

Decision Support System in Determining the right Investment Instrument

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ABSTRACT

The number of investment instrument is often confusing for people who have minimal knowledge but still want to investing. Due to the many investments instrument offered, with the lack of public literacy in financial management, most people have a fear of missing out which case the phenomena of FOMO (Fear of Missing Out), the desire of people to get rich quick without thinking about the risk future which result in many fraudulent practices circulating in the community. This study aims to assist users in deciding the right investment instrument according to the user's risk profile. The decision support system in determining investment instrument with AHP (Analytical Hierarchy Process) Method is a method for problems in determining priorities from various alternative. AHP will make it easier to determine the right instrument.

INTRODUCTION

Money is one of the important most important media of exchange in human social life today. Everyone has their own way to managing their finances. Expenditures in money management must be based on financial economics which is divided into 4 aspect, namely general knowledge, savings, insurance and investment. Investment is one way for individual to achieve the goal the want to achieve in life. Will be very difficult to achieve financial freedom (retirement) in the future if you only rely on sources of income in the form of savings or deposits. Because the inflation rate every year is higher than the interest rate savings or deposits. This inflation effect will reduce the value of the currency we currently have. Therefore, we need to invest to further develop or fight the inflation rate [1]. Frequent fluctuations and increasing inflation day by day encourage someone to invest their money [2]. Investment is an act of placing one current fund or money into an instrument to gain profits in the future [3].

According to Lypsey [4], investment is the expenditure of goods that are not consumed at this time which is based on the time period. Each investment product has different advantages, risks and features. Therefore, before investing, it must be in accordance with the risk profile of each individual. Today's investment is not only followed by high people, because when there is also an investment with a capital that can be adjusted for all people [5].

The risk profile is something that must be known by someone before starting to invest, this is in order to determine the instrument or type of investment that is suitable for oneself, especially regarding personal finances or to achieve certain goals [6]. Investment is divided into three, namely short-term investment, medium-term investment and long-term investment. In that time period, the investment objectives must be adjusted based on the risk profile of each individual to minimize the risk in investing. There are various risk profiles in investment, including a conservative risk profile, a moderate risk profile and an aggressive risk profile. However, research result in general show that there are still many low levels of financial literacy in some developed countries, especially in developing countries including Indonesia [7] this condition is a serious problem considering that financial literacy and knowledge have an impact on personal financial management. It is recommended that each individual has appropriate financial planning so that there is no anxiety in the future and learn a lot of knowledge for good financial planning. In order to form an investment portfolio that suits each individual [8].

A decision support system is a computer-based system that can assist humans in making certain decisions. Therefore, a decision support system is the right solution to help individuals who are still new to determining their risk profile and also the appropriate investment product. In making decision support system the author will use the AHP (Analytical Hierarchy Process) method, this method was taken because this method allows the selection of multiple criteria with different level of importance and also the selection of the most suitable criteria from several alternatives [9]. The use of a Decision Support System using the AHP method can help to simplify and simplify decision making easily with the desired criteria [10].

RESEARCH METHODS

The AHP method develops a numerical value to rank each decision alternative, based on the extent to which each alternative meets the decision-making criteria. The AHP method also provides solutions for the company to facilitate the decision-making process accurately and objectively [11]. This study implementing several problem criteria in determining alternatives for the right risk profile for an individual that will be processed by AHP and the calculated into small problem, so that the best alternative result be obtained. The most widely used multi-criteria analysis in decision making is the basis for the completing the AHP process [12] :

- a. Define the decision hierarchy with attributes (criteria) and alternatives (risk profile) representing the relationship.
- b. Comparison criteria and alternatives using pairwise comparison matrix to determine the relative importance of attributes and alternatives, involving comparison of how well appear with different attributes and the best alternative.
- c. Measure consistency by finding the maximum eigenvalue weight (λ_{max}) and CI (Conformity index) of the attributes and alternatives.
- d. Calculating the consistency ratio CR (Correspondence Ratio) = CI/RI where RI (Randomly Generated Conformity Index)
- e. Following step d, the best alternative result will appear following the best ranking comparison according to calculation from the AHP system. And user will know risk profile that suitable for him/her self

This study focuses on the selecting the risk profile before making an investment. For individuals, especially those who are still new to the investment world and who have low financial literacy. The system will help individual to get best recommendation result based on AHP calculations and rankings. The result was obtained based on predetermined criteria and a process approach that was theoretically used approach priorities, criteria and alternatives based on the established hierarchy. AHP compares each criterion's importance and the candidates' values on each criterion to calculate for determining or making the best decision [13].

Hierarchy is based on a pre-existing combination, the combination can be through ideas, views of other or experience. Therefore, the hierarchical structure has no standard or creation of hierarchy. It is a complex, multi-person, multi-criteria decision problem [14]. Process carried out by AHP helping to solve problems, namely by making problem solving hierarchy. The hierarchical arrangement is obtained from several part or variable in the problem-solving process. Next, a hierarchical arrangement will be given assessment of the importance of each part contained therein. This rating then it will show which variable more important or which has priority. Due to several cases in various problems have a various difficulty, thus, the hierarchical structure will be different from each other [15]. The scale used in the assessment in the pairwise comparison matrix often refers to the literature. It refers to assigning a score from one to nine with an appropriate explanation. RI value is very important to calculate the CR value. In this study, the RI value was adjusted as required when criteria are applied to three items. The RI value used is 0.90.

Hierarchy is defined as a representation of complex problem in a multi-level structure where the first level is objectives, followed by the level of factors, criteria, sub-criteria and so on down to the last level of the alternatives. With a hierarchy, a complex problem can be broken into groups which are the arranged into a hierarchical form so that problem will appear more structure and systematic [16].

Analytical Hierarchy Process (AHP) is a method that is most widely used in decision making. The AHP method can describe and solve many criteria. In this system, AHP will evaluate individual risk profile based on experience, long-term, return and also the purpose of investing in each alternative risk profile. Because of the many differences in each individual who are interrelated in terms of these criteria, it is necessary to prioritize in this system. The right solution must be found later to create an efficient structure [17]. Priority in determining the right risk profile is experience in investing. This intended if them does not have experience in this field, it can reduce the risk that will be accepted in making investment. Research that applies the Breadth First Search method has a high level of accuracy sufficient in recognizing and classifying characters to manage finances effectively determine the characteristics of individual investment. The level of accuracy of the Breadth First Search method in recognizing characteristics and providing related explanations obtained is 91.6% [18].

The higher someone motivation, the higher interest to invest. Investment risk has an effect negative and also significant to person interest in investing. The higher the risk, lower interest of the person to invest. Besides understanding investment has a positive effect, which increases one understanding of investing will increase the motivation of the person to be interested in investing [19]. Therefore, experience must be given highest priority to reduce risk on investing. The most important the aspect of AHP analysis is placing parts or variables in a hierarchy and assigning numerical values for each variable with the highest priority [20]. Therefore, the final decision is very accurate. Figure 1 shows step of the AHP method.

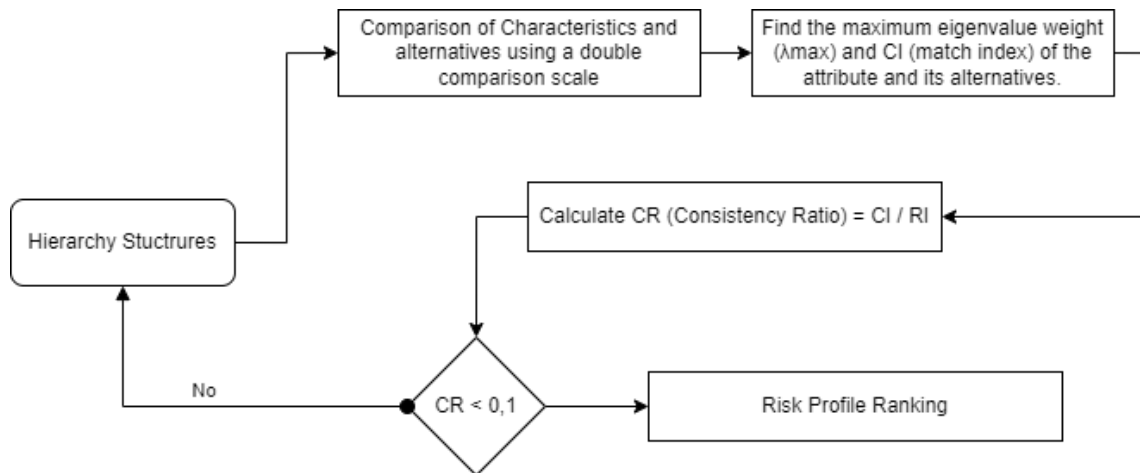


Figure 1. Step AHP Method

RESULTS

The following is the AHP hierarchy determining the risk profile for individuals in Figure 2 that has been created based on determined criteria.

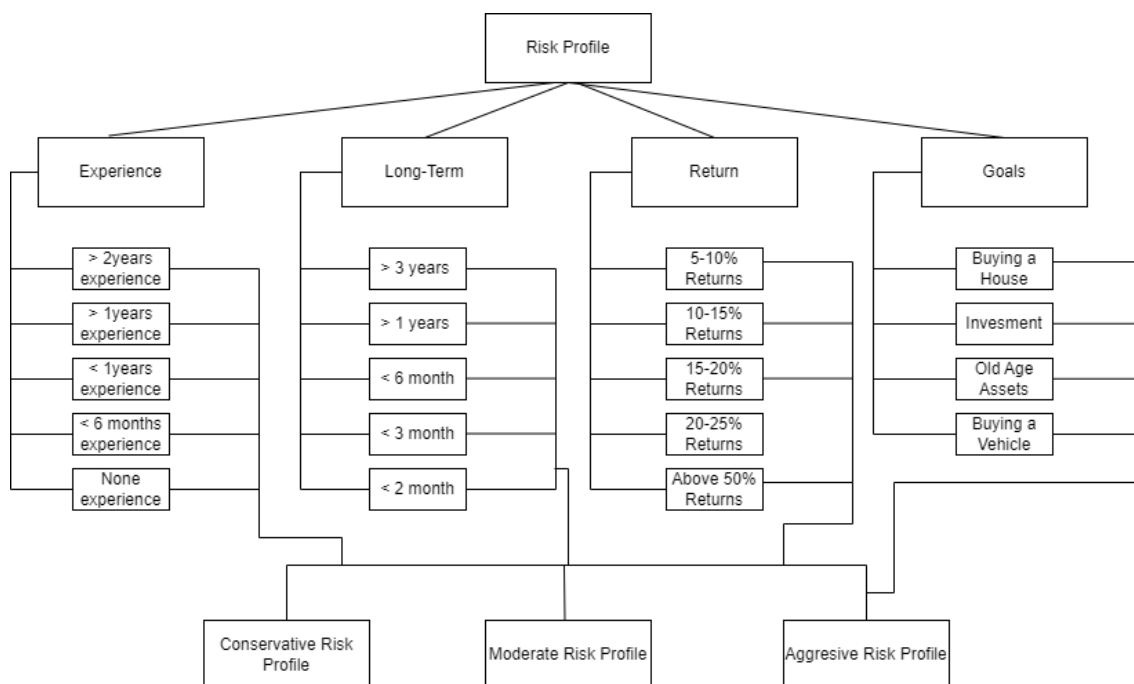


Figure 2. Hierarchy Risk Profile Decision System

The criteria that have been are affixed with sub-criteria. Based on the reference, there are 4 criteria and 19 sub-criteria. Then compared between one criteria with another criteria. Then compare the criteria with their respective sub-criteria. So that criteria below 10% are obtained by calculating the random index that was previously made by measuring consistency. Decision making can be made based on hierarchical ranking, therefore previously there were various decisions that were difficult to obtain from decision-making criteria, choices and various weight of consideration.

DISCUSSION

Consistency test was carried out to ensure the value of the Consistency Ratio (CR) ≤ 0.1 . by calculating the Consistency Ratio (CR) = CI/IR (see table 1) if it turns out that the CR value is greater than 0.1 then the comparison matrix pairing should be improved.

Table 1. Consistency Ratio Calculation Matrix

Criteria	Quantity per Line	Priority	Result
Experience	1.99	0.45	2.44
Long-Term	1.24	0.26	1.51
Return	0.85	0.19	1.04
Goals Investment	0.34	0.08	0.43
Total			5.43

Table 2. IR Table

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0,00	0,00	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,49	1,51	1,48	1,56	1,57	1,59

Calculating Consistency Ratio (CR) = CI/IR

$$CR = -0.66 / 0.90 = -0.733$$

Then the consistency ratio is acceptable because CR less than 0.1

After the consistency test is complete, the next step is to calculate the weight of the attribute values. The calculation of the attribute value weights is obtained by multiplying all the weight on the criteria, sub-criteria and alternatives. This calculation aims to see the ranking of the three existing risk profiles to choose from which one is the best and right. Therefore, calculation of the attribute value weight focuses on the multiplication performed on every aspect of hierarchy. The final result is the sum of criteria priority value matrix and Decision matrix (see table 5). Code C1-C4 are the four criteria with three alternatives. Table 5 shows total ranking of three risk profile that gets the first rank is Conservative with a value of 0.802. following a sequence of three risk profiles, described using a column chart in Figure 3. Rating Process by applying the Analytical Hierarchy Process (AHP) method.

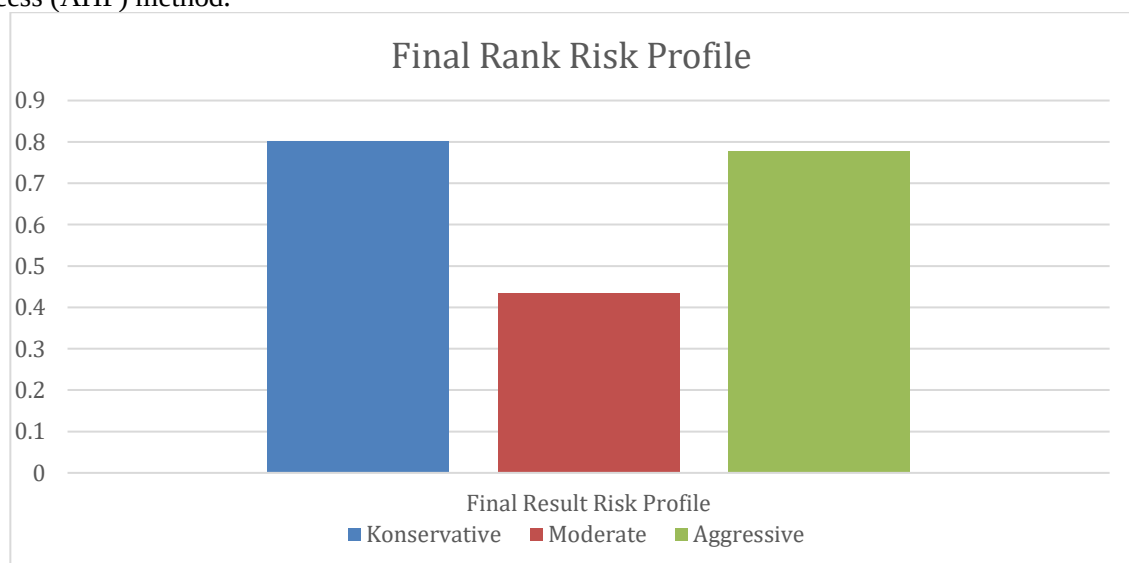


Figure 3. Final Rank Attributes Values

Table 3. Criteria Priority Value Matrix

No	Criteria Code	Criteria Name	Priority Value
1	C1	Experience	0.444
2	C2	Long-Term	0.274
3	C3	Return	0.187
4	C4	Investment Goals	0.0093

Table 4. Decision Matrix

No	Name	Experience	Long-Term	Return	Goals
1	Konservative	1	0.448	0.751	1
2	Moderate	0.636	0.197	0.227	0.562
3	Aggresive	1	0.448	1	0.231

Table 5. Attribute Value Calculation Data

No	Name	Experience	Long-Term	Return	Goals	Total Value
1	Conservative	1 x 0.444	0.448 x 0.27412	0.751 x 0.187	1 x 0.093	0.802
2	Moderative	0.636 x 0.444	0.197 x 0.274	0.227 x 0.187	0.0562 x 0.093	0.433
3	Aggressive	1 x 0.444	0.448 x 0.274	1 x 0.187	0.231 x 0.093	0.776

CONCLUSIONS AND RECOMMENDATIONS

Based on the result of the analysis and design that has been done, the key can be obtained that the Analytical Hierarchy Process method can be implemented into a profiling system investment risk, so that one can know the risk profile in investing. This decision support system also provide recommendations on what investment instrument are suitable according to their risk profile.

Based on the AHP calculation, the most important priority criteria are obtained in determining the selection of the right risk profile for individual, where experience is a priority in choosing a risk profile and the highest attribute value is obtained by a conservative risk profile with a value of 0.802

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