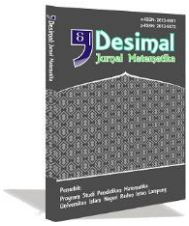
Desimal: Jurnal Matematika Vol 6 No 1 (2023) 1-6

Contents lists available at DJM

DESIMAL: JURNAL MATEMATIKA

p-ISSN: 2613-9073 (print), e-ISSN: 2613-9081 (online), DOI 10.24042/djm

http://ejournal.radenintan.ac.id/index.php/desimal/index



The optimal portfolio of islamic stocks using the markowitz and black-litterman models

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ARTICLE INFO

Article History
Received : 23-11-2022
Revised : 11-04-2023
Accepted : 29-04-2023
Published : 30-04-2023

Keywords:
Markowitz Model, Black-Litterman Model, Portfolio.

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Doi: 10.24042/djm.v6i1.14499

ABSTRACT

The portfolio with the best combination of profit and risk or the investor's choice is called the optimal portfolio. The Black-Litterman and Markowitz models were used to determine the optimal portfolio during the covid-19 pandemic. Sharia stock data, that is consistent with the Jakarta Islamic Index for the 2019-2021 period, is used in this research. The stock combination of the Markowitz model is better than the Black-Litterman model. The expected value of the portfolio obtained is 0.0066, which is greater than the risk-free asset return of 0.0011 on the day of broadcast. The portfolio risk of the Markowitz model is smaller than the Black-Litterman model, which are 0.0010972 and 0.0013917, respectively. so it can be said that the Markowitz model is better than the Black-Litterman model in the formation of a Sharia stock portfolio during the covid-19 pandemic.

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INTRODUCTION

In investing in financial assets, fund owners must diversify their capital into various assets to avoid large losses. This combination of assets is called a portfolio. A stock portfolio that provides the highest level of profit with a certain risk or provides the smallest risk with a certain level of profit is known as an efficient portfolio. The portfolio with the best combination of profit and risk levels or the investor's chosen portfolio is called the optimal portfolio. An optimal portfolio is a portfolio that is selected according to investor preferences from a set of portfolios. Meanwhile, according to Hartono, (2010), the optimal portfolio is the portfolio with the best combination of expected return and risk. There are several methods to determine the optimal portfolio, including the Markowitz model and the Black-Litterman model.

Markowitz (1952) created a portfolio selection model that incorporates the principle of diversification. Then Black & Litterman (1992) developed a model that combines investor knowledge with sample information in the form of historical stock

price data of a company in a state of equilibrium. The Black–Litterman model combines investor knowledge with the Capital Asset Pricing Model (CAPM) equilibrium model, which is then solved in the form of a mathematical model.

One of the risks that is being felt directly by the whole world is the Covid-19 pandemic that is currently hitting this country. The effects of Covid-19 have had an effect on stock investment. During the Covid-19 pandemic, the IHSG had a sharp downward trend, so reserves are better if allocated to real assets (Dewi, 2020). Silalahi et al. (2022) and Chasanah et al. (2020) form an optimal portfolio using a single index model. The optimal portfolio of the single index model on Islamic stocks did not provide optimal benefits to investors during the Covid-19 pandemic (Chasanah et al., 2020). However, Tjahjawati & Amalia (2021) stated in her research that the Markowitz model is better than the single index model. Then, Megawati et al. (2022) in her research stated that the value at risk of selected stocks using the Markowitz model produces optimal returns. Furthermore, Chindrianti et al. (2022) analyzes the formation of an optimal portfolio using the CAPM and concludes that the optimal portfolio using the CAPM method is the portfolio with the largest Sharpe index value. However, Ratri (2015) states that the Black-Litterman model has smaller risks than the CAPM in forming an optimal portfolio.

The objectives of this research are to determine consistent Islamic stocks during the Covid-19 pandemic, determine the optimal portfolio of Islamic stocks using the Markowitz and Black-Litterman models, and compare the optimal portfolio results obtained from the Markowitz and Black-Litterman models.

METHOD

The general steps taken include:

1. Choose stocks that are consistent in Jakarta Islamic Index (JII) during the Covid-19 pandemic, namely around 2019-2021.
2. Retrieving closing stock price data from https://finance.yahoo.com/ and calculating the return for each stock.
3. Calculates $E(R_i)$ and the variance of each consistent stock.
   The expected return is generated from the total return divided by the number of periods (n) on the stock.
4. Forming the optimal portfolio of the Black-Litterman model.
   The procedure for forming the optimal portfolio of the Black-Litterman model uses the modified Tauhid et al. (2022) procedure, which is as follows:
   a. Determine the Excess return to beta (ERB) and the Cutoff point (C) of each stock using the formula in Elton et al. (2014) and compare them. The selected stocks are stocks that has ERB>C
   b. Determines the CAPM and investors' perspectives, namely the link matrix of the proportion of investors' perspectives (P) and the expected return of investors' perspectives (Q)
   c. Determines the weighting parameters (τ) determined by investors. τ in this research uses 0.025 according to the assumptions of Black and Litterman.
   d. Determines the diagonal matrix (Ω), which is a diagonal matrix that expresses the level of investor confidence in every perspective taken by investors on a company's stock price.
   e. Calculates the expected return value of the Black-Litterman model (μ)
   f. Calculates the expected return value and the variance of the portfolio

formed in the Black-Litterman model.

5. Forming an optimal portfolio of Markowitz models.
   The procedure for forming a portfolio is as follows:
   a. chooses a stock that has $E(R_i) > r_f$,
   b. calculates the covariance of each selected stock,
   c. calculates the risk of the Markowitz model portfolio with the same size of the expected return portfolio as the Black-Litterman model.
6. Evaluate the results in the following way:
   a. see the comparison between the optimal portfolio of stocks generated by the Markowitz model and the Black-Litterman model.
   b. compares the optimal portfolio return and r_f.

RESULTS AND DISCUSSION

Secondary data analysis and a quantitative approach were used in this study. The data used is weekly data on closing prices for Islamic stocks included in the Jakarta Islamic Index (JII) for the period 2019 to 2021. The data used comes from the Yahoo finance website. The selected data is consistent data on JII for the last 3 years, namely 19 Islamic stocks, including ADRO, ANTM, BRPT, CPIN, EXCL, ICBP, INCO, INDF, INTP, ITMG, KLBF, PGAS, PTBA, SMGR, TLKM, TPIA, UNTR, UNVR, and WIKA.

Furthermore, from the selected stocks, an optimal portfolio is formed based on the Markowitz model and the Black-Litterman model. Basically, these two models have differences, namely in the Black-Litterman model, subjective investor views are taken into account in analyzing portfolio performance, while the Markowitz model is not involved.

The Optimal Portfolio of the Black-Litterman Model

ERB and C are calculated from consistent stocks, to choose which stocks can optimize the portfolio. In this research, the C chosen was C=0.00319578260931885, the highest of the C for each stock is the C of ANTM stock. Stocks that have ERB>C are shown in Table 1.

Table 1. Selected Stocks for the Optimal Portfolio of Black-Litterman Model

Stock Code	ERB	C
ADRO	0.01053	0.00155
ANTM	0.00541	0.00260
EXCL	0.00513	0.00295
ITMG	0.00505	0.00311
TLKM	0.00348	0.00320

The CAPM calculation is carried out on stocks that will be used as the optimal portfolio and the CAPM is obtained as shown in Table 2.

Table 2. CAPM and Stock Returns

Stock Code	CAPM	Stock Returns
ADRO	0.00192	0.01416
ANTM	0.00307	0.00689
EXCL	0.00171	0.00707
ITMG	0.00198	0.00547
TLKM	0.00186	0.01081

In this research, the author also acts as a subjective stock investor who looks at stock returns and the price of each stock. The author chooses 5 stocks that are selected for the optimal portfolio of the Black-Litterman model. Then calculate the return CAPM (π), Q, P, and Ω, using the formula in Tauhid (2022), which is used in calculating the expected return value of Black-Litterman, and the results are as follows:

$$\mu = \begin{bmatrix} 0.00621 \\ 0.00858 \\ 0.00489 \\ 0.00910 \\ 0.00518 \end{bmatrix}$$

Next, the proportion of stocks from the optimal portfolio that has been formed is calculated using the formula by Elton et al. (2014). The proportion of stocks in the Black-Litterman model portfolio is shown in Table 3.

Table 3. Portfolio Stock Proportions of the Black-Litterman model

Stock Code	Stock Proportion (%)
ADRO	0.16
ANTM	0.10
EXCL	0.09
ITMG	0.25
TLKM	0.40

$E(r_p)$ and σ^2 of the optimal portfolio of the Black-Litterman model are 0.006629 and 0.0013917.

The Optimal Portfolio of the Markowitz Model

Consistent stocks that meet $E(r_i) > r_f$ are shown in Table 4.

Table 4. Selected Stocks for the Markowitz Model

Stock Code	$E(r_i)$
ADRO	0.00707
ANTM	0.01081
EXCL	0.00547
ITMG	0.01416
PGAS	0.00409
PTBA	0.00432
TLKM	0.00689

Selected stocks for the optimal portfolio of the Markowitz model are shown in Table 5.

Table 5. The Optimal Portfolio of the Markowitz Model

Stock Code	Stock Proportion (%)
ADRO	0.10
ANTM	0.01
EXCL	0.15
ITMG	0.06
PTBA	0.20
TLKM	0.48

Optimal Portfolio Comparison

The optimal portfolio combination of the Markowitz model and the Black-Litterman model is not much different. This is shown in Figure 1. The number of stocks in the Markowitz model portfolio is 6 stocks, more than the combination of stocks in the Black-Litterman model portfolio which is 5 stocks. In Figure 1, Table 3, and Table 5, it is also seen that the TLKM stock is the stock that has the largest proportion.

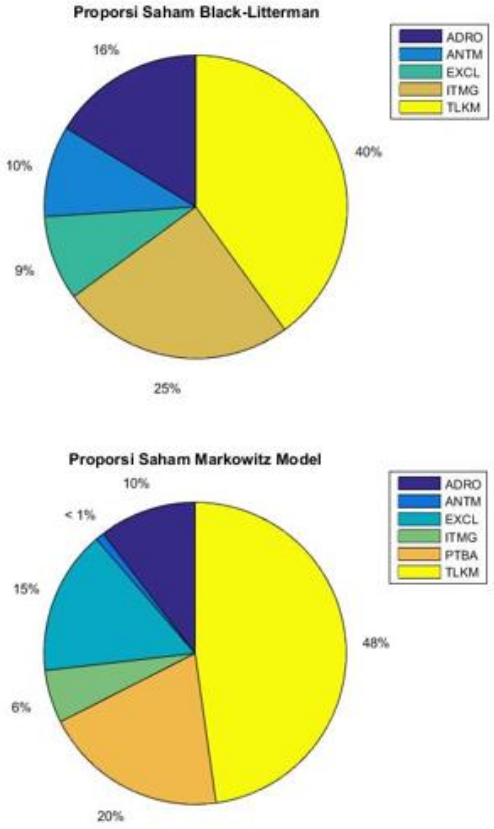

Figure 1. Stock Proportions of the Black-Litterman and Markowitz Models

Based on Figure 1, the largest proportion of stock for both models is the TLKM stock. Then the stock that has the smallest proportion is the ANTM stock while in the Black-Litterman model is the EXCL stock.

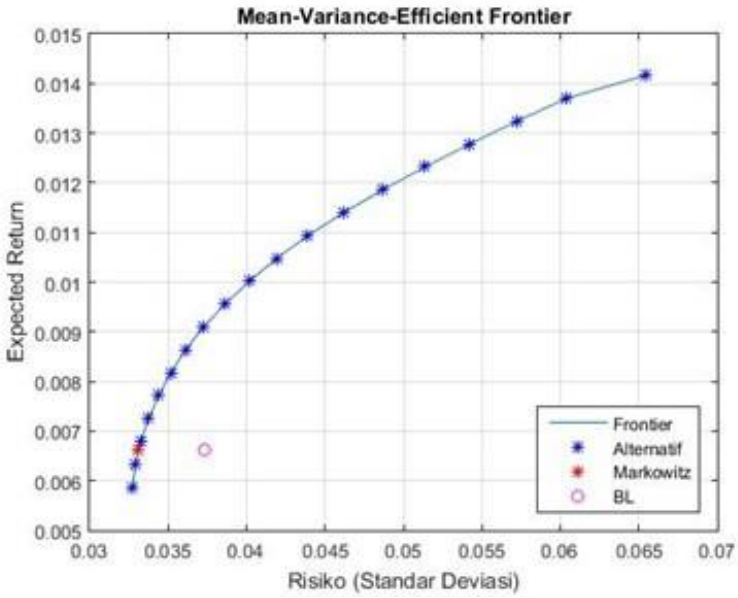

Figure 2. $E(R_i)$ and σ of Black-Litterman and Markowitz Model

In Figure 2 it can be seen that of the 19 efficient stocks, the expected return value of the portfolio from both models is 0.0066. The risk of the Markowitz model portfolio is lower, namely, 0.0010972, than the risk of the Black-Litterman model portfolio, which is 0.0013917.

CONCLUSIONS AND SUGGESTIONS

The expected return value of the optimal portfolio for the Black-Litterman model is 0.0066. This value is greater than the return on risk-free assets. This means that buying stocks by forming an optimal portfolio of the Black-Litterman model will generate greater returns compared to just saving.

Using the same expected value as the Black-Litterman model, the risk of the optimal portfolio of the Markowitz model is smaller than the Black-Litterman model, namely 0.0010972 and 0.0013917, respectively. Then, seen from the number of stock combinations formed, the Markowitz model provides more diversification than the Black-Litterman model. So, it can be said that the Markowitz model is better than the Black-Litterman model during the Covid-19 pandemic. So, investors can buy ADRO, ANTM, EXCL, ITMG, PTBA, and TLKM stocks. Suggestions for further research are to determine how long investors should invest in the optimal portfolio that has been formed.

ACKNOWLEDGE

This research was funded by the Ministry of Research and Technology/National Research and Innovation Agency, no. 0060/D5/SPKP/LPPM/UNSUT/VI/2022.

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