

# Research on Influence Factors of Online Financing for Start-ups Based on "Non-financial Index" Credit Dimension

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**Abstract.** For the problem of small and micro enterprise credit evaluation and financing difficulties, this article takes the “non-financial index” dimension of corporate credit as the starting point to study the influencing factors of online financing for start-ups. Based on the 13 indicators disclosed by 547 start-ups projects in the field of shared economy/artificial intelligence and consumption upgrade in Beijing on the online financing platform, this paper conducted an empirical study on the influencing factors of online financing for start-ups. By means of factor analysis and binary logistic regression predicting models, it is found that the influence factors of corporate credit “non-financial indicators” for online financing of start-ups are the overall quality level of the founding team, the influence of the industry sector in which the entrepreneurial project is located, the disclosure of the basic information and the business model for start-ups. Among them, the overall quality level of the founding team has the greatest impact and each increase of one unit will increase the forecast success rate of financing results by 70.8%. The overall prediction accuracy of the model is 70.9%. These four factors can reflect the company's solvency and willingness to pay debts highlight the credit level of enterprises, thus affect the successful effect of online financing.

## Introduction

With the call for “mass entrepreneurship and innovation”, start-ups have sprung up since 2014, and the scale of their products and services output value is huge. Start-ups refer to enterprises that have just been founded and lack sufficient funds and resources [1]. They tend to be small and unsettled, and develop at a low speed. They often face the dilemma of “financing is difficult, financing is expensive” [2], especially in the case of external financing. The reason is closely related to the company's own credit.

Start-ups' credit cannot be accurately reflected because of their short development time, unregulated management, lack of a sound corporate financial system, and difficulty in disclosing more complete financial data [3]. They cannot obtain the trust and loans of financial institutions such as traditional commercial banks. It is necessary to guide the development of microfinance institutions. The establishment and improvement of the credit system, credit file and credit guarantee system of small and micro enterprises are also very important [4]. At the same time, the development of mobile Internet, big data and cloud computing technology has alleviated this problem to some extent. The rise of the Internet financing platform is in full swing, breaking the boundaries of traditional bank financing and lending, and greatly filling the gap in the supply space of the online lending market of start-ups. It can fully discover the credit value of the start-ups through real data resources and technological advantages, accurately reflect its credit level, and to some extent solve the problem of information asymmetry and incentive incompatibility of risk management in start-ups financing [5,6]. However, research on what factors on the online financing platform can reflect the level of corporate credit and thus affect the success of financing is not deep.

Combining the growth environment of start-ups and the development characteristics of Internet online financing platform, this paper empirically analyzes the influence factors of online financing of start-ups from the perspective of non-financial index of corporate credit. By summarizing the

specific quantitative mathematical model, it provides practical reference and index reference for the online financing model and process of domestic start-ups, and also provides theoretical supplement for the research of corporate credit non-financial index.

### **Start-ups Credit Theory Review and Hypotheses**

The status quo and development of China's commercial credit is not only closely related to the industry and scale characteristics, but also closely related to the profitability and growth of the company, and is also constrained by the external credit environment [7]. To improve small and micro start-ups' problems like weak culture of enterprises, difficulty in credit collection and the imperfect credit service system, credit information sharing mechanism should be rapidly improved [8]. Four financing innovation modes of internet finance and small and micro enterprises should be established [9]. The model of credit risk evaluation of lending enterprises, which is based on data mining technology, should be constructed and tested [10]. In the past three years, the overall credit level of start-ups in China has risen steadily, and their growth and compliance capabilities have gradually improved. However, the selection of credit rating indicators for start-ups can be described as a hundred flowers, and there is no unified standard and conclusion. The early scholars mainly evaluated corporate credit from four aspects: financial status, development ability, basic quality and innovative ability. With the continuous deepening of research, indicators such as macro environment, industry status, business owner quality and compliance status were also incorporated [11, 12]. However, this paper argues that it is too scattered and lacks an internal logic support. The credit indicators can be summarized and classified according to the theoretical support of credit definition [13] and credit connotation [14], combined with the general characteristics of China's start-ups and the status quo of credit development.

Corporate credit is mainly reflected in solvency and willingness to pay debts, but there are both financial and non-financial index in terms of specific forms of expression. If the characteristics of the two types of indicators can be fully combined, then the relevant factors affecting the online financing credit of enterprises can be effectively evaluated and the overall evaluation of corporate credit tends to be real [15]. This paper will focus on the "non-financial index" of the credit evaluation of online financing for start-ups. "Non-financial index" are closely related to the production and operation activities of enterprises. They can reflect the key factors affecting the formulation and implementation of business strategies [16], and then reflect the overall credit level.

Therefore, this paper comprehensively considers current situation of the development of various online financing platforms, links accuracy and integrity of information disclosure of non-financial index such as business environment, capability and entrepreneurship team, in order to explore the main influencing factors of online financing of start-ups. This study proposes following hypotheses:

Hypothesis 1: The overall quality level of the founding team has a positive impact on the successful results of online financing for start-ups.

Hypothesis 2: The degree of disclosure of basic information has a positive effect on the successful results of online financing for start-ups.

Hypothesis 3: The degree of business model disclosure has a positive impact on the successful results of online financing for startups.

Hypothesis 4: The impact of the industry in which the entrepreneurial projects is has a positive impact on the results of online financing for start-ups.

### **Methods**

#### **Sample and Data**

According to the survey, the network access flow of the 36Kr start-ups project docking platform is ranked high. Compared with other Internet financing platforms such as Yiren Loan and Rong 360, it is more focused on entrepreneurial services, with more financing data, and performs well in the dimensions of credit non-financial index such as business environment, operational capability and

entrepreneurial team. Therefore, the platform was selected as an empirical research platform. Based on the dimension of credit non-financial index, a large amount of data was collected from 645 Beijing samples on the platform. Through the repetitive screening of the original samples and the cleaning of missing data items, 547 complete data remained after pre-processing, including 183 shared economic, 182 artificial intelligence and 182 consumption upgrade fields.

### Measures

This research designs variable combining with 11 representative online financing impact factors on the platform. The variable definition is shown in

Table 1: Each data contains 13 variables, among which the “Y, Y1” variable belongs to the dependent variable, which is used to express the financing result of the start-ups in the 36Kr platform. The other variables are independent variables, which mainly reflect some influence factors disclosed by the online financing of start-ups.

Table 1, Variable definition table

Variable name	Definition
Start-ups online financing results(Y)	0:Financing failure, 1:Financing success
Start-ups success financing round(Y1)	1: Angel Round, 2: Pre-A Round, 3: A or A+ Round, 4: B Round, 5: C Round, 6: D Round, 7: E Round and Enterprise Listed
The industry in which start-ups are located(X1)	1:"Sharing economy", 2:"artificial intelligence", 3:"Consumption upgrade"
Start-ups business model disclosure details(X2)	1: vague, 2: more vague, 3: clearer, 4: clear
Whether the start-ups disclose the business registration information(X3)	0:Undisclosed, 1:Disclosed
Is there an introduction to the founding team information(X4)	1:Yes, 0:No
Founding team disclosure details(X5)	1:1 person, 2:2 people and above
Is there information on the founder position(X6)	1:Yes, 0:No
Is there an introduction to the founder's degree(X7)	1:Yes, 0:No
Does the founder have relevant industry experience(X8)	1:Yes, 0:No
Start-ups establishment period(X9)	1:1 year, 2:2 year, 3:3 year, 4:4 year and above
Start-ups registered capital (thousands) (X10)	1:5000 or less, 2:5000 to 10000, 3:10000 to 15000, 4:15000 or more
Whether the number of employees in start-ups is disclosed(X11)	0:Undisclosed, 1:Disclosed

### A logistic Model and Empirical Analysis

#### *Normal Distribution and Significant Difference Test of Indicator Data*

Through the one-sample K-S test, the adjoint probability P of all variables is much less than 0.05, indicating that the sample population does not satisfy the normal distribution. Therefore, in the test of the significant difference in the indicator data, the non-parametric test should be used. The Wilcoxon signed rank method was used to test the significant difference of each indicator variable. The results are shown in Table 2.

Table 2, Test statistics

Variable	K-S Z	Asymp. Sig. (2-tailed)	Variable	K-S Z	Asymp. Sig. (2-tailed)
X1	-1.982	0.048	X7	-4.126	0.000
X2	-2.173	0.030	X8	-4.309	0.000
X3	-1.219	0.223	X9	-3.104	0.002
X4	-5.240	0.000	X10	-0.731	0.046
X5	-6.050	0.000	X11	-9.365	0.000
X6	-5.372	0.000			

The indicator variables that have significant differences at a given 10% level are: X1-X11 (except X3), so the X3 is excluded. That is to say, the “Whether the start-ups disclose the business registration information” indicator is excluded, and the other 10 indicators are applied in the model and further analyzed.

### ***Factor Analysis of Indicators***

From the KMO and Bartlett's Test of Sphericity output, the KMO value is 0.695, and the Bartlett Sphericity test statistic observation value is 2987, the corresponding probability p is much smaller than the significance level  $\alpha=0.01$ . So it is suitable for factor analysis. The above 10 indicators were reduced and simplified by factor analysis, and then four independent and meaningful common factors were obtained. See Table 3.

Table 3, Rotated component matrix

	Component			
	1	2	3	4
X4	.876	-.236	.230	-.245
X6	.874	-.230	.228	-.252
X5	.864	.010	.020	-.043
X8	.668	.328	-.182	.245
X7	.545	.217	-.330	.293
X2	.255	.649	-.209	-.165
X9	-.135	.304	.719	.173
X11	.144	.407	.517	.454
X10	-.183	.258	.350	-.605
X1	.109	-.679	.216	.344

Among the four common factors, F1 mainly explains whether there is team information introduction, team size, founder's position information, industry experience and academic qualifications, which comprehensively reflects the overall quality of the founding team. F2 mainly explains the disclosure details of the business model of the start-ups, and shows the market and profitability of the enterprise products. F3 mainly explains whether the establishment time, registered capital and number of employees of the start-ups are disclosed. This factor shows the basic information of the enterprise. F4 mainly explains the status of the industry in which the start-up is located and reflects the influence of the industry environment.

After the extraction of 4 common factors, the regenerative commonality occurs. There are two variables with a common degree of 0.9 or higher, and five variables with a common degree of 0.6-0.9, indicating that the information loss of each indicator is relatively small. The effect is ideal. At the same time, the contribution rate of the common factor reaches 69.04%, which basically contains and can describe all the indicators well. So that further analysis with binary logistic regression can be carried out.

After the rotation, according to the factor score coefficient matrix, the scores of the four common factors can be further calculated. The score expressions are:

$$F_1 = 0.049X_1 + 0.001X_2 + 0.402X_4 + 0.259X_5 + 0.402X_6 - 0.037X_7 + 0.030X_8 + 0.019X_9 + 0.184X_{10} - 0.048X_{11} \quad (1)$$

$$F_2 = 0.110X_1 + 0.063X_2 - 0.168X_4 + 0.083X_5 - 0.171X_6 + 0.440X_7 + 0.373X_8 - 0.158X_9 - 0.576X_{10} + 0.173X_{11} \quad (2)$$

$$F_3 = -0.580X_1 + 0.501X_2 - 0.061X_4 + 0.047X_5 - 0.054X_6 + 0.098X_7 + 0.156X_8 - 0.045X_9 + 0.315X_{10} - 0.044X_{11} \quad (3)$$

$$F_4 = 0.083X_1 - 0.007X_2 - 0.026X_4 + 0.004X_5 - 0.029X_6 - 0.010X_7 + 0.095X_8 + 0.616X_9 + 0.032X_{10} + 0.645X_{11} \quad (4)$$

### *Empirical Analysis of Binary Logistic Regression*

The explained variables in this paper are binominal, which are classified into financing success and financing failure. The success probability of online financing of start-ups can be predicted by logistic regression model. Assuming that the dependent variable Y obeys the binomial distribution, the value is 1 or 0, 1 indicates that the financing is successful, and 0 indicates the financing failure: the probability of successful financing is  $P(Y=1)$ . The standardized online financing results of start-ups are taken as dependent variable; the four common factors obtained by factor analysis are used as independent variables, and then perform the binary logistic regression analysis. After performing the logistic regression step, the variance analysis table (Table 4) and the regression equation coefficient table (Table 5) are obtained.

Table 4, Model summary

Step 1	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
	616.571 <sup>a</sup>	.198	.267

The F-test statistic of the model coefficient comprehensive test table has a P value smaller than 0.001, indicating that the logistic regression equation is highly significant. The pseudo-R square is 0.198 and 0.267 respectively. These two indicators reflect the extent to which the independent variables of the current model explain the variation of the dependent variable from different angles.

Table 5, Variables in the equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 <sup>a</sup>	F1	.708	.106	44.668	1	.000	2.030
	F2	.290	.099	8.666	1	.003	1.337
	F3	.605	.101	36.021	1	.000	1.831
	F4	.490	.101	23.546	1	.000	1.632
	Constant	.467	.099	22.191	1	.000	1.595

In the significance test of the regression coefficient, the significant probabilities of the common factors are all less than 0.05, indicating that these four common factors have great impact on the online financing of start-ups. The common factor regression coefficient symbols are all positive, indicating that they are all positive effects. Therefore, online financing of start-ups can refer to the regression results to improve the team's comprehensive ability and promote the financing development of entrepreneurial projects. Combined with Table 5, a logistic regression equation for online financing of start-ups is obtained:

$$\log\left(\frac{P}{1-P}\right) = 0.708 * F_1 + 0.29 * F_2 + 0.605 * F_3 + 0.49 * F_4 + 0.467 \quad (5)$$

This is online financing success rate:

$$P(Y = 1) = \frac{\exp(0.708 * F_1 + 0.29 * F_2 + 0.605 * F_3 + 0.49 * F_4 + 0.467)}{1 + \exp(0.708 * F_1 + 0.29 * F_2 + 0.605 * F_3 + 0.49 * F_4 + 0.467)} \quad (6)$$

After logistic regression analysis, the overall accuracy of the prediction model for online financing of start-ups reached 70.9% (see Table 6), which achieves a good prediction effect. The probability of occurrence of the first type of error, the start-ups that have not obtained financing are judged as successful financing enterprises, is about 43.6%; the probability of occurrence of the second type of error, the start-ups that has realized financing is judged as the financing failure enterprise, is about 19.3%.

Table 6, Classification table

	Observed		Predicted		
			Y		Percentage Correct
			Financing failure	Financing success	
Step 1	Y	Financing success	124	96	56.4
		Financing failure	63	264	80.7
		Overall Percentage			70.9
a. The cut value is .500					

## Summary

### Results

Based on factor analysis and binary logistic regression, the following conclusions can be drawn:

There are four main factors that affect the online financing of start-ups: the overall quality level of the founding team, the disclosure degree of the enterprise's basic information, the disclosure degree of the business model and the influence of the industry in which the enterprise is located. When other factors remain unchanged, raising the overall quality level of the founding team by one unit will lead to a 70.8% increase in the success rate of the financing results prediction, followed by the degree of disclosure of the basic information of the start-ups, which is 60.5%. The second is the impact of the start-up industry, 49.0%; the last is the degree of disclosure of the business model, 29.0%.

1. The overall quality of the founding team has a positive impact on the successful results of online funding for start-ups. Hypothesis 1 was thus supported. The higher the overall quality of the founding team has, such as team education, driving force, industry experience; the successful rate of financing will be greatly improved.

2. The extent to which start-ups' basic information is disclosed has a positive effect on the successful results of their online financing. Therefore, hypothesis 2 was supported. The more comprehensive and detailed the basic information disclosure, the higher the successful rate of online financing reaches.

3. The extent to which the business model is disclosed has a positive effect on the successful results of online financing for start-ups. Thus hypothesis 3 was supported. The more detailed the business model disclosure, such as the company's revenue, profit and cash flow, the higher the successful rate of online financing for start-ups have.

4. Industry impact has a positive impact on the results of online financing for start-ups. Thus hypothesis 4 was supported.

Above characteristic factors reveal the solvency and willingness of the start-ups to repay debts through the dimension of "non-financial index" of the credit, highlight the credit level of the



enterprise and then influence the successful effect of online financing. The prediction model based on logistic regression for successful results of online financing of start-ups has certain practical value for its overall prediction accuracy is 70.9%.

### **Discussion**

With the rise of credit mainstream awareness in China, it is believed that the impact of corporate credit on online financing of start-ups will become more and more important.

From the perspective of external environment: in the early stage of start-up development, the main business field determines the future survival and expansion space of the enterprise. The industry related business environment and policy advantages help to improve the overall credit level, and affect directly whether the enterprise can be favored by the capital in order to achieve markedly development. Therefore, the national government should give full play to coordination and initiative, promote the establishment of credit information sharing platform for start-ups and try to maintain and protect a commercial environment of credit evaluation, credit cultivation and credit supervision. Internet financing platform should constantly strengthen the credit awareness, continuously explore the use of credit scenarios, and try to further innovate Internet online financing products and credit services on the basis of credit records and credit reports.

From the perspective of the enterprise itself: a high quality and high credit team is the premise of the survival and development of the enterprise, which is conducive to the successful realization of online financing. The information disclosure of start-ups business model is directly related to whether the product and service are recognized by the market and whether the profit can be transformed. Enterprises with outstanding business models can enhance their own attractiveness, enhance the capital market's cognition of corporate credit and obtain capital more smoothly. Therefore, start-ups should lead by example, standardize the status of credit management, strive to improve their own enterprise credit rating, shape and improve the value of enterprise credit from non-financial dimensions like the overall quality of the founding team, business model and so on.

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