



Designing a Valuation Model for Petroleum Startups

Ali Mohammad Ghanbari

Assistant Professor of Accounting, Department of Accounting, Tehran Faculty of Petroleum, Petroleum University of Technology, Tehran, Iran
(Corresponding Author)
aganbari@put.ac.ir

Seyed Ali Hoseini

Assistant Professor of Accounting, Department of Accounting, Faculty of Social Sciences and Economics, Alzahra University, Tehran, Iran
hosseinira@yahoo.com

Hosein Moradi Esfanjani

Master of Finance, Department of Finance and Accounting, Tehran Faculty of Petroleum, Petroleum University of Technology, Tehran, Iran
Moradihosein.1494@yahoo.com

ABSTRACT

Development of downstream operations in the Iran's petroleum industry has always been considered as a necessity in to create more value-added. One of ways to accomplish the mission, especially in the current situation, is exploiting the capacity of petroleum startups. Considering that these companies need to be valued for financing, and since the traditional valuation methods do not provide efficiency, identification of valuation drivers for these startups as the main objective of research is an important step towards creating common literature between investors and venture capital company in order to use qualitative methods of valuation and facilitate financing process. The present study seeks to examine the influential factors affecting the valuation of petroleum startups in Iran. To this end, after reviewing theoretical foundations and interviewing with some experts and venture capitalists, environmental (contingent) effective factors were identified. Then a questionnaire was developed and distributed over statistical sample. The empirical findings revealed that the business team, size of the opportunity, marketing, sales & partner's channels, competitive environment, product power and the intellectual properties, time for idea implementation, investment rounds, as well as laws and regulations, have the most explanatory power in the valuation of Iranian petroleum startups, respectively. We provided some suggestions and policy implications in this regard.

Keywords:

Valuation, Knowledge-based economy, Startup, AHP, Petroleum industry.

1. Introduction

Iran has been ranked as one of the primary countries in the Middle East in terms of science production, but as we know, it can not meet the needs of the country, and must be passed through commercialization. The title of knowledge-based economy is a well-known explanation that is considered as the main pillar of the resistant economy. The Ministry of Petroleum has continuously considered the petroleum industry as a source of knowledge for the resistant economy. In recent years, huge positive steps have been taken in the field of oil and gas, as well as in other areas, and the number of startups in the field of energy, especially oil and gas, has also been rising. But any promotion requires sufficient knowledge and infrastructure to sustain its long-term continuity. The collapse of financial markets in East Asia has also confirmed this boom without adequate infrastructure. Another issue that has always faced many challenges in the talks between the investor and the company is the valuation of startups, which usually have a number of different characteristics against matured companies. Due to these differences, traditional valuation methods for these modern companies are not sufficient. Therefore, we need models and methods to identify the challenges of knowledge-based companies' in terms of criteria and important drivers for valuation. Undeniably, the identified drivers will be enough when take into account the native requirements and contingencies of the country. In this regard, a study on the creation of a common language between investors and startups can be a worthwhile effort for the growth of knowledge-based companies and the country's economy.

The present study seeks to investigate the valuation drivers of knowledge-based companies by focusing on oil and gas sector using survey methods. Because of the problems to value startups using traditional methods, it's imperative that we look for newer and more innovative ways. These new methods will naturally be more qualitative due to the lack of accurate information in emerging companies. Damodaran (2009), the most prominent professor of valuation in the world, believes that, the more qualitative model will result in better valuation of startups. The reason is that the favourable situation of a company in those propellants can be a sign of its optimal revenues and value creation in the future, and

as a result, the company, on average, is more valuable. Innovative and knowledge-based companies in the field of energy are one of the key factors for promoting the country's power in dealing with threats. The industry elders also acknowledge that innovative companies and scientists in different sectors of the oil and gas industry should play a role. In addition to legislation and enforcement of executive bodies, efforts have been contributed in recent years to support energy startups in which oil and gas are one them, and all of these efforts are indicative of the importance of the issue. Therefore, academics will have to take steps to create the necessary literature. In this regard, the present study seeks to develop a model for valuing startups that are newly established in the field of oil and gas, in order to create a link between investors and owners.

The second part discusses theoretical foundations and the research background. Methodology, the empirical results of data analysis and conclusions are also presented in sections three, four and five, respectively.

2. Literature Review

Startup valuation in the venture capital (VC) context is often said to be more art than science (Kohn,2018). One of the goals of the neutral valuation expert is to find the intrinsic value of the startup, but since it is not possible to find precise value, then the ultimate art of the expert is approaching to intrinsic value, as much as possible. Generally speaking, the valuation methods for startups are different from those for mature companies with constant revenue streams. As shown in Figure 1, the mature companies value can be reached using market price of outstanding shares, but we must estimate the value of future potentials to predict the startups values. The difficulties are appeared right here. Lack of historical data, low earning levels, high dependence on private equity, exposure to different claims as well as surrounding with some risks are among the common characteristics of startups making it difficult to use conventional valuation processes (Ebrahimi,2016).

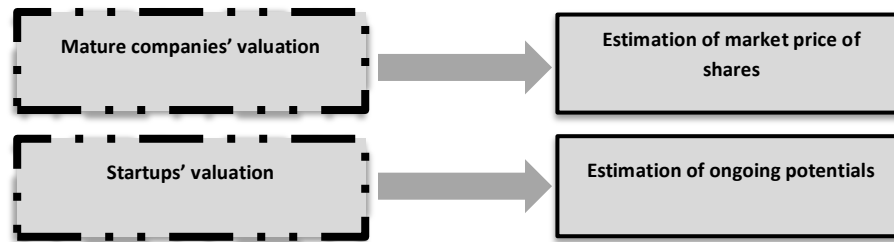


Figure1: differences in the concept of valuation in startups and mature companies

Under the umbrella of startups, which are also typically native, these companies can not be valued by the conventional models introduced for mature companies; due to the lack of experience in the field of business and the uncertainty about the business model and future earnings (Damodaran,2009). There are various valuation methods for startups that are classified in three categories of asset-based, income-based, and relative valuation methods. Asset-based methods value a business based on its assets. Methods such as the adjusted value of the book value, the value of the company's cash flow (the value of the company when its activities are stopped and all its assets are sold) and the replacement value that takes into account the costs necessary to re-establish a business fall into the first category. We mean income-based methods, which are used by theories and principles of finance, accounting, and studying the status of the company in the past, as well as by carefully examining the various factors affecting a business (regardless of the value of similar businesses) to predict the future earnings of a company and calculate the company's intrinsic value. In this approach, we must carefully examine all the macro and micro factors affecting the company's value, according to which the company's future cash flows, along with their expected risks and growth. Relative methods also use information from other similar companies to value a company. In fact, in the form of a thumbnail, we can approximate the value of the target company by comparing similar companies. It should also be accepted that the more the company is in the early stages of growth, the use of precise valuation models will not mean a better and more accurate valuation, because accurate valuation is carried out with a series of assumptions, and for each of these assumptions, the relevant and reliable information must be collected. But in the context of well-known startup as the target companies, can not be

valued through the models introduced in the previous section due to lack of prior experience and uncertainty about the business model and future earnings.

If we want to value knowledge-based companies using asset-based methods, we are faced with the hinder that corporations do not have significant current assets; in other words, what corporations know about assets are more soft assets than tangibles. At the same time, the main value of startups is due to their future growth, not current assets. In the revenue-driven approach, according to their low operating experience, these companies will be expected to miss their future earnings, as these companies will consistently change their business model in line with the feedback they receive from the market. In fact, due to the innovative nature of business models, uncertainty about future cash flows is high and usually entrepreneurs and venture investors do not agree on such cases; on the other hand, the appropriate discount rate determination to calculate the current value of future revenues, is difficult and results in disagreement between the parties. The asymmetric information of the parties also makes it difficult for the other party to accept the calculated value, regardless of the method used. In the case of relative methods, we also need to consider the problem of startup companies whether we want to use similar listed or private companies, but in both cases we face some problems. Of the major problems with private companies, we can point out the time differences, their non-standard capital structure, the accounting differences in the preparation of financial statements, and the fact that the transaction price does not reflect the net worth of the business. In the case of similar publicly-traded corporations, the company's life cycle, the high rates of failure, the diversification of investor portfolios, and the unprofitability of startups act as obstacles (Damodaran, 2009). Hand (2005) provided evidence that as startups mature, financial

information becomes more value-relevant than the non-financial form. From the VCs' point of view, Wright et al. (2004) show that VCs' use of particular valuation methodologies depends on the institutional setting. VCs seem to view intellectual property and alliances as means to reduce information asymmetries and as value-enhancing factors emphasizing their importance for startup valuations in the VC context (Block et al. 2014). Considering the above, qualitative methods should be used to value knowledge-based companies. The qualitative methods are not meant to refer to any value for the company, but when the valuation model of existing companies and their average valuations are obtained, an indicator for the value of the target company can be found through comparing the target company with the average of the companies in terms of the criteria and weight, which, along with the average value of the companies, will determine the value of the target company, quantitatively. The paper explicitly identifies the drivers of valuation in startups that are active in the field of oil and gas, and weigh each of them in terms of respective explanatory power of the company's overall value.

McMillan et al. (1987) and Van Osnabrugge (1990) found that two important factors determine the value of start-up companies: self-entrepreneurs, and management team. Lerner (1994) showed that the number and breadth of patents for biotech startups within the US context are positively related to those startups' pre-money valuations. Feeney et al. (1999) focused on the decision-making process of investors and concluded that important criteria in valuing startups are the entrepreneurial abilities and background of their activities. Mason & Harrison (1999) agreed with both of these, adding that marketing strategies and financial planning are also of particular importance. Van Osnabrugge & Robinson (2000) list important criteria from the perspective of angel's investors in Europe, whose enthusiasm for entrepreneurs and their trustworthiness were first and second. The potential for product sales and the entrepreneurial expertise was also third and fourth value drivers. Engel (2003) has divided the methods of startup's valuation in two categories. The first is the classical methods that can be used independently disregarding the purpose of the valuation, while the second-class methods are more appropriate to the particular circumstances of the venture capital funds.

In another study, Quirin et al. (2000) identified resource replacement, resource growth, production growth, and exploration costs as key factors in the stock valuation of oil companies. Gompers & Lerner (2000) provided evidence that fund inflows into the VC industry increase startup valuations and that this effect could, from a financial perspective, neither be traced back to a startup's better risk profile nor to improved cash flow expectations. The authors suggest that increased supply in the VC industry implies higher competition among VCs, thus leading to higher startup valuations. In addition, they argued that public market valuations also increase startup valuations. Davila et al. (2003) argued that headcount growth is correlated positively with changes in valuation over successive financing rounds. Mason & Stark (2004) identified financial figures and other measurable factors such as sales, market size, and patent protection as the most important issues in valuing startup companies. Batjargal & Liu (2004) examined 158 investment decisions from VCs based in China and showed that Chinese VCs with strong ties from previous relationships with entrepreneurs tend to assign higher valuations to the startups of those entrepreneurs Davila & Foster (2005) discovered a positive association between the early adoption of management accounting systems, which they define as a subset of management control systems, and valuation mechanism. Strategic alliances offer powerful means to gain access to resources and to signal investee quality through pacifying information asymmetries (Uzzi 1996; Nicholson et al. 2005; Miloud et al. 2012). Based on signaling theory, Nicholson et al. (2005) show that biotech ventures with strategic alliances with pharmaceutical companies receive higher valuations. In addition, the results of Hand (2005) are consistent in that the number of strategic alliances are, on average, positively correlated with the valuations of biotech startups, even though the valuation effect on a round-by-round basis is noticeably low. Sudek (2006) has conducted a similar study with American angel investors and has come up with different results in which trustworthiness and management team are ranked as first and second. The enthusiasm, rank third and the probable path of withdrawal is in fourth place to determine the value of startups. In terms of value drivers, according to Osmundsen et al. (2006), petroleum production as well as replacement rate of resources are major drivers of the petroleum

company's valuation. Interestingly, Kaplan et al. (2007) examined 145 VC investments in 107 ventures in 23 countries and find in their descriptive analysis that pre-money valuations vary across legal regimes. Furthermore, they concluded that VCs do not trade off more downside protection in the form of US style contractual terms against a higher startup valuation, but that the opposite holds. Fernandez (2007) has categorized corporate valuation techniques into six categories: balance sheet-based, income statement-based, goodwill-based, and cash flow-based. Value added-based and option-based valuation methods. Damodaran (2009) concludes that another widely used method is the method that must be identified for the use of coefficients. Similar companies are those companies that have cash flow, growth potential and similar risk. In fact, the ideal mode is to identify and value a company that is exactly the same in terms of risk, growth and cash flows. According to this definition, similar companies are not necessarily in the same industry. They also can be private or publicly-traded of the same kind, and each of them should be selected, carefully. Hochberg et al. (2010) described the density of the presence of venture investors and the level of networking formed as determinants of the valuation of newly founded firms. Cumming and Walz (2010) study VC funds from 39 countries and concluded that VCs tend to assign higher valuations to their unrealized investments in countries with less regulated legal and accounting systems. Cumming and Dai (2011) revealed as well as venture investor and market conditions, the degree to which the investor is prudent, and the size and focus, are also among factors that influence the negotiator's power of the investor and as a result the startup valuation. Payne (2011) identified the major drivers of value in emerging startups in terms of teams, size of opportunity, product or technology, competitive position, and marketing and sales partners. He is one of the most prominent investors in the Silicon Valley, who has a great deal of interest, and emphasized the above factor in his later articles at a time closer to the present. Cumming & Dai (2011) investigate the effects of fund size and VCs' limited attention on the valuations of startups by studying 9266 financing rounds in the USA. The findings revealed that more reputable VCs assign lower valuations, and additionally that fund size is usually negatively related to startup valuations, implying that larger fund size is correlated with more

bargaining power. Miloud et al. (2012) illustrate that in the case of 102 French startups from 18 different industries, VCs assign higher valuations to ventures operating in highly differentiated industries having higher growth rates. Heughebaert & Manigart (2012) supposed that VC investors are heterogeneous and hence that VC firm type goes along with bargaining power, implying that VCs with relatively stronger bargaining power set lower startup valuations. They also find that for 180 Belgian VC-backed startups a proprietary deal flow (as in the case of university VC firms) and lower investor competition (as represented by government VCs targeting niche markets) lead to lower startup valuations than those set by independent VCs in line with the bargaining power argumentation mentioned above. Hsu & Ziedonis (2013) examined the 370 semiconductor startups and concluded that the number of patent applications filed is associated with higher startup valuations. Intriguingly, Greenberg (2013) conducts a fine-grained analysis of 317 Israeli technology startups differentiating between pending and granted patents and showed that patent applications are significant and positively related to venture valuations, while they are not relevant to the valuations of software startups. Sievers et al. (2013) addressed that in Germany firm age is insignificant in determining startup value, implying that conducting a new financing round is more informative than a startup's age. However, the finding stands in contrast to that of Armstrong et al. (2006) who, while also controlling for funding series, showed that age is significant and negatively related to valuation of US startups. Davila et al. (2015) argued that for a cross-sectional sample of 66 startups around the world, VCs assign a premium to startups adopting management control systems, improving decision-making and execution. Moreover, the effect is apparently more significant for startups operating in high growth and competitive markets and also for the use of strategy-implementing systems. Wasserman (2016) examined the startups valuation drivers and showed that founders might have to surrender control to acquire a higher valuation. Wasserman (2016) also revealed that ventures in which the founder is still CEO and/or controlling the board of directors at the time of the most current financing round are devoted to lower valuations. He also argued the personal networks of entrepreneurs are connected with higher valuations as such networks facilitate entrepreneurs recruiting

employees. Andreas Köhn (2018) takes a systematic review on the existing empirical literature to illustrate the determinants of startup valuations in the VC context. He also seeks to provide an organizing structure to the current literature as well as to detect academic voids and directions for future studies. The study develops an integrative framework for the factors determining startup valuations in the VC environment, which should be of use to both practitioners and researchers. It illustrates that in the VC market, startup valuations are determined within a complex setting because the interplay and dynamics of the different factors concerning startups VCs, and the external environment all contribute to the final outcome. In his framework, factors such as business team, startup characteristics, strategic alliances as well as reputations and type of investors must be included in startups valuations along with financial information.

In Iran, several studies have been carried out in the field of venture capitals and startups and several books have been written in this field¹. However, at the best of authors knowledge, no study has been conducted on the valuation of startups and factors affecting it, especially from the perspective of Iranian venture capitalists. The main reason for this is that the issue of startup has been officially introduced to financial literature and the capital market only for several years and during which no times were devoted to address the issue of valuation of startups as one of the main challenges facing these companies in Iran. Therefore, domestic studies regarding the Iranian startups are focused on entrepreneurship management approach. Asali and Al-Badawi (2015), reviewed several companies with a high growth rate and in the context of startups, and determined the key factors affecting the value of these companies. The purpose of this study was to help making correct decisions by investors and companies that accelerate the financing and capitalization. The results indicated that the use of discounted cash flow and real options methods are the most efficient in valuing startups. Also according to the results of this research, management team, products and technology, planning strategies, marketing, financing and product markets are among the most important factors that should be considered in the valuation of startups. Nadafi and Ahmadvand (2016) have identified and prioritized the factors affecting the development of new businesses in the

country. In their beliefs, innovative startups play a key role in employment and increasing production, while various factors affect the expansion of these businesses at micro and macro levels. In this research, 40 cases were selected purposefully from Isfahan province. After reviewing theoretical foundations, interviewing and creating discourse space, 50 items were extracted and distributed among them. In the next step, the participants arranged the items in three groups, agreeing and opposing, and the results were analyzed using the exploratory factor analysis method. The results showed that the viewpoints of the participants are two distinct patterns. The first pattern focuses on the speed of action, the teamwork, the essence of the idea and the opportunity while the second on the customer, rivals, and investor partners and sponsors. In the first model, attention is focused on creativity and the creation of the grounds for innovations in people who are prone to learning through the education and creation of cultural foundations in the community. While in the second model, support for potential capacities, investment security and the creation of a working group in the emerging business is considered.

3. Methodology

This research is applied in terms of purpose and takes an analytical-survey strategy. The methodology used is also mixed one (mono-multi) along with an inductive approach. The statistical population is consisting of CEO, financial managers of investment companies in field of oil and gas, and on the other hand, the owners of oil and gas startups that have been able to finance or have been valued. Professors, academic venture capital elites and other experts in this field are also part of the population. Part of the proponents of the valuation of startup companies (initial list) is identified through theoretical foundations and by referring to the researches; however, in order to identify all of the value drivers and identify those environmental and contingency factors that are specific to the oil and gas industry of the country, a semi-structured interview was conducted with the statistical sample. In this way, 30 people with managerial responsibilities, powers and responsibilities of financing and valuation in investment companies or related organizations, along with entrepreneurs and owners of startups, were selected using purposeful snowball sampling. The

results of this interview were investigated qualitatively using the content analysis method without applying the statistical tests and the final list (secondary list) of the propulsors was extracted.

In the next step, a researcher-made questionnaire is set up in the Likert spectrum for the purpose of consensus on the listed proponents, the elimination or localization of some of the identified factors in the previous step. The questionnaire contains progenitors identified from theoretical foundations, previous research, and interview and is distributed among 30 interviewed members as well as 30 experts (60 questionnaires in total). In order to evaluate the significance of each of the components affecting the valuation of petroleum startups, the results are analyzed by one sample t-test in SPSS software. The output of this test is the elimination of unrelated factors (insignificant) of the model.

The Hierarchy Analytical Process (AHP) method has also been used to determine the importance of each component in valuing the underlying startups, based on the responses received from the questionnaire in the expert choice software. Finally, the model for the valuation of companies under study is developed and designed through factor analysis (exploratory and confirmatory) in LISREL software. In order to assess the validity of the questionnaire, it has been tried to compile and arrange the questionnaire in consultation with the supervisors and advisor, as well as comments and comments from respondents during the interview. To assess the reliability of the questionnaire, the Cronbach's alpha test was used after sub-test. The level or unit of analysis in this research is made up of individuals.

4. Results

The results of the content analysis of the interview are presented in Table 1 and show that in assessing the value of knowledge-based businesses in the oil and gas industry, the country should pay attention to some drivers and these factors must be considered for the purposes of determining the intrinsic and real value of these companies. In view of the answers provided, it is evident that some of the identified terms are more relevant to some of the underlying factors and are therefore categorically homogenous in nature. Therefore, in general, all identified items can be classified in the form of eight factors as described in

the following table and further examined (in the form of a questionnaire).

Table1: interview results

Factors	Elements
1.Business Team	<ul style="list-style-type: none"> - The experience of the company team in the business administration - The experience of the company team in the specific field of the company - A manager or operating director, financial or technology director, and ... among team members - The CEO's desire to step down as needed and the existence of a more experienced CEO - The degree of education of the founders of the company - The degree of completeness of the team
2. Size of Opportunity	<ul style="list-style-type: none"> - Target market size - The revenue potential of the target market in the next 3 years
3.Product Power & Intellectual Properties	<ul style="list-style-type: none"> - Definition and product development - Product position in the value chain or product performance for customers - Easy to copy by others - The insurance coverage
4.Competitive Environment	<ul style="list-style-type: none"> - The power of market competitors - The power of competitive products
5.Marketing, Sales, Partners	<ul style="list-style-type: none"> - The utilization of sales, marketing and partner's channels - Key partners
6.Need for Investment Rounds	<ul style="list-style-type: none"> - The need for reinvestment and potential risks
7.Time Management for Idea Implementation	<ul style="list-style-type: none"> - The degree of readiness of the market to attract a product or service offered by the company - The time it takes to turn the idea into a commercial product
8.Laws and Regulations	<ul style="list-style-type: none"> - The complexity of the laws and regulations of the business sector and the difficulty of obtaining permits in that area

After analyzing the content of the interview, a researcher-made questionnaire in the Likert spectrum containing eight factors and components related to each of the factors identified as the result of the interview was arranged and made available to 60 members of the statistical population of the research. Of the 60 questionnaires distributed in hard copy and on the Internet, 54 cases were completed and sent to the researcher. Therefore, it can be said that the research questionnaire had a relatively high response rate (90%). The results of the sub-test run show that the Cronbach's alpha coefficient for the questionnaire

is approximately equal to 0.805. Considering that the value of this coefficient exceeds the target threshold of 0.7, it can be said that the questionnaire meets the required reliability.

After verifying the normalization of responses, one sample t-test was performed and the results were presented in the research appendix. Considering that in all factors and components, the empirical means are higher than the theoretical average (3), from the viewpoint of the research samples, the empirical impact of each of the factors and components on the value of petroleum startups are more than theoretical, so there is not enough evidence to reject the effect of these eight factors and their respective 20 factors. Friedman test has been used to ensure a significant difference between the identified factors. The null hypothesis in this test is set as the absence of a significant difference between the subject and the alternative hypothesis states that there is a significant difference between the factors of the subject. The results of Friedman test show that there is a significant difference between identified factors (see Annex).

In the next step, in order to weigh the factors by AHP method, after setting the matrix of decision options and the paired comparison of decision criteria (explanatory power and predictive power) of the hierarchical tree, the table 2 was drawn up. The hierarchical tree has eight choice options and two key criteria, namely explanatory power and predictive power, which first shows how each of the discovered revelations can explain the value of petroleum startups. The latter shows how much of these factors can measure the value of knowledge-based companies in the coming years. The first related to effectiveness, and the latter measures the rate of efficiency in determining the value underlying companies (Bewen, 2001).

Table 2: hierarchy tree for decision options

Effective factors on petroleum startup valuations							
Criterion 1: predictive power				Criterion 2: explanatory power			
F1	F2	F3	F4	F5	F6	F7	F8

At the first level, it can be seen that according to the final weights obtained for each of the decision criteria, from the perspective of the research samples, the explanatory power of factors is much more than the predictive power of and this is why the factor analysis section should pay particular attention to this criterion. In general, the results of determining final weights based on decision criteria are described in Table 3 for each decision option.

Based on the results, business team, size of the opportunity, marketing channels, sales, partners and competitive environment have the most explanatory power in the valuation of petroleum startups in Iran, and should be ahead of other factors such as product power, Intellectual property, time of the implementation of the idea, investment, and regulations. Since the weights associated with each of the factors are identified, we can describe the results and develop the final model using the exploratory and confirmatory factor analysis. For this purpose, KMO and Bartlett's tests must be performed to ensure that data are tailored to the factor analysis. The more this statistic interpret as the more appropriate the sample for performing factor analysis. In the Bartlett test, the relationship between the factors and variables is estimated by predicting the identify matrix (a matrix whose all its diagonal elements are one and its non-negative elements take zero). The results of KMO and Bartlett tests are presented in Table 4.

Table3: final weiths of descision options

Codes	Decision options	Final weights	Priority
F1	Business Team	0.3344	1
F2	Size of Opportunity	0.1905	2
F5	Marketing, Sales, Partners	0.1486	3
F4	Compettitive Environment	0.1098	4
F3	Product Power & Intellectual Properties	0.0700	5
F7	Time Management for Idea Implementation	0.0688	6
F6	Need for Investment Rounds	0.0512	7
F8	Laws and Regulations	0.0263	8
Total	1

Table 4: KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.881
Bartlett's Test of Sphericity	Approx. Chi-Square	2044.569
	df	53
	Sig.	.000

According to the table, the KMO test statistic is more than 0.69, and the zero hypothesis is rejected due to the fact that the significance level of the Bartlett test is less than 5%. Therefore, it can be said that the factors and variables (elements) are sufficient to perform the factor analysis. After ensuring that the use of factor analysis method is correct, the commonities between variables should be estimated. Table 5 shows the variables' commonities / differences with the factor inputs of the variables.

As shown in the table above, all the coefficients common values are higher than 50%, and as a result the factors and components have high ability in the explanation of the variance of the studied variable (startups value). Of course, it should be noted that some differences are also observed in this regard, because the coefficient is lower for some components.

To determine the final list of variables (factors) affecting the valuation of petroleum startups, through factor analysis, the specific values and variance corresponding to each of the variables should be calculated and judged as well as in Table 6. The variance explained is the cumulative percentage of total variance. The specific value of each factor is the ratio of the variance of all variables (factors) by which the factor is determined. The special amount is calculated through sum of squares of the factor loads associated with all the variables in, and its lower level stands for having lower effect on the explanation of the dependent variable, so it can be deleted from the model because it does not have the explanatory power. In the extraction sum of squared loading, determined variance is given to factors that have their special values greater than one. The rotation sum of squared loadings column also shows the set value of the extracted factors after the rotation. The third column of the table reveals the cumulative determination coefficient or the degree to which the cumulative explanatory power relates to the dependent variable (the value of the petroleum startups here). This column provides the main criterion for judgement.

As it can be seen, about 68% of the total change in the value of Iranian petroleum startups can be explained through the five factors that have the highest weights in the AHP ranking and these include business team, size of opportunity, marketing channels, sales and partners, competitive environment and product power and intellectual properties. The results indicate factors such as the proper timing of the idea, need for investment, and laws and regulations do not have adequate power to explain the value of petroleum startups. In order to ensure and assess the adequacy of the determination coefficients, the changes in the special values (value of startups) with respect to the factors are plotted with the scree plot arrangement in SPSS software to perceive the above-mentioned discussions, visually (Figure 2).

As in Figure 1, from the fifth factor the variabilities in the specific value of the dependent variable gradually become less and less; therefore, the five factors mentioned above can be identified as the most important factors affecting the value of petroleum startups. The final model identifies the factors and drivers that affect the valuation of underlying companies in LISREL software, as illustrated in Figure 3.

Table 5: The amount of initial commonities and commonities after extracting factors for the variables

	Initial	Extraction
TEM1	1.000	0.743
TEM2	1.000	0.645
TEM3	1.000	0.662
TEM4	1.000	0.865
TEM5	1.000	0.625
TEM6	1.000	0.741
OPSZE1	1.000	0.620
OPSZE2	1.000	0.885
PRPWINT1	1.000	0.658
PRPWINT2	1.000	0.745
PRPWINT3	1.000	0.926
PRPWINT4	1.000	0.897
COMEN1	1.000	0.758
COMEN2	1.000	0.902
MSPCH1	1.000	0.684
MSPCH2	1.000	0.748
INVSMT1	1.000	0.954
IDEA1	1.000	0.667
IDEA2	1.000	0.718
LAWRE	1.000	0.811

Extraction Method: Principal Component Analysis

Table 6: determination coefficients and special values for variables

Component	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.059	42.536	42.536	11.059	42.536	42.536	4.984	19.169	19.169
2	2.650	10.194	52.730	2.650	10.194	52.730	3.420	13.154	32.323
3	1.551	5.966	58.697	1.551	5.966	58.697	3.346	12.870	45.193
4	1.253	4.820	63.517	1.253	4.820	63.517	3.100	11.923	57.116
5	1.074	4.130	67.647	1.074	4.130	67.647	2.738	10.531	67.647
6	.952	3.661	71.308						
7	.809	3.110	74.419						
8	.740	2.848	77.266						

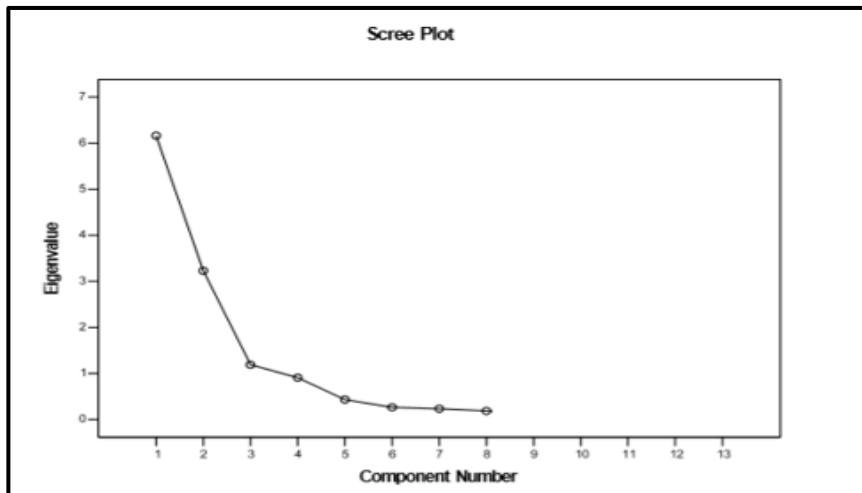


Figure 2: scree plot for determining the number of optimal factors

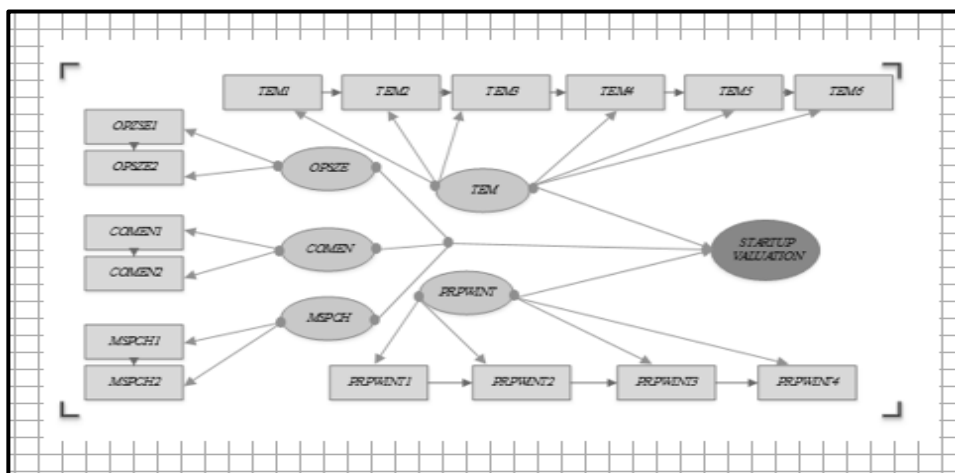


Figure 3: final model of the factors influencing the valuation of Iranian petroleum startups

5. Discussion and Conclusions

Startup financing is an important step towards realizing a knowledge-based economy, employment and increasing productivity. In this regard, the creation of common literature between the owners of the mind and the owners of the capital is considered as a stage in which the design of the valuation model of startups is also in this direction. The results showed that eight main drivers as well as 20 corresponding components can affect startup valuations in Iranian petroleum sector. Some of these drivers are the result of a review of the literature and the other achievements are environmental factors that were contributed through surveying study. The results obtained in this study are partially compatible with the McMillan et al. (1987), Mason & Harrison (1996), Feeney et al. (1999), Van Snaerrach (2000), Van and Robinson (2000), Sudek (2006), Hsu (2007), Maxwell et al. (2011), Payne (2011), and Borkeos (2016). What seems to be necessary to achieve a necessary idea, is the business team. A good team can turn a poor product or service into an attractive one for the market, and this is why investors believes that the investment is actually investment on team as the most important assets. The size of the opportunity, size of the market and the potential for income generation are another important indicator that affects the value of petroleum startups; because the value is directly related to the size of the market in which it operates and the market share. As much as a company is operating in a mass market with more market share, means more turnover and higher profits, resulting in high corporate value. In order to realize the important role of increased sales, material supply and sustainability, the participation of marketing channels, sales and strategic partners is another important driver that respondents also emphasized. The competitive environment, is important due the fact that rivals of the company have always been trying to gain more market share. Therefore, in order to comment on corporate value, the competition environment in which it operates must be entered into valuation models. The extent of the development and definition of the company's proposed product, as well as the intellectual properties, are another proponent. An idea, as long as it does not deal with the complexities of a product or service, is fraught with risk and the likelihood of failure, and little or no value will be generated. So the extent of product development as a diminutive of risk and increasing

value of the company is important from the investor's point of view. Investors consider need for capitals because when a startup needs investment, it means that the company's greater need for financing and is translated in more risks, since the company's failure to finance can lead to a complete closure. The complexity of the laws and regulations and the difficulty of obtaining the various permissions required is another impulse that can affect the value of a startup. Investors are less willing to invest on industries where licensing practices are subject to a lot of controversy and red tapes; which can lead to lower company valuation. Given the interdisciplinary and multi-dimensional nature of valuation process as well as the fact that intuition and valuation experience have a significant impact on valuation, it is imperative that officials and practitioners of the petroleum sector apply the results to weight the existing drivers and evaluate the performance of the model. Petroleum startups can also focus on the results from the start of the company's attention to the drivers that can affect the company's final value. Educational Institutions should develop training courses and curricula on investment literature of startups, financing methods, valuation process, the terms of the investment contract in startups, etc., to foster specialist human capitals in the petroleum industry financing, risk and investment. Lack of time and accuracy of respondents, unwillingness to answer and complete the questionnaire, permissiveness, fatigue, distraction, etc. are among limitations that might affect the results. Considering the above limitations, it is suggested to identify and introduce methods and mechanisms for the explanation of the propulsors identified in this study. To identify any changes in the important propulsion according to the industry's needs, it is suggested for future studies to take this research at a specified time interval in the coming years (three to five years).

References

- 1) Asali Storki, M., & Al-Badawi, A., (2015). Presentation of a model for the valuation of knowledge based companies in Iran in order to decide on investment. Master thesis, Tarbiat Modares University, Faculty of Industrial Engineering.
- 2) Beven, K. (2001). On explanatory depth and predictive power. *Hydrological Processes*, 15(15), 3069-3072.

- 3) Block JH, De Vries G, Schumann JH, Sandner P (2014) Trademarks and venture capital valuation. *J Bus Ventur* 29(4):525–542
- 4) Boatsman, J. R., & Baskin, E. F. (1981). Asset valuation with incomplete markets. *Accounting Review*, 38-53.
- 5) Brennan, M. J., & Schwartz, E. S. (1985). Evaluating natural resource investments. *Journal of business*, 135-157.
- 6) Cox, J. C., Ross, S. A., & Rubinstein, M. (1979). Option pricing: A simplified approach. *Journal of financial Economics*, 7(3), 229-263.
- 7) Cumming, D., & Dai, N. (2011). Fund size, limited attention and valuation of venture capital backed firms. *Journal of Empirical Finance*, 18(1), 2-15.
- 8) Damodaran, A. (2009). *The Dark Side of Valuation (paperback): Valuing Young, Distressed, and Complex Businesses*. Ft Press.
- 9) Damodaran, A. (2009). Valuing young, start-up and growth companies: estimation issues and valuation challenges.
- 10) Davila A, Foster G, Gupta M (2003) Venture capital financing and the growth of startup firms. *J Bus Ventur* 18(6):689–708
- 11) Davila A, Foster G (2005) Management accounting systems adoption decisions: evidence and performance implications from early-stage/startup companies. *Account Rev* 80(4):1039–1068
- 12) Davila A, Foster G, Jia N (2015) The valuation of management control systems in start-up companies: international field-based evidence. *Eur Account Rev* 24(2):207–239.
- 13) Engel, R. (2003). *Seed-Finanzierung wachstumsorientierter Unternehmensgründungen*. Verlag Wiss. und Praxis.
- 14) Feeney, L., Haines Jr, G. H., & Riding, A. L. (1999). Private investors' investment criteria: insights from qualitative data. *Venture Capital: An international journal of entrepreneurial finance*, 1(2), 121-145.
- 15) Fernández, F. L., Fernandez, P., & Fernández, P. (2002). Valuation methods and shareholder value creation. Academic Press.
- 16) Fernández, P. (2007). Company valuation methods. The most common errors in valuations. Research paper no, 449.
- 17) Gompers P, Lerner J (2000) Money chasing deals? the impact of fund inflows on private equity valuation. *J Financ Econ* 55(2):281–325.
- 18) Greenberg G (2013) Small Firms, big patents? estimating patent value using data on Israeli start-ups' financing rounds. *Eur Manag Rev* 10(4):183–196.
- 19) Heughebaert A, Manigart S (2012) Firm valuation in venture capital financing rounds: the role of investor bargaining power. *J Bus Financ Account* 39(3–4):500–530.
- 20) Hochberg, Y. V., Ljungqvist, A., & Lu, Y. (2010). Networking as a barrier to entry and the competitive supply of venture capital. *The Journal of Finance*, 65(3), 829-859.
- 21) Houlihan Valuation Advisors/VentureOne (1998) The pricing of successful venture capital-backed high-tech and life-sciences companies. *Bus Ventur* 13(5):333–351.
- 22) Hsu, D. H. (2007). Experienced entrepreneurial founders, organizational capital, and venture capital funding. *Research Policy*, 36(5), 722-741.
- 23) Hsu DH, Ziedonis RH (2013) Resources as dual sources of advantage: implications for valuing entrepreneurial-firm patents. *Strateg Manag J* 34(7):761–781.
- 24) Köhn, A. (2018). The determinants of startup valuation in the venture capital context: a systematic review and avenues for future research. *Management Review Quarterly*, 68(1), 3-36.
- 25) Kumar Bhaskaran, R., & K Sukumaran, S. (2016). An empirical study on the valuation of oil companies. *OPEC Energy Review*, 40(1), 91-108.
- 26) MacMillan, I. C., Zemann, L., & Subbanarasimha, P. N. (1987). Criteria distinguishing successful from unsuccessful ventures in the venture screening process. *Journal of business venturing*, 2(2), 123-137.
- 27) Mason, C. M., & Harrison, R. T. (1996). Informal venture capital: a study of the investment process, the post-investment experience and investment performance. *Entrepreneurship & Regional Development*, 8(2), 105-126.
- 28) Mason, C., & Stark, M. (2004). What do investors look for in a business plan? A comparison of the investment criteria of bankers, venture capitalists

- and business angels. *International small business journal*, 22(3), 227-248.
- 29) Maxwell, A. L., Jeffrey, S. A., & Lévesque, M. (2011). Business angel early stage decision making. *Journal of Business Venturing*, 26(2), 212-225.
- 30) Miloud T, Aspelund A, Cabrol M (2012) Startup valuation by venture capitalists: an empirical study. *Venture Cap* 14(2-3):151-174.
- 31) Nadafi, R., & Ahmadvand, M. (2016). Identify and Prioritize Promoters of Innovative Business Development (Startups) using Qi Methodology. *Journal of Entrepreneurship Development*, 10(3): 517-534.
- 32) Nicholson S, Danzon PM, McCullough J (2005) Biotech-pharmaceutical alliances as a signal of asset and firm quality. *J Bus* 78(4):1433-1464.
- 33) Qalibaf Asl, H., Rostami, M., & Ansari, H. (2006). Reviewing the common practice of valuing companies and introducing appropriate models. *Quarterly journal of financial research*, 9(2): 12-24.
- 34) Quirin, J. J., Berry, K. T., & O'Brien, D. (2000). A fundamental analysis approach to oil and gas firm valuation. *Journal of Business Finance & Accounting*, 27(7-8), 785-820.
- 35) Sudek, R. (2006). Angel investment criteria. *Journal of Small Business Strategy*, 17(2), 89-104.
- 36) Sievers S, Mokwa CF, Keienburg G (2013) The relevance of financial versus non-financial information for the valuation of venture capital-backed firms. *Eur Account Rev* 22(3):467-511.
- 37) Uzzi B (1996) The sources and consequences of embeddedness for the economic performance of organizations: the network effect. *Am Sociol Rev* 61(4):674-698.
- 38) Van Osnabrugge, M. (2000). A comparison of business angel and venture capitalist investment procedures: an agency theory-based analysis. *Venture Capital: An international journal of entrepreneurial finance*, 2(2), 91-109.
- 39) Van Osnabrugge, M., & Robinson, R. J. (2000). *Angel Investing: Matching Startup Funds with Startup Companies--The Guide for Entrepreneurs and Individual Investors*. John Wiley & Sons.
- 40) Wasserman N (2016) The throne vs. the kingdom: founder control and value creation in startups. *Strateg Manag J* 38:255-277

Note

ⁱ . For example, see the books named "venture capital, 2003" or "risk premium, 2014" and "Silicon Walley, 2015".