Optimizing Hajj Fund Management through Islamic Finance Instrument

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Abstract

The management of Hajj funds must be done effectively using a rigorous standardized risk management approach. This study aims to create a Hajj fund management model using Islamic financial instruments through the optimal portfolio method and strategic asset allocation. The model was built using historical data from 2010–2022, involving Islamic deposits, government sukuk (SBSN), corporate sukuk, and Islamic stocks, which were analyzed with the Markowitz portfolio equation in Excel Solver. The result showed that the optimal portfolio yields an 8.50% expected return with a 4.00% risk; strategic asset allocation produces an 8.25% return with a 2.99% risk. The policy implication of this research is the need to review the initial deposit of pilgrims and explore alternative investments to bridge the gap between the actual cost of Hajj and pilgrims' payments while improving returns.

Keywords:
hajj fund; investment; optimal portfolio; strategic asset allocation; Markowitz model

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INTRODUCTION

The concept of Hajj fund management in Indonesia is a crucial issue due to the size of the Hajj fund, the long waiting period for the departure of prospective pilgrims, and the high expectations of the management results. The main challenges are high expectations from the public and investment risks, fluctuations in the Sharia financial market, and the increasing cost of organizing the Hajj pilgrimage. Indonesia, as a country with an immense Muslim majority, is highly interested in performing the fifth pillar of Islam, which is reflected in the number of Hajj applicants (Karimah & Iskandar, 2020). Table 1 shows the data on the number of hajj registrants and waiting time for each province.

Table 1. The Number of Hajj Registrants and Waiting Time for Prospective Pilgrims

Province	Number of Hajj Registrants	waiting time for prospective pilgrims
Aceh	132.507	35
North Sumatera	153.063	22
West Sumatera	100.658	26
Riau	118.359	27
Jambi	84.676	33
South Sumatera	147.491	25
Bengkulu	33.884	35
Lampung	147.016	25
Bangka Belitung Island	26.641	29
Riau Island	26.903	27
Dki Jakarta	213.994	29
West Java	775.953	31
Central Java	877.986	33
Yogyakarta	97.465	34
East Java	1.112.897	36
Banten	237.765	28
Bali	17.685	29
NTB	148.434	38
NTT	13.799	24
West Kalimantan	47.711	27
Central Kalimantan	40.828	29
South Kalimantan	134.440	39
East Kalimantan	82.998	44
Northern Kalimantan	12.104	41
North Sulawesi	10.638	18
Central Sulawesi	41.040	24
South Sulawesi	248.280	49
Southeast Sulawesi	49.248	28
Gorontalo	14.795	18
West Sulawesi	34.981	40
Maluku	14.248	19
North Maluku	19.547	26
West Papua	24.092	21
Papua	11.394	26

Source: Siskohat Ministry of Religious Affairs of the Republic of Indonesia RI 2023, data processed (2023)

Table 1 shows that the total number of prospective pilgrims reached 5.253.520, while on the other hand, the quota provided by the government of Saudi Arabia is limited. The Hajj quota is a limit on the number of Indonesian pilgrims given by the Kingdom of Saudi Arabia government based on the provisions of the Organization of the Islamic Conference (OIC) as stipulated in the Minister of Religious Affairs Regulation Number 14 of 2012. The quota for Indonesian pilgrims is outlined in a memorandum of understanding between the Minister of Religion of the Republic of Indonesia and the Minister of Hajj of the Kingdom of Saudi Arabia regarding preparing the Hajj every year before the Hajj operation. The Minister of Religious Affairs uses this memorandum of understanding to set national, provincial, and special hajj quotas with the principles of fairness and proportion. The presence of quotas results in long queues in Indonesia called waiting lists, a severe obstacle to prospective pilgrims. The limited quota and the high interest of Indonesian Muslims have resulted in protracted queues of pilgrims (Bramayudha & Irawan, 2023).

Table 1 above shows that the lowest waiting lists for prospective pilgrims are in West Papua province, Maybrat district, and East Kalimantan province: Mahakam Ulu district, East Kalimantan province, which are 12 and 17 years old, respectively. The most extended waiting period occurs in Bantaeng, Sidrap, Pinrang, Pare-pare, and Wajo districts of South Sulawesi Province, which is 41–46 years, and on average, this waiting period occurs for 24–25 years. This condition will continue to grow as the number of Hajj applicants increases daily.

The financial management of Hajj starts with an initial deposit of IDR 25,000,000 for prospective pilgrims, which is included in the Hajj Implementation Fee (BPIH). The President determines the amount deposited through a designated Sharia Bank or national commercial bank managed by the Minister of Religious Affairs.

Indonesia's Hajj administration fund has created a wave of complex debates regarding the financial management of the Hajj. Research on Hajj funds is usually conducted in countries with larger Muslim populations, such as Indonesia, India, Lebanon, Tunisia, Dubai, and Qatar (Ladki & Mazeh, 2017). Several researchers have proposed ideas about managing Hajj funds in various investment instruments. Sarniti & Wirdyaningsih (2020) researched the optimization of Hajj fund management through the synergy of the Hajj fund scheme and productive zakat. Ismal & Septiana (2019) discuss the management of Hajj funds through portfolio formation in the money market, while Aziz (2018) and Jumali (2018) discuss Hajj financial management by focusing on aspects such as wakalah and cost accountability. Muneeza (2018) compared Hajj financial management in Indonesia, Malaysia, and the Maldives. Karimah & Iskandar (2020) delves into the potential of infrastructure-based sukuk as an alternative investment option for optimizing Hajj fund management. Pratiwi et al. (2019) focus on optimizing Hajj funds through Islamic banks.

These debates range from the number of Muslims who register as prospective Hajj pilgrims to the deposit funds they must pay. The length of the waiting period before departing for Hajj has also become an inevitable topic. All these elements can make

the Hajj fund a promising source of long-term investment (Setyawan et al., 2020). This investment potential is evident in the amount of funds under management, which reached a spectacular figure of $145.7 trillion in 2020, according to the audited 2021 BPKH Annual Report. With an average waiting period of 25 years, some even reaching 48 years, according to the Ministry of Religion's Siskohat 2023, this fund is a valuable asset that can be optimally utilized for the benefit of the people. The management of Hajj deposit funds can benefit pilgrims by reducing the costs associated with organizing Hajj and improving the quality of services (Abidin, 2016). The benefits of these funds are not only limited to increasing returns but also involve the development of the Islamic finance industry and potential economic growth, which is growing in Indonesia (Hulwati et al., 2023). Furthermore, Rusydiana et al. (2021) found that the research suggestion is to look for alternative investment management of Hajj funds.

Approaches to investment management include the "Portfolio Theory" proposed by Markowitz in 1952, which states that return and risk are interrelated and measurable, allowing the determination of the appropriate level of risk for each level of return in a portfolio (Markowitz, 1952). This concept gave birth to "Modern Portfolio Theory," which suggests that risk can be managed by assembling several securities into a portfolio. In this case, the standard deviation or variance measures risk (Markowitz, 1952). This theory has been supported by ideas such as the Treynor Ratio, which includes the variables Market Value, Time, and Risk (Treynor, 1962), and the Sharpe Ratio, which uses standard deviation to measure the appropriateness of portfolio returns (Sharpe, 1964). These ideas, including the Modern Portfolio Theory, Treynor Ratio, and Sharpe Ratio, can help investment managers such as BPKH construct an optimal portfolio to achieve desired investment returns with an acceptable level of risk.

The use of Markowitz's theory in portfolio formation has been widely investigated. Becker et al. (2013) compared the traditional Mean Variance by Markowitz with Michaud's "resampled efficiency", finding that Markowitz's optimization method performs better. Tu & Zhou (2011) combined the "naive" 1/N method with other advanced strategies in the study, finding that the combination of strategies was superior in performance to the 1/N strategy. In Indonesia, some researchers have also applied the Markowitz Model. Chasanah et al. (2017) concluded that optimal portfolio formation with the Markowitz Model is more dominant than the Single Index Model. Meliala & Sukarno (2023) constructed optimal portfolios for stocks from different sectors in Indonesia. The success of Markowitz's theory in various studies confirms its relevance in investment management practice.

Implementatively, Markowitz's theory will be used to form strategic asset allocation. Several researchers have used asset allocation strategies for investment management and have shown that investment returns can be maximized through asset allocation strategies. Among these studies include strategic asset allocation of pension funds, an application of Markowitz portfolio theory (Menjeri, 2018), A simplified perspective of the Markowitz portfolio theory (Kumar, 2018), sustainability in supplier selection and order allocation: combining integer variables with Markowitz portfolio theory (Kellner & Utz, 2019), the

application of Markowitz portfolio theory to producing the world's major field crops (Vasylieva, 2020), and strategic asset allocation with illiquid Alternatives (Luxenberg et al., 2022).

Previous research has yet to specifically find an ideal Hajj fund management model with an optimal, liquid, low-risk investment portfolio following sharia provisions based on consideration of market conditions. Previous research (Setyawan et al., 2020; Witjaksono & Bustomi, 2021) has only looked for the best combination of investment instruments based on investor scenarios. This research contributes to studying the asset allocation model for the Hajj Financial Management Agency, which is expected to provide alternative investment portfolios to obtain optimal benefit value.

This study aims to create a Hajj fund management model using Islamic financial instruments through the optimal portfolio method and strategic asset allocation. For the Hajj Financial Management Agency (BPKH), it is essential to adopt an optimal investment fund allocation strategy by utilizing various financial instruments that match the best combination of risk and return or following the predetermined investment target. Practically, the novelty of this research is to provide an alternative optimal asset allocation strategy for Hajj funds in Indonesia based on Islamic financial instruments, including the Islamic money market and capital market, considering three critical aspects: policy, market timing, and instrument selection.

METHODS

Markowitz's portfolio selection approach is used to determine the optimal portfolio, aiming to maximize returns at a certain risk level. The first simulation uses modern portfolio theory data from 2010–2022, while the second uses a strategic asset allocation strategy based on economic and market conditions. Data from bullish, normal, and recession conditions are used. Data analysis is done by calculating through the application of the Markowitz model, which consists of several steps as follows: First, determining the Individual Instrument Return Value of Islamic Banking deposit return is found using the formula:

$$R\square = \frac{Ry}{12}$$

where is $R\square$: monthly return Ry: annualized return.

Next up is the sukuk sovereign (SBSN)/ sukuk corporation:

$$R\square = \frac{P_t - P_{t-1} + C}{P_{t-1}}$$

Where is $R\square$: Return Sukuk, P_t: Sukuk price for the period, P_{t-1}: Sukuk price in previous period, C: profit sharing or margins.

Islamic stocks: $R\square = \frac{IHSI_t - IHSI_{t-1}}{IHSI_{t-1}}$

where is $IHSI_t$: The individual stock price index in month t, $IHSI_{t-1}$: Individual stock price index in month t-1

Second, determining the expected return of individual instruments

$$E(R_i) = \sum_{i=1}^{n} p_i \, (r_i)$$

Where is, E (R_i): expected return of instrument i (%); p_i: probability of an event (return) (%); r_i: rate of return of instrument i (%).

Third, determining Individual Instrument Risk

$$\sigma_i^2 = \frac{\sum_{j=1}^{N} [(Rij - E(Ri)]^2}{n-1},$$

Where is σ_i^2: Variance of investment in assets i, σ_i: Standard Deviation, Rij: Return on investment i in condition j, E(Ri): Expected Return on Investment I, N: Number of observation.

Fourth, determine the expected return portfolio by using the following formula:

$$E(Rp) = \sum_{i=1}^{n}(Wi).\,(E(Ri))$$

Where is, E(Rp): Expected Return Portfolio, Wi: The Weight Of I-Securities Portfolio, E(Ri): Expected Return Individual.

Fifth, determine the expected portfolio risk (variance and standard deviation)

$$\sigma_p = \sqrt{\sigma_i^2},$$

Where is, σ_p^2: Variance of portfolio investment, σ⊡: Standard Deviation of Portfolio. Afterwards, you can determining with the formula, Covariance = $E\{[R_i - E(R_i)]\} \{[R\_j - E(R_j)]\}$.

Sixth, determining the optimal portfolio alternative. Calculates the expected return and risk of a portfolio of equal proportions. The expected return of a portfolio is the weighted average return of each stock in the portfolio in percentage terms. portfolio in percentage terms. It is calculated by accumulating the product of individual expected returns and individual stock proportions. The expected return of each company's portfolio is calculated using the following equation:

$$E(Rp) = \sum_{i=1}^{n}(Wi).\,(E(Ri))$$

Where is, E(Rp): Expected Return Portfolio, Wi: The Weight Of I-Securities Portfolio, E(Ri): Expected Return Individual

Portfolio risk is the chance of failure of an investment in a portfolio in percentage terms. Calculating portfolio risk requires measuring the standard deviation of each company. The difference is found because the portfolio has more than one stock.

Another variable included is covariance, which measures the relationship of the movement of one stock to another. Min $\sigma_p^2 = W_1^2\sigma_1^2 + W_2^2\sigma_2^2 + 2W_1W_2Cov(R_1R_2)$ Constraints: $W_1 + W_{2\,+}$ Wi = 1, W_1, W_2 + Wi ≥ 0, Max E(Rp) = $\sum_{i=1}^{n}(Wi).\,(E(Ri))$. Constraints: W_i (E(R_i)) = 1, W_1, W_2 ≥ 0, where is, σ_p^2: Variance of portfolio investment, σ⊡: Standard Deviation of Portfolio, W_1: proportion of security 1 portfolio, W_2: portfolio proportion of security 2, $Cov(R_1R_2)$: Covariance of security 1 and 2.

SHARPE RATIO

The relative return to risk analysis used in this study is the Sharpe ratio. The Sharpe ratio measures how much return is expected to be generated for each unit of total risk. A

positive Sharpe ratio indicates that the investment portfolio formed can provide additional investment returns greater than the risk-free asset. The risk-free asset indicator used in this study is the BI rate. The higher the positive value of the Sharpe ratio, the better the portfolio performance or the smaller the Sharpe ratio, the riskier the investment portfolio (Sharpe, 1964).

Measuring portfolio performance, the Sharpe ratio bases its calculation on the concept of a capital allocation line as a benchmark, by dividing the portfolio risk premium by its standard deviation. Thus, the Sharpe ratio can be used to measure the risk premium for each unit of risk in the portfolio. To calculate the Sharpe ratio, the following equation can be used:

$$Sp = \frac{E(R_p) - R_f}{\sigma_p}$$

Where is, Sp: Sharpe ratio, R_p: Return portfolio., R_f: risk free, σ_p: risk portfolio. The optimal portfolio is selected based on the rate of return, the given risk, and the portfolio optimization of the Sharpe index. Investors tend to avoid risk (Fabozzi & Modigliani, 2009), so it tends to choose the portfolio with the lowest risk in each category. Then when risk levels are equal, portfolios that offer the highest returns are usually chosen more favorably. In the other hand, when aiming for the same level of return, preference leans towards portfolios with lower risk.

RESULT AND DISCUSSIONS

Strategic asset allocation is used to get the best combination of investment placement. This study will find a portfolio model with the best combination using Islamic banking deposits, state sukuk, corporate sukuk, and Islamic stocks. Islamic banking deposits are the most stable investment instruments, as shown in Table 2. Sukuk government and corporate sukuk are generally relatively safe with high return achievements. Meanwhile, Islamic stocks are investment instruments vulnerable to various economic conditions, making them very volatile and high-risk.

The results of the calculation of returns on Islamic financial instrument data from 2010-2022 are presented in Table 2. Based on Table 2, the return investment profile shows that Islamic Banking Deposits have a minimum value of 0.0316, a maximum value at the largest return value in the study period of 0.0732, and a mean or average of 0.055162. The standard deviation of Islamic banking deposits is 0.0126. The mean value shows the average expected return value of 5.52%, and the standard deviation, which shows the risk value, has a value of 1.26%. This result means that Islamic banking deposits provide an expected annual return of 5.52% with a risk level of 1.26%. Government Sukuk/SBSN has a minimum value of -0.0521, a maximum value at the largest return value in the study period of 0.1289, and a mean or average of 0.07859. The standard deviation owned by Government Sukuk (SBSN) is 0.05237. The mean value shows the average return value of 0.07859, and the standard deviation, which shows the risk value, has a value of 0.05237. This result means that Government Sukuk (SBSN) provides a return per year of 7.86% with a risk level of 5.24%.

Table 2. Profile Investment Return Individual (in %)

Year	Return			
	Islamic Banking Deposits	Government Sukuk	Sukuk Corporation	Islamic stocks
2010	0.0732	0.1075	0.0939	0.2706
2011	0.0630	0.0997	0.1143	0.0078
2012	0.0627	0.0938	0.0361	0.1054
2013	0.0479	-0.0521	0.0183	-0.0200
2014	0.0731	0.1165	0.0990	0.1853
2015	0.0666	0.0690	0.0966	-0.1260
2016	0.0555	0.1087	0.1409	0.1613
2017	0.0591	0.1289	0.1227	0.0752
2018	0.0519	0.0186	0.0333	-0.0845
2019	0.0468	0.1231	0.1441	0.0284
2020	0.0443	0.1125	0.0933	-0.0917
2021	0.0316	0.0668	0.0857	-0.1150
2022	0.0414	0.0287	0.0644	0.0439

Source: Data Processed (2023)

Sukuk Corporation has a minimum value of 0.0183, a maximum value at the most considerable return value in the study period of 0.1441, and a mean or average of 0.08789. The standard deviation owned by Sukuk Corporation is 0.04000. The mean value shows the average return value of 0.8789, and the standard deviation, which shows the risk value, is 0.04000. This result means that Sukuk Corporation provides a return per year of 8.79% with a risk level of 4.00%. Islamic stocks have a minimum value of -0.1260, a maximum value at the largest return value in the study period of 0.2706, and a mean or average of 0.03390. The standard deviation owned by Islamic stocks is 0.12357. The mean value shows the average return value of 0.0339, and the standard deviation, which shows the risk value, is 0.12357. This result means that Islamic stocks provide a return per year of 3.39% with a risk level of 12.36%.

The subsequent managerial action involves computing the risk (standard deviation) over the entire duration of the study for each instrument. Risk corresponds to the square root of variance; thus, the risk calculation aligns with the variance calculation. This process can be facilitated using the "=stdeva" function in Microsoft Excel software, using the returns for each instrument across the study period as arguments to determine the risk associated with each instrument. The following are the results of the calculation of expected return and risk from the two simulations that will be carried out.

Table 3. Profile of Expected Return and Risk Instrument Modern Portfolio Theory

No	Investment Instruments	E (Ri)	Risk
1	Government Sukuk (SBSN)	7.86%	5.24%
2	Sukuk Corporation	8.79%	4.00%
3	Islamic Banking Deposits	5.52%	1.26%
4	Islamic Stocks	3.39%	12.36%

Source: Data Processed (2023)

Furthermore, Table 3 shows that the highest return expectation is in the Sukuk Corporation instrument of 8.79%, followed by Government Sukuk of 7.86%, then Islamic Banking Deposits provide an expected return of 5.52%, and Islamic Stocks give the lowest return expectation of 3.39%. Then, the highest individual instrument risk per year is found in the Islamic Stocks instrument, amounting to 12.36%; the second and third orders are Government Sukuk 5.24% and Sukuk Corporation 4.00%. Islamic Banking Deposits obtain the lowest risk at 1.26%.

Meanwhile, the expected return and risk with the strategic asset allocation approach are shown in Table 4, which shows that in a bullish market, Government Sukuk provides an expected return of 11.54% per year, Sukuk Corporation 11.41% per year, Islamic Banking Deposits 6.52% per year, and Islamic Stocks 17.31% per year. The highest risk is in Investment Instruments Islamic Stocks at 8.03%, and the lowest is in Government Sukuk (SBSN) at 0.98%. Then, in normal market conditions, Government Sukuk provides an expected return of 8.24% per year, Sukuk Corporation 8.89% per year, Islamic Banking Deposits 4.91% per year, and Islamic Stocks 1.41% per year. The highest risk is in investment instruments like Islamic stocks (8.08%), and the lowest is in Islamic banking deposits (1.37%). Whereas in market recessions, Government Sukuk provides an expected return of 3.70% per year, Sukuk Corporation 6.04% per year, Islamic Banking Deposits 5.27% per year, and Islamic Stocks of -8.06% per year. Investment Instruments show the lowest risk during market recessions in Islamic Banking Deposits at 0.98%.

Table 4. Profile of Expected Return and Risk Instruments *Strategic Asset Allocation*

No	Investment Instruments	Bullish		Normal		Recessions	
		E (Ri)	Risk	E (Ri)	Risk	E (Ri)	Risk
1	Government Sukuk (SBSN)	11.54%	0.98%	8.24%	3.61%	3.70%	7.07%
2	Sukuk Corporation	11.41%	2.18%	8.89%	4.21%	6.04%	4.04%
3	Islamic Banking Deposits	6.52%	0.93%	4.91%	1.37%	5.27%	0.98%
4	Islamic Stocks	17.31%	8.03%	1.41%	8.08%	-8.06%	4.42%

Source: Microsoft Excel (Data Processed)

After obtaining the expected return and risk of investment instruments, the variance and covariance matrix of each portfolio can be found. Tables 5 and 6 show the positive

or negative relationship of each investment instrument that can help BPKH diversify in the formation of the optimal portfolio. The following are the results of the calculation of the variance and covariance matrix of the two simulations carried out:

Table 5. Variance Covariance Matrix of Modern Portfolio Theory Approach

	Government Sukuk	Sukuk Corporation	Islamic Banking Deposits	Islamic Stocks
Government Sukuk	0.002531	0.001529	0.000227	0.002421
Sukuk Corporation	0.001529	0.001477	0.000070	0.001140
Islamic Banking Deposits	0.000227	0.000070	0.000147	0.000866
Islamic Stocks	0.002421	0.001140	0.000866	0.014092

Source: Data Processed (2023)

The correlation coefficient between securities also plays an important role in reducing portfolio risk, with a value of +1 indicating a perfect positive correlation, 0 indicating no correlation, and -1 indicating a perfect negative correlation (Lee et al., 2016). Next, substitute the covariance matrix into the optimal portfolio combination model using Microsoft Excel Solver to get the optimal portfolio combination results (Chao et al., 2019).

Table 6. Variance Covariance Matrix of Strategic Asset Allocation Approach

Market Bullish				
	Government Sukuk	Sukuk Corporation	Islamic Banking Deposits	Islamic Stocks
Government Sukuk	0.00007	0.00002	-0.00002	-0.00050
Sukuk Corporation	0.00002	0.00036	-0.00015	-0.00083
Islamic Banking Deposits	-0.00002	-0.00015	0.00006	0.00040
Islamic Stocks	-0.00050	-0.00083	0.00040	0.00484
Market Normal				
	Government Sukuk	Sukuk Corporation	Islamic Banking Deposits	Islamic Stocks
Government Sukuk	0.00104	0.00069	0.00020	0.00038
Sukuk Corporation	0.00069	0.00142	-0.00005	-0.00090
Islamic Banking Deposits	0.00020	-0.00005	0.00015	0.00063
Islamic Stocks	0.00038	-0.00090	0.00063	0.00522
Market Recessions				
	Government Sukuk	Sukuk Corporation	Islamic Banking Deposits	Islamic Stocks
Government Sukuk	0.00375	0.00197	0.00006	-0.00190
Sukuk Corporation	0.00197	0.00122	0.00011	-0.00111
Islamic Banking Deposits	0.00006	0.00011	0.00007	-0.00021
Islamic Stocks	-0.00190	-0.00111	-0.00021	0.00147

Source: Data Processed (2023)

Table 7 shows the optimal portfolio combination with the modern portfolio theory approach. Each model's portfolio with the highest Sharpe index value is considered the optimal portfolio; therefore, the eighth portfolio alternative with a Sharpe number of "0.9124" is the most optimal. Combining portfolios with Islamic financial instruments such as government sukuk (SBSN), sukuk corporations, Islamic banking deposits, and Islamic stocks forms various portfolio returns and risks.

Table 7. Optimal Portfolio Combination of Islamic Financial Instruments Modern Portfolio Theory Approach

Alternatives	Weights				Return	Risk	Sharpe
	Government Sukuk	Sukuk Corporation	Islamic Banking Deposits	Islamic Stocks			
1	0.00%	0.00%	0.00%	100.00%	3.39%	11.87%	-0.1230
2	4.16%	5.03%	1.98%	88.82%	3.89%	10.70%	-0.0898
3	30.83%	11.53%	0.00%	57.64%	5.39%	7.79%	0.0693
4	56.29%	18.23%	0.00%	25.47%	6.89%	5.37%	0.3801
5	66.66%	20.96%	0.00%	12.38%	7.50%	4.79%	0.5536
6	73.45%	22.75%	0.00%	3.80%	7.90%	4.61%	0.6612
7	42.91%	57.09%	0.00%	0.00%	8.39%	4.12%	0.8594
8	31.04%	68.96%	0.00%	0.00%	8.50%	4.00%	0.9124

Source: Data Processed (2023)

Table 8 shows the optimal portfolio combination with the strategic asset allocation approach in a bullish market. Based on calculating the optimal portfolio in bullish conditions, it can provide seven (7) alternative portfolios. The optimal portfolio based on these data is in alternative 1, which is seen from comparing the Sharpe index with other portfolio alternatives because it has the highest Sharpe number (12.298). This alternative is suitable for use with BPKH's risk-averse position but still gets maximum returns.

Table 8. Optimal Portfolio Combination of Islamic Financial Instruments Strategic Asset Allocation Approach (Bullish Market)

Alternatives	Weights				Return	Risk	Sharpe
	Government Sukuk	Sukuk Corporation	Islamic Banking Deposits	Islamic Stocks			
1	14.84%	15.46%	69.71%	0.00%	8.02%	0.26%	12.298
2	14.98%	15.60%	55.64%	13.77%	9.52%	0.99%	4.699
3	20.02%	20.93%	36.13%	22.93%	11.02%	1.41%	4.382
4	23.70%	24.86%	18.10%	33.34%	12.52%	1.96%	3.909
5	17.49%	17.88%	11.33%	53.29%	14.02%	3.44%	2.669
6	10.19%	10.08%	5.60%	74.14%	15.52%	5.00%	2.135
7	1.74%	1.63%	0.83%	95.80%	17.02%	6.64%	1.834

Source: Data Processed (2023)

Table 9 shows the optimal portfolio combination with the strategic asset allocation approach in the normal market. Based on the calculation of the optimal portfolio under normal circumstances, it can provide six (6) alternative portfolios. The optimal portfolio based on these data is in alternative 5, which is seen from comparing the Sharpe index with other alternative portfolios because it has the highest Sharpe number (1.137).

Table 9. Optimal Portfolio Combination of Islamic Financial Instruments Strategic Asset Allocation Approach (Market Normal)

Alternatives	Weights				Return	Risk	Sharpe
	Government Sukuk	Sukuk Corporation	Islamic Banking Deposits	Islamic Stocks			
1	8.92%	9.77%	4.57%	76.74%	2.91%	5.54%	-0.350
2	17.67%	21.28%	5.75%	55.30%	4.41%	4.07%	-0.108
3	28.73%	38.83%	6.35%	26.09%	6.50%	2.67%	0.619
4	27.48%	52.32%	5.97%	14.23%	7.41%	2.61%	0.981
5	24.10%	67.08%	5.00%	3.82%	8.25%	2.99%	1.137
6	17.63%	77.13%	3.30%	1.95%	8.50%	3.23%	1.131

Source: Data Processed (2023)

Table 10 shows the optimal portfolio combination with the strategic asset allocation approach in market recessions. Based on calculating the optimal portfolio in a recession, it can provide seven (7) alternative portfolios. The optimal portfolio based on these data is in alternative 6, which is seen from comparing the Sharpe index with other alternative portfolios because it has the highest Sharpe number (0.357).

Table 10. Optimal Portfolio Combination of Islamic Financial Instruments Strategic Asset Allocation Approach (Market Recessions)

Alternatives	Weights				Return	Risk	Sharpe
	Government Sukuk	Sukuk Corporation	Islamic Banking Deposits	Islamic Stocks			
1	0.00%	63.86%	0.00%	36.14%	0.94%	1.33%	-2.933
2	0.00%	74.50%	0.00%	25.50%	2.44%	1.88%	-1.282
3	0.00%	85.15%	0.00%	14.85%	3.94%	2.53%	-0.358
4	0.00%	95.79%	0.00%	4.21%	5.44%	3.22%	0.185
5	0.00%	97.96%	0.00%	2.04%	5.75%	3.36%	0.268
6	0.00%	82.27%	17.72%	0.01%	5.90%	2.94%	0.357
7	0.00%	95.26%	4.73%	0.01%	6.00%	3.35%	0.343

Source: Data Processed (2023)

Table 11 shows the recommended optimal portfolio combination using the strategic asset allocation approach considering market timing selection. Investment options for government sukuk, sukuk corporations, Islamic banking deposits, and Islamic stocks provide a return on bullish market conditions based on historical data of 8.02% with a

risk of 0.26%. In normal market conditions, it can provide a return of 8.25% with a risk of 2.99%. However, when the market is experiencing a recession, the optimal portfolio return only provides a return of 5.90% with a risk of 2.94%.

Table 11. Recommendations for Optimal Portfolio Combination of Islamic Financial Instruments Strategic Asset Allocation Approach

Market Timing	Weights				Return	Risk	Sharpe
	Government Sukuk	Sukuk Corporation	Islamic Banking Deposits	Islamic Stocks			
Bullish	14.84%	15.46%	69.71%	0.00%	8.02%	0.26%	12.298
Normal	24.10%	67.08%	5.00%	3.82%	8.25%	2.99%	1.137
Recession	0.00%	82.27%	17.72%	0.01%	5.90%	2.94%	0.357

Source: Data Processed (2023)

These results show that the four portfolios are suitable for use in various market conditions. However, the role of investors and investment policy determines the return and risk received. For example, in a bullish position, if investors want maximum return with a risk that can still be tolerated, the portfolio choice is in alternative 7 (see Table 8). The portfolio can provide an expected return of 17.02% with a risk of only 6.64%. Seeing the increasing development of Islamic stocks in Indonesia, Islamic stocks can be an alternative to optimizing investment in Hajj fund management (Deananda & Wirdyaningsih, 2020). This analysis follows the risk profile of BPKH, which tends to avoid risk (risk-averse). This condition is reasonable due to regulations that limit investment in BPKH to being as far away as possible from losses because any losses will be borne together (joint responsibility).

Hajj fund revenue comes from Bipih deposits, which are deposits of prospective pilgrims. The position of Hajj financial managed funds at the end of 2022 was recorded at IDR 166.0 trillion. Based on data from the BPKH financial report in 2022, BPKH-managed funds are currently allocated 29.5%, or 48.9 trillion rupiahs, in the BPS-BPIH fund placement portfolio with most placements in deposits in Islamic banks and 70.5%, or 117.1 trillion rupiahs, in the investment portfolio with most investments in securities. Table 12 shows the total returns obtained by BPKH in its placements and investments from 2018 to 2022 are 5.3%, 6.3%, 5.4%, 6.9%, and 6.3%, respectively, or an annual average of 6.04%. Through these placements and investments, the level of profitability/return in the form of the value of the Hajj financial management funds investment portfolio is obtained.

Table 12. Total Return on Management Results BPKH 2018 - 2022

	In %					
Rentability	Total Return (*Yield*, %)	5.3	6.3	5.4	6.9	6.3
	Return on Placement (%)	4.7	5.4	4.0	3.7	3.3
	Return on Investment (%)	6.3	7.3	6.4	7.9	7.4

Source: BPKH Financial Report 2018 - 2021 (Audited), BPKH Financial Report 2022 (Unaudited), BPKH Finance Sector

The actual cost of Hajj has experienced an upward trend from year to year. In the 2018 Hajj season, the actual cost of Hajj reached 69.2 million; in 2019, it rose to 70.6 million; in 2020, it fell to 68.6 million; it rose again in 2021 to 76 million; and it reached 97.8 million in 2022. Although there were no Hajj departures in 2020 and 2021 due to the COVID-19 pandemic, the BIPIH paid by prospective Hajj pilgrims generally experienced a significant increase, thus driving expectations of increased costs through the value of benefits. The increase in the cost of organizing the Hajj pilgrimage may pose a risk to the sustainability of the Hajj fund. Generally, the public perceives that the cost of Hajj per pilgrim is only around IDR 35.2 million, with an initial deposit of IDR 25 million and a final deposit of IDR 10.2 million. However, the actual cost reaches Rp 97.9 million, including airline tickets, accommodation, transport, and others. In reality, pilgrims get a subsidy (indirect cost) of around IDR 58.03 million from the development of the initial deposits of pilgrims who depart and wait. The number of pilgrims departing with waiting pilgrims reaches 1 to 23 or 221 thousand to 5 million pilgrims. The mismatch between the actual cost of Hajj and the deposit paid by the congregation (Bipih or direct cost) in the long run can threaten the financial sustainability of Hajj if adjustments are not made (BPKH, 2020).

The average increase in the value of benefits, BIPIH and BPIH Hajj RI, from 2010 to 2023 was 15.77%, with the initial Bipih fixed at Rp. 25 million. This increase was attributed to exchange rate fluctuations and inflation during the pandemic. However, the increase in BPIH did not increase the congregation's settlement deposit, increasing BPKH's responsibility. Therefore, BPKH must consider alternative investment options and cooperation that can potentially increase investment returns (Hulwati et al., 2023).

Suppose a simulation is carried out based on the results of the analysis. In that case, the average increase in the value of benefits (BIPIH and BPIH Hajj RI) is as follows: Increase in benefits from 2010 to 2023 by 15.77%. The initial Bipih has remained fixed since 2010 at Rp. 25 million. While the increase in Bipih on average per year from 2010–2023 amounted to 4%, the increase in BPIH per year from 2010–2023 amounted to 7.75%. Then, the total increase in BIPIH and BPIH on average per year from 2010 to 2023 amounted to 11.75%. Then, the simulation based on the current conditions in 2023 in the management of Hajj is as follows:

1. Prospective pilgrims who register in 2023 pay an Initial Deposit of IDR 25 Million and must wait at least 11 years for the opportunity to go on Hajj.

2. BPKH will manage the Initial Deposit Fund for at least 11 years.

3. Assuming that the BPIH will increase by 7.75% per year, and the BPIH for 2023 is IDR90.00 million/congregation, the BPIH in 11 years will be IDR166.72 million.

4. If the Bipih is also assumed to increase by 4% per year, then the 2023 Bipih is 49.89 million; at 11 years, it is IDR 71.84 million. So, the Repayment Deposit in 2023 is 49.89 million, which will also increase to 71.84 million.

5. Thus, the Initial Deposit Fund of Prospective Pilgrims deposited to be managed by BPKH must at least get a Total Benefit (Virtual Account) of IDR166.72 million - IDR25 million - IDR71.84 million = IDR69.88 million.

6. The Total Benefit of Rp69.88 million must be obtained from the management of funds of Rp25 million for 11 years, which means that it must get a compounded return of 13% per year.

7. To be able to cover the Bipih and BPIH gap, BPKH must be able to place and invest in instruments that provide a minimum return of 13%

Meanwhile, table 7 shows that the formation of optimal portfolios in Islamic financial instruments such as deposits in Islamic banks, state sukuk, corporate sukuk, and Islamic stocks was only able to generate a return of 8.50% with a risk level of 4.00%. Such an optimal portfolio is formed due to the asset class that occupies the highest weights, having minimal risk and high return expectations. Investments with minimal risk but still getting adequate returns are usually very favored by investors. However, the results of this calculation also provide seven other alternative investment models, which can be selected according to the specified investment policy and market timing. The optimal portfolio combination in this research produces a smaller return than other studies that use direct investment placement. For example, Setyawan et al. (2020) resulted in a combined return of 14.70% in the moderate scenario, 26.62% in the aggressive condition, and 7.76% when using the conservative scenario.

Furthermore, table 8 results simulations based on market condition scenarios (market timing selection) in bullish conditions obtained a return of 8.02% and a risk of 0.26%. Meanwhile, strategic asset allocation using other portfolio alternatives can be an option to pursue profits when the market is bullish, for example, by considering Islamic Stocks as an alternative investment option when economic and market conditions are bullish. This result can be seen from the optimal portfolio choices in alternatives 2, 3, 4, 5, 6, and 7. These alternatives provide portfolio returns and risks that can be adjusted to the BPKH risk profile. Islamic Stocks are proven to provide double-digit expected return portfolios when the market is bullish.

In normal conditions, a return of 8.25% and a risk of 2.99% are obtained (see table 9). When the market is normal, strategic asset allocation can follow alternative recommendation five by placing many funds in Sukuk Corporation and Government Sukuk (SBSN). This condition states that when the market is normal, choosing investment instruments like Islamic stocks still has a high risk. In contrast, Islamic banking deposits are stable but do not yield better returns when compared to Sukuk.

In recessionary conditions, a return of 5.90% and a risk of 2.94% are obtained (see Table 10). Strategic asset allocation during a market recession suggests that specific investment instruments like Islamic stocks should not be used due to their high volatility. Government Sukuk, on the other hand, may also be affected by deteriorating economic conditions and may not be a suitable choice in recessionary circumstances. Conversely, Sukuk Corporation consistently yields positive returns in recessionary markets, making it a preferred choice for many fund placement strategies. Islamic banking deposits are also favoured as they serve as cash reserves during economic downturns. Analyzing the investment return profiles of various Islamic financial instruments, it becomes evident

that deposits remain stable under all research period conditions, unlike other Islamic financial instruments.

The largest investment allocation in the strategic asset allocation approach based on market timing is in deposits and sukuk. Following Syakir's (2020) assertion, as cited in Witjaksono & Bustomi (2021), financial instruments and investments in the form of deposits and Sukuk are deemed capable of enhancing the benefits' value through the utilization of capital market instruments and the implementation of strategies like tax-saving, allocation towards maturity, and those categorized as available for sale. In addition, the placement of Hajj fund investment in deposits is an alternative investment allocation that gets the best sentiment with a percentage of positive sentiment of 50%, neutral 50%, and negative 0% (As-Salafiyah, 2022). However, it is worth noting that this research presents an alternative potential return of up to 17.02% (refer to Table 8). Nevertheless, this level of return is not applicable for BPKH due to the associated risk, which stands at 6.64%, and the allocation does not adhere to the diversification principle, as it predominantly invests in Islamic stocks.

The current placement and investment of BPKH, with restrictions on regulations, could be more optimal for obtaining returns. The average yield per year is 6.04%, the placement yield is 4.22%, and the investment return is 7.06% per year, below the optimal portfolio return on Islamic financial instruments. The management of Hajj funds faces challenges such as low benefit value in virtual accounts, a decline in Hajj registrants due to economic turmoil, and a lack of returns to cover the gap. Witjaksono & Bustomi (2021) suggested that BPKH can implement a strategic allocation strategy to optimize its investment funds. This strategy involves selecting a combination of financial instruments that offer the best balance between return and risk or are in line with the investment target that has been set previously.

To tackle the mentioned challenges, endeavors to increase the returns on the value of benefits derived from managed Hajj funds can be undertaken through the following approaches: 1) increasing the number of Hajj registrants; 2) enhancing the investment yield on the value of benefits managed by BPKH; 3) refining the efficiency of BPIH per pilgrim; and 4) raising the initial deposit of BPIH per congregation (Pujiharto et al., 2022). According to Hendrizal et al. (2023), the increase in Bipih aims to sustain the value of benefits for pilgrims who will depart in the coming years.

The sustainability of Hajj fund management needs to be maintained with efforts focused on increasing indirect costs through appropriate investments. Law No. 34/2014 of the Hajj Financial Management Agency (BPKH) provides a legal basis for managing Hajj funds through various investment instruments. Following the BPKH strategic plan 2022-2027, the allocation of hajj funds is placed in the form of current accounts, savings, and deposits at BPS BPIH (Bank Receiving Deposits for Hajj Pilgrimage Costs), with a maximum proportion of 30% of the total hajj financial management funds. Investments are also made through sharia instruments, gold, direct investment, and others. In the first three years of operation, Islamic banking investments can reach 50%, then drop to 30%.

Gold investments, direct investments, and other investments are limited, but securities investments are not restricted. In 2022, BPKH will increase its focus on direct investment domestically and in Saudi Arabia to achieve efficiency in BPIH. This result aligns with the findings of Ali & Mandalia (2021) research, which suggests that improved returns on Hajj funds can be achieved through direct investment schemes in transportation, hotels, convention businesses, and souvenir provision.

CONCLUSION

The optimal portfolio forms a portfolio return and risk variation of 8.50% for return and a standard deviation/risk of 4.00%. This simulation recommends allocating Hajj fund investment assets to Government Sukuk/SBSN at 31.04%, Sukuk Corporation at 68.96%, deposits in Islamic banks at 0.00%, and Islamic stocks at 0.00%. Through strategic asset allocation and market timing for active portfolio approaches, Hajj fund management strategies in Islamic financial instruments produce several portfolio alternatives. In bullish conditions, the optimal portfolio lies in alternative 1, with the highest Sharpe ratio of 12.298, providing a return of 8.02% and a risk of 0.26%, distributed on Government Sukuk, Sukuk Corporation, and Islamic Banking Deposits. Under normal conditions, the optimal portfolio in alternative 5 has a Sharpe ratio of 1.137, generating a return of 8.25% and a risk of 2.99%, allocated to Government Sukuk, Sukuk Corporation, Islamic Banking Deposits, and Islamic Stocks. Under recessionary conditions, the optimal portfolio lies in alternative 6 with a Sharpe ratio of 0.357, giving a return of 5.90% and a risk of 2.94%, and allocations to Sukuk Corporation, Islamic Banking Deposits, and Islamic Stocks. Each condition offers portfolio alternatives with different returns and risks.

This study shows that Islamic financial instruments can generate higher returns than the current investments made by BPKH, but more is needed to overcome the annual BPIH increase. The government should adjust risk, investment allocation, and initial BPIH amount regulations. Regulations for Hajj finances should also be improved, as most of it is invested in low to medium-risk deposits and government securities. The limitations of Islamic investment instruments and the lack of equity structure in BPKH's financial management are also fundamental. BPKH should consider diversified investment alternatives, such as cooperation with investment managers, Islamic stocks on the Indonesia Stock Exchange, sukuk with investment-grade ratings, and Islamic mutual funds.

REFERENCES

Abidin, M. (2016). Analisis Investasi Dana Haji dalam Pembiayaan Infrastruktur dan Peningkatan Kualitas Penyelenggaraan Ibadah Haji (Analysis of Hajj Fund Investment in Infrastructure Financing and Improving the Quality of Hajj Implementation). *Harmoni*, *15*(2), 152–164.

Ali, M., & Mandalia, S. (2021). Direct Investment Strategy in Domestic Hajj Financial Governance. *Imara: Jurnal Riset Ekonomi Islam*, *5*(1), 1–10.

As-Salafiyah, A. (2022). Sentiment Analysis on Hajj Fund Investment Allocation In Indonesia. *Halal Tourism and Pilgrimage*, *1*(1), 1-8. https://doi.org/https://doi.org/10.58968/htp.v1i1.70.

Aziz, R. M. (2018). Hahslm Theory as Guidance of Straight Path in Management of Hajj and Finance. *Proceeding of the International Conference on Islamic Finance, Economics and Business*, 105–120. https://doi.org/10.18502/kss.v3i8.2503.

Badan Pengelola Keuangan Haji. (2020). *Rencana Strategis BPKH 2018-2022*. Jakarta: BPKH.

Becker, F., Gürtler, M., & Hibbeln, M. (2013). Markowitz versus Michaud: Portfolio Optimization Strategies Reconsidered. *The European Journal of Finance, 21*(4), 269-291. https://doi.org/10.1080/1351847X.2013.830138.

Bramayudha, A., & Irawan, A. (2023). Hajj and Umrah during Pandemic Covid-19 : The Case of Indonesia. *International Journal of Islamicate Social Studies*, *1*(1), 13–21.

Chao, X., Tao, X., & Zeng, L. (2019). Application of Markowitz's Portfolio Theory in Obtaining the Best Portfolio in the Stock Market. *Proceedings of the First International Symposium on Management and Social Sciences*, 119–122. https://doi.org/10.2991/ismss-19.2019.25.

Chasanah, S. I. U., Lesmana, D. C., & Purnaba, I. G. P. (2017). Comparison of The Markowitz and Single Index Model Based on M-V Criterion in Optimal Portfolio Formation. *International Journal of Engineering and Management Research*, *7*(4), 323–328.

Deananda, A. Z., & Wirdyaningsih. (2020). Alternative Optimization of Hajj Fund Using Sharia Shares. *Advances in Social Science, Education and Humanities Research*, *413*(34), 34–40. https://doi.org/10.2991/assehr.k.200306.176.

Fabozzi, F. J., & Modigliani, F. (2009). *Capital Markets: Institutions and Instruments*. New Jersey: Pearson Prentice Hall.

Hendrizal, Syamsir, & Frinaldi, A. (2023). Policy Analysis For the Determination of BIPIH For Indonesian Hajj Pilgrims in 2023. *Ilomata International Journal of Social Science (IJSS)*, *4*(2), 267–277.

Hulwati, Mujiono, S., Andespa, R., & Fadhlan, A. (2023). Unveiling the Benefits of Hajj Funds Investment in Indonesia. *Share: Jurnal Ekonomi dan Keuangan Islam*, *12*(1), 179–200. https://doi.org/10.22373/share.v12i1.16082.

Ismal, R., & Septiana, N. I. (2019). Islamic Hedging for Pilgrimage Funds: Case of Indonesia. *Qualitative Research in Financial Markets*, *11*(3), 328–341. https://doi.org/10.1108/QRFM-11-2017-0101.

Jumali, E. (2018). Management of Hajj Funds in Indonesia. *Journal of Legal, Ethical and Regulatory Issues*, *21*(3), 1–9.

Karimah, I., & Iskandar, S. (2020). Optimization of Hajj Fund Development through Infrastructure-based Sukuk. In. Susetyo, H., Waagstein, P. R., & Cahyono, A. B. (Eds). *Advancing Rule of Law in a Global Context*. London: CRC Press.

Kellner, F., & Utz, S. (2019). Sustainability in Supplier Selection and Order Allocation:

Combining Integer Variables with Markowitz Portfolio Theory. *Journal of Cleaner Production*, *214*, 462–474. https://doi.org/https://doi.org/10.1016/j.jclepro.2018.12.315.

Kumar, V. (2018). A Simplified Perspective of the Markowitz Portfolio Theory. *IJRAR-International Journal of Research and Analytical Reviews*, *5*(3), 193–196.

Ladki, S. M., & Mazeh, R. A. (2017). Comparative Pricing Analysis of Mecca's Religious Tourism. *International Journal of Religious Tourism and Pilgrimage*, *5*(1), 20–28.

Lee, H., Cheng, F., & Chong, S. (2016). Markowitz Portfolio Theory and Capital Asset Pricing Model for Kuala Lumpur Stock Exchange : A Case Revisited. *International Journal of Economics and Financial Issues, 6*(3S), 59–65.

Luxenberg, E., Boyd, S., Van Beek, M., Cao, W., & Kochenderfer, M. (2022). Strategic Asset Allocation with Illiquid Alternatives. *Proceedings of the 3rd ACM International Conference on AI in Finance, ICAIF 2022*, 249–256. https://doi.org/10.1145/3533271.3561769.

Markowitz, H. (1952). Portfolio Selecion. *Journal of Finance*, *7*(1), 77–91. https://doi.org/10.2307/2975974.

Meliala, F. U., & Sukarno, S. (2023). Optimal Investment Portfolio Analysis Using the Markowitz Model for Stock In Each Sector in the Indonesia Stock Market During Covid 19. *Journal Research of Social Science Economics, and Management*, *2*(8), 1884–1892. https://doi.org/10.59141/jrssem.v2i08.399.

Menjeri, O. M. (2018). Strategic Asset Allocation of Pension Funds: An Application of Markowitz Portfolio Theory. *(Unpublished Thesis).* University of Nairobi.

Muneeza, A. (2018). A Comparative Study of Hajj Fund Management Institutions in Malaysia, Indonesia and Maldives. *International Journal of Management and Applied Research*, *5*(3), 120–134. https://doi.org/10.18646/2056.53.18-009.

Pratiwi, A. D., Fahmi, I., & Ismal, R. (2019). Optimal Hajj Funds Management by Islamic Bank. *Etikonomi*, *18*(2), 303–314. https://doi.org/10.15408/etk.v18i2.10938.

Pujiharto, Y. R. C., Mariyanti, T., Jayaprawira, A. R., & Terah, Y. A. (2022). Financial Management of Indonesian Hajj Against the Yield by Using a Dynamics System Model. *APTISI Transactions on Management (ATM)*, *7*(1), 69–78. https://doi.org/10.33050/atm.v7i1.1818.

Rusydiana, A. S., Antonio, M. S., Assalafiyah, A., & Yusup, A. (2021). Hajj Investment Fund: A Bibliographic Study of the Hajj Economy. *International Journal of Religious Tourism and Pilgrimage*, *9*(1), 132–146.

Sarniti, & Wirdyaningsih. (2020). Optimization of Hajj Fund Management in Indonesia with Productive Zakat. *Advances in Social Science, Education and Humanities Research*, *413*(34), 166–170. https://doi.org/10.2991/assehr.k.200306.205.

Setyawan, A., Wibowo, H., & Kamal, M. (2020). Analysis of Optimization Model of Haji Financial Investment Portfolio in BPKH RI (Haji Financial Management Agency of the Republic of Indonesia). *Jurnal Ekonomi dan Perbankan Syariah*, *8*(1), 5–27. https://doi.org/10.46899/jeps.v8i1.173.

Sharpe, W. F. (1964). Capital Asset Prices: a Theory of Market Equilibrium Under Conditions of Risk. *The Journal of Finance*, *19*(3), 425–442. https://doi.org/https://doi.org/10.1111/j.1540-6261.1964.tb02865.x.

Treynor, J. L. (1962). The Treynor Capital Asset Pricing Model. *Journal of Investment Management, 1*(2), 6072-6080.

Tu, J., & Zhou, G. (2011). Markowitz Meets Talmud: A combination of Sophisticated and Naive Diversification Strategies. *Journal of Financial Economics*, *99*(1), 204–215. https://doi.org/10.1016/j.jfineco.2010.08.013.

Vasylieva, N. (2020). Application of Markowitz Portfolio Theory to Producing the World Major Field Crops. *AGRIS On-Line Papers in Economics and Informatics*, *12*(4), 123–131. https://doi.org/https://doi.org/10.7160/aol.2020.120409.

Witjaksono, B., & Bustomi, H. (2021). Optimum of Strategic Asset Allocation for Indonesian Hajj Fund. *Signifikan: Jurnal Ilmu Ekonomi*, *10*(2), 195–208. https://doi.org/10.15408/sjie.v10i2.20020.