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Providing a Risky Investment Model in the Insurance Industry based on the Fuzzy Network Analysis Process

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ABSTRACT

Identifying and presenting a high-risk investment model for insurance institutions in line with the establishment of an insurance risk-taking investment fund. This research is considered to be applied in terms of purpose and field descriptive in terms of nature, and because it tries to present a model using the process of fuzzy network analysis, it is also considered as a type of modelling. In this paper, it has been tried to identify and introduce the most important factors and effective factors of venture capital (VC) using the fuzzy network analysis process technique in the insurance industry. The population of this study was insurance companies and the statistical sample includes 54 experts in the field of insurance. The required information was collected in 2023 using a standard questionnaire. Due to the lack of independence and dependence between the effective factors, the fuzzy network analysis process method was used to identify the possible dependencies between the factors and measure them for the development of the VC model, and the results were prioritized by the non-fuzzy network analysis process method. The findings of the research show that operating cycle indicators, total asset turnover ratio, total investment return, loss ratio, asset-to-debt ratio are ranked first to fifth among VC indicators. Venture capital helps the insurance industry to establish internal accounting rules and standardize their financial statements. In other words, venture capital support modifies the "hard" and "soft" information required for insurance.

1. Introduction

The insurance industry, along with the stock exchange and the bank, is one of the main pillars of financial markets, which plays a very important role in the dynamics of financial markets through covering and

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transferring risk and investing technical reserves in financial and real assets and implementing profitable economic activities. By providing security and reducing the risks that threaten investments, insurance provides the means to promote investment. Thus, the development of insurance activities requires an efficient capital market, and on the other hand, the growth of the capital market depends on the active role of insurance and the mutual relationship between the two. The market of insurance services must be transformed and new products must be produced in the insurance industry. Especially the products that will make the capital market flourish by reducing investment risk. Venture capital (VC) is not limited to financial resources, but includes assistance, management consulting, marketing, as well as facilitating networking and required communication and analysis of insurance company information. Venture capital is one of the types of non-stock market investments that are made in fast-growing start-up companies. The role of risk-taking investors is not limited to financing, but their managerial support is more important than financial capital. Their placement in the board of directors of investing companies transfers experience and management knowledge to the new group and is also considered a credit and support for the investing company in business interactions [16]. In short, venture capital (VC) has been defined as the initial financing of start-up companies with high growth potential by funds and investment institutions that have sufficient expertise in various sectors such as finance, technology, entrepreneurship, law and accounting [4].

The insurance industry can become insurable by covering risks and risks by using technical reserves and collecting small and scattered funds and turning them into investable funds in equipping companies' financial resources and creating a sense of participation and creating a market of full competition and allocation Favorable resources will lead to increased production and economic growth while creating employment. Insurance is one of the financing tools. In addition to lowering the total risk related to a country's economic activities, insurance companies are also able to be effective in facilitating business, commerce and entrepreneurship activities [2]. These characteristics have caused risky investment to be considered as one of the most important supporting infrastructures of the insurance industry. Risky investment is one of the infrastructures that play an effective role in completing the compensatory and protective insurance system in the economy. Therefore, insurance as an efficient tool of the capital market, creating an insurance risk-taking investment fund is a necessary option. Insurance risk investment fund can be the main source of foreign financing for insurance companies. IVCs are a direct solution that insurance companies can use to bridge the gap in financing the diversity of their branch services. Due to the fact that IVCs are established with a motivation beyond financial profitability. Insurance venture capital funds are the main component of many investors' portfolios. By being able to provide private market rates of return, these funds can complement other private market strategies with more conservative risk/reward profiles.

The activity of these two departments together with each other in an efficient, complementary, powerful and supervised manner; It is considered a necessary and sufficient condition for a favorable economic system. Financial development affects economic growth through different channels. These channels include diversifying, reducing liquidity risk, and reducing asymmetric information before and after the event between lenders and borrowers [13].

The theory of fuzzy sets has also been widely used to solve problems in various fields of science since it was proposed by Lotfizadeh [12] the process of fuzzy network analysis seems suitable for designing such a system due to having non-deterministic inputs and the ability to run on application software [19]. Therefore, the importance and necessity of this research can be examined from two theoretical and practical aspects. In the theoretical aspect, considering that despite the searches, any study or research was found regarding this issue in the countries, so this paer can lead to the identification of risky investment criteria in the form of a coherent model. In this paper, in order to perform pairwise comparisons of model factors, the fuzzy method, which is used to consider subjective issues and uncertainty in the field of decision-making and has higher reliability than similar methods, has been used. From the practical point of view, this research can help by identifying the dimensions of VC and insurance risk investment fund (IVC) and can help in drawing the favorable conditions, planning and policy making of risky investment in the country's insurance industry; Because it is very important

for insurance companies as one of the main compensatory and protective systems in the economy and risk transfer. Based on this, the current research seeks to provide a model for risky investment in Iran's insurance industry so that managers and officials of insurance companies can develop financial infrastructure and create innovation in insurance policies based on guaranteed investment (GIC) and Creating a risk-taking insurance investment fund. This paper begins with the analysis of the benefits of risky investment in the insurance industry and based on the process of fuzzy network analysis, it tries to answer the research questions, which are the effective factors of VC in the insurance industry and their prioritization? What are the effective components and indicators of VC in the insurance industry? What is the weight of VC factors in the insurance industry?

It should be noted that according to the investigations, no research was found that tried to present a typology about this type of risky investment for the country's insurance industry.

The paper proceeds as follows. The next section introduces the theoretical based and literature review, then methodology presented in Section 3. Section 4 illustrates the empirical results. Section 5 summarizes the main results obtained and suggests potential extensions.

2. Theoretical Frameworks and an literature review

By reviewing the literature related to venture capital issues, many authors have tried to provide a single, inclusive and universal definition of the concept of VC. Diversity in disciplinary approaches to the concept, such as statistical, financial, mathematical, entrepreneurial and accounting approaches, seems to be the main reason for the multiplicity of comprehensive definitions in the term venture capital. This type of investment usually involves a six-step process including: initial introduction and agreement, initial evaluation, comprehensive evaluation, investment and management activities after that, and exit [9]. In Iran, apart from banks, which are known as providers of short-term or medium-term credits for economic units, insurance also plays an important role in the country's economy as an important source of financing and investment. In this way, investing from capital and technical reserves is one of the important duties of insurance companies. Investment enables insurance companies to cover their potential committed losses and earn significant profits. Zhou [24] financing constraints are common for companies that are in growth stages and can lead to investment inefficiency [5]. Wu and Xu [22] believe that in the current economic crisis and the reluctance of insurers to purchase the limit of obligations, insurance companies are faced with more difficulties and challenges, and actually achieving the optimal level of deposits with banks is more preferable and priority for Insurance companies have enjoyed. VCs have been allowed to develop rapidly and play increasing roles in the market over time [17]. Venture capital (VC) is one of the most important sources of capital for newly established companies.

Risk-taking investors mainly: finance growing and newly established companies; They buy the shares of the company; They help in the development of new products or services; By actively participating in the company, they create value; Expecting higher profits, they accept higher risks; They have a long-term orientation.

VC support of hard information and soft information of insurance companies in risk coverage and insurable risks improves one of the few effective tools for funding constraints. As the insurance industry relies on hard quantifiable information such as financial evaluations to make risky investment decisions. The participation and support of VCs in the insurance industry, as a shareholder in various aspects, can improve the quality of performance and the variety of services of the insurance industry and risk management.

Lotfizadeh [12] for the first time, by introducing the "theory of fuzzy sets", he provided the foundations for modelling imprecise information and approximate reasoning with mathematical equations, which in itself brought about a huge evolution in mathematics and classical logic. Meanwhile, the concept of membership function is of special importance in the theory of fuzzy sets, because all the information related to a fuzzy set is described by its membership function and it is used in all the applications and problems of the theory of fuzzy sets. Be made the membership function determines the fuzziness of a fuzzy set. In the literature of fuzzy set theory, various methods have been introduced to define the membership function. The membership function used in this paper is triangular. Also, for fuzzy comparisons of different options, it is necessary to apply fuzzy

operators on these triangular fuzzy numbers. The use of fuzzy information in decision-making, calculations and modelling is different from the implementation of fuzzy results in the real world. For this purpose, it is necessary to convert fuzzy numbers into definite numbers. To convert a fuzzy number into a definite number, there are various methods such as α cut, maximum membership degree, maximum-average membership degree, center of gravity, weighted average, etc. In this paper, the center of gravity method is used.

Steps of decision making by ANP method:

ANP is a comprehensive decision-making approach that is a generalization of hierarchy (AHP) to network. Although the AHP technique removes the basic defects of measurement, it does not measure the possible dependencies between indicators. In the AHP method, it is assumed that the indicators presented in the hierarchical structure are independent of each other, which is not always acceptable. Therefore, the ANP approach also considers dependency and feedback. In this method, pairwise comparisons are made of judgments that use definite numerical values and a scale of 1 to 9 [5].

Because the matrix of pairwise comparisons is the result of the subjective perception of decision makers and this subjective perception is a vague and unclear concept, therefore fuzzy numbers are the best option for combining the opinions of experts [12].

Calculation of special matrices: the concept of super matrix is similar to the Markov chain process. The super matrix is able to limit the coefficients to calculate all priorities and as a result the cumulative effect of each element on other elements in interaction [14]. In this paper, a method has been used in which after defining the matrix of pairwise comparisons in the form of triangular fuzzy numbers to determine the inconsistency rate (if needed) and perform subsequent ANP calculations using the center of gravity dephasing method, de-fuzzing is done and then other steps are executed according to the ANP method.

Kaur and et al [12] try to identify and prioritize risks in decentralized finance. This study conducted an extensive survey of the literature to identify various risks involved in decentralized finance. For empirical analysis, the study collected data from 90 experts. A fuzzy analytical hierarchical process (F-AHP) was applied to prioritize various risks in decentralized finance. Pairwise comparison and weights of all the criteria and sub-criteria revealed that technical risks are the most significant ones, followed by legal, regulatory, and financial risks. Among the sub-risks, financial risks are at the highest level, followed by smart contract risks and transaction risks. The outcomes of this research have several implications for regulators, policymakers, entrepreneurs, technologists, and practitioners. These stakeholders can focus on these vulnerabilities and offer more sustained solutions in the future.

Lukić and et al [9] determine the risk level of a contract extension with the existing policyholders, which is further propagated to the business effectiveness and long-term sustainability of the company. The uncertainties in the relative importance of risk factors, their values, and risk levels are described by the linguistic forms, which are modeled by using the fuzzy sets theory. The evaluations of the relative importance of risk factors are stated as a fuzzy group decision-making problem. The weights of risk factors are obtained by using a fuzzy analytic hierarchy process. The determination of production rules for the assessment of the risk level is based on fuzzy IF-THAN rules. The verification of the model is performed by using real-life data originating from the insurance company which operates in the Republic of Serbia.

Zhang used fuzzy decision-making methods in his research and determined five general evaluation indicators after choosing one or more plans for investment. The basis of his evaluation is being close to the best answer and the greatest distance from the worst answer, which is the same logic in the TOPSIS method [23].

Hall and Hofer [8] raise the importance of the type of risk-taking investment process in investment success and state which criteria are used in which stage of the risk-taking investment management process [8].

CAPCOs in America, which are an example of institutions that have private financing (in this case by insurance companies) and private management, and were created within the framework of a special law in America. CAPCOs are financed by insurance companies in exchange for 100% tax credits for 10 years for taxes on insurance premiums. The investment goals of CAPCOs are to maximize the rate of return (IRR) of investments by considering the legal requirements of the government [1]. In the field of risky investment in the

insurance industry, due to the high uncertainty in predicting their future earnings and the lack of previous financial information, this simple and obvious definition of economic value is insufficient and becomes a fundamental challenge. An approach that has gained acceptance in recent years in the field of high-risk investment valuation is the real option valuation method [3].

Wu and Xu [22] investigated the role of risky investment in small and medium enterprises (SME) loans in China. They selected a complete sample of the National Stock Exchange (NEEQ) in 2013 and 2014, which included 337 observations in 2013 and 1544 observations in 2014. They found that VC support can effectively improve access to bank loans, especially short-term, lower-cost, and unsecured loans. VC-backed loans are less likely to default and have a positive relationship with SME performance. Further findings show that VC support through both "hard" information, on higher quality financial statements, and "soft" information, on the creditworthiness of SMEs, alleviates information asymmetry between banks and SMEs.

Mazloomi and Natghi [14] pointed out that they investigated the presentation of a model for the risks in Iran's insurance industry and tried to determine the importance of each one using the Turkish technique of Foundation Data Method (GT) and Structural Equation Modelling (SEM). that after classification, the strategic management risks of Iran's insurance industry in the form of; Business (environmental) risks, organizational risks, operational (process) risks, technical risks, knowledge risks, human resources risks and event risks were identified and the validity of the designed model was confirmed through structural modelling.

Dehghani and Shahryar [7] investigated the proposed model of enterprise risk management in insurance companies and analysed the position of enterprise risk management in the insurance industry and its consequences, and they used a three-layer model (board of directors/senior management, audit committee, committee risk) has checked.

3. Research methodology

This research is considered to be field based in terms of practical purpose and descriptive in nature. In terms of the fact that it tries to identify and explain the effective factors of risky investment in the insurance industry, it is exploratory and because it tries to provide a model using the process of fuzzy network analysis, it is also considered a type of modelling. The current research is planned in the form of four sections. At first, the opinions and experiences of experts and experts in the field of insurance industry were investigated and the most important influencing factors of VC were identified, then based on the exchange of opinions with the professors and experiences of the experts and experts of the studied statistical community, the criteria and sub-criteria of the model were determined. Finally, based on Huang's pairwise comparison questionnaire, the priority of each of these factors was determined based on the fuzzy network analysis process (FANP). After collecting the questionnaires and extracting the answers, the necessary data to use the Super Decision test was provided.

In this paper we used triangular fuzzy method. It is a fuzzy number represented with three points as A = (a_1, a_2, a_3) [13].

This representation is interpreted as membership functions.

$$\mu_{(A)}(X) = \begin{cases} 0, & X < a_1 \\ \dfrac{X - a_1}{a_2 - a_1}, & a_1 \le X \le a_2 \\ \dfrac{a_3 - X}{a_3 - a_2} & a_2 \le X \le a_3 \\ 0, & x > a_3 \end{cases}$$

Now if you get crisp interval by a_i-cut operation, interval A_a shall be obtained as follows$\forall\, a \in [0,1]$. From:

$$\frac{a_1^{(a)} - a_1}{a_2 - a_1} = a, \qquad \frac{a_3 - a_1^{(a)}}{a_3 - a_2} = a$$

The fuzzy numbers used in this paper to form pairwise comparisons suggested by Zhang [23] are listed in the **Table 1**. In this way, the opinions of experts are considered in a definite scale, corresponding to the **Table 1**.

Table 1. Pairwise comparisons

Linguistic variable	Fuzzy number	The fuzzy number scale
The equal	$\tilde{1}$	(1,1,1)
The Middle	$\tilde{2}$	(1,3,2)
A little more important	$\tilde{3}$	(2,3,4)
The Middle	$\tilde{4}$	(3,4,5)
More important	$\tilde{5}$	(4,5,6)
The Middle	$\tilde{6}$	(5,6,7)
Much more important	$\tilde{7}$	(6,7,8)
The Middle	$\tilde{8}$	(7,8,9)
Definitely more important	$\tilde{9}$	(8,9,9)

The population of this study was insurance companies and the statistical sample includes 54 experts in the field of insurance. The required information was collected in 2023 using a standard questionnaire.

In order to determine the parameters and indicators of the model, after reviewing the literature and studying the internal and external researches regarding the factors presented in VC, and after holding discussion sessions with professors and experts in the insurance industry community, the most important factors were determined, and were determined as variables of the model and were investigated in the form of a questionnaire at the disposal of community experts. Based on this, the influencing factors of risky investment in the insurance industry are shown from 2 main criteria (with the letter C which stands for Criteria) each of which includes sub-criteria (indices) was formed, these main criteria are:

Insurance (C_1)

Financial (C_2)

Table 2. The variables description

Main criterion (C)	Definition and explanation	Sub Index (I)
Insurance (C_1)	Operating cycle = logarithm of production insurance premiums. These amounts are included in non-life insurances based on issued insurance premiums and in life insurances based on collected (received) insurance premiums.	Opercycle (I_1)
Insurance (C_1)	Damage coefficient = damage incurred / insurance premium earned	Damage coefficient (I_2)
Insurance (C_1)	Turnover ratio of total assets = premium earned / total assets	Turnover ratio of total assets (I_3)
Financial (C_2)	Return on investment = profits made on investments / average investment in the whole year	ROI (I_4)
Financial (C_2)	Asset-Liability Ratio = Total Liabilities / Total Assets	Lev (I_5)
Financial (C_2)	Return on assets = net profit before tax / total assets	ROA (I_6)
Financial (C_2)	(net cash flow from operating activities - net cash flow from investment activities) / (total assets at the beginning of the year)	CFIO (I_7)
Financial (C_2)	Return on equity = net profit before tax / total equity	ROE (I_8)
Financial (C_2)	Tobin Q = (market value of ordinary shares at the end of the period + book value of liabilities at the end of the period) / (total assets at the end of the period)	Tobin's Q (I_9)
Financial (C_2)	Size of fixed assets = fixed assets / total assets	FA (I_{10})
Financial (C_2)	Instant or current ratio = bank balance, cash and revolving funds / current liabilities	Quickratio (I_{11})

Table 2 is shown among the following criteria (or the same indicators that are indicated by the letter I, which stands for Index).

After holding a group discussion session and exchanging opinions with experts and experts of the statistical society and using a table designed to identify the interactions, dependence and interaction of these eleven indicators, it was obtained in the form of a table of interactions and dependences, which is shown in Table 3.

Table 3. Identification of interactions between risky investment indicators in the insurance industry

Index	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}	I_{11}
I_1				×	×					×	×
I_2			×								
I_3						×				×	
I_4							×			×	
I_5	×		×		×	×					
I_6							×				
I_7	×									×	
I_8	×						×			×	×
I_9								×		×	
I_{10}	×		×			×					
I_{11}		×		×	×	×					

4. Data analysis

Defuzzification is the process of obtaining a single number from the output of the aggregated fuzzy set. It is used to transfer fuzzy inference results into a crisp output. In other words, defuzzification is realized by a decision-making algorithm that selects the best crisp value based on a fuzzy set. There are several forms of defuzzification including center of gravity (COG), mean of maximum (MOM), and center average methods. Center of gravity de-fuzzing method is used to de-fuzzify triangular fuzzy numbers. In this research, in order to increase the speed and accuracy of de-fuzzification calculations, the following pseudo-code is used under MATLAB software.

For applying this method, let us assume that $A = \{(x, m(x)): x \in U\}$ is the final fuzzy set determining the problem's solution. We correspond to each $x \in U$ an interval of values from a prefixed numerical distribution, which actually means that we replace U with a set of real intervals. There is a commonly used in fuzzy logic approach to represent the system's fuzzy data by the coordinates (x_c, y_c) of the COG, say F_c, of the area F, which we calculate using the following well known from Mechanics formulas:

$$x_c = \frac{\iint_F x dxdy}{\iint_F dxdy} \quad , y_c = \frac{\iint_F y dxdy}{\iint_F dxdy}$$

The compatibility rate of individual questionnaires was also calculated, and all of them were less than CR=0.0153, which shows the compatibility of experts' answers [17, 20].

In this part, all calculations are used using Super Decision software, which is also approved by Thomas Saati. Unbalanced supermatrix: The balanced supermatrix is obtained from the product of the cluster matrix in the unbalanced supermatrix. It is possible that the supermatrix obtained as described above is unbalanced, that is, the sum of the values of its individual columns is not equal to one. In this case, it is necessary to convert the unbalanced supermatrix into a balanced supermatrix.

Balanced supermatrix: In order to obtain the balanced supermatrix, the cluster matrix must be obtained first. Then, the balanced matrix is obtained by multiplying the similar terms of the cluster matrix and the unbalanced matrix

Table 4. Unbalanced supermatrix

	Insurance	Financial	1	2	3	4	5	6	7	8	9	10	11
Insurance	0.00	0.50	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Financial	0.50	0.00	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
1	0.15	0.20	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
2	0.23	0.02	0.10	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
3	0.02	0.04	0.10	0.10	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
4	0.02	0.02	0.10	0.10	0.10	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5	0.06	0.02	0.10	0.10	0.10	0.10	0.00	0.10	0.10	0.10	0.10	0.10	0.10
6	0.01	0.03	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10	0.10	0.10	0.10
7	0.11	0.05	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10	0.10	0.10
8	0.30	0.04	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10	0.10
9	0.03	0.07	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10
10	0.04	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.10
11	0.04	0.29	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00

Cluster matrix:

Table 5. Cluster matrix

Cluster Name	VC	Criteria
VC	0.5	0.5
Criteria	0.5	0.5

Table 6. Balanced supermatrix

	Insurance	Financial	1	2	3	4	5	6	7	8	9	10	11
Insurance	0.00	0.24	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Financial	0.24	0.00	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
1	0.059	0.098	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
2	0.117	0.060	0.05	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
3	0.013	0.093	0.05	0.05	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
4	0.004	0.010	0.05	0.05	0.05	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05
5	0.013	0.019	0.05	0.05	0.05	0.05	0.00	0.05	0.05	0.05	0.05	0.05	0.05
6	0.002	0.075	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.05	0.05	0.05	0.05
7	0.060	0.061	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.05	0.05	0.05
8	0.161	0.151	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.05	0.05
9	0.044	0.021	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.05
10	0.138	0.101	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00	0.05
11	0.149	0.071	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00

Formation of limited supermatrix: The weighted supermatrix obtained from the above section does not result in constant and unitary weights for the elements. For this purpose, the weighted supermatrix should reach the k+1 power (where k is a number large enough to obtain a single weight for each element). This can be done using Super Decisions software. Extracting the priorities from the supermatrix: after forming the limited

supermatrix, the elements of the cluster of options and the cluster of indicators have corresponding fixed weights. These weights are the final weight of these elements for decision making. The final priorities and weights obtained from the Super Decision software are as described in the table below.

Table 7. Restricted supermatrix (output of Super Decision software)

	Insurance	Financial	1	2	3	4	5	6	7	8	9	10	11
Insurance	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129
Financial	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129
1	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096	0.096
2	0.87	0.87	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087	0.087
3	0.89	0.89	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089	0.089
4	0.88	0.88	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
5	0.80	0.80	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
6	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063
7	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047	0.047
8	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052
9	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049
10	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056
11	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045

Confirming and validating the method of solving a problem requires comparing the results of that problem with different approaches that are available in the literature to solve the mentioned problem. In a case study, the FANP method was used to prioritize effective criteria in the VC process. In addition, since the fuzzy ANP method provides a consistent rate for the results and because all the matrices of pairwise comparisons have been consistent to obtain the results. The results show the reliability of the research findings. In relation to fuzzy ANP, it is assumed that the criteria have internal dependence and the structure is hierarchically networked. In the case of fuzzy ANP, expert opinions are gathered using geometric mean. The output of the Super Decision software for ANP-fuzzy calculations and the obtained weights for the indicators in the final restricted matrix are given. Based on fuzzy ANP calculations, the "I_1" index, i.e. the "operating cycle" factor, is the most important effective index in the evaluation based on experts' opinion. After this index, there is "I_3", or "turnover ratio of total assets". "I_4" index, or in other words "return on investment", is in the third place after these two factors. After them, the "I_2" index, "damage coefficient", is the next priority. "Lev" index, "debt-to-asset ratio" ranks fifth among VC indices. "Quick ratio" index is the 11th place among VC indices. The comparison of the obtained weights for the effective indicators of VC in the insurance industry based on the fuzzy ANP approach is shown in Table 7.

5. Conclusion

The implementation of VC is not possible without determining the appropriate indicators and cannot lead to the promotion of investment, the implementation of profitable economic activities, and therefore it is necessary to explain and define the appropriate criteria and indicators of VC for financial institutions. The emerging VC fund is one of the efficient infrastructures that can play a positive role in supporting the insurance industry. VC support to the insurance industry by covering and transferring risk and becoming insurable risks can be done by using technical reserves and collecting small and scattered funds and turning them into investable funds in equipping companies' financial resources and creating a sense of participation and creating Full competition market and favourable allocation of resources while creating employment will lead to increased production and economic growth, the insurance industry is one of its financing tools, which can focus the activities of insurance institutions by providing the required infrastructure in these areas. Guide it in that direction and promote the position of the insurance industry in the economic and social growth of the country. VCs help the insurance industry establish internal accounting rules and standardize their financial statements. In other words, VC support fixes the "hard" and "soft" information required for insurance. Risky investment is a key indicator and perhaps the most important concern of the insurance industry, considering that risky investment has a special place in insurance and sometimes it is even called the opposite of insurance. Therefore, the creation of "Creation of IVC insurance risk investment fund" is a solution that should be considered in creating the basic elements of a stable financial system for better economic outcomes in the future. For the purpose of future research, it is suggested to investigate the risky investment of reinsurance of catastrophic events.

Considering the long experience in the insurance market, insurance companies can study the status of companies active in the financial market as a reliable support. Also the approved companies introduce themselves to the people in different ways, such as granting insurance approval or insuring the shares of these companies, and be effective in gaining people's trust in investing in the economy. Also, due to the high ability and ability that insurance companies have in identifying the financial status of companies and providing insurance support to companies that have a suitable financial status, they can cooperate with the economy in increasing the number of companies in the financial market and create a healthy competition between them and attract investors.

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