

The Research on Financing Efficiency from Chinese Equity Crowdfunding Platform: a DEA Approach

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Abstract: The financing problems become hot in nowadays social discussion. The climax of internet revolution prompted equity crowdfunding websites which are emerging to invest in the initial stage of innovation projects. This paper analyzes the high level of financing efficiency on 16 equity crowdfunding platforms (ECP). The DEA model was established to find out the financing efficiency level of ECP. It suggests how ECP promote management and supervision even legislation including a better way for innovation projects to fund.

1. Introduction

Small and micro businesses have been an important guarantee to solve the employment problems and create harmonious society which also is a strong power to push economic growth in China. But it is in a difficult situation with financial predicaments. In order to encourage the development of innovative small and micro businesses, Chinese government insists on the innovative development which is the key to 13th Five-Year Plan, including a series of preferential policy to support the development of innovative enterprises and tax reduction. Those measures transmit that Chinese government will plunk for developing innovative enterprises and making more preferential policies. However, a growing number of investors seek opportunities while a lot of companies need capital. Besides, the crush comes with that the regulatory ability of domestic authorities is hard to catch the pace of the increasing number of Internet-based financing institutions. A large number of investors decide to push their investment stage forward under Internet revolution. Thus, the ECP shows up which is a special institution to invest small innovative enterprises on the initial stage.

Crowdfunding is a business model which originates in the United States and sourced the concept of micro-finance and crowdsourcing[1]. As a new way to raise money, it pursues by more and more Internet platforms. There are many definitions of crowdfunding. Ethan Mollick (2013) defined crowdfunding as business model which entrepreneurial individuals or groups could use Internet rather than traditional financial intermediaries to attract investment in a large number of individual investors and obtain a return to equity or money [2]. Generally, crowdfunding is divided into four parts, including commodity-based, charity-based, peer-to-peer lending and equity-based [3]. Belleflamme (2011) proposed that financing like equity-based crowdfunding is easier to fund [4]. And Henrique (2012) believes that equity crowdfunding could completely replace the traditional financing and it will be a powerful instrument for small and micro business on the initial stage [5]. Therefore, it focuses on the equity crowdfunding on Interne-based, such as Angelist in America and

Angelcrunch in China.

From the financial innovation point of view, companies can finance through ECP rather than seeking venture capital or other traditional forms, which is a reasonable way to solve issues of innovative companies. ECP represents the direction and future trends of internet-based finances [6]. Factors theoretical model for equity crowdfunding projects financing performance Haichao Zheng (2015) discussed factors which could influence the financing efficiency of innovation projects. And it based on the signal transfer theory of uncertainty, investment risk, human resources [7]. As venture capital investors, Anja Hagedorn and Andreas Pinkwart analyzed seven stages of ECP and research the internal mechanism deeper by using the data of German equity crowdfunding industry[8]. Schwienbacher and Larralde (2010) considered small businesses will have more choice to fund and those traditional financial institutions may make compromise on financing costs because of the expansion of ECP [9]. Klöhn and Hornuf (2012) adopted a model from legal perspective to test ECP, and the market situation is complex and in chaos [10]. So far, some experimental unit emerged in Shenzhen and Hangzhou and it is a little for this industry. Equity-based crowdfunding is still at the edge of illegal fund-raising. The great difference between business survival and development makes such success stories of ECP harder to copy and imitate. A majority of ECP are taking rigorous measures, so it is troubling to obtain first-hand platform data. As to the financing efficiency evaluation, scholars mainly take methods like multiple-input and multiple-output to measure the financing efficiency of businesses in China. Data Envelopment Analysis mainly maintains input parameter or output parameter constantly through production troubles, and the relevant mathematical programming and statistical data obtained will be in favor of making relatively effective production. It needs to work out the level which deviates from the decision units and evaluate the value of relative effectiveness. This is the process that gives an evaluation to make better assess. DEA is good for the decision from the decision making unit point of view. It focuses on optimizing all the decision making units and points out adjusted direction on correlative index which fully considers the optimal input-output tasks and also reflects all information and features of evaluation object itself better. Cooper and Rhodes (1978) have pioneered the theory of measuring the efficiency decision-making units. Scholars can use this model to estimate a production department whether is scale efficiency or technology efficiency [11]. Scholars began to take deeper researches on DEA Evaluation and they published their researches on books and papers about DEA theory and DEA applications. Banker (1984) first proposed to estimate the returns to scale of DMUs by DEA.

In this article, it builds DEA model to analyze and evaluate financing efficiency of equity crowdfunding. Firstly, it needs to build financing efficiency evaluation model and combine relevant financial or non-financial data of 16 ECP. And choosing three input parameters and three output parameters is necessary to build DEA model to evaluate the efficiency. The software of DEAP2.1 was developed for testing financing efficiency, ECP is included. The occurrence of those platforms is helpful to understand the real condition about it. The suggestions to improve the financial efficiency and enhance the level of regulation are all based on empirical results.

2. Data and methods

2.1 Building the basic model of DEA

DEA usually regards DMU as institutions and organizations which are evaluated by this method. The original model of DEA was known as the CCR due to the calculation the value of $crste$ and $vrste$ for research object. There are 16 decision making units. While building the former for ECP to obtain the value of financing efficiency, it assumed that each decision making unit has the same inputs of three and uses $i = 1, 2, \dots, m$ to represent the DMU. As to the same outputs of three, it

represented by $r = 1, 2, \dots, s$. The item X_{ij} represents the i -th input of the j -th DMU. Y_{rj} is the r -th output of the j -th decision making unit. The inputs and outputs of decision making unit can be delegated by the following formulas (CCR):

$$v_d(\varepsilon) = \min \left[\theta - \varepsilon \left(\sum_{j=1}^m s^- + \sum_{j=1}^r s^+ \right) \right]$$

$$s.t. \begin{cases} \sum_{j=1}^n x_j \lambda_j + s^- = \theta x_0 \\ \sum_{j=1}^n y_j \lambda_j - s^+ = y_0 \\ \lambda_j \geq 0 \\ s^+ \geq 0, s^- \geq 0 \end{cases} \quad (1)$$

When the software shows that $E^* = 1$, $s^{*+} = 0$ and $s^{*-} = 0$, the decision making unit j_0 is in a DEA effective level while the operating activities simultaneously achieve an virtual value of crste and vrste, and the optimal value is reached. When the software shows that $E^* = 1$, but there is non-zero (> 0) number between s^{*+} and s^{*-} . The decision making unit j_0 is in a weak-effective level. When the software shows that $E^* < 1$, The decision making unit j_0 is in an invalid level.

2.2 Variables

According to the data of Electronic Commerce Research in China, it shows that the total crowdfunding platform in the world accounts for 889 in 2013 and increases by 38.7% compared with 2012. The growth rate of ECP is slightly ahead of the average. *Crowdfunding services industry 2014* considered that the growth rate of the number of Chinese ECP is annual at about 80% from 2011 to 2014. The equity crowdfunding is an emerging business which belongs to internet-based finance. It is in a rising trend, especially in 2014. The research statistic shows that the totaling projects serviced by 16 ECP account for 72756. There are successful 870 projects to be funded and raised 4 755.18 million yuan. Each project could obtain in the amount of 5.79 million yuan in an average level, which illustrates the low financing efficiency of ECP.

(1) Input parameters. i) Volumes. It refers to the total number of all successful projects in ECP. The most successful platform in China is angle crunch which has fund 309 projects for small micro businesses. As one of the most important ECP to finance, volume is also a symbol of the strength to the ECP in China. ii) The number of certified investors. It included those investors who are certified investors on these 16 platforms or supporters under unavailable information condition. The supporters just count for at least once behavior to be active. If the platform one person has many support behaviors in a relevant time and the statistics have showed repeatedly actions, it is all calculated to one person not counted by times. iii) The total number of projects. The total number of lining or lined projects on an ECP is to raise money for small and micro businesses. The successful financing rate can be figured out by the parameter.

(2) Output parameters. i) The option adjusted duration of financing. It refers to the projects get the successful financing from ling to be lined on a certain ECP. Some platforms regulate those projects of small and micro businesses which competes the foundation on a fixed time or get the enough venture capital within the limited time. Considering that there are some platforms may have difficult in financing on time and it could be seen as failure of fund. The option adjusted duration of angle crunch is 30 days. The fixed foundation is that platforms stop financing when the projects achieve the target to raise enough money. ii) The average cost of financing. It refers to one project

which funds on ECP for financing and needs to pay the service charge to the platform as financing cost. iii) Turnover. It is the average turnover of each project and the exactly amount of foundation of every successful project of small and micro businesses in platforms.

3. Results

3.1 Descriptive patterns

The sample standards divided into three parts, the amount of funding, certification by powerful authorities and the number of successful projects is included. To take a deep research on 16 relatively large ECP, it selects a long time span for the study which is from its foundation to the end of the first quarter of 2015. Due to the available and operable data, it chooses six indicators which are volume, the number of certified investors, the total number of projects, the option adjusted duration of financing, turnover and the average cost of financing. For facilitating the calculation, this paper made a standardization process on some data. The estimation results calculated by deap2.1 software concluded in Fig.1, Fig. 2, Fig. 3 (All data is in the end of 2015 May 10).

EFFICIENCY SUMMARY:				
firm	crste	vrste	scale	
1	1.000	1.000	1.000	-
2	0.032	0.039	0.815	drs
3	0.434	1.000	0.434	drs
4	1.000	1.000	1.000	-
5	1.000	1.000	1.000	-
6	0.917	1.000	0.917	drs
7	0.564	0.572	0.985	irs
8	0.209	0.366	0.572	irs
9	1.000	1.000	1.000	-
10	1.000	1.000	1.000	-
11	0.947	0.990	0.957	irs
12	0.299	0.315	0.950	drs
13	0.652	1.000	0.652	drs
14	1.000	1.000	1.000	-
15	1.000	1.000	1.000	-
16	1.000	1.000	1.000	-
mean	0.753	0.830	0.893	

SUMMARY OF OUTPUT SLACKS:			
firm output:	1	2	3
1	0.000	0.000	0.000
2	0.000	0.000	0.000
3	0.000	0.000	0.000
4	0.000	0.000	0.000
5	0.000	0.000	0.000
6	0.000	0.000	0.000
7	0.000	0.000	395.365
8	0.000	0.000	113.611
9	0.000	0.000	0.000
10	0.000	0.000	0.000
11	4.298	0.000	955.551
12	0.000	0.000	521.546
13	0.000	0.000	0.000
14	0.000	0.000	0.000
15	0.000	0.000	0.000
16	0.000	0.000	0.000
mean	0.269	0.000	124.130

SUMMARY OF INPUT SLACKS:			
firm input:	1	2	3
1	0.000	0.000	0.000
2	8.816	0.000	1375.171
3	0.000	0.000	0.000
4	0.000	0.000	0.000
5	0.000	0.000	0.000
6	0.000	0.000	0.000
7	6.491	0.000	0.000
8	0.000	0.000	112.404
9	0.000	0.000	0.000
10	0.000	0.000	0.000
11	15.174	0.000	0.000
12	0.000	780.100	0.000
13	0.000	0.000	0.000
14	0.000	0.000	0.000
15	0.000	0.000	0.000
16	0.000	0.000	0.000
mean	1.905	48.756	92.973

Fig.1 Results of efficiency Fig.2 Results of output slacks Fig.3 Results of input slacks

3.2 Summary statistics of output parameters

The statistics are commonality index for each platform. The relevant measurement results of 16 ECP are distributed in Table 3 through calculations by deap2.1 software:

	1	0.8-1	0.6-0.8	0.4-0.6	0.2-0.4	0-0.2
Crste	8	2	1	2	2	1
Vrste	11	1	0	1	2	1
Scale	8	5	1	2	0	0

4. Summary

4.1 Conclusion

Base on availability of the sample data, six indicators can be calculated to quantize the crste, vrste and scale efficiency of the ECP, mostly in the range between [0.6, 1], indicating that the platforms can partly ease the problem of enterprise financing. However, they are still in the early stages of development, of part of which the fairly low financing efficiency needs to be improving. Taken as a whole, ECP has smaller scale, fewer projects and narrower target mainly on high-tech company comparing with traditional financing approaches. It remains considerable room for their growth. For non-DEA efficient decision-making unit, there exist redundant inputs and insufficient outputs. In other words, there is still doubt at the authenticity of financing amount and whether the money will be use properly. The structure of crowdfunding platform remains imperfect, and its

management also need to be improve. Most platforms profit via commission of financing, which determines these platforms have a great incentive to help the project get fund, but ignoring both checking before and supervising after financing is easily to make investors suffered loss in this case.

4.2 Enlightenments

The imperfection of ECP is mainly reflected in mismanagement after financing. Relevant investing experiences, skill of assets management as well as willingness to support entrepreneurship are all required for social investor to make investment in the start-up of innovative enterprises. Investors seek maximum return, so do the enterprises. Their potential conflict exposes significant moral risk. As discussed above, better supervising system should ECP practice. As far as the current amount and developing level are concerned, about supervision on equity crowdfunding there are the following problems:

Firstly, in traditional financing institutions, a whole set of programs will be gone through to ensure investors reducing risk by such ways as carrying out due diligence investigation, publishing information disclosure rules or conducting audit on enterprises. However, on ECP, these programs was compressed drastically for various reasons, causing that investors can only rely on their own information channel and experience to make the risks and benefits judgments. Investors, moreover, own unfairly rights, that is, only to choose whether offering financing, comparing with their duties. Secondly, some entrepreneurs on platforms don't have good diathesis. Thirdly, social investors are lack of the ability to obtain relevant financial information about the risk and the identification to risk. The capability to make a price for risk is also extremely in deficiency.

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