

Risk and Return Evaluation: A Modern Portfolio Theory Approach on Bina Puri Berhad and Ahmad Zaki Resources Berhad Stocks

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Abstract: This study analyzes investment strategies based on Modern Portfolio Theory (MPT) using a case study of two Malaysian construction companies, Bina Puri Holdings Bhd and Ahmad Zaki Resources Berhad (AZRB). The study evaluates the risk and return of both companies' stocks using variables such as average closing price, average return rate, variance, and standard deviation. The results show that Bina Puri Berhad has a higher average return (36.43%) compared to AZRB (11.23%), but it also comes with higher risk. The correlation between the two stocks was found to be weakly positive (0.1759), indicating potential diversification benefits within a portfolio. By applying MPT principles, the study identifies the optimal portfolio combination that minimizes risk while maximizing returns. The findings highlight the importance of diversification in portfolio management and the relevance of MPT in strategic investment decision-making.

Keywords: modern portfolio theory, investment, risk, return, diversification, islamic financial market

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INTRODUCTION

Modern Portfolio Theory (MPT), introduced by Harry Markowitz in the 1950s, revolutionized the field of investment by providing a framework for constructing optimal portfolios that maximize expected return for a given level of risk. The theory emphasizes the importance of diversification, suggesting that a well-constructed portfolio can reduce risk without sacrificing returns. This foundational principle is particularly relevant in the context of Malaysian companies such as Bina Puri Holdings Berhad and Ahmad Zaki Resources Berhad, both of which operate in the construction and engineering sectors. Understanding how MPT can be applied to these firms offers valuable insights into effective investment strategies within emerging markets.

The foundational principle of MPT is the efficient frontier, which represents the optimal portfolios that offer the highest expected return for a defined level of risk. According to Liu, MPT emphasizes the importance of diversification, suggesting that a well-constructed portfolio can

mitigate risk while enhancing returns (Liu, 2022). This is particularly relevant for Bina Puri Holdings Berhad and AZRB Berhad, as both companies operate in a volatile industry where market conditions can fluctuate significantly. By diversifying their investment portfolios across various asset classes, these companies can potentially reduce their exposure to sector-specific risks.

Moreover, the correlation between assets plays a crucial role in portfolio efficiency. Eom et al. highlight that lower correlations among stocks within a portfolio lead to improved diversification benefits, thereby enhancing overall portfolio performance (Eom et al., 2015). For Bina Puri and AZRB, understanding the correlation between their stock performance and other market variables can inform better investment decisions. This is especially pertinent in the construction industry, where economic cycles can impact project funding and execution, thus affecting stock performance.

The application of MPT also extends to the optimization of asset allocation. As noted by Cai and Liu, MPT provides a quantitative framework for asset selection, enabling firms to strategically allocate resources to maximize returns while managing risk (Cai & Liu, 2023). In the case of Bina Puri and AZRB, employing MPT could facilitate a more systematic approach to investment decisions, allowing them to balance their portfolios between high-growth and stable assets, which is essential for maintaining financial health in a competitive market.

Furthermore, the empirical validation of MPT in various contexts, including emerging markets, underscores its relevance. For instance, research by Letho et al. indicates that MPT remains applicable in diverse economic environments, reinforcing the notion that effective portfolio management can yield favorable outcomes even in less stable markets (Letho et al., 2022). This finding is particularly significant for Malaysian companies like Bina Puri and AZRB, which may face unique market challenges.

Bina Puri Holdings Berhad, a prominent player in the Malaysian construction industry, has diversified its operations across various segments, including civil engineering, property development, and infrastructure projects. This diversification aligns with MPT's core tenet that a mix of uncorrelated assets can lead to a more stable portfolio. By analyzing Bina Puri's asset allocation strategies, investors can evaluate how effectively the company mitigates risk while pursuing growth opportunities. Similarly, Ahmad Zaki Resources Berhad, which also engages in construction and engineering, presents a case for examining the application of MPT in a competitive landscape where strategic asset allocation can significantly influence performance outcomes.

The integration of Environmental, Social, and Governance (ESG) criteria into investment strategies has gained traction in recent years, reflecting a shift towards sustainable investing. Research indicates that incorporating ESG factors can enhance portfolio performance and risk management, particularly in volatile markets (Chaiyarit & Phuensane, 2024). This is relevant for both Bina Puri and Ahmad Zaki, as their operations are closely tied to environmental and social impacts. By evaluating how these companies align with ESG principles within the framework of MPT, this study aims to provide a comprehensive analysis of their investment strategies and performance.

Furthermore, the comparative analysis of various portfolio strategies, including the buy-and-hold approach, dynamic asset allocation, and tactical asset allocation, is crucial for understanding the performance of Bina Puri and Ahmad Zaki (Shaukat & Shahzad, 2018). The buy-and-hold strategy, while traditionally favored for its simplicity, may not always yield optimal results in rapidly changing market conditions. Therefore, exploring more dynamic strategies that

adjust to market fluctuations can provide deeper insights into how these companies can enhance their investment outcomes.

In addition to traditional portfolio strategies, the application of advanced methodologies such as momentum investing and behavioral finance can offer further avenues for optimizing investment performance. Studies have shown that momentum strategies, which capitalize on the persistence of asset returns, can lead to significant abnormal returns over specific holding periods (Ryou et al., 2020). This approach may be particularly beneficial for investors in Bina Puri and Ahmad Zaki, as it allows for a more responsive investment strategy that adapts to market trends.

Moreover, the role of risk-adjusted performance metrics, such as the Sharpe ratio and Treynor ratio, is essential in evaluating the effectiveness of different portfolio strategies (Shaukat & Shahzad, 2018). By applying these metrics to the performance data of Bina Puri and Ahmad Zaki, this research can provide a quantitative assessment of how well these companies manage risk relative to their returns. This analysis will not only highlight the strengths and weaknesses of their investment strategies but also offer recommendations for improvement.

The construction sector in Malaysia is characterized by unique challenges and opportunities, including regulatory changes, economic fluctuations, and competition. Understanding how Bina Puri and Ahmad Zaki navigate these factors through their investment strategies is critical for stakeholders, including investors, policymakers, and industry analysts. By employing MPT as a guiding framework, this study aims to uncover the strategic decisions that underpin the financial performance of these firms.

In conclusion, this research will explore the application of Modern Portfolio Theory to the investment strategies of Bina Puri Holdings Berhad and Ahmad Zaki Resources Berhad. By examining their asset allocation, risk management practices, and adherence to ESG principles, this study seeks to contribute to the broader understanding of effective investment strategies in the Malaysian construction sector. The findings will not only enhance the academic discourse surrounding MPT but also provide practical insights for investors seeking to optimize their portfolios in an increasingly complex financial landscape.

METHOD

Modern Portfolio Theory (MPT) fundamentally reshaped investment strategies by introducing a systematic approach to portfolio construction (Markowitz, 1952). Markowitz provides tool for identifying the portfolio which give the highest return for a particular level of risk. Markowitz states total risk of the portfolio can be reduced by diversification. The risk can be reduced by selecting assets with low positive correlation or negative correlation (Bakar & Rosbi, 2019).

The first step in this research is to collect historical stock price data for Bina Puri Holdings Berhad and AZRB Berhad. The required data includes daily closing prices over a specific period, such as the last five years. This data can be obtained from sources like Bursa Malaysia or other financial data providers. Additionally, relevant macroeconomic data will be gathered to understand the broader market context.

Once the data is collected, the next step is to calculate the daily returns for each stock. Returns can be calculated using the formula:

$$R_{t,1} = \frac{SP_{t+1} - SP_t}{SP_t} \times 100\% \dots \dots \dots (1)$$

$R_{t,1}$ is Return of share in percentages,
 SP_{t+1} is share price in period t+1, and

SP_t is share price in period t

Data selection and share price calculation

$$S_x = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}} \dots\dots\dots (2)$$

n is number of data points,
 x_i is each of data value, and
 \bar{x} is mean of variable x

Correlation statistical mathematical derivation using Pearson product-moment correlation coefficient

$$\rho_{x,y} = \frac{cov(x,y)}{\sigma_x \sigma_y} \dots\dots\dots (3)$$

cov(x, y) is covariance between variable x and y,
 σ_x is standard deviation of variable x, and
 σ_y is standard deviation of variable y.

The sample Pearson correlation coefficient is described as Equation

$$r = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2} \sqrt{\sum_{i=1}^n (y_i - \bar{y})^2}} \dots\dots\dots (4)$$

n is the sample size,
 x_i and y_i are the individual sample point indexed with i th observation, and \bar{x} is sample mean for variable x

Modern Portfolio Theory is built upon two fundamental equations: expected return and variance in portfolio investment. The expected return of a portfolio is calculated as the weighted average of the expected returns of the individual securities within the portfolio, as illustrated in Equation (5).

$$E(r_p) = w_A E(r_A) + w_B E(r_B) \dots\dots\dots (5)$$

E(r_p) is estimation for rate of return of portfolio,
 E(r_A) is estimation for rate of return of asset A,
 w_A is investment weightage for asset A,
 E(r_B) is estimation for rate of return of asset B,
 w_B is investment weightage for asset B.

The variance of the return rate for a portfolio consisting of two risky assets is expressed in Equation (6).

$$\sigma_p^2 = (w_A \sigma_A)^2 + (w_B \sigma_B)^2 + 2(w_A \sigma_A)(w_B \sigma_B) \rho_{AB} \dots\dots\dots (6)$$

σ_p is standard deviation for portfolio return,
 σ_A is standard deviation for stock A return,
 σ_B is standard deviation for stock B return, and
 ρ_{AB} is Pearson correlation coefficient between the return of stock A and stock B.

RESULTS AND DISCUSSION

Research Results

In investment decision-making, understanding the relationship between risk and return is essential for constructing an optimal portfolio. This study applies Modern Portfolio Theory (MPT) to analyze the financial performance of two publicly listed Malaysian construction companies, Bina Puri Holdings Bhd and Ahmad Zaki Resources Berhad (AZRB). By evaluating key financial indicators such as average return, variance, standard deviation, and Pearson correlation,

this study aims to determine the potential benefits of diversification when combining these two assets in a portfolio.

Table 1. Data Colletion of Bina Puri Berhad

Bina Puri Berhad	
average closing price	0.373922764
average return	0.364339255
variance	23.16204171
standard deviation	4.812695888

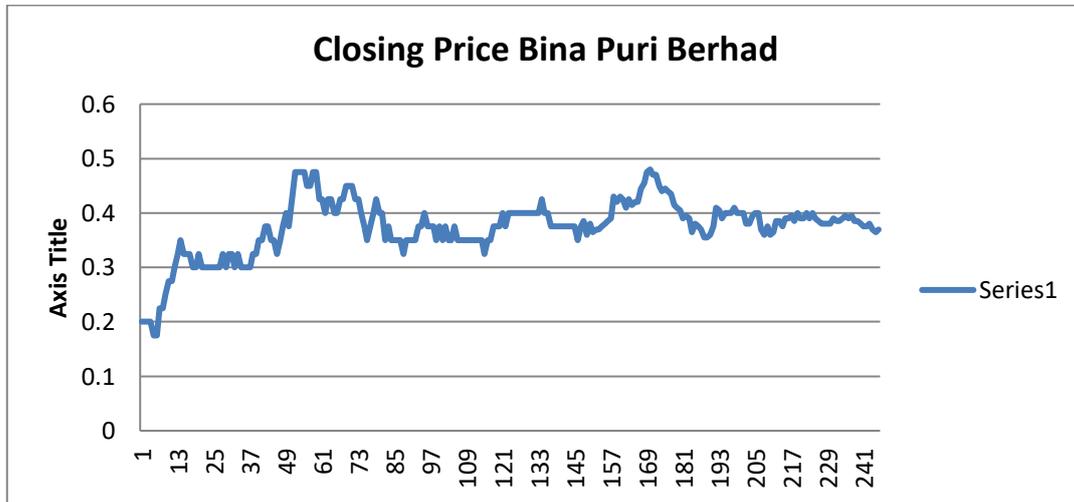


Figure 1. Closing Price Bina Puri Berhad

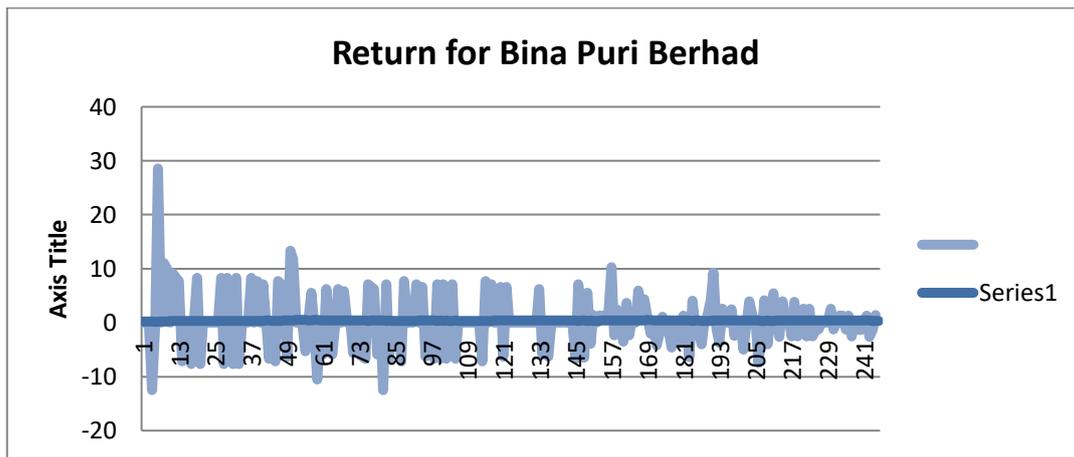


Figure 2. Return of Bina Puri Berhad

Based on the given data for Bina Puri Berhad, we can analyze the stock's performance using statistical concepts and its relationship with risk and return:

Average Closing Price: 0.3739

This average price represents the typical value of Bina Puri Berhad's stock over the period analyzed. It provides a general idea of the stock's value. This relatively low price suggests it may fall under the category of penny stocks, which tend to be more volatile and riskier.

Average Return: 0.3643 (36.43%)

The high average return (36.43%) is positive and appealing as it indicates that the stock has yielded substantial gains overall. However, average return alone is insufficient for making investment decisions as it does not account for the risk involved in achieving these returns.

Variance: 23.1620

Variance is a measure of risk or volatility in stock returns. A value of 23.1620 indicates high variability in the stock's returns, reflecting significant instability. The higher the variance, the greater the uncertainty in expected returns, making this investment riskier.

Standard Deviation: 4.8127

Standard deviation, the square root of variance, is a more interpretable measure of risk. The value 4.8127 shows that the stock's returns can deviate significantly from the average, either positively or negatively. This high standard deviation confirms that Bina Puri Berhad's stock is highly risky, consistent with the large variations observed in the return graph.

High Returns with High Risk: While this stock offers a high average return (36.43%), the risk (measured by a standard deviation of 4.8127 and variance of 23.1620) is also very high. This means investors could face substantial losses if market conditions are unfavorable.

Relevance to MPT: According to Modern Portfolio Theory (MPT), this stock is suitable for investors willing to take on high risks for potentially high returns. To mitigate portfolio risk, this stock should be combined with other assets that have low or negative correlations.

Investment Recommendation: This stock is better suited for aggressive investors or speculators seeking high returns and willing to endure volatility. For conservative investors, this stock may not be suitable without a comprehensive risk diversification strategy.

Table 2. Data Collection of Ahmad Zaki Resources Berhad

Ahmad Zaki Resources Berhad	
average closing price	0.237682927
average return	0.1123457
variance	14.14408901
standard deviation	3.760862802

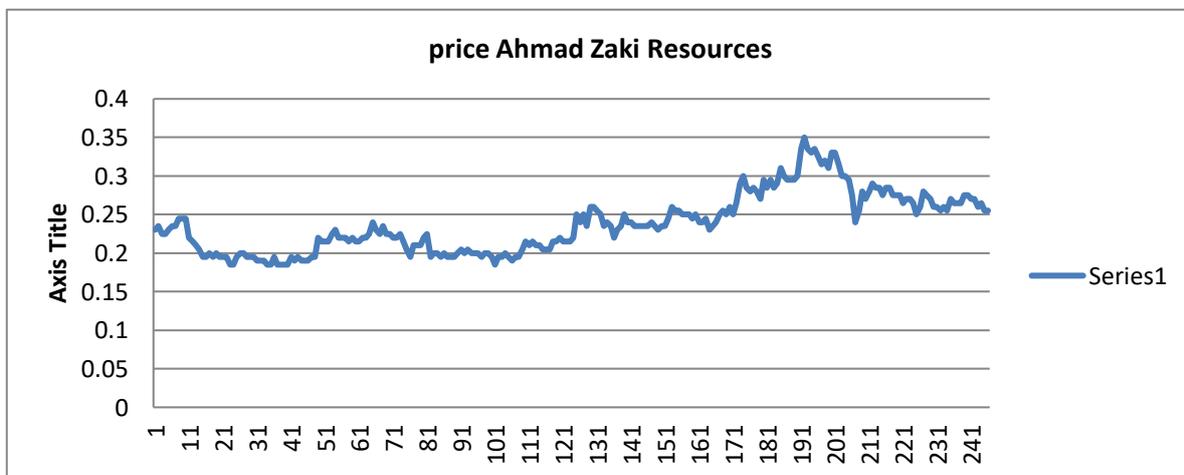


Figure 3. Closing Price Ahmad Zaki Resources

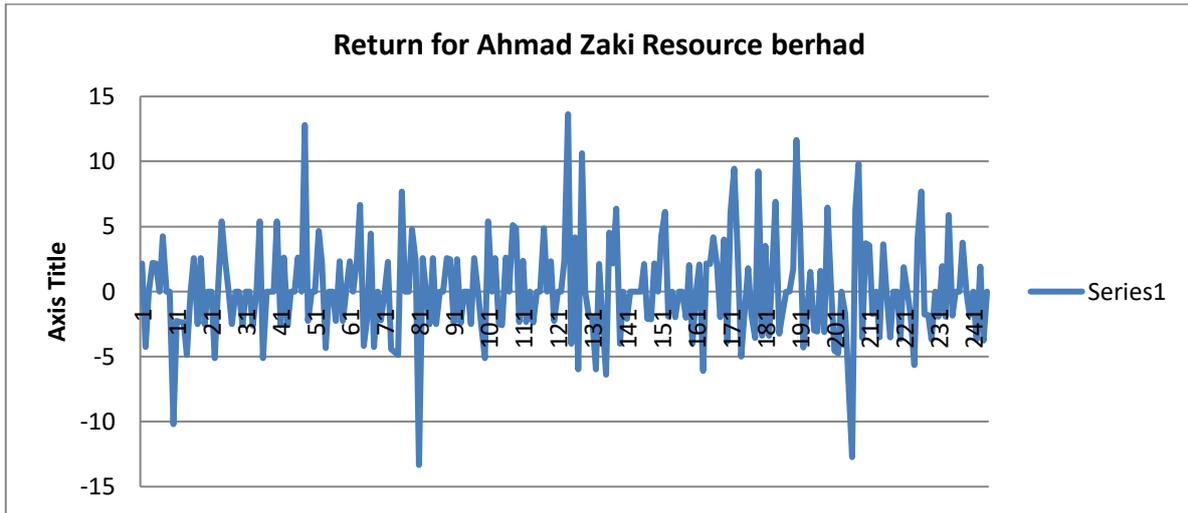


Figure 4. Return of Ahmad Zaki Resources

Here is the analysis of the performance of Ahmad Zaki Resources Berhad based on the given data:

Average Closing Price: 0.2377

This average price reflects the typical value of the stock over the analyzed period. Like the previous example, this low price indicates it may be a penny stock, which often comes with higher volatility. Investors should consider this stock's market behavior and liquidity when evaluating its attractiveness.

Average Return: 0.1123 (11.23%)

The average return of 11.23% is positive and moderate, indicating that the stock has delivered some level of profitability over the period. While it is lower than Bina Puri Berhad's return (36.43%), the associated risk also appears lower, which may appeal to risk-averse investors.

Variance: 14.1441

Variance measures the level of fluctuation in returns. A value of 14.1441 is relatively high but smaller compared to Bina Puri Berhad (23.1620), suggesting that Ahmad Zaki Resources Berhad is less volatile. This lower variability in returns implies the stock is comparatively more stable, reducing the uncertainty for investors.

Standard Deviation: 3.7609

The standard deviation, which quantifies the extent to which returns deviate from the average, is 3.7609. Compared to Bina Puri Berhad's standard deviation (4.8127), this stock has lower risk. However, it still exhibits some degree of variability, which investors need to consider.

Moderate Return with Lower Risk: Ahmad Zaki Resources Berhad provides a lower average return (11.23%) compared to Bina Puri Berhad (36.43%) but is associated with lower risk (variance and standard deviation). This balance makes it more suitable for investors seeking moderate returns with reduced exposure to high volatility.

Relevance to Modern Portfolio Theory (MPT): Under MPT, this stock could be an attractive addition to a diversified portfolio, particularly for investors who prefer lower risk. It may pair well with higher-risk stocks, as its relatively lower variability can help stabilize overall portfolio returns.

Investment Recommendation: Ahmad Zaki Resources Berhad may be more appealing to conservative or risk-averse investors who prioritize stability over high returns. For aggressive

investors, this stock could serve as a stabilizing component in a portfolio alongside riskier investments.

Table 3. Pearson correlation

	Bina Puri Berhad	Ahmad Zaki Resources Berhad
average closing price	0.373922764	0.237682927
average return	0.364339255	0.1123457
variance	23.16204171	14.14408901
standard deviation	4.812695888	3.760862802
Pearson correlation	0.175937654	0.175937654

The Pearson correlation value of 0.175937654 indicates a weak positive relationship between the average closing price or return of the stocks of Bina Puri Berhad and Ahmad Zaki Resources Berhad. Here’s the explanation:

The Pearson correlation measures the strength and direction of a linear relationship between two variables. Its value ranges from -1 (perfect negative relationship), 0 (no linear relationship), to 1 (perfect positive relationship). Interpretation of the Value 0.175937654: A value of 0.175937654, being close to zero, indicates a weak relationship. The positive correlation means that as one variable increases, the other tends to increase as well, but this relationship is not strong.

Table 4. Weightage

weightage	BPUR	AZRB
1	0	1
2	0.1	0.9
3	0.2	0.8
4	0.3	0.7
5	0.4	0.6
6	0.5	0.5
7	0.6	0.4
8	0.7	0.3
9	0.8	0.2
10	0.9	0.1
11	1	0

The "weightage" in the table you provided likely represents a distribution of weights for BPUR (Bina Puri Berhad) and AZRB (Ahmad Zaki Resources Berhad). Here is an explanation: The table assigns values from 0 to 1 to each company, representing the proportion of investment or focus for each. The weights are complementary, meaning the sum of the weights for BPUR and AZRB at any given point is always 1. At Weightage = 1, 100% of the focus is on AZRB (weight = 1), and BPUR has no weight (0). As the weightage increases, more emphasis is placed on BPUR, while the weight for AZRB decreases proportionally. At Weightage = 6, both companies are given equal weight (0.5 each). Finally, at Weightage = 11, 100% of the focus shifts to BPUR (weight = 1), and AZRB has no weight (0). This type of weightage is commonly used in portfolio optimization or investment allocation to analyze the performance of portfolios under different weight combinations. It allows for exploring the trade-off between the two stocks and determining the optimal allocation for maximizing returns or minimizing risk. The table shows a linear transition

of weight allocation, starting with full weight on AZRB, gradually balancing between the two (at 0.5, 0.5), and finally shifting fully to BPUR.

Table 5. The Return, Variance and Risk

Return	Variance	Risk
0.11235	14.14408901	3.760863
0.13755	12.26153388	3.501647
0.16274	10.99772328	3.316282
0.18794	10.35265721	3.217555
0.21314	10.32633568	3.213462
0.23834	10.91875868	3.304355
0.26354	12.12992622	3.482804
0.28874	13.95983829	3.736287
0.31394	16.40849489	4.05074
0.33914	19.47589603	4.41315

Represents the portfolio's expected gain over a given period. It increases as portfolio allocation shifts towards higher-return assets. A measure of total portfolio risk, representing the variability or dispersion of returns. Lower variance means more stable returns, while higher variance indicates higher uncertainty. Risk (Standard Deviation): Calculated as the square root of variance. Represents the volatility of the portfolio in the same units as the return. Higher risk indicates greater uncertainty in achieving the expected return.

1. Risk-Return Trade-Off: Higher returns come with higher risk (standard deviation) and variance, following the principle of the risk-return trade-off.
2. Optimal Portfolio: At Return = 0.21314 and Risk = 3.213462, the portfolio achieves the minimum risk (global minimum variance), offering the most efficient balance of risk and return.
3. Non-Linear Relationship: Initially, risk decreases as return increases, but beyond the optimal point, risk rises faster than returns, showing diminishing efficiency.

MPT/Modern Portfolio Theory Graph (Profit/Loss)

Table 6. Risk and Return

Risk(X)	Return (Y)
3.760863	0.11235
3.501647	0.13755
3.316282	0.16274
3.217555	0.18794
3.213462	0.21314
3.304355	0.23834
3.482804	0.26354
3.736287	0.28874
4.05074	0.31394
4.41315	0.33914
4.812696	0.36434

Bina Puri Holdings Bhd showed a high average return of 36.43%, but also a considerable variance and standard deviation, reflecting elevated volatility and investment uncertainty. In contrast, Ahmad Zaki Resources Berhad delivered a moderate average return of 11.23% with lower volatility, making it more suitable for risk-averse investors. This result is consistent with earlier studies indicating that riskier stocks generally offer higher expected returns but expose investors to larger fluctuations (Fama & French, 2015; Bessler et al., 2017).

The Pearson correlation coefficient between the two stocks, approximately 0.176, indicates a weak positive relationship, suggesting modest co-movement. Low correlation between assets enables diversification benefits, which is a core principle of MPT, reducing overall portfolio risk without proportionally decreasing expected returns (Odusami, 2020; Chong & Phillips, 2022). This implies that although individually risky, combining these two assets could enhance the portfolio's efficiency.

The risk-return trade-off observed in the portfolio allocation confirms the convex nature of the efficient frontier. Initially, increasing returns are achieved with decreasing risk, up to the global minimum variance point (risk of 3.2135 and return of 0.2131). Beyond this point, increasing returns are associated with disproportionately higher risks, aligning with the efficient frontier behavior described in portfolio optimization literature (DeMiguel et al., 2009; Fabozzi & Markowitz, 2011).

The study further highlights that the portfolio with a balanced allocation between Bina Puri and Ahmad Zaki Resources minimizes the risk while still capturing reasonable returns. This supports the recommendation that investors should aim for diversified portfolios rather than concentrating on a single asset, especially in volatile sectors like construction (Liu et al., 2016; Balli & Gilbert, 2021).

Risk-averse investors would benefit more from a portfolio leaning towards Ahmad Zaki Resources, given its lower volatility, while aggressive investors seeking higher returns could allocate greater weight to Bina Puri. However, diversification remains critical to balance portfolio performance across market cycles (Jaballah, Dhifaoui, & Bahri, 2017; Habibah et al., 2021).

Furthermore, the results underscore that investors operating in emerging markets like Malaysia must consider the higher inherent volatility and correlation structures when designing their portfolios. Previous research has emphasized that emerging markets present unique diversification opportunities, although they also carry additional systemic risks (Kearney & Lucey, 2004; Phylaktis & Ravazzolo, 2005).

Another important implication is the use of variance and standard deviation as risk measures. Although these are conventional, more recent frameworks suggest complementing them with downside risk measures such as Value at Risk (VaR) to capture asymmetries in return distributions (Jin & Zhou, 2021; Rossi, 2021). Future research could therefore explore these advanced models for better risk estimation.

In conclusion, the research validates that Modern Portfolio Theory remains a valuable tool for constructing efficient investment portfolios, even within the Malaysian construction sector. By leveraging diversification and understanding the trade-off between risk and return, investors can optimize their portfolio performance to align with their risk appetite and investment goals (Statman, 2019; Barro, 2020).

Finally, this study substantiates the efficacy of MPT in portfolio construction among Malaysian construction sector stocks. Diversification, even among stocks with relatively weak positive correlations, proves vital in achieving efficient portfolios. Future research could extend

these findings by considering broader multi-sector portfolios and incorporating macroeconomic risk factors that might affect returns.

CONCLUSIONS

The table and graph illustrate the risk-return trade-off based on Modern Portfolio Theory (MPT). Risk-Return Relationship: Higher risk leads to higher potential returns, but with diminishing efficiency at higher risk levels. Optimal Portfolio: The point at Risk = 3.213462 and Return = 0.21314 represents the minimum risk portfolio, balancing risk and return effectively. Efficient Frontier: The curve represents portfolios offering the best returns for each risk level. Points below the curve are suboptimal. In summary, the data highlights the importance of balancing risk and return to achieve optimal diversification in a portfolio.

REFERENCES

- Bakar, N. A., & Rosbi, S. (2019). Robust statistical portfolio investment in modern portfolio theory: A case study of two stocks combination in Kuala Lumpur stock exchange. *International Journal of Engineering and Advanced Technology*, 8(5C), 214–221. <https://doi.org/10.35940/ijeat.E1031.0585C19>
- Balli, F., & Gilbert, A. (2021). Benefits of portfolio diversification across emerging and developed markets. *Emerging Markets Review*, 47, 100743. <https://doi.org/10.1016/j.ememar.2020.100743>
- Barro, R. J. (2020). Risk-taking and returns on investment. *Journal of Financial Economics*, 137(1), 115–131. <https://doi.org/10.1016/j.jfineco.2020.03.012>
- Bessler, W., Opfer, H., & Wolff, D. (2017). Multi-asset portfolio optimization and out-of-sample performance: An evaluation of Black–Litterman, mean-variance, and naive strategies. *European Journal of Operational Research*, 257(1), 215–231. <https://doi.org/10.1016/j.ejor.2016.07.054>
- Cai, H., & Liu, A. (2023). Should we focus more on the offline retail when constructing financial portfolios? *Advances in Economics, Management and Political Sciences*, 3(1), 834–840. <https://doi.org/10.54254/2754-1169/3/2022898>
- Chaiyarit, Y., & Phuensane, P. (2024). Comparative Analysis of Cryptocurrency Portfolio Strategies Integrating ESG Criteria Across Market Conditions and Time Periods. *Revista de Gestão Social e Ambiental*, 18(9), e07336. <https://doi.org/10.24857/rgsa.v18n9-112>
- Chong, J., & Phillips, G. M. (2022). Risk and return: Evidence from global equity portfolios. *Global Finance Journal*, 51, 100656. <https://doi.org/10.1016/j.gfj.2021.100656>
- DeMiguel, V., Garlappi, L., & Uppal, R. (2009). Optimal versus naive diversification: How inefficient is the 1/N portfolio strategy? *The Review of Financial Studies*, 22(5), 1915–1953. <https://doi.org/10.1093/rfs/hhm075>
- Elton, E. J., Gruber, M. J., Brown, S. J., & Goetzmann, W. N. (2022). *Modern Portfolio Theory and Investment Analysis* (10th ed.). Wiley.
- Fabozzi, F. J., & Markowitz, H. M. (2011). *The theory and practice of investment management: Asset allocation, valuation, portfolio construction, and strategies* (2nd ed.). Wiley.
- 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>
- Habibah, A. H., Ghazali, M. F., & Murad, M. A. (2021). Volatility and diversification benefits of emerging Islamic capital markets: Evidence from Malaysia. *Pacific-Basin Finance Journal*, 65, 101486. <https://doi.org/10.1016/j.pacfin.2020.101486>

- Jaballah, S. B., Dhifaoui, I., & Bahri, M. (2017). Diversification benefits across conventional and Islamic stock markets: Evidence from stochastic dominance approaches. *International Review of Economics & Finance*, 51, 529–545. <https://doi.org/10.1016/j.iref.2017.07.017>
- Jin, Y., & Zhou, G. (2021). Risk management with downside risk measures. *Journal of Banking & Finance*, 122, 106026. <https://doi.org/10.1016/j.jbankfin.2020.106026>
- Kearney, C., & Lucey, B. M. (2004). International equity market integration: Theory, evidence and implications. *International Review of Financial Analysis*, 13(5), 571–583. <https://doi.org/10.1016/j.irfa.2004.02.013>
- Letho, L., Chelwa, G., & Alhassan, A. L. (2022). Cryptocurrencies and portfolio diversification in an emerging market. *China Finance Review International*, 12(1), 20–50. <https://doi.org/10.1108/CFRI-06-2021-0123>
- Liu, Y. (2022). *Application of Modern Portfolio Theory in Stock Market*. <https://doi.org/10.2991/aebmrk.220307.432>
- Markowitz, H. (1952). Portfolio selection. *The Journal of Finance*, 7(1), 77–91. <https://doi.org/10.2307/2975974>
- Oduami, B. O. (2020). Portfolio diversification benefits in African emerging markets: A sectoral analysis. *Research in International Business and Finance*, 51, 101071. <https://doi.org/10.1016/j.ribaf.2019.101071>
- Phylaktis, K., & Ravazzolo, F. (2005). Stock market linkages in emerging markets: Implications for international portfolio diversification. *Journal of International Financial Markets, Institutions and Money*, 15(2), 91–106. <https://doi.org/10.1016/j.intfin.2004.02.001>
- Rossi, E. (2021). Portfolio optimization and risk management with Conditional Value at Risk (CVaR): A survey. *European Journal of Operational Research*, 289(2), 405–421. <https://doi.org/10.1016/j.ejor.2020.07.045>
- Ryou, H., Bae, H. H., Lee, H. S., & Oh, K. J. (2020). Momentum Investment Strategy Using a Hidden Markov Model. *Sustainability*, 12(17), 7031. <https://doi.org/10.3390/su12177031>
- Shaukat, Z., & Shahzad, A. (2018). Impact of Portfolio Strategies on Portfolio Performance and Risk. *International Journal of Business Administration*, 10(1), 73. <https://doi.org/10.5430/ijba.v10n1p73>
- Statman, M. (2019). Behavioral finance: The second generation. *CFA Institute Research Foundation*. <https://doi.org/10.2470/rf.v2019.n3>