SHARIA STOCK SELECTION IN INDONESIA STOCK EXCHANGE (IDX): A FUZZY-ANP APPROACH

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Abstract: The purpose of this study is to develop a fuzzy analytic network process (FANP) model to evaluate and select a portfolio of Islamic stocks on the Indonesia Stock Exchange (IDX). A fuzzy analytic network process (FANP) is used to the develop indicator and portfolio selection ranking. It can make it easier for investors to make investment decisions through financial portfolio return. However, in fact and reality, investors need fast investment decision, therefore, portfolio selection is most important. The fuzzy-ANP analysis method can be used to evaluate and to make prioritize ranking of investment decision variables. The results of this study are found that profitability is the most important criterion for investors to select Islamic stock portfolios in Indonesia stock exchange. In addition, the value of Return on assets (ROA), Return on equity (ROE), Return on Investment (ROI), Net profit margin (NPM), Earning per share, return on sales Ratio and Return on Capital of a company.

Keywords: Sharia stock selection, fuzzy analytic network process, Indonesia Stock Exchange

INTRODUCTION

The portfolio selection problem is considered during Covid-19 pandemic. Financial markets are becoming increasingly complex. Investors must therefore consider many factors and various aspects of markets to increase their profits. With progress in financial engineering, many methods have been developed to explore the behaviour of financial markets (Chao et al. 2019; Kou et al. 2019a). Most investors attach their wealth to stock exchange markets, and most prefer combinations of different stocks since single stocks carry inherent risks. Portfolio selection is therefore an important topic of investigation (Li et al. 2017; Wu et al. 2019).

The portfolio selection has been widely explored across several fields, ranging from traditional and quantitative finance to artificial intelligence machine learning and artificial intelligence (Li and Hoi 2014). Generally, portfolio selection aims to achieve certain long-term targets by allocating wealth to a set of assets (Li et al. 2015a, b). While previous studies have extensively investigated portfolio selection based on financial considerations, it is also worthwhile to consider non-financial issues. As with any decision-making problem, many factors are directly and indirectly involved in portfolio selection. In this regard, investigating, recognizing, ranking, and applying criteria to assess and select portfolios has posed a challenge for researchers, managers, investors, and practitioners.

Since, there are many risks that must be mitigated including lower investment return. These risks can be minimized by stock portfolio selection and diversification of portfolio. The portfolio selection is assisting investors in making decisions to determine which

portfolio can generate certain profits, even in the smallest risk (Fu Jeng, 2015)

The reason for this this research is conducting during the COVID-19 pandemic aimed at to understand the importance of the ongoing effects of COVID-19 on economic conditions. The Covid-19 pandemic and global economic recession has shrunk global economy and energy demand (Yoshino, Taghizadeh-Hesary, & Otsuka, 2021). The impact of the pandemic is not limited to the short run only, but also in the long run, as it is hurting the financial backbone (C. Li, Su, Yaqoob, & Sajid, 2021). Furthermore, The Covid-19 pandemic poses negative and unpredicted consequences in the economy which increased more confusion, lowering trust, creating turmoil in economic market and increasing uncertainty among investors (Karakosta, Mylona, Karásek, Papapostolou, & Geiseler, 2021).

Hence the time period influence investors make decision to select portfolio investment, include the COVID-19 pandemic period. The landscape of the Indonesian people's investment and finance is changing during the Covid-19 pandemic. Sharia stocks are positive in the midst of the Covid-19 pandemic. As reported by the three indices are the Indonesian Sharia Index (ISSI), the Jakarta Islamic Index 70 (JII70), and the Jakarta Islamic Index (JII). The growth of Islamic investors in the stock exchange has grown consistently. As recorded by Financial Services Authority of Indonesia (OJK) the number of investors were 99,383 investors, with a growth of 15.71% compared to the end of 2020. The Islamic capital market Indonesia is experiencing growth which is very significant, both from the side sharia investors,

transaction performance and product innovation (Otoritas Jasa Keuangan, 2021).

The present study, therefore employ a fuzzy analytic network process (FANP) to rank portfolios on Indonesia Stock Exchange (IDX). Indonesia Stock Exchange (IDX) is a stock exchange based in Jakarta, Indonesia. A fuzzy analytic network process (FANP) to rank portfolios has been used for investment decision and stock trading strategy development, these efforts have been mostly focused on portfolio selection rank based on factors-factors that considered by Investors. Since, Investors who have good goals and plans usually do not only pursue profit, but also prioritize stability and other factors. This is what makes investors, both new and existing in the Islamic stock market, look at Islamic stocks. The significance of this investor interest also indicates one of the advantages of investing in Islamic stocks. The are many research studies related to portfolio selection has been carried out by several researchers, such as Gölcük & Baykasoɪlu, (2016) that find out ANP based model for portfolio selection problem. Fuzzy ANP method was used to clarify interdependencies among attributes, and the fuzzy ANP method was employed to select the best alternative portfolio selection. Furthermore, fuzzy ANP were used to evaluate measurement criteria and find the importance degrees, therefore, the fuzzy ANP was implemented in Tehran Stock Exchange. The aims of using fuzzy analytic network process (FANP) method are to determine the objectives of the classical utility theory under uncertainty and to find out the objectives of the financial criteria in the utility framework which are the same as the financial targets on the performance of portfolio itself. This study of Portfolio Islamic stock selection is used fuzzy

analytic network process (FANP) to rank portfolio's structure approach from the viewpoint of ranking investors' relative views on portfolio's performance. this approach is considered relevant because it can determine judgments and decisions in selecting the optimal portfolio during uncertainty conditions, such as Covid-19 pandemic. The fuzzy analytic network process (FANP) for portfolio selection based on financial criteria and environmental performance to solve the problem of selecting a multi-attribute financial portfolio under two types of uncertainty. This study distinguishes between criteria based on historical financial performance (liquidity ratio, profitability, growth and leverage ratio).

LITERATURE REVIEW

This section focusses prior studies on portfolio selection considering there are some important researches to obtain research gap identification. This part is divided into three subsections: Indonesia Stock Exchange (IDX), Sharia Stock, portfolio selection, portfolio selection criteria, related work.

The rise of Indonesia's Islamic capital market has already begun with the launched of Indonesia Sharia Stocks Index (ISSI) as a composite index of Islamic stocks, which consists of all Islamic stocks that listed in Indonesia Stock Exchange (IDX), in 2011 (https://www.idx.co.id/en-us/idx-islamic/). Sharia stock as defined by Financial Services Authority (OJK)' act number 15/POJK.04/2015 as the definition of stocks in the context of sharia stocks refers to the

definition of stocks in general as stipulated in the laws and regulations of OJK, and its covered:

1. Contract, business operational management, business activity

2. Assets as underlying contract, business operational management, business activities; and/or

3. Assets related to the securities and the issuers of stocks in accordance to the sharia principles in capital market

There are many researches on portfolio selection which in fact give different results, such Yoshino et al., (2021) is stated in the era of the Coronavirus (Covid-19) pandemic that carried out economies in a turmoil, however, investors are concerned more about the rate of return and risk of investment. They never care to the environment and SDG indicators. Unlike, study conducted by Alhassan & Naka (2020) that proved a positive relationship between stock liquidity and future investments. Where research is conducted by Galankashi, Rafiei, & Ghezelbash (2020); Xidonas, Steuer, & Hassapis, (2020); Peykani, Mohammadi, Jabbarzadeh, Rostamy-Malkhalifeh, & Pishvaee, (2020) found criteria for profitability, growth and liquidity were very effective in making investment decisions. However, profitability is the most important that affecting investment decision, followed by growth and trading volume (Lee, Huang, Chang, & Cheng, 2011). Dissimilarity to study through Lv, Zhang, Peng, & Ralescu (2020) is confirmed financial performance by considering background risk and asset liquidity does not effectively affect the investments made by investors in financial securities.

The analytical network process (ANP) as a comprehensive approach is utilized due to its essential excellence to focus on the analyses of interdependent relationships among the factors. Through the understanding of the interactions between key factors (Lee et al., 2011), it is discover the decision-makers' preferences (Ghannadpour, jokar, & Makui, 2018). Fuzzy analytic network process is a tool to identifying elements in formulating financial decision or business strategy. Moreover, many stock portfolio decisions are best described in an environment where goals, constraints and possible sets of actions are vague and uncertain. To handle this uncertainty in decision-making, Fuzzy analytic network process provides a promising approach (Ocampo, 2016).

The fuzzy-ANP network analysis process is appropriated and very accurate method to measurement of financial performance indicators, since its represent real-life situations, and most of the indicators in a measurement system and the experts' judgments may be associated with uncertainty and part of the decision data can be precisely measured for portfolio decision making. In addition to taking into account the interrelationship between criteria, the fuzzy ANP model also considers the uncertainty in the prioritization process of strategic choices. fuzzy analytic network process (ANP) were applied to prioritize business strategies (Tohidi, Ghorbani, Karbasi, Asgharpourmasouleh, & Hassani-Mahmooei, 2020), it is include for the portfolio selections method. Moreover, the research conducted by (Galankashi et al., 2020) affirmed that the fuzzy-ANP network analysis process is very effectively method to evaluate the relative weights of

the profitability, market, and risk criteria to determine the ranking of alternatives in determining the optimal portfolio.

Portfolio selection

The objective of portfolio selection is to measure utmost combination of securities from a large quantity of available securities in the capital market. In addition, the purpose of portfolio selection is to capitalize on the investment earning of investors. There are some theories related to portfolio selection, which are The Markowitz mean-variance (MV) theory (1952), investors have a trade-off between return maximization and risk minimization of portfolio selections. However, investors can capitalize the investment return as well as considered risk level, or the investors be capable of focusing on risk minimization for a preordained return of investment level. However, the Markowitz mean-variance (MV) theory is considered very basic the selection portfolio selection. Furthermore, Investors could believe different types of risk in the portfolio selection according to different sustainability and objectives. It is studied by Li, Li, Hui, & Wong, (2018) which found that individuals with low financial sustainability who prefer to satisfy their lower-level (safety) needs first, and, thereafter, look for higher-level (self-actualization) needs do prefer portfolio selection investors with high financial sustainability.

In the past years, portfolio selection reports have developed complex mathematical and models to reflect real-world factors. It can be seen from numerous previous studies related to differences in research results which can be concluded in portfolio selection criteria, such as Aouni, Doumpos, Pérez-Gladish, & Steuer (2018); Dutta, Biswal, Acharya, & Mishra (2018); Masmoudi & Abdelaziz, (2018);

Mansour, Cherif, & Abdelfattah (2019). On this basis research gap and finding a previous study, this study investigated on the selection of Islamic stock portfolios using the Fuzzy-ANP method. Thus, the problems in this study that have been proposed into three research questions are as follows

1. What are the financial criteria that influence investors' decisions in choosing a sharia stock portfolio on the IDX.
2. How to find out the relationship between financial criteria and decision making.

How FANP can be used to express decision judgments.

METHODS

This study is utilized the Analytical Network Process Analysis (ANP) multicriteria methodology based on portfolio selection criteria for analysing complex relationships between different decision levels in the form of a network and considers interactions and feedback between the criteria and the alternatives of portfolio selection to obtain maximalization of investment return and investment sustainability. A wide range of portfolio selections over financial criteria performance and indicators played importance role to formulate investment decision of fund manager, investors during uncertainty period, such as COVID-19 pandemic. The investor's portfolio selection criteria train a supervised technique, which can predict the factors investment decision about Islamic stocks in Indonesia Stock Exchange (IDX). Moreover, the objective of this study is to compare the results of an unsophisticated prioritization with the ANP multicriteria methodology in the case of the

Islamic stock selection, where there is a specific criteria for portfolio selection which is being applied for the strategic investment decisions to obtained profit maximalization and sustainable investment (Alinezhad, 2018). The ANP methodology, demonstrably better method and valid approach to the Islamic stock portfolio selections approach, because it allows for a clearer and more consistent prioritization of the need for Islamic portfolio selection effectively compiles the rank criteria of investment decisions.

According to Galankashi et al., (2020), in general, the steps that must be taken in using ANP are as follows:

1. First phase: this stage is to develop the Main portfolio selection criteria as discussed earlier; numerous factors should be considered in portfolio selection. The different keywords (e.g., portfolio selection criteria, portfolio selection measures, portfolio selection metrics, effective factors of portfolio selection, portfolio assessment criteria) were used to enhance the quality of the findings. Furthermore, this study is used to the criteria which based on the Top Gainers of Islamic stocks based on the Shariah Stock Index.

2. The second phase: This stage is established to prioritize the portfolio selection criteria; it is necessary to apply the most important criteria when assessing portfolios.

3. The Third Phase: a step to rank an alternatives criterion It is necessary, therefore, to apply an efficient approach in consideration of the specific characteristics of the problem. This study aimed to rank different portfolios on the Indonesia Capital Market.

a. Fuzzy-ANP Method for Islamic Portfolio Selection

General Overview of Research Desain

This research is used data sampling for 12 investment fund managers, who is expert to Islamic financial inclusion under unit Islamic fund manager in Jakarta area. To find relationship between an investor's investment decisions and financial performance in selecting the Sharia shares on the Indonesian Stock Exchange (IDX) thereof the Fuzzy logic method as the initial stage to obtain criterion and sub-criteria with the highest to lowest value based on financial performance. the criteria and sub-criteria for financial performance classified from the literature review. The main criteria consisting of Profitability, Growth, Market, Risk, and Liquidity.

b. The Financial Performance Criteria

In this study, the financial performance criteria are considered portfolio selection of investors' criteria as listed as the follows:

Table 1. The Indicators and Sub Criteria of Financial Performance

Goal	Criteria	Sub Criteria	Source of the Study
Portfolio selection	*Profitability*	*Return on asset*	(Edirisinghe & Zhang, 2008), (Basilio et al., 2018)
		Return on equity	(Edirisinghe & Zhang, 2008), (Basilio et al., 2018)
		Return on Investment	(Li et al. 2018), (Bruni et al. 2016)
		Net profit margin	(Edirisinghe & Zhang, 2008), (Journal, 2017)

		Earnings per share	(Li et al. 2018), (Basilio et al., 2018)
		Return on sales Ratio	(Li et al. 2018),
		Return on Capital Employed	(Messaoudi et al. 2017), (Guerard et al., 2015)
	Growth rate	Revenue growth rate	(Edirisinghe & Zhang, 2008)
		Net Profit growth rate	(Guo et al., 2016)
		Earnings per share Growth rate	Edirisinghe & Zhang, 2008)
		Dividen per share	(Edirisinghe and X Zhang 2015)
		Sales Growth	(Jothimani et al. 2017),
		Net income growth rate	(Edirisinghe and X Zhang 2015)
	Market	Price to earnings ratio	(Messaoudi et al. 2017)
		Price to book ratio	(Sharma and Mehra 2017)
		Dividend Yield Ratio	(Messaoudi et al. 2017)
		Price cash flow ratio	(Mohapatra and Misra 2019),
		Dividend payout ratio	(Edirisinghe and X Zhang 2015)
	Risks	Financial risk	(Bianchi et al. 2019),
		Market risk	(Messaoudi et al. 2017),

|		Systematic risk	(Li et al. 2019),
		capital loss	(Bianchi et al. 2019)
		Foreign Exchange Risk	(Bianchi et al. 2019)
	Liquidity	Debt equity ratio	(Zhang et al. 2016),
		Net gearing	(Zhang et al. 2016),
		Interest coverage ratio	(Zhang et al. 2016),
		Current Ratio	(Zhao and Xiao 2016)
		Cash ratio	(Caccioli et al. 2016)
		Quick Ratio	(Edirisinghe and X Zhang 2015)

RESULT AND DISCUSSION

The Fuzzy Analytical Network Process Analysis (FANP) helped to select multi criteria decision making for portfolio selection. the financial portfolio criteria and sub criteria is formulate weighting the criteria and sub criteria. for the reason that fuzzy logic requires weights, the weights in the ANP are used to perform data processing using fuzzy. Since, the basic principle of fuzzy is to choose portfolio selection criteria which has a positive or negative criteria for investment decision making.

1. The Development of Structure Decision Model

The initial stage of this Analytical Network Process Analysis is the preparation of a network of interests, namely by grouping criteria

and sub-criteria. There are four levels in the preparation of this ANP interest network, namely goals (overall object), criteria, sub-criteria, and alternatives. In this study, in addition to obtaining the priority weights of each interest, the use of ANP is also to make financial performance measurement and direct comparation. The model as follow;
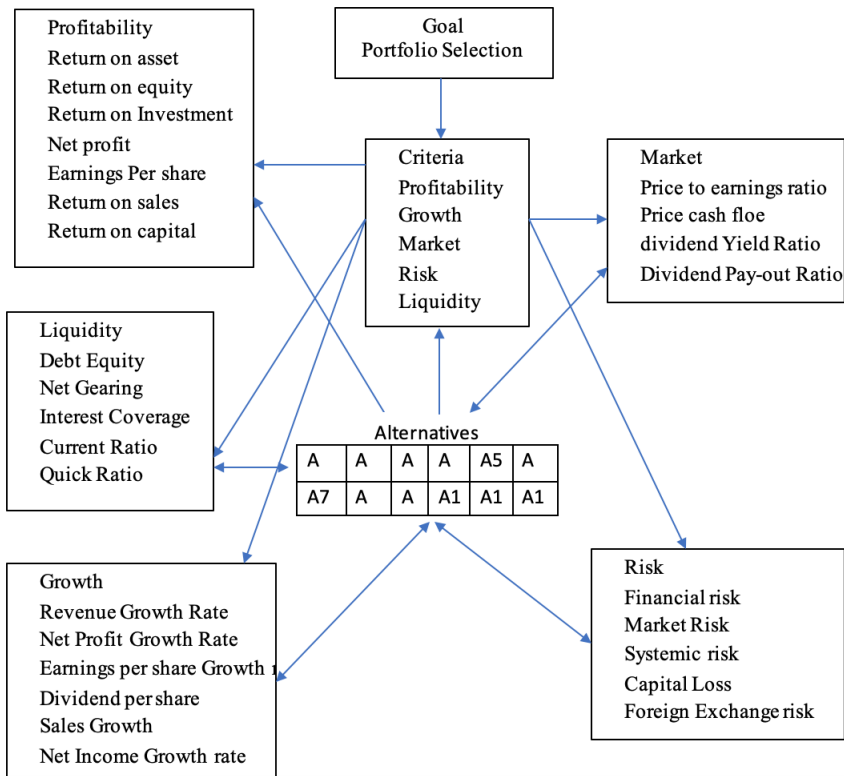
Shariah Portfolio Selection Model

2. Pairwise Comparison Matrix of Dependent Variables

The weighting result of dependent matrix is obtained through questionnaires scores to the experts in portfolio selections. In this study, data were obtained from questionnaires and discussion results of the

fund manager. Financial performance result is taking together with investment experts or investment managers. The result of weighting is formed from the pairwise comparison matrix. The fund managers are filled the score of questionnaires based on their experts and experiences to choose rank of portfolio selections. Respondents' fil up the level of importance of each criterion and sub-criteria, these score 1-9 had been adapted from Saaty's rule for a pairwise comparison. Through super Decision 2.10 software, researcher can immediately acquire the average value of respondents' weights. The results of the ANP for financial performance, as follow;

Table 2: The weights of sub-criteria of financial performance

Criteria	Sub-criteria	Weight	Inconsistency
Profitability	Return on asset	0,37597	0,07994
	Return on equity	0,14562	
	Return on Investment	0,1009	
	Net profit margin	0,0707	
	Earnings per share	0,01846	
	Return on sales Ratio	0,11218	
	Return on Capital Employed	0,17618	
Growth	Revenue growth rate	0,27713	**0,08884**
	Net Profit growth rate	0,13460	
	Earnings per share Growth rate	0,08400	
	Dividen per share	0,27583	
	Sales Growth	0,06049	

	Net income growth rate	0,16794	
Market	*Price to earnings ratio*	0,21912	**0,03018**
	Price to book ratio	0,13772	
	Dividend Yield Ratio	0,05701	
	Price cash flow ratio	0,36702	
	Dividend pay-out ratio	0,21912	
Risk	*Financial risk*	0,12391	**0,05846**
	Market risk	0,07223	
	Systematic risk	0,10554	
	capital loss	0,64803	
	Foreign Exchange Risk	0,05027	
Liquidity	*Debt equity ratio*	0,26102	**0,07525**
	Net gearing	0,08949	
	Interest coverage ratio	0,17885	
	Current Ratio	0,07173	
	Cash ratio	0,28693	
	Quick Ratio	0,11198	

Source: Data analysis

3. Super Matrix Comparation

a. *Unweighted Super matrix*

The result of unweighted super matrix shows that the value of the influence of the Profitability sub-criteria (0.352234), the fact is greater than the effect of the consistency of risk quality (0.242927). The effect of the Profitability sub-criteria on the level of income growth illustrates the example of this case.

Table 3. Unweighted Super matrix

Chapter Kode Labels		Growth		Liquidity					
		Revenue Growth Rate	Sales Growth	Cash Ratio	Current Ratio	Debt Equity Ratio	Interest Coverage Ratio	Net Gearing	Quick Ratio
Alternative	Profitability	0,353234	0	0,2	0,2		0,2	0,2	0,2
	Risk	0,242927	0	0,2	0,2	0,255721	0,2	0,2	0,2
Goal	Selection	0	0	0	0	0	0	0	0
	Portofolio	0	0	0	0	0	0	0	0
Growth	Dividen Per	0	0	0	0	0	0	0	0
	Share	0	0	0	0	0	0	0	0
	Earning Per Share Growth	0	0	0	0	0	0	0	0
	Rate	0	0	0	0	0	0	0	0
	Net Income	0	0	0	0	0	0	0	0
	Growth Rate	0	0	0	0	0	0	0	0
	Net Profit	0	0	0	0	0	0	0	0
	Growth Rate	0	0	0	0	0	0	0	0
	Revenue Growth Rate	0	0	0	0	0	0	0	0

Source: Data analysis

b. *Weighted Super matrix*

The weighted super matrix is the result of the unweighted super matrix multiplier that the influence weight criteria or matrix clusters. The score of comparison sub-criteria to other sub-criteria on the weighted super matrix is indifferent from the value on the unweighted super matrix. The weighted super matrix can be illustrated as follow;

Table 4. Weighted Super matrix

Code Labels		Liquidity				Market			
		Debt Equity ratio	Interest Rate Coverage Ratio	Net Gearing	Quick Ratio	Dividend yield ratio	Dividend pay-out ratio	Price cash flow ratio	Price to book ratio
Alternative	Profitability	0,44	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Goal	Risk	0	0,2	0,2	0,2	0,2	0,2	0,2	0,2
	Portofolio Selection	0	0	0	0	0	0	0	0
Growth	Dividen per share	0	0	0	0	0	0	0	0
	Earning per share growth rate	0	0	0	0	0	0	0	0
	Net Income Growth Rate	0	0	0	0	0	0	0	0
	Net Profit Growth Rate	0	0	0	0	0	0	0	0
	Revenue Growth Rate	0	0	0	0	0	0	0	0

Source: Data analysis

c. *Limiting Super matrix*

The result of the limit super matrix is the weight score of multiplied influence to the weight of each indicator. The limiting super matrix value is obtained from the score of the unweighted super matrix. These value as the basis for determining the criteria of the ANP processing result. The result of the limiting super matrix as follow:

Table 5. Limiting Super matrix

Code Labels		Growth		Liquidity					
		Revenue Growth Rate	Sales Growth	Cash Ratio	Current Ratio	Debt Equity Ratio	Interest Coverage Ratio	Net Gearing	Quick Ratio
Alternativ	Growth		0	0,2	0,2	0	0,2	0,2	0,2
	Liquidity	0,211	0	0,2	0,2	0	0,2	0,2	0,2
	Market		0	0,2	0,2	0	0,2	0,2	0,2
	Profitabili	0	0	0,2	0,2	0	0,2	0,2	0,2

	Risk	0	0	0,2	0,2	0	0,2	0,2	0,2
Goal	Portfolio Selection	0	0	0	0	0	0	0	0
Growth	Dividend Per Share	0	0	0	0	0	0	0	0
	Earnings Per Share Growth Rate	0	0	0	0	0	0	0	0

Source: Data analysis

4. The weight financial performance indicator results

Based on the super decisions software result is obtained that the profitability, Risk, Liquidity, Market, and Growth criteria are criteria important for portfolio selection. the result as follow:

Table 6. Financial Criteria

No.	Criteria	Weights	Ranking
1.	Profitability	0,35223	1
2.	Growth	0,03264	5
3.	Market	0,16107	4
4.	Risk	0,24293	2
5.	Liquidity	0,21113	3

Source: Data analysis

The FANP method considers the weights from the largest to the smallest value. The weighting process of the sub criteria are discussed according to profitability, growth, market, and risk. (Galankashi et al., 2020). Factors with impacts on Shariah stock return under fundamental analysis are basically the key variables offinancial statement ofthe

underlying firm such as profitabilty. this result accordance to study conducted by(Aouni et al., 2018) that profitability is main financial criteria of return on investment, especially stocks. The expected profitability is most significantly correlated with expected and average future stock returns (Lee et al., 2011).

Through this FANP logic, criteria are considered, as results FANP is obtained good criteria for investment decision making in investment criteria ranking. Therefore, the portfolio selection criteria can obtain optimum investment profitability. the weight criteria as summarised as table.

CONCLUSION

Prior to analyze discussion of indicator portfolio selections using the Fuzzy-Analytic Network Process method. It can be concluded, there are five criteria for financial performance as consideration to select sharia stocks in the Indonesia Stock Exchange. The financial performance criteria are profitability, growth, market, risk, and liquidity. However, the results of fund manager respondent. The most important criteria is profitability, and risk is the most important indicator to select portfolio during pandemic COVID-19, nonetheless revenue growth rate, and net profit growth as less important to select portfolio.

The need for the future research is to examine the criteria of shariah stock selection and other factors as suggested by the Investment Manager (MI), namely the distribution factor of the number of investors in certain areas and free float (the number of securities that can be traded) which can influence investor decision making in portfolio selection. sharia shares to get more optimal profits and results.

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