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Risk Pricing and Investment Efficiency in Indonesia's Sustainable Mining Industry

Fangky A. Sorongan[1,a)], Niko Silitonga[2,b)], Achmad Syauqi Ilal Jinan[3,c)], Amri Fahrizal[4)]

[1,2,3,4] *Faculty of Economics and Business, Perbanas Institute, Jakarta, Indonesia*
[a)] *Corresponding author: f.sorongan@perbanas.id*
[b)]niko@perbanas.id
[c)]Syauqi.jinan@perbanas.id

Abstract. *The mining sector has become one of the most strategically important industries in Indonesia, supported by abundant mineral reserves, downstream industrialization policies, and increasing global demand for energy-transition commodities. Despite its significant contribution to economic growth and capital market development, mining stocks remain highly exposed to systematic risk arising from commodity price volatility, macroeconomic uncertainty, and regulatory changes. Existing studies applying the Capital Asset Pricing Model (CAPM) in Indonesia have predominantly focused on broad market indices such as LQ45, IDX30, and JII70, while limited attention has been devoted to sector-specific analyses covering a complete economic cycle. This study aims to evaluate the relationship between systematic risk and stock returns and determine investment feasibility among mining companies listed on the Indonesia Stock Exchange during the 2019–2024 period. Employing a quantitative descriptive design, the study analyzes 37 mining firms selected through purposive sampling. Expected returns are estimated using the Capital Asset Pricing Model by incorporating individual stock returns, market returns, risk-free rates, and beta coefficients. The findings reveal that the mining sector exhibits an aggressive risk profile with an average beta coefficient of 1.19 and an average realized return of 1.87%, supporting the high-risk–high-return proposition. Furthermore, Security Market Line analysis identifies 32 stocks as efficient (undervalued) and five stocks as inefficient (overvalued). The study contributes to asset-pricing literature by providing sector-specific evidence across multiple economic regimes, including pre-pandemic stability, pandemic disruption, and post-pandemic recovery. The findings offer practical guidance for investors seeking to identify undervalued mining stocks and optimize portfolio allocation decisions under varying market conditions in emerging markets.*

Keywords: Capital Asset Pricing Model; Systematic Risk; Stock Return; Investment Efficiency; Mining Industry; Indonesia Stock Exchange; Asset Pricing

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INTRODUCTION

Financial markets perform a critical function in modern economies by facilitating the efficient allocation of resources between surplus and deficit economic units. Through capital markets, corporations gain access to long-term financing while investors obtain opportunities to allocate capital in pursuit of future returns. In emerging economies, the role of capital markets becomes increasingly important as governments seek to mobilize domestic and foreign investment to support sustainable economic development and industrial transformation. Consequently, understanding how risk influences investment returns remains one of the central concerns in financial economics and investment management (Fama & French, 2015; Hou et al., 2020). The fundamental principle underlying investment decision-making is the trade-off between risk and return. Rational investors are generally assumed to prefer higher returns while simultaneously seeking to minimize exposure to uncertainty. However, because higher expected returns are typically accompanied by higher levels of risk, investors must carefully evaluate whether the potential reward justifies the risks undertaken. This relationship forms the cornerstone of Modern Portfolio Theory and subsequently serves as the foundation for numerous asset-pricing models developed to explain security valuation in financial markets (Markowitz, 1952; Sharpe, 1964). Among the various approaches developed to evaluate the risk–return relationship, the Capital Asset Pricing Model (CAPM) remains one of the most influential and widely applied frameworks in both academic research and investment practice. CAPM proposes that the expected return of a security is determined by three primary components: the risk-free rate, the market risk premium, and the systematic risk of the security measured through its beta coefficient. According to the model, investors should only be compensated for systematic risk because unsystematic risk can be diversified away through portfolio construction. Consequently, securities with higher systematic risk should generate higher expected returns as compensation for increased uncertainty (Sharpe, 1964; Fama & French, 2015).

Although CAPM has been extensively tested in developed and emerging financial markets, empirical evidence regarding its effectiveness remains mixed. Several studies report a positive and statistically significant relationship between systematic risk and expected return, supporting the theoretical assumptions of CAPM. Conversely, other studies suggest that beta alone may be insufficient to explain cross-sectional differences in stock returns, particularly during periods characterized by substantial market disruption, economic crises, or structural transformations (Hou et al., 2020; Sehgal & Balakrishnan, 2023). These inconsistencies indicate that the performance of CAPM may vary across industries, countries, and economic conditions, thereby necessitating further empirical investigation. Indonesia represents a particularly interesting context for examining CAPM performance because of its status as one of the largest emerging economies in Southeast Asia. Over the past decade, Indonesia has experienced substantial economic expansion accompanied by increasing capital market participation, financial inclusion, and foreign investment inflows. At the same time, the Indonesian economy remains heavily influenced by commodity-related industries, particularly the mining sector, which contributes significantly to national income, export earnings, fiscal revenues, and employment creation. Consequently, fluctuations in mining-sector performance often have important implications for broader economic activity and financial market dynamics.

The strategic importance of Indonesia's mining industry is closely linked to the country's abundant natural-resource endowment. Indonesia possesses approximately 42% of global nickel reserves and substantial deposits of coal, copper, gold, tin, and bauxite. These resources have positioned the country as a key supplier within global commodity markets and strengthened its role within international supply chains. The increasing demand for critical minerals associated with renewable-energy technologies and electric-vehicle production has further enhanced the strategic relevance of Indonesia's mining sector in recent years. In addition to favorable resource endowments, government policies have played an important role in transforming the mining industry. Since 2020, the Indonesian government has actively promoted downstream industrialization through restrictions on raw mineral exports and incentives for domestic processing activities. These initiatives aim to increase value-added production, strengthen industrial competitiveness, and attract foreign direct investment into mineral-processing industries. As a result, investor interest in mining companies has increased substantially, particularly among firms involved in nickel processing and battery supply chains.

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Despite these favorable developments, mining companies remain exposed to significant uncertainty arising from commodity-price volatility, macroeconomic instability, geopolitical developments, environmental regulations, and fluctuations in global demand. Such conditions frequently generate substantial variations in stock performance, making investment decisions within the mining sector particularly challenging. Unlike defensive industries whose earnings tend to be relatively stable, mining firms operate within highly cyclical environments where changes in commodity prices can dramatically influence profitability and investor expectations. Consequently, evaluating whether mining stocks provide adequate compensation for their risk exposure becomes an important concern for investors and portfolio managers. The importance of risk assessment became even more apparent during the COVID-19 pandemic. Beginning in early 2020, global financial markets experienced unprecedented volatility as economic activity declined sharply and uncertainty increased significantly. Commodity prices fell dramatically during the initial stages of the pandemic, negatively affecting mining-company revenues and market valuations. However, the subsequent recovery period was characterized by rising commodity prices, expanding industrial demand, and increasing investment associated with energy-transition initiatives. This sequence of events generated substantial variation in stock performance across mining companies and created a unique environment for evaluating the effectiveness of asset-pricing models across different economic regimes.

The period from 2019 to 2024 therefore provides a particularly valuable setting for investigating risk–return relationships within the mining sector. The observation period captures three distinct economic phases. The year 2019 represents relatively stable pre-pandemic conditions and serves as a baseline for evaluating subsequent developments. The period 2020–2021 reflects severe market disruption caused by the COVID-19 pandemic, characterized by heightened uncertainty, declining economic activity, and extraordinary volatility. Finally, the years 2022–2024 represent the recovery phase, during which commodity prices increased substantially, industrial activity resumed, and government-led downstream industrialization policies gained momentum. Examining mining-stock performance across these distinct phases allows a more comprehensive assessment of CAPM than studies focusing exclusively on a single market condition. Numerous studies have previously applied CAPM within the Indonesian capital market. Putri et al. (2025) found that CAPM successfully distinguished feasible and infeasible investment opportunities among IDX30 constituents. Similarly, Sa'adah and Hidayat (2024) demonstrated that CAPM could identify efficient and inefficient securities within the LQ45 index. Research conducted by Aprialinita et al. (2022), Ilham and Kalimah (2025), and Wardono et al. (2023) also reported that CAPM remains useful for supporting investment decision-making and portfolio selection in various market segments. Furthermore, Silfiah et al. (2023) applied CAPM within the mining sector and concluded that the model effectively identified attractive investment opportunities among mining companies.

Nevertheless, existing studies exhibit several important limitations. First, the majority focus on broad market indices such as LQ45, IDX30, and JII70 rather than industry-specific contexts. Consequently, relatively little is known about CAPM performance within sectors characterized by high systematic risk and strong commodity dependence. Second, many studies employ relatively short observation periods that do not adequately capture economic cycles or structural changes affecting asset-pricing dynamics. Third, limited research has examined CAPM performance across periods encompassing pre-crisis stability, crisis disruption, and post-crisis recovery. These limitations restrict understanding regarding the robustness of CAPM under varying macroeconomic environments.

The present study addresses these gaps by focusing specifically on mining companies listed on the Indonesia Stock Exchange during the period 2019–2024. By examining a sector characterized by substantial exposure to commodity-price fluctuations and regulatory transformation across multiple economic regimes, the study provides a more comprehensive evaluation of CAPM applicability within emerging-market resource industries. Moreover, the study contributes to asset-pricing literature by assessing whether CAPM remains effective in identifying efficient investment opportunities under conditions characterized by extraordinary uncertainty and structural change. Accordingly, this study aims to analyze the relationship between systematic risk and stock returns and to evaluate investment feasibility among mining companies listed on the Indonesia Stock Exchange using the Capital Asset Pricing Model. Specifically, the study seeks to identify efficient and inefficient securities through comparisons between realized returns and CAPM-

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derived expected returns. In doing so, the study provides practical guidance for investors while simultaneously contributing to theoretical discussions regarding asset-pricing behavior within commodity-intensive emerging markets.The remainder of this article is organized as follows. The next section reviews the theoretical foundations and prior empirical literature underlying the study. The methodology section describes research design, sample selection, data sources, and analytical procedures. Subsequently, empirical findings and discussion are presented. The final section concludes the article by outlining theoretical contributions, practical implications, limitations, and recommendations for future research.

Existing CAPM studies in Indonesia predominantly focus on broad stock-market indices and relatively short observation periods, resulting in limited understanding of risk–return dynamics within the mining sector across multiple economic regimes. Consequently, evidence regarding CAPM effectiveness in identifying efficient mining stocks during the transition from pre-pandemic stability, through pandemic disruption, to post-pandemic recovery remains insufficient. This study is among the first to evaluate CAPM-based investment efficiency among Indonesian mining companies across a complete economic cycle (2019–2024) encompassing pre-pandemic stability, COVID-19 market disruption, commodity-boom recovery, and downstream industrialization policy implementation.

LITERATURE REVIEW

The theoretical foundation of this study is rooted in Modern Portfolio Theory (MPT) introduced by Markowitz (1952). MPT argues that investors behave rationally by selecting portfolios that maximize expected returns while minimizing risk exposure. The theory emphasizes that investment decisions should not be evaluated solely on the basis of expected returns but rather on the trade-off between risk and return. Through diversification, investors can reduce firm-specific risk; however, market-wide or systematic risk cannot be eliminated. Consequently, systematic risk becomes the primary determinant of expected returns in equilibrium capital markets. A major contribution of Modern Portfolio Theory is the distinction between systematic and unsystematic risk. Unsystematic risk originates from firm-specific factors such as operational inefficiencies, management quality, or business strategies and can be diversified away. In contrast, systematic risk arises from macroeconomic factors affecting all securities simultaneously, including inflation, interest rates, exchange rates, economic recessions, commodity-price fluctuations, and geopolitical uncertainty. Because systematic risk cannot be eliminated through diversification, investors require compensation for bearing such risk. This proposition subsequently became the conceptual foundation for the Capital Asset Pricing Model. Within the context of mining companies, Modern Portfolio Theory is particularly relevant because mining firms operate in highly uncertain environments characterized by commodity-price volatility, cyclical demand fluctuations, environmental regulations, and geopolitical developments. These conditions create substantial exposure to systematic risk and therefore make mining stocks suitable for evaluating the applicability of asset-pricing models based on risk-return trade-offs.

Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) developed by Sharpe (1964), Lintner (1965), and Mossin (1966) extends Modern Portfolio Theory by providing a framework for estimating expected returns based on systematic risk. CAPM proposes that investors should only be rewarded for bearing systematic risk because unsystematic risk can be eliminated through diversification. Consequently, securities with higher systematic risk should generate higher expected returns than securities with lower systematic risk.
The expected return of a security is determined by three components: the risk-free rate, the market risk premium, and the security's beta coefficient. Formally, CAPM can be expressed as:

E(R_i)=R_f+\beta_i[E(R_m)-R_f]
where:

- (E(R_i)) = expected return of security *i*;
- (R_f) = risk-free rate;
- (\beta_i) = beta coefficient measuring systematic risk;
- (E(R_m)) = expected market return.

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According to CAPM, securities positioned above the Security Market Line (SML) are considered undervalued because they generate returns exceeding those required for their level of risk. Conversely, securities positioned below the SML are considered overvalued because investors receive insufficient compensation relative to the risks undertaken. Despite the emergence of multifactor asset-pricing models such as the Fama–French Three-Factor Model and Arbitrage Pricing Theory, CAPM remains one of the most widely used models in financial practice because of its conceptual simplicity, intuitive interpretation, and extensive empirical application across global financial markets (Fama & French, 2015; Sehgal & Balakrishnan, 2023).

Efficient Market Perspective

The Efficient Market Hypothesis (EMH) provides an additional theoretical perspective supporting this study. EMH suggests that security prices reflect all available information, implying that opportunities for abnormal returns should be limited in efficient markets. Under this framework, stock prices adjust rapidly to new information, causing securities to trade around their intrinsic values. However, market inefficiencies may arise because of information asymmetry, investor sentiment, behavioral biases, liquidity constraints, or extraordinary economic shocks. Such conditions can generate temporary deviations between observed stock prices and fundamental values. Consequently, asset-pricing models such as CAPM remain useful for identifying potential mispricing opportunities and evaluating investment attractiveness. The mining sector provides a particularly relevant context for examining these issues because commodity-price shocks, policy interventions, and global economic uncertainty frequently influence investor perceptions and market valuations. Therefore, CAPM-based analysis can assist investors in identifying whether mining stocks are fairly valued, undervalued, or overvalued relative to their systematic risk exposure.

Stock Return

Return represents the financial gain obtained from an investment over a particular period and constitutes the primary motivation for investment activities. In financial economics, returns are generally categorized into realized returns and expected returns. Realized returns reflect actual investment performance observed from historical data, whereas expected returns represent future compensation anticipated by investors based on risk assessments and market expectations. Stock returns are influenced by numerous factors, including corporate profitability, dividend payments, macroeconomic conditions, market sentiment, commodity-price movements, and industry-specific developments. Within the mining sector, fluctuations in commodity prices play a particularly important role because they directly influence company revenues and profitability. Consequently, mining stocks frequently exhibit substantial variations in return performance across different market conditions. In CAPM analysis, realized returns serve as benchmarks for evaluating investment performance. Securities generating realized returns greater than expected returns are considered attractive because investors receive compensation beyond the level required by their risk exposure. Conversely, securities generating realized returns below expected returns may indicate overvaluation and reduced investment attractiveness.

Systematic Risk (Beta)

Risk refers to uncertainty regarding future investment outcomes. In capital-market theory, systematic risk represents the portion of total risk arising from economy-wide factors that influence all securities simultaneously. Examples include inflation, interest-rate changes, exchange-rate fluctuations, geopolitical instability, commodity-price shocks, and macroeconomic downturns. CAPM measures systematic risk using beta coefficients. Beta indicates the sensitivity of a security's return relative to market-return movements. A beta coefficient equal to one indicates that a stock moves proportionally with the market. Securities with beta values greater than one are classified as aggressive because they respond more strongly to market fluctuations, whereas securities with beta values below one are considered defensive because they exhibit lower sensitivity to market movements. Mining companies frequently exhibit relatively high beta values because their earnings depend heavily on external economic factors and commodity-market conditions. Consequently, investors generally require higher expected returns to compensate for the elevated systematic risk associated with mining investments.

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Expected Return and Investment Efficiency

Expected return represents the minimum compensation required by investors for bearing a specific level of systematic risk. CAPM predicts that expected returns increase proportionally with beta coefficients, reflecting the positive relationship between risk and return.Investment efficiency is evaluated by comparing realized returns with CAPM-derived expected returns. Securities generating realized returns above expected returns are classified as efficient or undervalued because investors receive compensation exceeding market expectations. In contrast, securities generating realized returns below expected returns are classified as inefficient or overvalued because investors receive inadequate compensation relative to their risk exposure. This framework provides a practical mechanism for identifying attractive investment opportunities and supporting portfolio-allocation decisions.

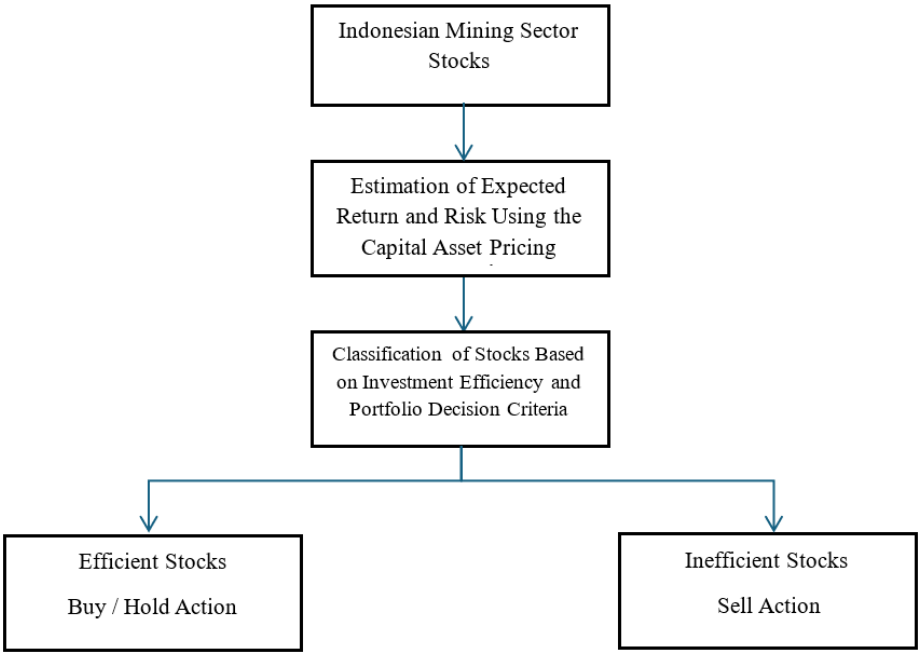

Figure 1. Research Framework for Assessing the Investment Efficiency of Indonesian Mining Stocks Using the Capital Asset Pricing Model (CAPM)

METHODS

This study employed a quantitative descriptive research design to evaluate the relationship between systematic risk and stock returns and to assess investment feasibility among mining companies listed on the Indonesia Stock Exchange using the Capital Asset Pricing Model (CAPM). The quantitative approach was considered appropriate because the analysis relied on numerical market data derived from stock prices, market indices, and risk-free interest rates. Rather than testing causal relationships among variables, the study adopted an asset-pricing perspective aimed at determining whether mining stocks generated returns commensurate with their systematic risk exposure. The observation period covered January 2019 to December 2024, thereby capturing stock performance across three distinct economic regimes: pre-pandemic stability, pandemic-induced market disruption, and post-pandemic recovery accompanied by commodity-price expansion and downstream industrialization policies.

The population consisted of all mining companies listed on the Indonesia Stock Exchange during the 2019–2024 period. The mining sector was selected because of its strategic role within the Indonesian economy, substantial exposure to commodity-price fluctuations, and increasing relevance within global

energy-transition supply chains. Samples were selected using purposive sampling to ensure that only firms meeting the analytical requirements were included in the study. Companies were required to be continuously listed throughout the observation period, possess complete monthly stock-price data, and provide sufficient information for calculating stock returns, beta coefficients, and expected returns under the CAPM framework. After applying these criteria, 37 mining companies were included in the final sample.

This study relied exclusively on secondary data obtained from publicly available and authoritative sources. Historical stock-price data were collected from the Indonesia Stock Exchange and supporting financial databases such as Yahoo Finance and Investing.com. Market returns were represented by movements in the Jakarta Composite Index (JCI/IHSG), while the risk-free rate was proxied using the Bank Indonesia benchmark interest rate. Additional industry information was obtained from reports published by government agencies and mining-sector institutions. The use of secondary data enabled objective measurement of stock performance and minimized potential respondent bias.

Data analysis followed the standard CAPM procedure. First, individual stock returns were calculated using monthly stock-price movements. Second, market returns were estimated based on changes in the Jakarta Composite Index. Third, the risk-free rate was determined using the average Bank Indonesia benchmark interest rate. Subsequently, beta coefficients were estimated to measure systematic risk exposure. Expected returns were then calculated using the Capital Asset Pricing Model equation. Finally, realized returns were compared with expected returns to classify stocks as efficient or inefficient investments. Securities with realized returns exceeding expected returns were categorized as efficient (undervalued), whereas securities with realized returns below expected returns were classified as inefficient (overvalued). Security Market Line analysis was subsequently employed to evaluate stock valuation and formulate investment recommendations.

RESULTS AND DISCUSSION

Analysis of Realized Returns

The first stage of the empirical analysis involved calculating realized stock returns (Ri) for each sample company. Realized returns represent the actual gains earned by investors and therefore provide an indication of historical investment performance. The results reveal considerable variation in return performance among mining firms during the observation period, reflecting differences in operational efficiency, commodity exposure, market positioning, and investor sentiment.

Table 1. Summary of Realized Return Performance

Indicator	Value
Number of Sample Firms	37
Average Actual Return (Ri)	1.87%
Return Characteristic	Positive
Sector Classification	High-return Sector

The average realized return of 1.87% indicates that mining companies generally generated positive returns throughout the study period. This finding reflects favorable commodity-market conditions during the recovery phase following the COVID-19 pandemic, increasing global demand for strategic minerals, and improved investor confidence associated with downstream industrialization initiatives. The positive return performance also suggests that investors participating in the mining sector benefited from the commodity-price expansion that occurred after the pandemic. Companies involved in nickel production and mineral processing particularly benefited from increasing demand generated by electric-vehicle manufacturing and renewable-energy development. Consequently, mining stocks emerged as one of the most attractive investment alternatives within the Indonesian stock market during the observation period.

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Market Return and Risk-Free Rate Analysis

Market returns were estimated using movements in the Jakarta Composite Index (JCI/IHSG), which served as a proxy for overall market performance. The analysis revealed substantial fluctuations in market returns throughout the observation period. During the early stages of the COVID-19 pandemic, market returns declined significantly because of heightened uncertainty and declining economic activity. However, market conditions improved considerably during the recovery period as investor confidence returned and economic growth accelerated. The risk-free rate was represented by the Bank Indonesia benchmark interest rate. Throughout the observation period, monetary authorities implemented several interest-rate adjustments in response to inflationary pressures, economic stabilization efforts, and post-pandemic recovery initiatives. These changes influenced investment decisions by affecting the opportunity cost of capital and investor preferences regarding risk-bearing investments.

Interestingly, the analysis identified a negative market risk premium during certain periods. This result indicates that average market returns occasionally fell below the prevailing risk-free rate, reflecting extraordinary market conditions and heightened investor risk aversion. Although uncommon under normal economic circumstances, such situations may occur during periods of severe uncertainty when investors prioritize capital preservation rather than return maximization.

Systematic Risk Analysis

Systematic risk was estimated using beta coefficients that measure the sensitivity of individual stock returns relative to market-return movements. Beta serves as the principal risk indicator within the CAPM framework because it captures the portion of total risk that cannot be diversified away.

Table 2. Beta Classification

Beta Value	Interpretation
$\beta < 1$	Defensive Stock
$\beta = 1$	Market-Equivalent Risk
$\beta > 1$	Aggressive Stock
Sample Average $\beta = 1.19$	Aggressive Sector

The findings reveal that the mining sector exhibited an average beta coefficient of 1.19, indicating an aggressive risk profile. Stocks characterized by beta values greater than one tend to experience larger fluctuations than the overall market. Consequently, investors holding mining stocks are exposed to greater market risk but may also receive higher expected returns as compensation. Several factors explain the elevated beta values observed within the mining sector. First, mining companies are highly dependent on commodity prices, which fluctuate according to global demand and supply conditions. Second, mining activities require substantial capital expenditures, creating high operational leverage and amplifying earnings volatility. Third, government regulations regarding exports, environmental protection, and downstream industrialization directly influence investor expectations and market valuations. Collectively, these factors contribute to higher systematic risk relative to less cyclical industries.

Expected Return Analysis

Expected returns were estimated using the Capital Asset Pricing Model by incorporating risk-free rates, market returns, and beta coefficients. The results indicate substantial variation in expected returns across companies because of differences in systematic risk exposure. Higher beta values generally generated higher expected returns, supporting the theoretical proposition that investors require greater compensation for bearing greater systematic risk. The positive relationship between risk and return is consistent with the assumptions of Modern Portfolio Theory and CAPM, both of which suggest that risk-bearing investments should generate superior expected performance relative to low-risk securities. The variation in expected returns also reflects differences in business models, operational structures, and commodity exposure among mining companies. Firms operating within rapidly growing mineral markets generally exhibited higher expected returns because investors anticipated stronger future earnings growth.

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Security Market Line Analysis

The Security Market Line (SML) provides a graphical representation of the relationship between systematic risk and expected return under CAPM assumptions. Securities located above the SML generate returns exceeding theoretical expectations and are therefore classified as undervalued. Conversely, securities positioned below the SML generate returns lower than expected and are considered overvalued. The SML analysis revealed substantial differences in investment attractiveness among mining firms despite operating within the same industry. These findings suggest that firm-specific performance and investor expectations continue to play important roles in determining stock valuation. Consequently, investors should not rely solely on sector-level analysis but should evaluate individual companies carefully when making investment decisions.

Investment Efficiency Classification

The final stage of the analysis involved comparing realized returns (Ri) with expected returns [E(Ri)] derived from CAPM calculations. Securities generating realized returns above expected returns were classified as efficient investments, whereas securities generating realized returns below expected returns were classified as inefficient investments.

Table 3. Investment Efficiency Classification

Classification	Number of Stocks	Percentage
Efficient (Undervalued)	32	86.49%
Inefficient (Overvalued)	5	13.51%
Total	37	100%

The results indicate that 32 out of 37 mining stocks (86.49%) were classified as efficient investments, while only five stocks (13.51%) were categorized as inefficient investments. This finding demonstrates that the majority of mining companies generated returns exceeding CAPM expectations and therefore provided attractive investment opportunities during the observation period. The dominance of efficient stocks reflects strong sectoral performance driven by commodity-price expansion, increasing mineral demand, and favorable government policies. Consequently, investors allocating capital to mining stocks generally received returns that adequately compensated for the risks undertaken.

Discussion

The findings provide strong support for the fundamental proposition of Modern Portfolio Theory and CAPM that higher systematic risk is associated with higher expected returns. The average beta coefficient of 1.19 combined with positive realized returns demonstrates that mining companies exhibit characteristics consistent with the high-risk–high-return principle. Investors accepting greater exposure to market fluctuations were compensated through superior return performance, confirming the theoretical relationship between risk and reward. The aggressive risk profile observed among mining companies can be attributed primarily to their dependence on commodity markets. Commodity prices respond rapidly to changes in global economic activity, industrial production, geopolitical developments, and technological transformation. Consequently, fluctuations in commodity demand directly influence mining-company revenues and profitability, generating substantial variations in stock prices.

One of the most important findings of this study is the dominance of efficient stocks within the mining sector. Several factors explain this phenomenon. First, post-pandemic economic recovery generated substantial increases in commodity demand, particularly for strategic minerals associated with renewable-energy technologies and electric-vehicle production. Rising demand translated into higher commodity prices and improved corporate earnings. Second, Indonesia's downstream industrialization policies strengthened investor confidence regarding long-term industry prospects. By encouraging domestic processing activities and value-added production, these policies improved growth expectations and increased the attractiveness of mining-related investments.

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Third, the expansion of global infrastructure investment and industrial production further increased demand for coal, nickel, copper, and other mining products. Consequently, mining companies experienced favorable market conditions that supported stock-price appreciation and investment performance.

The findings are broadly consistent with previous CAPM studies conducted in Indonesia. Research by Putri et al. (2025), Sa'adah and Hidayat (2024), and Aprialinita et al. (2022) similarly concluded that CAPM remains useful for evaluating investment opportunities and distinguishing efficient from inefficient securities.

However, this study extends existing literature in several important ways. First, unlike prior studies focusing on broad market indices, the present research specifically examines mining companies characterized by substantial exposure to systematic risk. Second, the six-year observation period captures multiple economic regimes, providing a more comprehensive evaluation of CAPM performance than studies limited to shorter time horizons. Third, the identification of a negative market risk premium contributes additional evidence regarding asset-pricing behavior during extraordinary economic conditions.

The study contributes to asset-pricing literature by extending CAPM evidence within a commodity-intensive emerging-market sector. The findings support the proposition that systematic risk remains a significant determinant of expected returns despite changing macroeconomic conditions and structural transformations. Furthermore, the dominance of efficient stocks suggests that CAPM remains a useful framework for identifying undervalued investment opportunities within emerging markets. At the same time, the occurrence of a negative market risk premium highlights the importance of considering broader economic conditions when interpreting CAPM outcomes. For investors and portfolio managers, the findings demonstrate that CAPM can be employed as a practical tool for evaluating investment opportunities within the mining sector. By comparing realized returns with expected returns, investors can identify securities generating superior risk-adjusted performance and optimize portfolio allocation decisions. Mining-company managers may also benefit from understanding the relationship between systematic risk and market valuation. Strategies aimed at improving operational efficiency, reducing uncertainty, and enhancing transparency may contribute to lower perceived risk and stronger investor confidence.

The results highlight the importance of maintaining a stable regulatory environment and supporting downstream industrialization initiatives. Consistent government policies enhance investor confidence, encourage long-term capital allocation, and strengthen the competitiveness of Indonesia's mining industry. Policymakers should therefore continue promoting value-added mineral processing while ensuring regulatory certainty and sustainable resource management.

CONCLUSIONS

This study evaluated risk–return dynamics and investment efficiency among mining companies listed on the Indonesia Stock Exchange during 2019–2024 using the Capital Asset Pricing Model. The findings reveal that the mining sector exhibits an aggressive risk profile characterized by an average beta coefficient of 1.19 and an average realized return of 1.87%. These results support the high-risk–high-return principle proposed by Modern Portfolio Theory and CAPM. Security Market Line analysis identified 32 stocks as efficient (undervalued) and five stocks as inefficient (overvalued), indicating that the majority of mining companies generated returns exceeding CAPM expectations. The findings demonstrate that CAPM remains a useful analytical framework for evaluating investment opportunities within commodity-dependent industries and emerging-market contexts. The study contributes to theoretical discussions regarding systematic risk and asset pricing while providing practical guidance for investors, portfolio managers, and policymakers. Nevertheless, several limitations should be acknowledged. The analysis focuses exclusively on mining companies listed on the Indonesia Stock Exchange and relies solely on the CAPM framework, which considers systematic risk as the primary determinant of expected returns. Future studies may extend this research by incorporating multifactor asset-pricing models such as the Fama–French Three-Factor Model, Carhart Four-Factor Model, or Arbitrage Pricing Theory. Comparative analyses across sectors and the inclusion of macroeconomic variables may also provide a deeper understanding of investment behavior and stock valuation within emerging markets.

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References

Aprialinita, A., Aulia, R., Aristi, D., Putri, N., & Permatasari, L. (2022). Capital Asset Pricing Model analysis for investment decision-making. *Research in Accounting Journal, 2*(3), 112–121.

Fama, E. F., & French, K. R. (2015). A five-factor asset pricing model. *Journal of Financial Economics, 116*(1), 1–22. https://doi.org/10.1016/j.jfineco.2014.10.010

Hartono, J. (2017). *Teori portofolio dan analisis investasi* (11th ed.). BPFE.

Hou, K., Xue, C., & Zhang, L. (2020). Replicating anomalies. *Review of Financial Studies, 33*(5), 2019–2133. https://doi.org/10.1093/rfs/hhy131

Ilham, M., & Kalimah, N. (2025). CAPM analysis for investment decisions in JII70 companies. *Journal of Islamic Finance Studies, 5*(1), 45–57.

Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *Review of Economics and Statistics, 47*(1), 13–37. https://doi.org/10.2307/1924119

Markowitz, H. (1952). Portfolio selection. *Journal of Finance, 7*(1), 77–91. https://doi.org/10.1111/j.1540-6261.1952.tb01525.x

Mossin, J. (1966). Equilibrium in a capital asset market. *Econometrica, 34*(4), 768–783. https://doi.org/10.2307/1910098

Putri, F. A., Nurman, N., Aslam, A., Ramli, M., & Anwar, H. (2025). Investment feasibility analysis using the Capital Asset Pricing Model in IDX30 companies. *Jurnal Manajemen dan Bisnis Ekonomi, 3*(2), 55–68.

Sa'adah, S., & Hidayat, R. (2024). Investment decision-making using CAPM on LQ45 companies. *Jurnal Manajemen dan Bisnis Ekonomi, 2*(1), 14–29.

Sehgal, S., & Balakrishnan, A. (2023). CAPM performance in emerging markets: A contemporary review. *Emerging Markets Review, 55*, 100954. https://doi.org/10.1016/j.ememar.2023.100954

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance, 19*(3), 425–442. https://doi.org/10.2307/2977928

Silfiah, S., Haeruddin, M., Nurman, N., Tawe, A., & Aslam, A. (2023). Application of CAPM in evaluating mining-stock investment opportunities. *Maximal Journal, 3*(2), 78–91.

Tandelilin, E. (2017). *Pasar modal: Manajemen portofolio dan investasi*. Kanisius.