



Comparison of Islamic and Conventional Bank Stock Portfolio Performance Using the Markowitz Model: Risk and Return Analysis on Four Selected Issuers

Aliffatul Laila^{1*}, Asrie Putri Janitha²

^{1,2,3}*Department of Mathematics, Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran, Jatinangor, Sumedang*

*Corresponding e-mail: aliffatul22001@mail.unpad.ac.id

Abstract

This study aims to compare the performance of Islamic and conventional bank stock portfolios in Indonesia using the Markowitz Model approach that focuses on return and risk optimization. The object of research includes four banking issuers, namely BBKA and BBNI (conventional), and BRIS and BTPS (sharia), with daily closing price data during the period March 2020 to March 2021. Calculations were made on expected return, risk (standard deviation), sharpe ratio, and optimal portfolio composition. The results show that the Islamic stock portfolio has a higher expected return (0.009385) than the conventional portfolio (0.001652), but is accompanied by greater risk. Nevertheless, the efficiency of the Islamic portfolio remains competitive based on the sharpe ratio indicator and the ratio of return to variance. The optimal composition in the Islamic portfolio is dominated by BTPS stocks (68.69%), while in the conventional portfolio it is dominated by BBNI stocks (62.19%). These findings suggest that an Islamic bank stock portfolio can be an investment alternative that is not only ethical, but also financially superior in terms of risk and return.

Keywords: Portfolio, Stock, Islamic Bank, Conventional Bank, Markowitz Model, Sharpe Ratio, Risk, Return.

1. Introduction

The development of the banking industry in Indonesia shows significant growth, characterized by the existence of two banking systems that run side by side, namely conventional banking and Islamic banking. Conventional banks operate based on an interest-based system, while Islamic banks apply Islamic principles, such as profit-loss sharing, the prohibition of usury, and the avoidance of speculative activities. Both play an important role in the national economy, including in capital market activities.

As an investment instrument, bank stocks attract investors due to their competitive return potential and high volatility. However, the differences in characteristics between Islamic and conventional bank stocks lie not only in ideological aspects, but also in financial performance, especially in terms of risk and return. Therefore, an objective approach is needed in assessing the efficiency and portfolio performance of these two types of banks.

The Markowitz model, or modern portfolio theory, is one of the commonly used approaches in constructing an optimal investment portfolio. This model considers the variance and covariance between assets to optimize expected returns with minimum risk through diversification (Markowitz, 1952). Thus, investors can form efficient portfolios that suit their risk-return preferences.

A number of previous studies have discussed the characteristics of Islamic and conventional stocks in the context of portfolios. Puspitasari et al. (2024) showed that Islamic bank stocks are more efficient than conventional bank stocks, especially during volatile market conditions. Aris (2021) used the Value at Risk (VaR) approach and concluded that Islamic stocks have competitive risk performance. Meanwhile, Hidayat and Pramono (2022) noted that although Islamic bank stocks have a relatively high risk, the returns remain comparable to conventional bank stocks.

Based on this background, this study aims to analyze and compare the performance of Islamic and conventional bank stock portfolios in Indonesia using the Markowitz Model approach, especially for four selected banking issuers. The analysis is conducted on the efficiency and risk-return performance of the portfolio with the hope of providing deeper insights, both theoretically and practically, regarding the potential competitiveness of Islamic-based investments compared to conventional ones.

2. Literature Review

2.1 Stock Portfolio

A stock portfolio is a collection of stock assets strategically selected to optimize return and minimize risk through the principle of diversification. Based on modern portfolio theory (Markowitz, 1952), rational investors will choose a portfolio with the highest return at a certain risk or the lowest risk at a certain return through a mean-variance optimization approach. The portfolio return is calculated as the weighted average return of each asset, while the risk depends on the variance and correlation between stocks (Gitman & Zutter, 2012). The Markowitz model allows the identification of the efficient frontier as the set of optimal portfolios (Reilly & Brown, 2012). In this study, the model is used to compare the performance of Islamic and conventional bank stock portfolios to assess their effectiveness and efficiency in the capital market.

2.2 Markowitz Model

Portfolio theory was developed by Harry Markowitz in the early 1950s and became a major cornerstone in the modern approach to investment management. The theory introduces the concept that investment should not only be seen from the potential return, but also should consider risk. One of Markowitz's main contributions is the importance of diversification, which is the combining of assets that are not highly correlated to reduce the total risk of the portfolio (Markowitz, 1952).

This model is known as the mean-variance model because it relates the expected return to the risk measured through variance or standard deviation. The main objective is to form an optimal portfolio that provides maximum expected return at a certain level of risk or minimum risk at a certain level of expected return.

In its application, the Markowitz Model assumes that investors will choose a portfolio that provides the highest expected return for a given level of risk or conversely, the lowest risk for a given expected return. Optimization is done with the constraint that the total portfolio weight must sum to 1 ($\sum w_i = 1$) and the weight is not negative

($w_i \geq 0$), because short-selling is not allowed. This model can be used to form a Minimum Variance Portfolio (MVP) or other efficient portfolios depending on the investor's objectives.

The Markowitz model is based on several assumptions, namely:

- There is only one investment period (single period).
- There are no transaction costs.
- Investors are rational and only consider return and risk.
- There is no risk-free asset.

The steps in applying this model include:

- Calculating the historical return of each stock.
- Estimating the expected return and risk of each stock.
- Constructing the variance-covariance matrix.
- Calculating the correlation coefficient between stocks.
- Determining the investment weight of each stock.
- Calculate the total return and risk of the portfolio.

2.3 Stock Return

Stock return is an important indicator used by investors to assess the potential profit from stock investment. In general, return is defined as the level of profit obtained by investors on investments made. This return reflects how much the price of a stock changes over time and is the basis for evaluating stock performance in the capital market. Mathematically, stock returns can be calculated using the formula:

Description:

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

$R_{i,t}$: i -th stock return at time t

$P_{i,t}$: closing price of the i -th stock at time t

$P_{i,t-1}$: closing price of the i -th stock at time $t-1$

This return is also called historical return because it is calculated based on past stock price data. In practice, a positive return indicates a profit (capital gain), while a negative return indicates a loss (capital loss).

2.4 Expected Return

Expected return is an estimate of the level of profit expected from a stock investment in the future, based on the calculation of the average return from the previous period. This calculation can be done for monthly, annual, or other periods relevant to the analysis being conducted. Mathematically, the expected return is calculated using the following formula:

$$E(R_i) = \frac{\sum_{t=1}^n R_{i,t}}{n} \quad (2)$$

Description,

$E(R_i)$: expected return of the i -th stock

$R_{i,t}$: i -th stock return in the t -th period

n : number of periods observed.

2.5 Stock Risk

Stock risk refers to the uncertainty associated with future returns. In this context, stock risk is often calculated using the variance or standard deviation of the stock's return. The variance measures how far the stock return moves from its average value, while the standard deviation gives an idea of how much fluctuation in returns occurs.

$$\sigma_i^2 = \frac{\sum_{t=1}^n (R_{i,t} - E(R_i))^2}{n} \quad (3)$$

and

$$\sigma_i = \sqrt{\sigma_i^2} \quad (4)$$

Description,

σ_i^2 : variance of i -th stock return

$R_{i,t}$: i -th stock return in period t

$E(R_i)$: expected return of the i -th stock

n : number of periods observed.

Standard deviation, which is the square root of variance, provides a measure of risk that is easier for investors to understand and interpret. This risk measurement is important because it helps investors evaluate the potential volatility of returns and make decisions that fit their risk profile (Tandelilin, 2010).

2.6 Sharpe Ratio

Sharpe Ratio is a measure used to assess risk-adjusted investment returns. It measures how much return is earned per unit of risk taken by the investor. In this context, we will discuss the Ex Ante Sharpe Ratio, which calculates the expected return per unit of risk based on future projections, not historical data. Mathematically, the Ex Ante Sharpe Ratio is calculated by the formula:

$$S_a = \frac{E[R_a - R_b]}{\sigma_a} \quad (5)$$

Description,

S_a : Ex Ante Sharpe Ratio

$E[R_a - R_b]$: expected return spread between the asset and the risk-free asset

σ_a : standard deviation of the asset return difference

2.7 Efficient Portfolio Concept

Markowitz (1952), as explained by Panjer et al. (1998) and Ruppert (2004), introduced the modern portfolio theory, which is the basis of theory which is the basis for building an optimal investment portfolio. This approach aims to:

- Maximize the expected return of the portfolio (μ_p), which is the weighted average of the returns of each asset in the portfolio.
- Minimize portfolio risk, as measured by the variance (σ_p^2) or standard deviation (σ_p) of the return of the portfolio.

At the heart of this approach is the importance of diversification, combining assets with imperfect correlations to reduce the total risk of the portfolio without significantly sacrificing returns.

2.8 Variance-Covariance Matrix Structure

The variance-covariance matrix (Σ) represents a measure of the relationship between the returns of various assets in a portfolio. The diagonal elements represent the variance of each stock's return, while the non-diagonal elements represent the covariance between stocks.

$$\Sigma = \begin{bmatrix} \sigma_1^2 & \sigma_{1,2} & \cdots & \sigma_{1,n} & \sigma_{2,1} & \sigma_2^2 & \cdots & \sigma_{2,n} & \vdots & \vdots & \vdots & \sigma_{n,1} & \sigma_{n,2} & \cdots & \sigma_n^2 \end{bmatrix} \quad (6)$$

Description,

σ_i^2 : variance of i -th stock return

σ_{ij} : covariance between i -th and j -th stock returns

n : number of stocks in the portfolio

This matrix is an important element in calculating the overall portfolio risk, and allows the analysis of statistical relationships between assets.

2.9 Portfolio Fund Allocation Optimization

Determining the proportion of investment in each stock is done by maximizing the investor's utility function, which considers risk aversion. The general formula for optimal weighting is:

$$w = \frac{2}{p} \Sigma^{-1} (\mu - \lambda e) \quad (7)$$

With the value of λ obtained through the Lagrange multiplier approach:

$$\lambda = \frac{e^T \Sigma^{-1} \mu - \frac{\rho}{2}}{e^T \Sigma^{-1} e} \quad (8)$$

Description,

w : stock weight vector

μ : return vector

e : unit vector

ρ : investor risk aversion parameter

2.10 Portfolio Performance Evaluation: Return, Risk, and Efficiency Ratio

To assess how effective a portfolio is, three main calculations are used:

1) Portfolio Return:

$$\mu_p = \mu^T w$$

2) Portfolio Variance:

$$Var_p = w^T \Sigma w$$

3) Portfolio Efficiency Ratio:

$$Ratio\ Portofolio = \frac{\mu_p}{Var_p}$$

This ratio shows how much return is generated relative to the risk borne. The higher the ratio, the more efficient the portfolio.

3. Materials and Methods

3.1 Materials

This study uses secondary data in the form of daily closing prices of four banking stocks that are actively traded on the Indonesia Stock Exchange (IDX), consisting of two conventional banks, namely, PT Bank Central Asia Tbk (BBCA) and PT Bank Rakyat Indonesia (Persero) Tbk (BBNI) and two Islamic banks including PT Bank Syariah Indonesia Tbk (BRIS) and PT Bank BTPN Syariah Tbk (BTPS).

The reasons for selecting these six banks are as follows:

- BBCA and BBNI are examples of the largest conventional banks in Indonesia in terms of assets, transaction volume, and market capitalization, thus reflecting the dominant performance of the conventional banking sector in the Indonesian capital market (OJK, 2023).
- BRIS was chosen because it is the entity resulting from the merger of three state-owned Islamic banks and is now the largest Islamic bank in Indonesia.
- BTPS represents micro-based Islamic banks with a financial inclusion orientation, and has medium capitalization with high liquidity.

With this composition, this study aims not only to compare the performance of Islamic vs conventional banks in general, but also to capture the diversity of characteristics and market segmentation of each banking entity in the two categories.

The observation period covers March 2020 to March 2021, assuming 246 trading days per year. Data is taken from the [id.investing.com](https://www.id.investing.com) website and used to calculate daily stock returns. The risk-free interest rate is taken from the BI 7-Day Reverse Repo Rate of 3.92 per year (Financial Services Authority, 2021), which is converted to 0.00015935 per day.

3.2 Method

The approach used is the Markowitz Model (1952), which emphasizes diversification and optimization of portfolio return and risk. The research steps include:

- 1) Calculating the daily return of each stock using the log-return formula.
- 2) Estimating expected return and standard deviation as risk proxies for each stock.
- 3) Construct a variance-covariance matrix between stock returns.
- 4) Use Markowitz portfolio optimization with the investor's risk aversion parameter (ρ) to determine the optimal weight of each stock.
- 5) Calculate the return and risk of the portfolio, and evaluate its efficiency using Sharpe Ratio and Return/Variance ratio.

4. Results and Discussion

4.1 Results of Calculation of Stock Return and Risk

After collecting daily stock price data from each issuer that is the object of research, daily return calculations are carried out using the log-return formula. Based on the results of these calculations, the expected return and standard deviation (as a measure of risk) for each stock are obtained. The calculation results are shown in Table 1 below.

Table 1: Calculation Results of Stock Return and Risk

Category	Stock Code	Expected Return	Risk (Standard Deviation)
Conventional	BBNI	0,00221	0,028929
	BBCA	0,00071	0,01949
Sharia	BRIS	0,00320	0,04157
	BTPS	0,12203	0,06074

BTPS stock recorded the highest expected return, which is 0.12203, but it is also accompanied by the largest risk (standard deviation of 0.06074), which shows the characteristics of high risk, high return (Jogiyanto, 2010). On the other hand, BBCA stock shows the most conservative profile, with the lowest expected return (0.00071) and the least risk (0.01949). This indicates that BBCA stocks are more suitable for investors with a low risk profile. Meanwhile, BRIS and BBNI are in between the two extremes, with BRIS having a relatively high return and risk compared to BBNI, but not as high as BTPS

4.2 Sharpe Rataio Calculation Results

Sharpe Ratio is used to measure investment performance by considering the level of return relative to the risk borne. Based on calculations using the expected return and risk of each stock and the risk-free interest rate (BI 7-Day Reverse Repo Rate of 3.92% per year or around 0.00015935 per day), the Sharpe ratio results are shown in Table 2 below:

Table 2: Sharpe Ratio Calculation Results

Category	Stock Code	Sharpe Ratio
Conventional	BBNI	0,071205
	BBCA	0,10568
Sharia	BRIS	0,07315
	BTPS	0,05006

Based on the calculation results, BBCA stock has the highest Sharpe Ratio value of 0.10568, followed by BRIS of 0.07315. This shows that both stocks have better risk-return performance than other stocks. Meanwhile, BBNI and BTPS have lower Sharpe Ratio values, 0.071205 and 0.05006 respectively, indicating that their portfolio efficiency is not as optimal as BBCA and BRIS.

4.3 Optimal Portfolio Formation

The Markowitz model is used to form two portfolios, namely:

a. Conventional Stock Portfolio (BBNI and BBKA)

Table 3: Conventional Stock Portfolio

Rho	BBNI Return	BBKA Return	BBNI Weight	BBKA Weight	Portfolio Return
10	0,00221	0,00071	62,19%	37,81%	0,001652

Based on the calculation results using the Markowitz Rho = 10 model, the BBNI stock return is 0.00221 and the BBKA stock return is 0.00071. The weight of fund allocation on BBNI shares is 62.19%, while on BBKA shares it is 37.81%. From this combination, the portfolio return is 0.001652.

b. Sharia Stock Portfolio (BTPS and BRIS)

Table 4: Sharia Stock Portfolio

Rho	BRIS Return	BTPS Return	BRIS Weight	BTPS Weight	Portfolio Return
10	0,0032	0,12203	31,31	68,69	0,009385

Based on the calculation results using the Markowitz Model at the value of Rho = 10, the optimal portfolio composition for Islamic stocks is obtained as follows: BRIS stock return of 0.0032 and BTPS stock return of 0.12203. The weight of fund allocation on BRIS shares is 31.31%, while on BTPS shares it is 68.69%. From this combination, a portfolio return of 0.009385 is obtained.

5. Conclusion and Implication

5.1 Conclusion

This research aims to analyze and compare the performance of Islamic and conventional bank stock portfolios in Indonesia using the Markowitz Model approach. Four banking issuers were selected as research objects, namely BBKA and BBNI (conventional banks), as well as BRIS and BTPS (Islamic banks), using daily closing price data during the period March 2020 to March 2021.

Based on the results of the calculation of return, risk, sharpe ratio, and optimal portfolio formation, the following conclusions are obtained:

- 1) Islamic stocks have higher expected returns, especially BTPS stocks, but are also accompanied by greater risk than conventional stocks. This shows the high risk, high return characteristics inherent in some Islamic stocks.
- 2) The Islamic portfolio shows superior performance in terms of portfolio return, which amounted to 0.009385, compared to the conventional portfolio which only amounted to 0.001652. However, the risk of the Islamic portfolio is also higher.
- 3) The highest Sharpe Ratio is obtained by BBKA stock, indicating the best efficiency individually. However, at the portfolio level, the combination of BRIS and BTPS produces greater returns with optimally diversified risk.
- 4) The optimal composition in the Islamic portfolio is dominated by BTPS (68.69%), while in the conventional portfolio it is dominated by BBNI (62.19%), showing the significant contribution of each stock to the total portfolio return.
- 5) to the total return of the portfolio.
- 6) Overall, the Islamic stock portfolio is proven to be more competitive and efficient in terms of risk and return, so it can be considered as a viable investment alternative, not only in terms of Islamic ethics, but also in terms of financial performance.

5.2 Implications

a. Practical Implications for Investors

- Investors with aggressive to moderate profiles can consider allocating funds to sharia stocks, especially BTPS and BRIS, because of the higher return potential despite the greater risk.
- Conservative investors can still rely on conventional portfolios with a combination of BBKA and BBNI to maintain inv3 Model approach provides a strong quantitative basis in developing a portfolio diversification strategy based on historical returns and risks.

b. Academic and Theoretical Implications

- This research strengthens previous findings that Islamic portfolios are not inferior in performance to conventional portfolios, and even tend to be more efficient when diversification is done properly.
- These results add empirical references for the development of sharia-based portfolio management studies, especially in the context of the Indonesian capital market

c. Policy Implications and Financial industry

- These findings provide impetus for regulators, such as OJK and IDX, to encourage the development of more diverse, transparent, and liquid sharia-based investment indices and products.
- Islamic banks need to strengthen their financial performance to not only be attractive in terms of sharia values, but also as a rational investment choice based on performance.

References

- Ang, R. (2001). *Portfolio and Investment: Analysis, Theory and Applications*. Jakarta: Salemba Empat. Indonesia Stock Exchange. *Journal of Sharia Economics Theory and Applied*, 8(1), 120- 132.
- Dewi, R. S., & Noviani, R. (2020). Analysis of Optimal Portfolio Performance Using the Markowitz Model. *Journal of Economics and Social Sciences*, 11(1), 45-55.
- Financial Services Authority. (2021). *BI 7-Day Reverse Repo Interest Rate Statistics*. Accessed from <https://www.ojk.go.id>
- Financial Services Authority. (2021). *List of Sharia Securities*. Accessed from <https://www.ojk.go.id>
- Gitman, L. J., & Zutter, C. J. (2012). *Principles of Managerial Finance* (13th ed.). Boston: Pearson.
- Hidayat, R. (2021). Efficiency Analysis of Sharia and Conventional Stock Portfolios Using the Sharpe Ratio. *Journal of Finance and Economic Research*, 8(2), 101-113.
- Investing.com. (2023). Daily Stock Price Data. Accessed from <https://id.investing.com>
- Jogiyanto, H. M. (2010). *Portfolio Theory and Investment Analysis*. Yogyakarta: BPFE.
- Markowitz, H. M. (1952). Portfolio Selection. *The Journal of Finance*, 7(1), 77-91.
- Markowitz. *Journal of Economic and Social Sciences*, 11(1), 45-55.
- Panjer, H. H., et al. (1998). *Financial Engineering: Derivatives and Risk Management*. Wiley. Ratio.
- Journal of Finance and Economic Research*, 8(2), 101-113.
- Ruppert, D. (2004). *Statistics and Finance: An Introduction*. Springer.