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A Study on the Influencing Factors of Network-lending Platform Collapse:

A Sample from Hubei Province

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Abstract: This paper studies the factors of network lending platform collapse. By collecting data and SPSS data analysis, this paper built a logistic regression model, verified the main factors influencing the network-lending platform collapse, and found out that all these elements including on-line time, term of loan, whether the platform has advanced the money, whether there are financing security companies to guarantee, as well as the management team's academic background, had some influence on the collapse of the platform. This has positive significance for investors to identify the network-lending platform.

Keywords: Lending platform, Influencing factors of platform collapse, Online-lending, P2P lending

1. INTRODUCTION

P2P lending, the short form for peer-to-peer lending, refers to an individual-to-individual credit and the lenders lend their money to the borrowers through online third party platform. It is one of the six major Internet financial models, including crowd funding, and third party payments. It has the advantages of low barriers and considerable yields. The lenders can invest their own spare cash and get higher yields than bank deposit interests. Due to no restrictions on the funding size, the lenders of P2P lending reached the wider population, such as students, working-class, small and micro enterprises and so on. For the borrowers, they can raise the funds in a short time period without being restricted to the strict requirements of borrowing from banks. Although P2P lending does have the advantage that traditional finance doesn't have, it faces greater risks, such as the risk of borrower default, the risk of platform collapse or making off with money, the legal risk and so on.

P2P lending has grown up abroad since 2005. In 2007 China established the first domestic P2P lending platform-PPDAI. Beginning in 2012, there is a sharp increase domestic P2P lending platforms, but starting from 2013, a large number of domestic P2P lending platforms problems has arisen. From the data of the home of network loan, the total number of the P2P lending platforms has reached 4029 by the end of April 2016, but the total number of crushing platforms has also reached 1598. The main type of problem platform is cash difficulties, making off with money and closing business, and these problem platforms generally cannot run for more than one year. What are the factors that cause these P2P lending platforms problems? The underlying reasons behind this deserve our analysis. From the literature at home and abroad, there are relatively few papers about the impacting factors of P2P lending platform collapse at home and abroad. Most of them are about the analysis of platform risks, and the research on the lenders' and borrowers' behaviors.

With Hubei Province as an example, this paper collected the monthly Hubei province lending platform data from May 2015 to April 2016, and analyzed the factors that may affect the platform running. A quantitative research method was used to test the influence of these factors on Hubei province network lending platform, and this paper tried to supplement and perfect the research from different viewpoints based on existing researches. In addition, the research results of this paper will be instructive to the operation of Hubei's network lending platform. Through the control and improvement of factors affecting the operation of the platform, it tends to

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develop better in the future. For people who want to engage in network lending business, during the process of building the platform, they should put their energy and resources on the factors that might affect future operation, and reduce the investment on the non-influencing factors, which not only to a certain extent reduces the cost, but also greatly lowers the possibility of platform collapse.

2. LITERATURE REVIEW

Within the latest years, a growing amount of research effort has been focused on P2P online lending. The operation model of P2P online lending has attracted many attentions. Ashta et al. (2009) divide online P2P lending platforms into commercial and non-commercial two types, based on the types and the approachs adopted by the platforms [1]. Tan et al. (2014) compare and analyze the typical operating model of domestic P2P lending industry from five aspects: the total turnover, net yield, lending popularity, borrowing popularity, superposition effect, and found that each of them has advantages and disadvantages [2]. Shi et al. (2015) claim that China's P2P lending has four main modes: pure online, online and offline guarantees, unsecured online and offline, and the transfer of credit [3].

Here are some studies on network lending platform risk. Miu (2014) believes that the main risks of P2P lending are credit risk and legal supervision risk [4]. Wang (2014) and Shen (2014) analyze the credit risk, and put forward some strategies and suggestions [5]. Gong et al. (2015) believe that there is credit risk, supervising risk, operational risk, technical risk and legal risk on P2P lending [6]. Pan (2015) believes that the four risks of credit risk, operational risk, technical risk and policy risk on P2P lending platform are nested and integrated [7]. Li et al. (2016) describe the P2P lending platforms and their associated risks by analyzing a dataset on failed and nonfailed P2P companies and the result indicates that an increase in the registered capital brings a decrease in the hazard ratio, while an increase in the interest rate results in an increase in the hazard ratio [8].

There are researches on risk evaluation index of P2P lending platform. Zhang (2015) sorts out the possibility of the risks on P2P lending platform, and considers credit risk and technology risk the biggest possibility, internal management risk, market risk and cooperation risk as the second biggest possibility and disorderly competition risk, reputation risk and legal risk the lowest possibility [9]. Byanjankar A et al. (2015) propose a credit scoring model through artificial neural networks in classifying peer-to-peer loan applications into default and non- default groups. Their research indicates that the neural network- based credit scoring model performs effectively in screening default applications [10]. Malekipirbazari M et al. (2015) propose a random forest (RF) based classification method for predicting borrower status. The results indicate that the RF-based method outperforms the FICO credit scores as well as LC grades in identification of good borrowers baesd on data from the popular social lending platform Lending Club [11].

Also, there are studies on factors affecting the operation of network lending platform. He (2014) believes that besides certain risks, China's network lending platform are also facing the problems of fraud or self-finance and cash difficulties and platform collapse [12].

From the researches at home and abroad, domestic and foreign scholars did relatively few researchers on the P2P lending platform. Most researches are about the loan success factors, borrower and lender behaviors and platform risk while in-depth studies on factors affecting the platform collapse are rare.

3. AN EMPIRICAL ANALYSIS OF THE FACTORS AFFECTING HUBEI NETWORK LENDING PLATFORM COLLAPSE

3.1 Preliminary analysis and processing of selected sample data

This paper mainly studies the influencing factors affecting network lending platform operation in Hubei

Province. The platform management is a dynamic process, and in order to better find out various influencing factors in the process of operation, this paper collected the network lending platform data in Hubei province from June 2015 to April 2016. From the home of the network-lending platform, there are a total of 123 platforms in Hubei province, but 54 of them have collapsed, with most platforms having problems before June 2015. Some of the platform websites cannot be found and data cannot be collected neither, so finally we collected only 87 platform data in Hubei province. The data are mainly from the home of network lending, network lending eye and network lending platform. There is a total of 2697 data, with some of the data being data itself, some being conversed via certain processing methods and 17 of them being missing data which cannot be found anywhere. Among them, 3 groups of missing data were eliminated, and the remaining 84 groups of data was analyzed via SPSS software.

3.2 Selection of influencing factors of platform collapse in Hubei

3.2.1   All possible influencing factors

30 possible influencing factors were initially selected, and data for these factors were also collected. These influencing factors come from literature research, and the general research on data collection is based on credit rating theory, upper echelon theory and asymmetric information theory. Here is a brief description of these possible factors.

The first are the platform credit factors. Credit rating theory put forward a series of credit rating factors, including capital and guarantees. Combined with the domestic P2P lending platform model, the registered capital, the company size, platform security mode and whether to join the third party credit agencies in the process of business can all be the influencing factors affecting the operation of the platform.

The second are the factors that may cause borrowers default, such as the borrowing interest rate and the term of borrowing. Some scholars have come to relevant conclusions. Therefore, the average annual yield rate on platform and return term and range are also the possible factors affecting the operation of the platform.

The third are the management team's demographic information factors, such as management team's age, education, gender, work experience, educational background, team size, personnel turnover, etc.

The fourth are the user experience factors, such as whether to support the transfer of debt, the speed of cashing, and whether to have smartphone APP. Currently there are no scholars doing researchers on such factors.

The fifth are other possible factors on the platform, such as bid security mode. We found out that, during the process of the platform analysis many platforms will deliver a commitment that will guarantee both the principal and the return and 100% guarantee both the principal and the return, which can attract lenders to come to bid on the platform. However, if the platform does not have good financial security, it may face significant risks. There are some other factors, such as whether the platform supports automated bidding, platform online time, whether Guarantee Corporation or VC companies involved in the partners and whether cooperation partners are exchanging.

3.2.2   Correlation analysis among factors

Due to the many possible influencing factors, we cannot guarantee that no correlation exists among all the factors. Also, in order to simplify the following work, in the selection of variables we first did the simple correlation analysis of these factors using SPSS software, excluding the variables having strong correlation and variables having weak correlation with the dependent variables, the personnel transfer (strong correlation with team size) and VIP guaranteed principal and return, guaranteed principal and return (associated with security mode), automatic bidding, partner transfer, whether they have a Security Company (associated with financing Security Companies), whether or not they have joined the third party credit agencies or Escrow Company, etc. Finally, the remaining factors are registered capital, company size, on-line time, average annual yield, term and

range, team size, gender, education, platform, security mode of platform series, and user experience. It is not complete to judge if the platform has used user funds deposit or loan loss provision deposit from the information on the platform. We cannot truly know if the platform has used funds deposit but doesn't build a pool of funds, so this paper doesn't choose it as a variable.

3.3 Selection of variables

3.3.1   Explained variables

Because this paper studies the influencing factors affecting the network lending platform collapse in Hubei Province, so the explained variable is the platform operation, and the platform operation is divided into two kinds: normal operation and problems arising. In this paper, the normal operating platform has the value of 0, and the problem platform has the value of 1. The problem platform refers to making off with money, closing business or cashing difficulty.

3.3.2   Explanatory variable

(1) Registered capital (ZB): the registered capital can reflect the financial strength of the platform to a certain extent. The stronger the financial strength is, the lower the possibility of financial risk is. The registered capital of this paper refers to the actual capital paid by the network-lending platform. Because the value of the registered capital is large, the logarithm is taken in the process of data processing.

(2) The size of the company (GM): the company size can reflect the platform extensions, and the bigger platform may require more manpower and material resources in the process of platform operation. The logarithm is also taken in the process of data processing.

(3) Online time (Date): the earlier the online time is, the more accumulation of business experience the company has, the better the business platform may be. But if the platform goes online all at a certain period of time, the competition among the platforms will be more intense. We cannot directly compare the online time of the platform. The online time in this paper is substituted by and the number of days from the time on the platform to May 1, 2016.The logarithm is used here.

(4) The average annual rate of return (SYL): the higher the loan interest rate, the greater the possibility of the borrower's overdue repayment or no repayment is. Without the third party security companies, if only the platform is to advance, then the platform will face greater financial risk. The SYL here is the average annual return around the year.

(5) Term and range (QX): under the situation of longer term and range, although the borrower with better credits is willing to repay the loan, but if the borrower has a financial problem, he won't be able to repay. Therefore, the longer the term and range are, the greater the possibility that the borrower will default on the loan is. While the shorter the term and range is, the borrower may be lending from the platform due to lack of ability to do short-term repayment, and may be lending. The term and range set on the platform has a certain impact on the operation of the platform. The term and range here refers to the longest term set on the network-lending platform.

(6) Platform security mode: a platform with a third party guarantee, not only can transfer part of the risk of operation, but also increase the investor's confidence in the platform in the case of asymmetric information. From the analysis of platform security, it is mainly the platform to advance and the financing and non-financing security companies, small loan companies, the risk reserve and shareholder wealth and some other security modes to do it. The security modes are divided into 6 categories. The platforms can use either one category or multiple ones, and there is no linear constraint between them.

B1= platform advances or not, "yes" is 1 and "no" is 0;

B2= a non-financing security company is involved or not, "yes" is 1 and "no" is 0;

B3= a financing security company is involved or not, "yes" is 1 and "no" is 0;

B4= a small loan company for security is involved or not, "yes" is 1 and "no" is 0;

B5= other means for security is involved or not, "yes" is 1 and "no" is 0;

B6= a risk reserve is involved or not, "yes" is 1 and "no" is 0.

(7) User experience: This is an index with new definition in this paper, mainly from three aspects to measure the registered user experience on the P2P network lending platform: the speed of transfer of debt, the speed of cashing out, and whether a mobile phone APP is used. From the collected data, the Hubei province network lending platform debt can be transferred for shorter periods, and most of them are ready to transfer at any time, with some being transferred in one month, so the debt transfer factor won't be divided into specific term and range.

D1= whether the debt can be transferred, "yes" is 1 and "no" is 0;

D2= whether you can cash out in a day, "yes" is 1 and "no" is 0;

D3= whether a cell phone APP is used, "yes" is 1 and "no" is 0.

(8) Management team quality: just like the top echelon theory introduced in the previous chapter, the demographic background information of top-level managers will have some impact on the company's business performance. Here the management team refers to the company's management team members shown on the network-lending platform. Because a lot of the information disclosed by the company cannot be obtained, such as the age of the management team, and the years of their working experience. Therefore, this paper chooses most information that can be obtained from the company, such as gender, educational background and team size. We used average value for gender and educational background.

E1= average value for gender, 1 for male managers, and 0 for female managers;

E2= average value for education level, 1 for all levels that the platform did not disclose and below the undergraduate level, 2 for undergraduate level, 3 for graduate level, 4 for doctorate level;

E3= team size, the number of team members.

As shown in Table 1 below, the table contains the explained variables and explanatory variables selected in this paper, as well as their variable symbols, and methods of data processing. In this paper, eight kinds of influencing factors and 17 explanatory variables are selected. In order to facilitate the analysis, we did some data processing to their values.

Table1. The explained variables and explanatory variables

names of variables		variable symbols	value
platform operation		y	the normal operating platform has the value of 0, and the problem platform has the value of 1
registered capital		ZB	Ln(ZB)
company size		GM	Ln(GM)
online time		Date	Ln(Date)
average annual yield		SYL	numerical value
term and range		QX	numerical value
security modes	platform advances or not	B1	"yes" is 1 and "no" is 0
	a non-financing security company is involved or not	B2	"yes" is 1 and "no" is 0
	a financing security company is involved or not	B3	"yes" is 1 and "no" is 0
	a small loan company for security is involved or not	B4	"yes" is 1 and "no" is 0

	other means for security is involved or not	B5	"yes" is 1 and "no" is 0
	a risk reserve is involved or not	B6	"yes" is 1 and "no" is 0
User experience	whether the debt can be transferred	D1	"yes" is 1 and "no" is 0
	whether you can cash out in a day	D2	"yes" is 1 and "no" is 0
	whether a cell phone APP is used	D3	"yes" is 1 and "no" is 0
Management team quality	gender	E1	1 for male managers, and 0 for female managers, then average value
	education level	E2	1 for all levels that the platform did not disclose and below the undergraduate level, 2 for undergraduate level, 3 for graduate level, 4 for doctorate level; then average value
	team size	E3	numerical value

3.4 Establishment of logistic regression model

Since the dependent variable is Bivariate with the value of 0 or 1, the general multiple linear regression model is not applicable. This paper uses a binary logistic regression model.

Y is a variable of type 0-1, X_1、X_2、X_3 …… are the determined variables correlated with Y variable, and the observed data for m is...... Y_m has the value of 0 or 1, so the logistic regression model is:

$$E(y) = P(y = 1) = p = \frac{1}{1 + e^{-g(x)}} \tag{1}$$

among $g(x) = \beta_0 + \sum \beta_j X_j$, $j = 1, 2, 3....m$; $\beta_1, \beta_2 ..., \beta_m$ are unknown coefficients of an independent variable. $\tag{2}$

The maximum likelihood method is used to estimate the parameters, and then the probability of an observed value is:

$$P(y_i) = p_i^{y_i} (1 - p_i)^{1 - y_i}, i = 1, 2, 3, ... n; y_i = 1 \text{ or } 0 \tag{3}$$

So the probability of the observed values is the y_i likelihood function:

$$L = \prod_{i=1}^{n} p_i^{y_i} (1 - p_i)^{1 - y_i} \tag{4}$$

After the logarithm of the likelihood function is used, we obtained:

$$\ln L = \prod_{i=1}^{n} \left[y_i \ln \left(\frac{p_i}{1 - p_i} \right) + \ln (1 - p_i) \right] = \prod_{i=1}^{n} \left[y_i \left(\beta_0 + \sum \beta_j X_{ij} \right) - \ln \left(1 + e^{\beta_0 + \sum \beta_j X_{ij}} \right) \right] \tag{5}$$

Likelihood estimation is carried out to obtain the parameter estimate.

3.5 Regression analysis and test

3.5.1 Regression analysis

With SPSS regression analysis, we selected dependent variables and all independent variables. Due to many selected variables, we cannot complete the analysis for only one step, so we chose the backward mode (Wald), the probability of explanatory variable is 0.05, and the probability of deleting is 0.1. The critical value of the explained variable's classification is 0.5. That is to say, the platform with the probability less than 0.5 is the normal operating platform, and the one with the probability larger than 0.5 is the problem platform. A total of 13 steps were taken through backward filtering of variables, with each step removing one of the least significant variables, as follows:

(1) We excluded the least significant variables at the first step. That is, at the first step, the significant level of B4 is 0.999, indicating that whether a small loan company is involved basically does not affect the operation of the network-lending platform.

(2) We excluded the least significant variables in the screening results at the second step, that is, the significant level of E1 is 0.993 in the second step result. The significant level of this variable is far greater than 0.05, indicating the gender of the management team, one of the demographic backgrounds, has little impact on the operation of the network-lending platform.

(3) We excluded the least significant variable in the screening results at the third step, that is, the significant level of B2 is 0.964 in the third step result. The significance level of this variable is far greater than 0.05, indicating whether the non-financing security company is involved has little impact on the operation of the network-lending platform.

(4) We excluded the D1 variable with a significant level of 0.902, indicating whether the support of debt transfer in the user experience does not affect the operation of the platform.

(5) We excluded the D2 variable with a significant level of 0.808, indicating that whether you can cash out in a day in the user experience will not affect the operation of the platform.

(6) We excluded the D3 variable with the significant level of 0.604, but in the process of analysis, did not combine the term and range variable, whether the mobile phone APP in the user experience has a significant impact on the operation of the platform, so we cannot determine if this factor has influence on the operation of the platform.

(7) We excluded the variables: the average annual yield, company size, team size, whether other security ways are involved, whether there is a risk reserve, and the registered capital, and the last remaining variables were the five variables with a significant level less than 0.05: Ln (Date), QX, B1, B3, E2.

3.5.2 Correlation analysis among variables

Table 2 is the correlation matrix of the above constants and coefficients. It can be seen from the table that Ln (Date) has the highest correlation with constants, because Ln (Date) is a numeric variable, and E2 has the lowest correlation with constants. The correlation among online time, term and range, platform to advance, financing Security Company to guarantee, and team education level is very weak, indicating that there is no collinearity among selected variables.

Table2. Correlation matrix

	constants	Ln(Date)	QX	B1	B3	E2
Constants	1.000					
Ln(Date)	-.955	1.000				
QX	.272	-.443	1.000			
B1	.124	-.260	.360	1.000		
B3	.275	-.433	.426	.437	1.000	
E2	-.073	-.182	.198	.229	.324	1.000

3.5.3 Line of best fit of logistic model

(1) Line of Best Fit Statistics

In practical problems, the classification table is usually used to reflect the line of best fit of the logical model. As it can be seen from table 3, the correct rate of y=0 prediction is 98.3%, and the accuracy rate of y=1 prediction is 50%. Therefore, the accuracy of the prediction for all cases is 89%. The accuracy of predicting the collapse of the platform is only 50%, which is possibly affected by data limitation. By the end of April 2016, in Hubei Province, a total of 54 platforms have collapsed, with most making off with money. After the collapse of the platform, we cannot open webpage of the platform so that we cannot collect all the data. We can only collect 16 platforms data. We also removed one platform with much missing data in the analysis process, and then only

15 platforms data were collected eventually.

   (2) The R square of Cox and Snell and the R square of Nagelkerke

The R square of Cox and Snell imitate the square interpretation linear model of R used in the linear regression model. The difference lies in that, it explains the logistic regression model based on the likelihood value, and its value is generally less than 1. While the R square of Nagelkerke is the adjustment of the R square of Cox and Snell, with the value between 0 and 1. The R square value of this model Nagelkerke is 0.467.

Table3. Classification table

steps	observed value		predicted value		
			operations		percentage
			0	1	
step 13	operations	0	58	1	98.3
		1	7	7	50.0
	overall percentage				89.0

3.5.4 Residual analysis

The residual analysis of the predicted results showed two outliers: 11 and 15. Their student residuals were greater than 2, and the residual value of the observation value of 11 was 16.218, which was obviously abnormal. In the residual analysis, the outliers in the explanatory variables can be detected via leverage and Cook distance, and the one with the Cook distance greater than 1 is an outlier. In the SPSS output table, both the Cook distance values of the two cases are far greater than 1, indicating that the two cases are the outliers in the explanatory variables and we can eliminate these two outliers, and then conduct another regression analysis.

3.5.5 Regression analysis results after excluding outliers

After we excluded outliers, the line of best fit of the model was greatly enhanced. As shown in Table 4, the accuracy of y=0 prediction reached 95.6%, the accuracy of y=1 prediction reached 64.3%, and the overall accuracy of prediction reached 90.2%. As shown in Table 5, the R square value of Nagelkerke is 0.635. From these two indexes, it can be shown that this model is significant and effective for the prediction of the operation of the platform.

Table 6 is the result of the final regression analysis. It can be seen from the table that the five variables and constants have passed the test of significant value 0.05. The third column of the table gives the coefficients of constants and variables.

The resulting logistic regression model is:

$$P(y_i = 1) = -20.565 + 5.052 * \ln(Date) - 0.412 * QX - 4.194 * B1 - 4.134 * B3 - 4.318 * E2$$

Table4. Classification table a

steps	observed value		predicted value		
			operations		percentage
			0	1	
steps 1	operations	0	65	3	95.6
		1	5	9	64.3
	overall percentage				90.2

a. .500   critical value .500

Table5.   Model summary

Steps	-2 logarithm likelihood	Cox & Snell R Square	Nagelkerke R Square
1	35.699^a	.380	.635

a. It is estimated to be terminated at the stack code 8, because the change of parameter estimation is less than.001.

Table6.   Variables in an equation

Steps	Variables	B	S.E.	Wald	df	p-value	Exp(B)
	Ln(Date)	5.052	1.743	8.400	1	.004	156.328
	QX	-.412	.169	5.928	1	.015	.662
	B1	-4.194	1.463	8.218	1	.004	.015
Step 1^a	B3	-4.134	1.472	7.894	1	.005	.016
	E2	-4.318	1.470	8.624	1	.003	.013
	Constant	-20.565	9.079	5.130	1	.024	.000

a.The variable entered on step 1：Ln(Date)、QX、B1、B3、E2。

4.   RESEARCH RESULT ANALYSIS

(1) Online time. From the results of empirical analysis, we can see that, the platform online time and the collapse of the platform have a significant positive correlation, which can explain that the collapsed platform is usually the earlier online platform. Due to the imperfect legal system and platform supervision system, and the immature platform credit evaluation system, the platform set up earlier sometimes were cheating and lying, and most of the collapsed platforms ended up with making off with money. On the other hand, some problems exist in Hubei province network-lending platform during the development process. Because the long-term development needs strong financial support, while most of the network-lending platforms in Hubei Province are private, with fewer platforms being statwned or venture capital background supported. Therefore, it is easy to encounter financial risks in the process of development. The later collapsed platforms are subject to cash difficulties or closed business.

(2) Term and range. The term and range have certain impact on the normal operation of the network-lending platform, but the impact is not significant. The shorter the term is, the more prone to problems the platform operations are. The shorter the term is, the stronger the mobility of the funds and the higher the demand for funds on the platform will be. On the other hand, lenders may be more willing to lend for a shorter period, but it may occur that in the short term the platform defaults and make off with money. For the borrowers, in the short term, they may not be able to raise funds for repayment. Then, there is a possibility of lending money, and the borrower is more prone to moral risk.

(3) Security mode. In all the platform security modes, the platform to advance and the financing security company to guarantee has the most significant impact on the platform operation. With these two modes, there is a smaller risk for the operation of the platform.

(4) Management team quality. The academic background of management team members is significantly related to the operation of the platform. The platforms with higher education level of management team are less likely to collapse. This conclusion shows that, in the process of network-lending platform, human factors cannot be ignored, and the quality of employees can influence the development of the platform to a certain extent.

(5) Other factors analysis. Before we introduce the term and range, whether the cell phone APP in the user experience was used has a significant impact on the platform's operation, but after the introduction of term and

range, the user experience does not have a significant impact on the operation of the platform. Whether the user experience has a significant impact on platform management can be further studied in the later stage. While other factors, such as the registered capital, the company size, the average annual rate of return, other types of security modes, the gender in the management team, and the team size have no effect on the platform operation.

In summary, online time, term and range, platform to advance or not, financing security company to guarantee or not and the educational background of the management team have certain impact on the network-lending platform in Hubei Province. It is not clear that whether a mobile phone APP is used in the user experience has some impact on the operation of the platform. while the registered capital, the company size, the average annual rate of return, other types of security modes, the gender in the management team, the team size, the transfer of debt, and the speed of cashing out have no effect on the platform operation.

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