessitating a thorough understanding of associated risks (Jogiyanto, 2015).

In his work, Jogiyanto (2015) underscores the importance of utilizing investment feasibility analysis techniques when formulating optimal portfolios. This methodology assists investors in their decision-making process by enabling them to choose portfolios that either yield the highest anticipated returns for a designated level of risk or exhibit the lowest risk for a specified expected profit. The outcomes of this research hold substantial value in imparting insights and knowledge regarding analytical methodologies for appraising returns and risks linked to stock investments, thereby offering significant advantages to investors.

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As indicated by Jayati, Handayani, and Zahro (2017), there exists a noticeable correlation in returns among multiple stocks, signifying their tendency to move cohesively and respond comparably to a shared factor or index, exemplified here by the Composite Stock Price Index (IHSG). Pratama (2019) elucidates that the Single Index Model functions as an analytical instrument for constructing an optimal stock portfolio from a selection of efficient portfolio options. This methodology simplifies the analytical process by reducing the number of variables under consideration. Nonetheless, it requires an extended calculation period and a larger sample size to generate more precise outcomes, thereby assisting in addressing the uncertainties inherent in stock investments within the capital market. A fundamental assumption of the Single Index Model posits that securities will exhibit correlation when their responses align with market returns (Oktaviani & Wijayanto, 2016).

This research relies on data from the LQ45 index, encompassing shares on the Indonesia Stock Exchange, chosen for its prominence, liquidity, and substantial market capitalization. These shares serve as a benchmark for stock price fluctuations on the IDX. We employ a semi-annual sampling approach to align with the LQ45 index's biannual updates in February and August. The study spans 2018 to 2021, offering valuable insights for future investment decisions.

According to insights provided by Nuzula and Nurlaily (2020), the selection of an optimal portfolio is fundamentally rooted in the pursuit of achieving an optimal balance between expected returns and risk. This study aims to delve deeper into this concept, not only by ascertaining the constituents of an optimal portfolio but also by scrutinizing the allocation of individual stocks within it. Furthermore, it seeks to assess the potential returns and risks associated with this blend of stocks. This analysis specifically pertains to companies included in the LQ45 index over the same period, with the objective of elucidating the dynamics and intricacies of these investments within the context of the LQ45 index constituents.

LITERATUREREVIEW

Portfolio theory, pioneered by the ground-breaking research of Harry Markowitz, stands as the cornerstone of contemporary investment management. As articulated by Reilly, Brown, and Leeds (1997), Markowitz's pioneering insights provide a profound comprehension of the intricate interplay between anticipated returns and risk. His research furnishes a robust framework for the construction of portfolios striving to attain the optimal trade-off between these pivotal elements. It underscores the significance of diversification in dispersing risk across a multitude of assets, thereby ultimately diminishing the overall portfolio risk. Markowitz introduced the concept of portfolio variance as a method for quantifying and assessing portfolio risk. He illustrated that by incorporating assets with low or negative correlations into a portfolio, the overall portfolio risk could be significantly mitigated. This seminal work laid the groundwork for contemporary portfolio theory, subsequently evolving into a cornerstone of investment management

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To elaborate on Markowitz's pioneering discoveries, it is crucial to delve into the significance of portfolio diversification. Diversification entails the dispersion of investments across diverse asset classes, sectors, and geographical regions with the aim of mitigating concentration risk. When amalgamated within a portfolio, assets characterized by low or negative correlations tend to behave independently, signifying that the performance of one asset is not closely intertwined with that of another. Consequently, if one asset underperforms, the potential losses can be counterbalanced by the positive performance of other assets, thereby reducing the overall portfolio risk.

Experts universally concur on the central theme that portfolio management seeks to optimize returns while effectively managing risk. The pivotal insight here is that investors can strike a balance between these two objectives through the judicious construction of portfolios. An efficient portfolio, as expounded by Tandelilin (2017), is one that yields the utmost possible return for a given level of risk, or alternatively, offers the lowest risk for an anticipated level of profit.

Nonetheless, the notion of an "Optimal Portfolio" takes this concept a step further. Within the framework of the efficient frontier, the optimal portfolio is the one an investor chooses from the array of options within the efficient portfolio set. The selection depends on the investor's distinctive preferences, encompassing their expectations regarding returns and their capacity to tolerate risk. It is this process of choice that fundamentally defines the essence of portfolio management.

The optimization of portfolios can be approached through various methodologies. Among these, the Markowitz method stands out, especially when combined with risk-free assets. Additionally, the Single Index Model, as proposed by Hartono (2017), presents a simplified yet effective approach to optimizing portfolios by capitalizing on the observed relationship between individual stock returns and fluctuations in market price indices.

Furthermore, contemporary portfolio optimization has progressed to encompass the inherent uncertainties and intricacies of financial markets. Insights from Fabozzi and Pachamanova (2016) advocate for a more dynamic approach, underscoring the integration of uncertainty sets into the optimization process. These sets transcend conventional point estimates, such as expected returns and stock covariance, by considering factors like the forecast errors associated with expected returns.

The envisioned optimal portfolio, as articulated by experts, constitutes an amalgamation of assets that embodies the most favourable blend of expected return and risk. In their pursuit of wealth accumulation, investors aim to construct portfolios that not only maximize their returns but also align with their risk tolerance and financial objectives. To attain this objective, it is essential to comprehend and employ sophisticated financial models, such as the Single Index Model, devised by William Sharpe in 1963. This model streamlines the computations necessary for portfolio optimization by capitalizing

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on the correlation between security prices and market price indices, illuminating how the majority of stocks typically react in a comparable manner to market fluctuations.

METHODOLOGY

The research methodology employed in this study is quantitative descriptive research, as outlined by Sugiyono (2017). The chosen unit of analysis for the sample in this research comprises shares, specifically those belonging to 45 issuers that consistently retained their inclusion in the LQ45 stock index throughout the period from 2018 to 2021.

The sampling method employed in this research is purposive sampling, as advocated by Sugiyono (2017). Following careful consideration of these criteria, a list of 28 issuers was compiled as the sample for this study.

RESULTS

The study's share price data comprises the closing prices at month-end between 2018 to 2021, sourced from 28 research shares on https://finance.yahoo.com/. Stock return and risk values were computed based on monthly stock price fluctuations.

Composite Stock Price Index (IHSG)

The subsequent dataset required for this research comprises the Composite Stock Price Index (IHSG) data spanning the period from 2018 to 2021, sourced from the website https://finance.yahoo.com/. IHSG data is instrumental in computing market return (Rm) and market risk (σm). The IHSG data utilized consists of the monthly closing prices for the years 2018 to 2021. Table 1 consist the list of monthly closing prices for IHSG during 2018 to 2021:

Table 1. List of IHSG Monthly Closing Prices for 2018 – 2021

Month	ClosingPriceIHSG			
	2018	2019	2020	2021
January	6,597.22	6,443.35	5,452.70	6,241.80
February	6,188.99	6,468.75	4,538.93	5,985.52
March	5,994.60	6,455.35	4,716.40	5,995.62
April	5,983.59	6,209.12	4,753.61	5,947.46
May	5,799.24	6,358.63	4,905.39	5,985.49
June	5,936.44	6,390.50	5,149.63	6,070.04
July	6,018.46	6,328.47	5,238.49	6,150.30
August	5,976.55	6,169.10	4,870.04	6,286.94
September	5,831.65	6,228.32	5,128.23	6,591.35
October	6,056.12	6,011.83	5,612.42	6,533.93
November	6,194.50	6,299.54	5,979.07	6,581.48
December	6,532.97	5,940.05	5,862.35	6,631.15

Source: www.finance.yahoo.com

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Bank Indonesia Certificate (SBI)

The risk-free interest rate adopted in this study is ascertained through the utilization of the Bank Indonesia Certificate (SBI). The SBI data is directly obtained from the official Bank Indonesia website, namely www.bi.go.id. The data encompassing SBIs for the years 2018 to 2021 is detailed in Table 2.

Table 2. SBI Interest Rate Data for the Period 2018 – 2021

No	Date	SBI (Monthly)	No	Date	SBI (Monthly)
1	February 15, 2018	4.25 %	25	January 23, 2020	5.00 %
2	March 22,2018	4.25 %	26	February 20, 2020	4.75 %
3	April 19,2018	4.25 %	27	March 19, 2020	4.50 %
4	May 17, 2018	4.50 %	28	April 14, 2020	4.50 %
5	May 30, 2018	4.75 %	29	May 19, 2020	4.50 %
6	June 29, 2018	5.25 %	30	June 18, 2020	4.25 %
7	July 19, 2018	5.25 %	31	July 16, 2020	4.00 %
8	August 15, 2018	5.50 %	32	August 19, 2020	4.00 %
9	September27, 2018	5.75 %	33	September17, 2020	4.00 %
10	October 23, 2018	5.75 %	34	October 13, 2020	4.00 %
11	November15, 2018	6.00 %	35	November 19, 2020	3.75 %
12	December 20, 2018	6.00 %	36	December 17, 2020	3.75 %
13	January 17, 2019	6.00 %	37	January 21, 2021	3.75 %
14	February 21, 2019	6.00 %	38	February 18, 2021	3.50 %
15	March 21, 2019	6.00 %	39	March 18, 2021	3.50 %
16	April25, 2019	6.00 %	40	April20, 2021	3.50 %
17	May 16, 2019	6.00 %	41	May 25. 2021	3.50 %
18	June 20, 2019	6.00 %	42	June 17,2021	3.50 %
19	July 18, 2019	5.75 %	43	July 22, 2021	3.50 %
20	August 22, 2019	5.50 %	44	August 19, 2021	3.50 %
21	September 19, 2019	5.25 %	45	September21,2021	3.50 %
22	October24, 2019	5.00 %	46	October 19,2021	3.50 %
23	November21, 2019	5.00 %	47	November18,2021	3.50 %
24	December 19,2019	5.00 %	48	December16,2021	3.50 %

Source: www.bi.go.id

Data Analysis

In this study, the Single Index Model is utilized to construct the optimal portfolio, focusing on two key indicators: the ERB value and the cut-off rate(Ci). This approach simplifies stock selection - stocks are considered for inclusion in the optimal portfolio if their ERB value equals or exceeds the Ci. Conversely, stocks with ERB values below the Ciare excluded. This method is advantageous as it accounts for systematic risk, often represented by a stock's beta value. Investors can choose stocks with higher ERB values to optimize their portfolio. The process involves several key steps.

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Stage 1: Calculation of Expected Return, Alpha, Beta, and Variance Error for Each Individual Stock

The expected return for each stock is calculated by summing the realized returns over the research periods and dividing by the number of periods. Realized returns are obtained by subtracting the current period's share price from the previous periods and dividing by the previous period's share price. Beta values are determined by multiplying an individual stock's total return by the average market return, divided by the market's variance. Additionally, the variance error, representing stock-specific unsystematic risk, is assessed at this stage.The results of these calculations, encompassing the expected return, alpha, beta, and variance error for each individual stock, are presented comprehensively in the Table 3.

Table 3. Individual Expected Return, Alpha, Beta and Error Variance

Issuer	E(Ri)	Ai	Bi	$\alpha^2 i$
ADRO	0.01504	0.01290	1.11820	0.01597
AKRA	-0.00025	-0.00397	1.94022	0.01221
ANTM	0.03297	0.02783	2.68194	0.03284
ASII	-0.00024	-0.00274	1.30204	0.00814
BBCA	0.01440	0.01268	0.89767	0.00309
BBNI	0.00560	0.00152	2.13221	0.01409
BBRI	0.00981	0.00705	1.43812	0.00691
BBTN	0.00014	-0.00482	2.58502	0.02960
BMRI	0.00537	0.00287	1.30329	0.00645
BSDE	-0.01000	-0.01312	1.62995	0.01069
EXCL	0.00628	0.00402	1.17807	0.01273
GGRM	-0.01186	-0.01368	0.94681	0.00888
HMSP	-0.02588	-0.02795	1.08131	0.00645
ICBP	0.00294	0.00257	0.19389	0.00368
INCO	0.01826	0.01482	1.79327	0.01623
INDF	0.00155	0.00059	0.50014	0.00505
INTP	-0.00439	-0.00675	1.23588	0.01317
JSMR	-0.00190	-0.00518	1.71098	0.01259
KLBF	0.00445	0.00319	0.65797	0.00462

Source: Processed data

Among the 28 research samples, ANTM shares delivered the highest expected return at 0.03297, while HMSP shares had the lowest expected return, reaching -0.02588.

Stage 2: Computation of Market Return

Market return is calculated by subtracting the current period's IHSG value from the previous periods and dividing by the IHSG value of the previous period. Expected market return is determined by averaging the realized returns and dividing by the total number of data points. Variance, a critical element in this context, is computed using the Var formula. The results of this stage, including the expected return and variance calculations for each individual stock, are detailed in Table 4.

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Table 4. Expected Return and Variance IHSG

E(Rm)	**0.00192**
Varians	0.00196

Source: Processed data

These calculations yield an expected monthly market return of 0.00192, accompanied by a quantified market risk of 0.00196. This positive expected market return underscores the appeal of capital market investments, presenting enticing potential returns for investors.

Stage 3: Evaluation of Risk-Free Rate

To assess the risk-free rate, data from the Bank Indonesia Certificate (SBI) is employed. As depicted in Table 5, the annual average SBI rate amounts to 4.63% per year. This is calculated by summing the SBI levels over four years and dividing by the total number of data points. Additionally, the monthly average SBI rate is obtained by dividing the annual average (4.63%) by the number of months in a year (12). Consequently, the monthly risk-free return is established at 0.0039, equivalent to 0.39%.

The monthly risk-free rate of 0.0039 is utilized in the calculation of the optimal stock portfolio using the Single Index Method. This choice aligns with the use of monthly share price data for the computations.

Table 5. Risk Free Rate

SBIAverage	**%**
SBI Average per year	4.63%
SBI Average per month	0.39%

Source: Processed data

Stage 4: Calculating Excess Return to Beta (ERB)

In the fourth stage, we proceed with the computation of ERB, which signifies the additional return obtained beyond the risk-free return from alternative assets. The ERB calculation results are thoughtfully presented in the provided Table 6.

Table 6. Excess Return to Beta (ERB) Calculation Results

Issuer	**E(Ri)**	**E(Rf)**	**βi**	**ERB [(E(Ri)–E(Rf))/βi]**
ADRO	0.01504	0.00386	1.11820	0.01000
AKRA	-0.00025	0.00386	1.94022	-0.00212
ANTM	0.03297	0.00386	2.68194	0.01085
ASII	-0.00024	0.00386	1.30204	-0.00315
BBCA	0.01440	0.00386	0.89767	0.01174

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BBNI	0.00560	0.00386	2.13221	0.00082
BBRI	0.00981	0.00386	1.43812	0.00414
BBTN	0.00014	0.00386	2.58502	-0.00144
BMRI	0.00537	0.00386	1.30329	0.00116
BSDE	-0.01000	0.00386	1.62995	-0.00850
EXCL	0.00628	0.00386	1.17807	0.00206
GGRM	-0.01186	0.00386	0.94681	-0.01661
HMSP	-0.02588	0.00386	1.08131	-0.02750
ICBP	0.00294	0.00386	0.19389	-0.00473
INCO	0.01826	0.00386	1.79327	0.00803
INDF	0.00155	0.00386	0.50014	-0.00461
INTP	-0.00439	0.00386	1.23588	-0.00667
JSMR	-0.00190	0.00386	1.71098	-0.00336

Source: Processed data

To identify candidate stocks for the portfolio from the pool of researched shares, a crucial step involves computing the ERB. As illustrated in Table 6, this section presents ERB calculations for all 28 individual shares subjected to analysis. Notably, among these shares, BBCA stands out with an impressive ERB of 0.01174, while UNVR shares display the lowest ERB at -0.07704. The optimal portfolio, aimed at maximizing returns, includes a selection of stocks characterized by high ERB ratios.

Stage 5: Establishing the Cut-Off Rate (Ci) and the Unique Cut-Off Point (C*)

The Ci emerges as a result of meticulous computations that consider market variance, return premiums compared to stock error variance, and the overall market variance. This complex calculation process contributes to the establishment of the Unique C*. In the context of the Single Index Model, this step involves systematically sorting shares in descending order based on their ERB values. You can conveniently review this informative arrangement in Table 7. The strategic utilization of the Ciand the determination of the Unique C* are fundamental aspects of the Single Index Model, enabling the selection of stocks for inclusion in the optimal portfolio. Through a meticulous consideration of these critical metrics, investors can make informed decisions, optimizing their portfolio and aligning their investments with their financial objectives and risk tolerance.

Table 7. Comparison of ERB Values with Cut-Off Rate (Ci)

Issuer	ERB	Ci	C*	Decision
BBCA	0.01174	0.00297	0.00297	Candidate
ANTM	0.01085	0.00251	0.00297	Candidate
PTBA	0.01022	0.00109	0.00297	Candidate
ADRO	0.01000	0.00118	0.00297	Candidate
INCO	0.00803	0.00176	0.00297	Candidate
BBRI	0.00414	0.00112	0.00297	Candidate
TLKM	0.00319	0.00059	0.00297	Candidate
EXCL	0.00206	0.00031	0.00297	Candidate

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BMRI	0.00116	0.00030	0.00297	Candidate
KLBF	0.00090	0.00012	0.00297	Candidate
BBNI	0.00082	0.00023	0.00297	Candidate
PGAS	(0.00062)	(0.00017)	0.00297	-
WIKA	(0.00072)	(0.00019)	0.00297	-
BBTN	(0.00144)	(0.00034)	0.00297	-
AKRA	(0.00212)	(0.00058)	0.00297	-
PTPP	(0.00253)	(0.00073)	0.00297	-
SMGR	(0.00263)	(0.00053)	0.00297	-
MNCN	(0.00304)	(0.00059)	0.00297	-
ASII	(0.00315)	(0.00071)	0.00297	-
JSMR	(0.00336)	(0.00080)	0.00297	-
UNTR	(0.00442)	(0.00033)	0.00297	-
INDF	(0.00461)	(0.00038)	0.00297	-
ICBP	(0.00473)	(0.00009)	0.00297	-
INTP	(0.00667)	(0.00104)	0.00297	-
BSDE	(0.00850)	(0.00210)	0.00297	-
GGRM	(0.01661)	(0.00236)	0.00297	-
HMSP	(0.02750)	(0.00572)	0.00297	-
UNVR	(0.07704)	(0.00265)	0.00297	-

Source: Processed data

Based on the information provided in Table 7, it becomes evident that only 11 shares qualify as potential candidates for inclusion in the optimal portfolio. These candidate shares are those whose ERB values either meet or surpass the designated Ci. Conversely, stocks with ERB values falling below the Ci do not qualify for the optimal portfolio. However, a nuanced consideration arises concerning candidate shares whose ERB values fall below the (C*). Specifically, shares such as EXCL, BMRI, KLBF, and BBNI, totalling four in number, are excluded from the roster of optimal portfolio candidates. This exclusion is based on the potential distortion it could introduce to the allocation proportions within the fund. Consequently, the optimal portfolio is thoughtfully curated, comprising seven selected shares: BBCA, ANTM, PTBA, ADRO, INCO, BBRI, and TLKM.

Stage 6: Computation of Weighted Scales and Allocation Proportions

Once the selection process identifies these seven shares for the optimal portfolio, the subsequent step involves determining the proportion (Wi) allocated to each selected share. This calculation is rooted in the initial computation of the weighted scale for each share (Zi). The intricacies of this procedure are meticulously elaborated in Table 8, which serves as an enlightening resource for computing weighted scales and their corresponding fund allocation proportions. This stage represents a pivotal step in achieving a well-balanced and diversified optimal portfolio, with funds thoughtfully allocated to these chosen shares. It ensures that the investment strategy aligns with the desired risk-return profile while optimizing the overall portfolio performance.

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Table 8. Calculation of Weighted Scale (Zi) and Proportion of Funds (Wi)

Issuer	Ci	Zi	Wi
BBCA	0.297%	168.606%	46.293%
ANTM	0.251%	45.021%	12.361%
PTBA	0.109%	49.320%	13.541%
ADRO	0.118%	42.674%	11.717%
INCO	0.176%	40.247%	11.050%
BBRI	0.112%	15.292%	4.199%
TLKM	0.059%	3.054%	0.838%
Total		364.213%	100.0%

Source: Processed data

The provided table 8 illustrates the allocation proportions (Wi) of funds necessary for constructing the optimal portfolio, with distinct weights assigned to each constituent: BBCA at 46.293%, ANTM at 12.361%, PTBA at 13.541%, ADRO at 11.717%, INCO at 11.050%, BBRI at 4.199%, and TLKM at 0.838%. It is noteworthy that PT BBCA commands the largest share of these allocated funds, accounting for 46.293%, while PT Telekomunikasi Indonesia (TLKM) holds the most modest proportion at 0.838%, as delineated in Table 8.

Stage 7: Computation of Portfolio Returns

After identifying the shares eligible for inclusion in the optimal portfolio and allocating their respective fund proportions, the subsequent stage entails computing the expected return of the portfolio. This computation is contingent upon the evaluation of the portfolio's alpha and beta. The portfolio alpha is obtained through the weighted average of individual stock alphas. The outcomes of this calculation are summarized in Table 9. This phase plays a crucial role in assessing the portfolio's performance and potential returns, providing investors with the insights needed to make informed investment choices while aligning their portfolios with their desired financial objectives and risk preferences.

Table 9. Calculation of Portfolio Return

Issuer	Ap	Bp
BBCA	0.59%	41.56%
ANTM	0.34%	33.15%
PTBA	0.15%	12.05%
ADRO	0.15%	13.10%
INCO	0.16%	19.82%
BBRI	0.03%	6.04%
TLKM	0.00%	0.70%
Total	1.43%	126.41%
E(Rm)		0.192%
E(Rp)=αp+(βp*E(Rm))		1.67%

Source: Processed data

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As indicated in Table 9 above, the portfolio return stands at 1.67%. This portfolio return figure is appealing, given that it surpasses the market rate of return E(Rm), which stands at 0.192%.

Stage 8. Portfolio Risk Calculation

To assess portfolio risk, it is essential to have information on the squared amount of systematic risk, market variance, and unsystematic risk of the portfolio, as presented in Table 10.

Table 10. Portfolio Risk Calculation

Issuer	Wi	Zi	Wi(Wixα^2ei)
BBCA	46.29%	0.47%	0.100%
ANTM	12.36%	4.70%	0.072%
PTBA	13.54%	1.31%	0.024%
ADRO	11.72%	1.84%	0.025%
INCO	11.05%	2.25%	0.028%
BBRI	4.20%	1.10%	0.002%
TLKM	0.84%	0.60%	0.000%
	Total		0.251%
	βp^2		159.80%
	$\alpha^2 m$		0.196%
$\alpha p^2 = \beta p^2 x \alpha^2 m + \alpha^2 ep$			0.564%

Source: Processed data

Based on the calculations presented in Table 10, the portfolio's risk is determined to be 0.564%. In summary, the results indicate that some individual shares yield returns higher than the portfolio's return, but they also carry higher risks than the portfolio. Furthermore, there are no shares with returns greater than the optimal portfolio while simultaneously having lower risk than the portfolio.

DISCUSSION

Analysing the Determination of the Optimal Portfolio

Among the various methodologies employed in the creation of an optimal portfolio, the Single Index Model stands out as a prominent approach. The effectiveness of the Single Index Model in determining the optimal portfolio relies on a meticulous comparison of the ERB value with a predetermined Ci. When the ERB value surpasses or equals the Ci, a stock qualifies as a candidate for inclusion in the optimal portfolio. Conversely, stocks with ERB values below the Cido not qualify as candidates for the optimal portfolio. This strategic approach offers a notable advantage by taking into consideration the systematic risk inherent in individual stocks, as indicated by their beta values.

It is important to acknowledge that investments in shares inherently carry risks, both

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systematic and unsystematic. While systematic risk is inherent and cannot be eliminated, investors have the flexibility to select shares with substantial ERB values. The valuable information contained in beta and ERB values assists investors in assessing alternative investment opportunities and fine-tuning the composition of an optimal portfolio.

Moreover, the practice of diversification serves as a prudent method for investors to mitigate unsystematic risks. Diversification is, in essence, the foundation of constructing an optimal portfolio. Rational investors naturally gravitate towards stocks that promise robust returns. Drawing insights from an exhaustive analysis of 28 research samples, this study reveals that seven shares exhibit the necessary attributes for inclusion in the optimal portfolio category. These selected shares possess ERB values surpassing the Ciand C* thresholds, solidifying their status as prudent options for capital allocation. Consequently, investors are well-advised to allocate their capital to these seven shares, specifically: BBCA, ANTM, PTBA, ADRO, INCO, BBRI, and TLKM. This nuanced analysis offers a deeper comprehension of the intricacies involved in formulating an optimal portfolio, guiding investors towards informed decisions that align with their financial aspirations and risk tolerance.

Optimal Portfolio Fund Proportion

Within the subset of seven shares classified in the optimal portfolio, the respective optimal allocations are distributed as follows: BBCA commands the most significant portion at 46.293%, succeeded by ANTM at 12.361%, PTBA at 13.541%, ADRO at 11.717%, INCO at 11.050%, BBRI at 4.199%, and TLKM at 0.838%.

The most substantial allocation of funds, amounting to 46%, is attributed to BBCA, primarily due to its position as a stock with the highest ERB value among the other six stocks. Additionally, BBCA holds the distinction of having the largest asset value and share capitalization within the banking and financial services sector. Conversely, the lowest allocation, standing at 1%, is assigned to TLKM.

The optimal portfolio, comprising these seven shares, encompasses a diverse range of sectors: BBCA and BBRI operate within the banking and financial services sector, while ANTM, PTBA, ADRO, and INCO are situated in the mining sector. Lastly, TLKM operates within the telecommunications sector. These findings underscore that the optimal portfolio is formed through the inclusion of shares from various companies operating in different sectors, all characterized by the highest ERB values compared to other shares, as well as substantial actual returns on shares. Consequently, the outcomes of this research hold practical utility for investors seeking to delineate the most suitable stock investment strategy.

Optimal Portfolio Return and Risk

The optimal portfolio, comprised of seven shares from the LQ45 index, boasts an average

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monthly portfolio return rate of 1.67% and an associated risk level of 0.564%. This composition represents the most favourable configuration in terms of risk-return trade-offs.

CONCLUSION

The optimal portfolio, curated from the LQ45 index, comprises a selective ensemble of seven prominent shares: BBCA, ANTM, PTBA, ADRO, INCO, BBRI, and TLKM. These specific shares stand out from their counterparts due to their possession of the highest ERB values.

The optimal allocation of the seven shares constituting the optimal portfolio is meticulously determined as follows: BBCA commands the most substantial portion, comprising 46.293% of the portfolio. ANTM follows with a weight of 12.361%, closely succeeded by PTBA at 13.541%. ADRO claims an 11.717% stake, while INCO secures an 11.050% share. BBRI is represented with 4.199%, and TLKM claims the smallest proportion at 0.838%. This strategic distribution of proportions is designed to optimize portfolio performance, aligning with the distinctive attributes of each share and catering to the investors' financial objectives and risk appetite.

The largest proportion of funds, amounting to 46%, is allocated to BBCA, primarily due to its possession of the highest ERB value among the other six shares. Additionally, BBCA stands out with the largest asset value and market capitalization in the banking and financial services sector. Conversely, TLKM holds the lowest proportion at 1%. The optimal portfolio comprises shares from diverse sectors, with BBCA and BBRI operating in the banking and financial services sector, ANTM, PTBA, ADRO, and INCO in the mining sector, and TLKM in the telecommunications sector. These findings emphasize that the optimal portfolio is a well-rounded combination of shares from various sectors. Consequently, investors can utilize the outcomes of this research to inform their stock investment strategies effectively.

The most optimal composition among portfolios, formed using seven shares from the LQ45 index, attains an average monthly return rate of 1.67% alongside a monthly risk level of 0.564%.

RESEARCHIMPLICATIONS

Theoretical Implications

The Single Index Model, as described by Halim (2018), operates on the premise that the returns of multiple securities are correlated, implying that they move in unison and react similarly to a single factor or index integrated into the model. This model proves instrumental in optimizing portfolios by assessing the ERB for each stock and ranking them based on their ERB values. To achieve this, it involves calculating individual stock

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returns, stock variance, and covariance with the market, systematic and non-systematic risk. A pivotal component of the Single Index Model is the computation of the ERB ratio, which entails comparing the return premium (the difference between stock return and the return of a risk-free asset, often the risk-free rate) to the stock's systematic risk, quantified by beta. The determination of the Ci is contingent on market variance and return premium relative to the stock's error variance.

Practical Implications

In practical terms, if the ERB ratio surpasses Ci, the stock qualifies for inclusion in the optimal portfolio. Conversely, if the ERB ratio falls short of Ci, the stock is excluded from the optimal portfolio. This method imparts a rigorous selection process to portfolio construction, ensuring that only assets meeting predetermined criteria are considered. The process of formulating an optimal portfolio entails the evaluation of each stock's ERB. Consistent with Elton and Gruber's 1995 model, the ranking of stocks from the highest ERB to the lowest aids in identifying those stocks that offer superior returns relative to their associated risk. Stocks possessing an ERB equal to or exceeding a distinct C* secure their place within the optimal portfolio.

Limitations and Future Research Directions

Furthermore, the determination of C* stands as a pivotal stage in the optimization process. The highest Ci value among the stocks incorporated into the optimal portfolio is designated as the C*. After establishing C*, the distribution of funds to each stock within the optimal portfolio can be ascertained according to predefined proportions. Investors, informed by their unique risk tolerance and return objectives, opt for stocks that fulfil the inclusion criteria (ERB > C*). These chosen stocks collectively constitute the optimal portfolio, embodying the investor's approach to attaining the most favourable equilibrium between anticipated return and risk.

Thus, portfolio optimization stands as a multifaceted discipline built upon a rich history of research and development. From Harry Markowitz's seminal contributions concerning diversification and portfolio variance to contemporary advancements in financial modelling and optimization techniques, the field continues to adapt to the evolving needs of investors. At its core, the fundamental principle remains unwavering: the pursuit of the optimal balance between anticipated return and risk through deliberate portfolio construction. The notion of an optimal portfolio signifies the zenith of this journey, wherein investors meticulously curate assets predicated on their unique risk-return profiles, forging a portfolio that harmonizes with their distinct financial objectives and preferences. These selections, often guided by advanced financial models and methodologies, may encompass risk-free assets, the Single Index Model, and more recent innovations tailored to accommodate the inherent uncertainties of

financial markets. By comprehending the fundamental tenets of portfolio optimization and harnessing the available tools for crafting optimal portfolios, investors can embark on informed decision-making journeys, aspire to financial success, and navigate the ever-evolving terrain of the financial markets.

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