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Identifying and ranking qualitative and quantitative factors of influential venture capital on optimizing the capital structure of knowledge-based companies

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Abstract

Venture capital is a type of investment in which individuals or companies invest in newly established or start-up projects in order to obtain higher profits in exchange for higher risk. Considering the role of this type of investment in financing and designing the optimal capital structure of knowledge-based companies and helping their growth and development, the purpose of this research is to identify and rank the quantitative and qualitative factors of venture capital effective in optimizing the capital structure of knowledge-based companies. For this purpose, with the help of simple random sampling and using Cochran's sampling formula, 150 managers of knowledge-based companies were selected as sample members. In order to identify the quantitative and qualitative factors of acceptable Venture capital, after referring to the research background and interviewing the experts, using the researcher-made questionnaire tool, and then factor loading of the mentioned factors through specific confirmatory factor analysis and finally the factors identified by ANP ranking method were classified. The results showed that technological factors, environmental factors, corporate indicators and management factors as the most important qualitative factors, and financial indicators can be listed as the most important quantitative factors in venture capital effective in optimizing the capital structure of knowledge-based companies. Among the identified factors, managerial factors have the highest rank, and the last rank belongs to technological factors. It was also determined that among the sub-components of these factors, the ability to establish effective communication, the experience of the management team, and the good reputation and ability of the management staff have the first to third ranks of the final weights. From the point of view of the respondents, corporate indicators have gained second importance, followed by financial indicators.

Keywords: venture capital, knowledge-based company, capital structure, financing
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1 Introduction

The word venture capital was used at the Public Conference of the American Bankers Association in 1939 for the first time by Jane Whiter. Venture capital plays an important role through active management and planning in the

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development of strategic models in target businesses and creating added value, and increasing the stock prices of these companies. Flourishing and developing the actions of venture capital is the motive force and the main way to new and innovative production growth in the technology era [30]. Venture capital occurs in companies that have achieved new technologies and innovative methods, and the investors own the socks of the company they invest in and therefore create wealth by doing it. Invested venture investment redeems by trading stocks [20]. Some studies show that venture capital has a significant role in developing knowledge-based institutes and also small and medium size. These studies, such as [5, 17], investigate venture capital in different terms, including improving investment methods, statistics studies in investable fields and its influence, financing, the structure of capital and [29]. Today, newly established companies and new technology-intensive institutions are included in one of the main sources of social growth and wealth creation in most countries in the world [3]. Many politicians pay attention to these companies in order to compose motivated policies and innovative facilities. According to this issue, these companies have main roles in the competitiveness of national and international economies because of being innovative and entrepreneurs [27]. Also, these kinds of companies can be called knowledge-based companies in Iran, politicians pay attention to these companies supported by the Law for supporting Knowledge-based companies, and other financial and non-financial policies have been considered to support the activities of these institutions [16]. One of the main issues in such companies is capital structure and determining its optimum composition; the results of some studies show that venture capital can affect the capital structure of these companies and the rebalancing of this structure after using venture capital [33]. Studies show in this regard that none of these theories and current patterns can interpret influential factors in determining the capital structure of these companies completely and provide assertive responses to the question that "why do a number of companies choose the options of issuing stocks? Some choose to use internal resources, and some others choose debts [36]. Achieving optimum capital structure in order to obtain the maximum profitability, value, and minimum capital cost is included in the important topics of studies of financial experts because capital is one of the main establishments of production. Previously, capital was raised as a tool of human actions mostly; but recently, capital has been considered as cash accumulation for starting or continuing an economic activity. Governments and economic companies need financing to start or continue an economic activity. This capital is supplied by governmental property or the owner of companies, or they are achieved by a financing process, and therefore, the process of financing is one of the important economic and financial topics. There are different methods and tools to finance, and each of them has its own features and characteristics. These methods and tools are interpreted and applied according to needs, financial capability, the condition of economic institutions, and the variety of people's behavior in investment and facing ventures [13, 24].

Knowledge-based companies deal with different challenges in their path of development and activities, and different variables affect the behavior of these companies. Therefore, identifying the best composition of capital and determining the optimum investment portfolio for newly established and knowledge-based companies have special importance. This determination requires identifying influential strategic factors and the appropriate capital structure of these companies. Venture capital is significantly effective in the innovation of a company and economic development as an essential part of the modern financial system; the effect of venture capital on the innovation of business and its ability to promote the development of innovative economics have been discussed widely in the existing literature [10, 12, 41]. The coordination between a venture investor and invested companies is important for developing entrepreneur companies because such investors provide more than capital surplus [5]. Mentioned investors participate actively in managing the companies with portfolios through personnel management, being a member of the board of directors, and sharing resources [5, 41, 42]. Such investors add value to the portfolio companies by providing guidelines and facilitating their access to investors, suppliers, customers, public institutions, industrial associations, and strategic alliance partners [4].

Despite conducted studies in the field of financing knowledge-based companies and the role of venture capital in the development of such institutions, it seems that the trend of developing existing patterns in this field faces different challenges by financial and banking institutions inside the country; in this regard, this research is going to investigate the role of venture capital in financing knowledge-based companies and identify and rank the influential factors and the consequences of venture capital in financing knowledge-based companies. Briefly, the importance of this research can be stated from a different point of view; first, not is venture capital one of the influential factors in capital flow and the total movement of the capital market, but also this type of investments and their effect on knowledge-based companies can increase the awareness of investors and managers of such companies in order to prevent wasting the rare economic resources by more awareness and knowledge. Second, conducting such research leads to increasing the trust of managers and decision-makers about the positive effects of venture capital and motivates more potential investors to invest in such companies. Third, knowledge-based companies are assessed in this research that economic politicians pay attention to them in the Islamic Republic of Iran's 20-Year Vision Plan and the Announcement of the Blanket Policies of Principle 44 of the Constitution, and they are considered as main actors in the capital market. Current research is going to achieve such purposes.

Venture capital has an important role in supplying capital and financing knowledge-based companies in recent years and helping develop and grow these companies; therefore, this research is going to identify and rank the qualitative and quantitative effective factors of venture capital in optimizing the capital structure of knowledge-based companies. Thus, the main problem of this research can be stated as follows: what are the quantitative and qualitative factors of venture capital, and how much each of these factors will affect optimizing the capital structure of knowledge-based companies?

2 Literature Review

Venture capital which is called "adventuresome capital" or "entrepreneur capital", is defined as supplying capital for new and entrepreneur companies and businesses (start-ups) and is generally knowledge-based, which has the potential to develop and grow value and, of course, high risk. Investors pay attention to these companies in their primary stages of growth and economic evolution, which fill the gap between capital and liquidity shortage by investing and becoming their stakeholders [30]. Briefly, venture capital is identified as the primary financing of new and young companies which seek to develop fast. Since the result of innovative activities is uncertain, banks often have less tendency to invest in such plans; therefore, an entrepreneur who doesn't have sufficient capital to implement his/her plan and the success of this plan is comparative goes to venture capital market. Therefore, the participation of venture capital is not only limited to financing but also includes providing continuous support and advice. Also, these companies have executive and operational roles and also, like other owners, share the risk of the company and have close cooperation with their purposes. One of the primary principles of venture capital is the investment in risky projects with predicting abundant earnings. These financial resources are invested in newly established corporations that need them. This corporation cannot be financed by banks and financial institutions. Because entrepreneurs cannot often provide an appropriate deposit, the validation of them to pay a loan is impossible due to the nodding acquaintance, the policy of banks is not based on accepting risk, and basically, banks monetize with the commission; thus, banks and financial institutions avoid financing these companies [23].

In fact, investment companies always worry about choosing the case of investment in the venture capital industry and should choose one or some cases among a large number of newly established companies. On the other hand, in this industry, as opposed to investing in Stock Exchange, newly established companies are considered as decision-making factors and have unique behavioral and performance features; so many newly established companies spend much time assessing the potential of investors to decide with which investor should cooperate and which one should be rejected [9]. So, compared to the other methods of financing, venture capital is not just added investment to a company [19]. Understanding and interpreting the venture capital process is the aim of many academic researches. Many researchers state evaluation criteria that are investigated by venture investors. For example, these criteria are related to team/entrepreneur quality, product/service uniqueness, and market attraction in the USA, South Africa, South Korea, Europe, and. . . .the results of these studies are the weighted list (based on wells study [39]) or ranked list (based on Poindicatorter study, 1976) of criteria. Wells concluded that venture investors consider the commitment of managers as the most important criterion for evaluating plans, and the criteria of product, market, and ability are ranked after it [8]. We are going to mention some of the most important and newest conducted research in this field.

Saadatnezhad et al. [32] seek to design a domestic model for one of the functional strategies of the bank in the field of technological, financial venture capital strategy in research called "Model for the effective implementation of technology venture capital strategy (Case Study; Future Bank)". They prioritized determining factors in previous research by exploratory factor analysis; then they determined final relations by using structural equation and confirmatory factor analysis model and concluded that the evaluating factors of venture capital plans, the trading and operational features of investment plans, entrepreneur factors are so important as the components and sub-components of venture capital in the proposed model. Ghazanfari et al. [15] ranked factors at different levels for Iranian companies in research called "A classification model of factors affecting the application of corporate venture capital strategy: An Interpretive Structural Modeling approach". According to their research, financial and strategic (level 1) consequences, the process and organizing of the CVC program (level 2), the motivation of venture and preparation for venture (level 3), environmental venture, and the development level of financial corporations (in level 4), supporting intellectual property (level 5) and environmental disturbance and competition in the environment (level 6) were determined as influential factors in applying corporation venture capital.

The aim of Palizdar et al. [28] study is to evaluate behavioral and environmental factors in absorbing venture capital to invest in these companies. The result of their study indicated that the ability to communicate, experience, and risk-taking of managers, the support of venture investors as well as primary resources have a meaningful relationship with absorbing venture investors in knowledge-based companies. According to obtained results from this study, companies,

in the case of the lack of capital adequacy and the necessity of absorbing capital especially venture capital, should consider this point that management team experience and also the ability to communicate effectively with other companies and private and juridical persons are included in the most influential factors of their success. Foroghi and Farrokhnia [14] identified and ranked these factors in research as "Providing a ranking model of influential factors on the decision-making process of venture capital by DEMATEL method" in the growth and creativity center of the Iranian navy. The results of the DEMATEL model showed that the management characteristics indicator is the most effective, and the financial consideration indicator is the most impressionable factor affecting venture capital decision-making. Also, "market features, entrepreneur characteristics, and the economic and organizational environment" indicators are ranked respectively.

The result of Karimkhani et al. [18] researches "Prioritizing Factors Affecting on the innovation of Target Firms from VCs perspective" for venture investment funds, and accelerators showed that preparing valuable information from a related industry, communicating and cooperating with industry activists, making aware about the threats and opportunities are the most important effective factors on the innovation of invested companies among determining factors. Chitsazan et al. [7] identified and ranked effective factors in evaluating new businesses by venture investors and ranked mentioned factors and determined the effecting way of every factor on the other by using interpretive structural modeling. Their research results showed that two factors, "scientific and academic experience" and "work experience", have been ranked in the top level (level 4), and they have the largest amount of influence, and the factor of "bargaining power" is ranked the lowest level that means the largest amount of dependence. The ten other factors (commitment and responsibility, market size, market growth, market competitiveness and industry, quality and technical capability, distinction and innovation, and sale and business model) have been ranked between mentioned factors.

The results of Banayi Shahani et al. [1] indicated that "access to governmental funds" prioritized the first and "geographical extent of the investment of fund" the last among the features of capital funds. Also, customer relations ranked at the top among business development indexes, and market performance ranked the lowest. Further findings showed that there is a positive correlation between all fund indexes and business development performance. Such correlation relationships led to creating the idea of investigating the causal relationships between the research variables. Finally, the analysis of the research measurement model and after filtering showed that the structures summarized the features of composite fund structure as risk-taking of the fund, active investing, the availability of governmental funds, the geographical extent of the fund capital, as well as the structure of business development include the performance of customer relationship, individual's performance, process performance, supplier performance. In addition to this investigation, investigating the structural model of the research's main testing hypothesis showed that the features of venture capital funds have a positive and significant effect on the development of knowledge-based businesses. The results of Derakhshan and Mohammadi's [8] research for investigating and prioritizing the considered factors of venture capitalists in the evaluation of projects based on a new idea, entitled "The Prioritization of Criteria Affecting the Evaluation of Venture Capital Projects" showed that the criterion of the financial considerations of product ranks on the top and the personality and the ability and characteristic of the entrepreneur and the product characteristics criteria are ranked in the next levels respectively. It is interesting that venture capital companies consider great importance to the personality of entrepreneurs.

Wang et al. [38] conducted research to identify the influential systematic factors in venture capital performance in emerging technologies; they showed, by using structural equation modeling on 61 data of venture investors in Beijing, that information acquisition, venture capital managers, and venture capital strategies have a positive effect on venture capital performance and venture capital strategies play a partial mediating role. Mishra et al. [21] conducted research entitled "choosing venture capital by using multi-criteria decision" to rank influential factors in the process of venture capital decision-making and the most important special factors and strategies of venture capital, respectively as product or service features, entrepreneur and management team characteristic, market characteristic, financial indexes. Monika and Anil [22] ranked influential factors in venture capital decision-making by using an analytic hierarchy process and showed that entrepreneurs' characteristics, financial considerations, and products and services are the most important influential factors in venture capital decision-making in the Indian industry, respectively. Rostamzadeh et al. [31] used multi-criteria decisions in venture capital with fuzzy data and the Vikor method and investigated venture capital conditions in Malaysia. The statistical population of this research was the business angels of Malaysia, and decision-making criteria (5 main criteria and 29 sub-criteria) were identified by this assumption. Their findings showed that Johor is the most appropriate city for venture capital. Kuala Lumpur, Penang, and Subahdar are ranked in the next places. According to the conducted research and literature review, also interview with experts, it is determined that the following factors can be considered as the most important components related to the qualitative and quantitative factors of venture capital affecting the optimization of capital structure in knowledge-based companies.

Table 1: identifying the qualitative and quantitative factors of venture capital affecting the optimization of capital structure in knowledge-based companies

Component	**Reference**
Debt ratio, trading risk, growth opportunity, profitability, financial flexibility, monopoly6 degree	[33]
Liquidity	[25]
Participating in social media	[26]
Social capital	[34]
Human capital, company lifetime	[2]
Governmental policies, financial supports	[40]
Innovative capabilities, using new and superior technologies	[37]
Collecting human capital, internal institutional factors, exciting opportunity, new innovations	[6]
Environmental factors, active and continuing monitoring	[35]
Management team experience, ability to communicate effectively, primary financial resources, governmental support, venture capitalists and entrepreneurs support, risk-taking of company managers, attracting venture capitalists, management performance, the composition of shareholders	[28]
Security factors, legal accelerating conditions, access to information, understanding risk, policies of the government, tax-related supports	[43]
Venture financing culture, changing entrepreneurs' attitude, supporting intellectual owning rights, technological risk, inherent risk, executive risk, environmental risk, market risk, type of target industry, culturalizing, type of target industry, geographical scope, exiting strategy, knowledge-based company size	[11]
Future perspectives, future growth opportunities, good reputation and ability to manage employers, economic conditions of the country, good reputation of the company, liquidity, ratio of long-term debt to capital, ratio of short-term debt to capital, future profitability, financial progress, institutional ownership, profitability ratios, major shareholders, family ownership, dividend policy, liquidity ratios, activity ratios.	Interview with academic experts and capital market activists (saturation level of 20 persons)

3 Research Methodology

This research is descriptive-survey research. The statistical population of this research is 242 managers of the knowledge-based companies and institutions of Fars province in Iran, among which 150 persons were selected according to simple random sampling and by using the Cochran formula in the risk level of 5%. Collecting data tools was the questionnaire the researcher based on extracted theoretical foundations. The final questionnaire included 39 items in order to identify the qualitative and quantitative factors of influential venture capital on optimizing capital structure in knowledge-based companies. To obtain this questionnaire, 70 factors (according to table 1) were extracted from theoretical foundations and interviews with experts, and the final items were decreased to 39 as well as confirming content validity by measuring the content validity ratio index and primary questioning from 20 persons of academic experts and capital market activists. Then determining factors were categorized into five groups of qualitative factors (technological, environmental, management, and corporative indexes) and quantitative factors (ratios and financial indexes), and the reliability of factors was measured by Cronbach's alpha method. According to the coefficient of Cronbach's alpha for technological factor (0.991), environmental (0.807), management (0.915), corporative indexes (0.769), and financial indexes (0.811), all of which were greater than 0.7, the reliability of the primary questionnaire were also confirmed, and the questionnaire was distributed and collected among the members of the sample (150 managers).

4 Research Findings

The factor loadings of components and determining factors are between 0.26 and 0.49, and the static t is greater than 1.96 in table 2, which shows the confirmation of determining factors in the significance level of 5%. The compositional reliability index (cp) is greater than 0.7, and Cronbach's Alpha also is an appropriate amount for all components, which shows sufficient reliability and is appropriate for structures. Also, the convergent validity index (AVE) is

greater than 0.5 for all components identified, and this confirms the structures meaningfully. To compile Table 2, the following equations were used to obtain the mean, standard deviation, test, composite reliability, convergent validity and Cronbach's alpha.

$$S^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1} \tag{4.1}$$

In formula (4.1), X is used to evaluate the population μ and the sample variance is used to evaluate the population variance. Because we don't always have access to all population data and we can't measure the true average of these data with correct estimation, so μ will not always be available. μ and population variance are two parameters that we measure based on N population (They are unknown most of the time).

$$S = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2} \tag{4.2}$$

Therefore, we come with the best estimate, which is X times, and substitute an average for the population average in the calculations.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{(S^2(\frac{1}{n_1} + \frac{1}{n_2}))}} \tag{4.3}$$

$$\alpha = \frac{k}{k-1}\left[1 - \frac{\sum S_i^2}{S_x^2}\right] \tag{4.4}$$

$$AVE = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum_i var(\varepsilon_i)} \tag{4.5}$$

$$\propto = \frac{k}{k-1}\left[1 - \frac{\sum S_i^2}{S_T^2}\right] \tag{4.6}$$

Path analysis in the process of structural equation model with LISREL software was applied to evaluate the presented model, whose findings have been presented in the following. In order to investigate the fitness of the model, the chi-square test, chi-ratio square test by 2 degrees of freedom, and the goodness of fit index of root mean square error was used. If the chi-square is not significant statistically, it shows that the fitness is very appropriate, but since this index is obtained in a greater sample than 100, so this is not an appropriate index for the fitness of the model. If the chi ratio square test by 2 degrees of freedom is lower than 3, it shows very appropriate fitness; the quantity of 2 depends on the volume of the sample, and a greater quantity of sample increases chi two more than it can be related to be false; goodness of fitness and mediated goodness of fitness indexes show the amount of relative variance and co-variance which is interpreted by the model' both of these criteria are varied between 0 and 1 the goodness of fitness with observed data is greater they closer to 1. If the comparative fit index of mediated goodness of fit index is greater than 0.090 and the root mean square error index is lower than 0.08, it shows that the fitness of the model is appropriate. Also, the minimum average interpreted variance in LISREL is acceptable at 0.35, and the compositional reliability is at least 0.5. If there is minimum average interpreted variance and compositional reliability, it can be said that the model has convergent construct validity. Also, in the field of the fitness of the model and to fit the model and confirm the -mentioned statistical indexes in each model, questions and components with a factor loading lower than 0.3 can be deleted and improve the fitness of the model.

In table 3, the results of the fitness test of the components of the questionnaire and the resulting model are presented. In the following, to fit the model we use some of the goodness of fit indicators including: GFI, AGFI and RMSEA, the values obtained shown in table 3 stating that the results of the model are reliable. Because the GFI and AGFI indices are both estimated more than the target, this statistic is greater than the 0.90 criterion. Also, the chi square ratio to the degree of freedom (X^2/df) shows a suitable value. Also, the RMSEA error criterion is estimated to be 0.03, which was smaller than the permissible limit of 0.08.

$$RMSEA = \sqrt{\frac{X^2 - df_{model}}{(N-1) \times df_{model}}} \tag{4.7}$$

Table 2: Factor analysis of determining qualitative and quantitative factors

Row	Factors	Items	Average	Standard deviation	Factor loading	Statistic t	Compositional reliability (Cp)	Convergent validity (AVE)	Cronbach alpha coefficient
1	Technological / qualitative	Using new and superior technologies	4.0581	1.0254	0.41	4.78	0.716	0.516	0.678
2		Participating in social media	4.3000	0.8226	0.33	4.38	0.918	0.608	0.732
3		New innovations	4.0161	0.9500	0.29	3.56	0.744	0.612	0.766
4	Environmental / qualitative	Growth opportunity	4.1056	1.0419	0.49	7.41	0.819	0.678	0.805
5		The type of target industry	3.9774	1.0158	0.43	7.60	0.774	0.617	0.811
6		Environmental change and disturbance	3.7613	1.0494	0.46	7.09	0.780	0.638	0.727
7		Culturlizing appropriate to venture to finance	3.6903	1.12956	0.28	3.29	0.918	0.556	0.855
8		The venture of the environment close to the company	4.0806	0.9603	0.39	5.97	0.817	0.709	0.910
9		Governmental support and tax exemption	3.7968	1.2440	0.35	4.72	0.882	0.611	0.927
10		Competition in an environment close to the company	4.0613	1.073	0.33	4.84	0.920	0.562	0.718
11		Supporting venture investors and entrepreneur	4.1161	0.9240	0.26	4.43	0.773	0.610	0.779
12		Economic conditions of the country and other environmental factors	4.2258	0.8634	0.45	4.39	0.916	0.451	0.617
13	Corporative indexes/qualitative	Prepare to participate in an external organization venture	3.8516	1.0289	0.34	5.67	0.844	0.577	0.556
14		Support intellectual ownership	3.9355	0.9531	0.33	6.71	0.798	0.703	0.689
15		Social capital	3.7258	1.0235	0.54	4.01	0.992	0.564	0.718
16		Knowledge-based company size	3.8935	0.991	0.39	5.68	0.916	0.559	0.899
17		Communicating with innovative and investing corporations	3.9871	1.0080	0.42	6.73	0.925	0.632	0.816
18		Trading risk	3.8065	1.0948	0.43	4.44	0.773	0.512	0.700
19		Future growth opportunities (owning other companies)	4.2000	0.8915	0.44	5.12	0.855	0.507	0.778
20		Company's motivation to external to organization venture	3.9290	0.9893	0.32	3.89	0.795	0.652	0.755
21		Exiting opportunity (strategies to exit passive capitals)	4.0806	0.9535	0.30	6.54	0.998	0.618	0.615
22		Process of corporative venture capital	4.1613	0.9242	0.29	7.12	0.894	0.559	0.822
23	Management/qualitative	Ability to communicate effectively	4.9810	0.121	0.39	4.55	0.718	0.717	0.876
24		Collecting human capital	3.1280	1.290	0.46	3.45	0.990	0.773	0.866
25		Management team experience	4.5560	0.334	0.38	6.77	0.916	0.603	0.755
26		Change in employers' attitude	3.2290	0.439	0.29	5.12	0.883	0.529	0.781
27		Investors' attitude	3.6780	1.298	0.41	5.99	0.689	0.628	0.885
28		Popularity and the capability of the management board	4.3290	1.887	0.33	4.38	0.777	0.788	0.716
29		Risk-taking the degree of managers	3.8850	0.554	0.43	3.99	0.990	0.582	0.706
30		Ability to attract investors	3.7560	1.098	0.49	4.28	0.919	0.599	0.599
31		The ratio of long-term debts to capital	4.1452	0.8784	0.41	7.66	0.718	0.662	0.719
32		The ratio of short-term debts to capital	3.9613	0.9339	0.32	7.40	0.885	0.704	0.688

33	Financial ratios and indexes/quantitative	Profitability ratio	4.0032	0.9637	0.36	7.31	0.988	0.629	0.823
34		Capital return	4.0968	0.9401	0.27	4.45	0.784	0.629	0.844
35		Activity ratio	4.3194	0.7576	0.43	6.45	0.885	0.583	0.825
36		Liquidity ratio	3.9548	1.0873	0.44	3.99	0.705	0.554	0.899
37		Low transaction costs compared to other similar companies	4.2097	0.9542	0.35	5.29	0.816	0.612	0.845
38		The ratio of obtained earnings per employer	4.0871	1.0530	0.30	4.34	0.845	0.549	0.811
39		The ratio of costs to the earnings of the company	4.2581	0.9231	0.41	5.99	0.734	0.622	0.876

The amount of GFI or comparative fitness index is 0.90, which shows an appropriate fitness of the model according to the standard amount of 0.9, which is the appropriate threshold of this index.

$$GFI = 1 - \frac{F_M}{F_{IND}} \tag{4.8}$$

Based on the estimates presented, it can be concluded that the model tested in the target society had a relatively good and acceptable fit. Therefore, the results of the research model show that the model used in the current research had a good fit.

$$AGFI = 1 - (1 - GFI)\frac{dl_{IND}}{dl_M} \tag{4.9}$$

The amount of CFI or comparative fitness index obtained from Bentler-Bonnet is 0.92, which shows an appropriate fitness of the model according to the standard amount of 0.9, which is the appropriate threshold of this index.

$$CFI = 1 - \frac{\max(X^2_{model} - df_{model}, 0)}{\max(X^2_{null} - df_{null}, X^2_{model} - df_{model}, 0)} \tag{4.10}$$

The amount of IFI or increased fitness index is 0.93, which shows an appropriate fitness of the model according to the standard amount of 0.9, which is the appropriate threshold of this index.

$$IFI = \frac{X^2_{null} - X^2_{model}}{X^2_{null} - df_{model}} \tag{4.11}$$

The amounts of NFI or normalized fitness index of obtained Bentler-Bonett is 0.90, which shows an appropriate fitness of the model according to the standard amount of 0.9, which is the appropriate threshold of this index.

$$NFI = \frac{(X^2_{null} - X^2_{model})}{X^2_{null}} \tag{4.12}$$

The amount of NNFI or non-standard normalized fitness index of Bentler-Bonett is 0.90, which shows an appropriate fitness of the model according to the standard amount of 0.9, which is the appropriate threshold of this index.

$$NNFI = \frac{\left(X^2_{null} - \frac{df_{null}}{df_{model}} \times X^2_{model}\right)}{X^2_{null} - df_{null}} \tag{4.13}$$

RFI, or relative fitness index, is 0.92, which shows an appropriate fitness of the model according to the standard amount of 0.9, which is the appropriate threshold of this index. The amounts of SRMR or second root mean remained square is 0.075, which the model has an appropriate fitness according to the standard thresholds, which is lower than 0.08.

Friedman test has been used to rank determining factors. Friedman test is the equivalence of the non-parameter test of dependent F in variance analysis in repeated amounts. In this case, assumptions such as normality of distribution, equality of variances, and continuity of the scale are not required to conduct variance analysis of repeated data. The following table shows the result of this test for the determining factors of this research:

Table 3: The results of the fitness of the model

Index type	Persian equivalence	Standard amount	Model fitness	Result
NFI	Bentler-Bonnet normalized fit index	$0.90 \leq$	0.90	appropriate
RFI	Relative fit index	$0.90 \leq$	0.92	appropriate
NNFI	Non-standard suitable index	$0.90 \leq$	0.90	appropriate
IFI	Incremental fit index	$0.90 \leq$	0.93	appropriate
CFI	Comparative fit index	$0.90 \leq$	0.92	appropriate
GFI	The goodness of the fit index	$0.90 \leq$	0.90	appropriate
P-Value	The root mean square of the estimation error	≤ 0.05	0.000	appropriate
SRMR	The square root of the standardized residual mean square	$0.08 \geq$	0.075	appropriate

Table 4: Friedman test to rank identified factors

Row	Average	Components	Rank
1	1.00	Technological/qualitative factors	5
2	2.46	Environmental/qualitative factors	4
3	4.00	Corporative/qualitative factors	2
4	2.54	Financial indexes and ratios/quantitative	3
5	4.78	Management/qualitative factors	1

As is obvious from table 4, management indexes have an average of 4.78 and rank first from the respondents' point of view. Corporative indexes have an average of 4, and financial indexes have an average of 2.54, ranking in the second and third places, respectively the fourth one is environmental factors in influential factors on optimum capital structure in knowledge-based companies. Finally, it is determined that technological factors are placed in the last rank.

MADM) used to rank the components related to determining factors which is similar to the Analytical Hierarchy process, but there are criteria or sub-criteria or options with dependence and relations in it. In fact, if there is a problem in which criteria are related together or sub-criteria have internal relations, this problem cannot be conducted by AHP because it is out of Hierarchy mode and created network mode. In this mode, the problem should be solved by ANP. ANP is a multi-criteria decision-making method that is used to determine the weight of criteria and choose an optimum option. In order to determine the weights of criteria in the Analytical Hierarchy Process (AHP), a pairwise comparison technique is used. ANP is the generalization of AHP. In some cases in which lower levels can affect upper levels or elements in the same level are independent of each other, AHP cannot be used anymore. ANP is a whole form of AHP but doesn't need a hierarchy structure and, therefore, shows more complicated relations between different levels of decision and considers interactions and feedback between criteria and alternatives. Weights resulting from causal relations between elements, along with the internal weights of each cluster, construct a basic supermatrix. This supermatrix is weighted by a linear method, and finally, the final weights of elements will be achieved by a relatively weighted supermatrix. Analytical Network Process provides a comprehensive and strong method for exact decision-making by using practical information or individuals' judge of each decision maker and makes the process of decision-making easier by providing a structure for organizing different criteria and evaluating the importance and priority of each of them rather than the options. The results of implementing this process are as the following:

Among the five determining factors, management factors have the highest rank; the last rank is technological factors. As is observed in table 5, among the sub-components of these factors, the ability to communicate effectively, management team experience, good reputation, and the ability to manage employers have been assigned the first to third ranks of the final weights. From the experts' point of view, corporative indexes are in the second rank of importance as qualitative factors, and after that, ratios and financial indicators have been considered quantitative factors.

5 Discussion and Conclusion

The current research was "Identifying and Ranking Qualitative and Quantitative Factors of Influential Venture Capital on Optimizing the Capital Structure of Knowledge-based Companies". The following factors are determined as influential factors on appropriate capital structure in knowledge-based companies:

Table 5: The results of ranking components by ANP

Row	Factors	Items	Rank	Final weight	Final weight in the sub-category
1	Technological /qualitative	Using new and superior technologies	21	0.0359	0.199
2		Participating in social media	39	0.0118	0.111
3		New innovations	30	0.0182	0.144
4	Environmental /qualitative	Growth opportunity	31	0.0175	0.106
5		The type of target industry	28	0.0199	0.148
6		Environmental change and disturbance	24	0.0259	0.200
7		Culturlizing appropriate to venture to finance	23	0.0293	0.205
8		The venture of the environment close to the company	22	0.0344	0.210
9		Governmental support and tax exemption	27	0.0204	0.162
10		Competition in an environment close to the company	29	0.0191	0.132
11		Supporting venture investors and entrepreneur	25	0.0231	0.191
12		Economic conditions of the country and other environmental factors	26	0.0211	0.176
13	Corporative indexes /qualitative	Prepare to participate in an external organization venture	37	0.0125	0.102
14		Support intellectual ownership	35	0.0141	0.116
15		Social capital	7	0.0783	0.311
16		Knowledge-based company size	18	0.0466	0.243
17		Communicating with innovative and investing corporations	5	0.0812	0.328
18		Trading risk	8	0.0755	0.303
19		Future growth opportunities (owning other companies)	20	0.388	0.205
20		Company's motivation to external to organization venture	6	0.0795	0.321
21		Exiting opportunity (strategies to exit passive capitals)	19	0.0425	0.233
22		Process of corporative venture capital	9	0.0710	0.299
23	Management /qualitative	Ability to communicate effectively	1	0.0991	0.378
24		Collecting human capital	17	0.0471	0.278
25		Management team experience	2	0.0933	0.367
29		Change in employers' attitude	38	0.0121	0.101
27		Investors' attitude	34	0.0155	0.106
28		Popularity and the capability of the management board	3	0.0864	0.353
29		Risk-taking degree of managers	32	0.0163	0.116
30		Ability to attract investors	4	0.0853	0.41
31	Financial ratios and indexes /quantitative	The ratio of long-term debts to capital	15	0.0590	0.248
32		The ratio of short-term debts to capital	16	0.0515	0.233
33		Profitability ratio	10	0.0688	0.287
34		Capital return	13	0.0645	0.266
35		Activity ratio	36	0.0130	0.112
36		Liquidity ratio	33	0.0159	0.128
37		Low transaction costs compared to other similar companies	14	0.0608	0.254
38		The ratio of obtained earnings per employer	12	0.0673	0.266
39		The ratio of costs to the earnings of the company	11	0.0689	0.275

- technological/qualitative factors
- environmental/qualitative factors
- management/qualitative factors
- financial ratios and indexes/quantitative

Among the five determining factors, management factors have the highest rank; the last rank is technological factors, and corporative indexes are in the second rank. All of these factors are identified as qualitative factors. According to the findings, it can be said that management factors and corporative factors of venture capital are the most influential factors on the optimum capital structure of knowledge-based companies, and the managers of these companies should pay more attention to them. Although the main base or so-called dominant capital of these knowledge-based companies is knowledge and technology, it should be mentioned that these kinds of companies will not achieve appropriate results without sufficient financing, so the main factor of the failure of these companies is the lack of capital. The most important financing resource of knowledge-based companies is venture capital which has been used in developed countries for about 50 years that funds like innovation and flourishing funds, research and technology funds of the province, and development of new technologies funds are implemented venture capital. Venture capital is an important resource for the financing of small and newly established companies like knowledge-based companies. Venture capital, along with managing aids, borrows capital from innovative and newly established companies which are growing and have an economic future. In other words, venture capital funds borrow their liquidity and expertise from knowledge-based companies, and they use them to produce knowledge-based products and marketing. Venture capital helps newly established companies to grow faster and commercialize their products by monitoring, consulting, facilitating access to financial resources, and using the opportunities on time as well as by their communication networks. Venture capital has a positive effect on the profitability of knowledge-based companies, and despite bank facilities, it is a type of financing which lets innovative and newly established companies grow and develop. These results are the requirements of paying more attention to these funds and developing their activities as much as possible. Despite the importance and necessity of taking risks in developing venture capital funds, the resource of these funds are limited in Iran and are mostly financed by the public budget. Institutional weakness is one of the main reasons for establishing these kinds of funds in Iran. Organizations have an important role in determining the motivations and the way of communicating with venture investors and knowledge-based businesses. Therefore, it is suggested the increasing participation of the private sector in this field and increase the resources of these funds. Knowledge-based companies are usually expensive because they are based on research, and they usually do not have the collateral and liquidity required to be mortgaged in the bank. If they provide the expected collateral to banks, the service and product costs will be increased to the great bank interest rate, which is not appropriate for a knowledge-based company in a normal competitive space. So despite the existence of many resources in banks, knowledge-based companies in Iran cannot use these resources well. Using tools and financial services for research and technology of new technology development funds is more optimum for these kinds of companies.

Creating consistent rules and regulations governing the establishment and the activity of funds, especially in the private sector, establishing institutions that support the establishment and activity of these funds, and interacting with knowledge-based companies such as consulting institutions and associations can help in financing these kinds of companies; also reengineering of accessing process of knowledge-based companies and facilitating and accelerating this process and creating institutions for screening and categorizing these plans and ideas of knowledge-based companies and conducting studies of markets can help to develop such companies and on the other hand, meaningful guide of governmental fund resources and exact control on the way of allocating it, creating mechanisms to increase the tendency of funds to participate and to motivate companies to participate with each other, especially in projects with a high chance is significant approaches. At last, creating supporting infrastructure for funds, especially in tax and judicial departments, and creating accurate and complete databases from knowledge-based companies and funds will also improve the access of these companies to financial resources. In the following based on the results of this research, the following suggestions are provided:

1. Preparing appropriate substrate in terms of management and policy-making, educational and research activities, infrastructures, network and scientific networks, innovation, and publishing and distributing knowledge in order to create and develop knowledge-based companies.
2. Facilitating the necessary mechanisms, modifying laws and regulations, as well as governmental and non-governmental support in order to develop knowledge-based companies.
3. Operationalizing and supporting the establishment of collective financing, developing and completing financing and capital systems with private brokers, and creating an appropriate substrate in order to use new technologies in liquidity and capital market.

4. Aiding to clear investment obstacles in technological and risky projects by developing venture stock exchange funds and increasing the capital of existing funds.
5. Aiding in establishing new tools in the capital market, including private venture funds, fund of funds, debt tools, etc., in order to diversify financing tools for innovative, technological, and knowledge-based companies.
6. Motivating economic activists and large economic and social institutions to invest in the knowledge-based field.

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