# Research on the Efficiency of China's P2P Network Lending Platform

## Jie ZHENG[1,a,*], Li-Yan WANG[1]

[1]School of Business, Guilin University of Electronic Technology, Guilin 541004, China

[a]zhengjie1123@126.com

**Abstract.** Efficiency is an important manifestation of corporate competitiveness and sustainable development capabilities. In this paper, the efficiency of the sample platform from the Internet financial registration disclosure service platform is calculated and analyzed using the super-efficient SBM model that considers undesired outputs, and found that most of the platforms are in an inefficient state. Among them, the background platform of state-owned assets is relatively high, followed by the private and venture capital background platform. The background of listed companies is relatively low. In terms of geographical distribution, the level of platform efficiency in developed eastern regions is higher than in other regions. Through regression analysis, we found that the operating time, annualized interest rate, average investment period and efficiency are positively correlated. This study has certain implications for the industry to achieve efficient development.

## Introduction

P2P network lending has rapidly developed in China, according to statistics from P2PEYE in June 2017, the number of P2P network lending platforms in China reached 4979, the monthly turnover was as much as 221.77 billion yuan, but there were 3209 problem platforms, far exceeding the number of 1770 normal operating platforms. The emergence of a large number of problem platforms not only causes losses to minority investors who are not high in risk tolerance, but also makes the entire industry face a reputational crisis, which is extremely unfavorable for the future development of P2P network lending.

Aside from the platform established for the purpose of financial fraud, most of the remaining issues have caused the platform to continue to operate due to poor management. However, the efficiency of the platform is an important indicator for evaluating the management level. At present, researches on the risk and efficiency of P2P network lending are mostly based on the individual trader's perspective, focusing on multiple transaction data based on a single platform to study borrower risk or loan success rate. Herzenstein et al. used the transaction data of "Prosper" as a research sample and found that the borrower's credit, personal information, etc. had a significant positive correlation with the success rate of borrowing [1]. In subsequent studies, it further pointed out that voluntary disclosure information can improve the success rate of loans for borrowers while borrowing at a lower interest rate obtained [2]. Ravina from the point of view of the borrower's physical characteristics found that people with relatively superior appearance were more likely to obtain loans under the same conditions, but the effect of difference in appearance on loan default rate was not significant, which is consistent with Duarte et al. found that borrowers with trustworthy looks agree with higher credit scores, relatively easier access to borrowing, and lower rates of default [3, 4]. As the P2P network lending model enters China and the scale of the online loan market is growing. Chinese scholars have begun to study various phenomena in the domestic P2P network lending market in light of China's specific scenarios. In the background of imperfect credit system in China, taking the data of the first P2P network lending platform-Paipai Lending-as an example, Xiao-Ni WEN and Xiao-Juan WU found that the increase in interest rate is negatively correlated with the loan success rate [5]. This is contrary to the existing research conclusions. The main reason for this result is that different platforms have different mechanisms for the borrower's borrowing quota and interest rate setting.

However, when China's P2P network lending platform problems occur frequently, it is far from

enough to focus only on the risk of the borrower or the success rate of borrowing. When investors make investment decisions, the first thing they face is how to choose a safe and reliable platform. Borrowers are concerned that the selected network lending platform can meet their own capital needs better and faster. The risk control level of high-efficiency network lending platform is often higher, and the possibility of problems on inefficient platforms is higher [6]. Based on this, this paper will use the Data Envelopment Analysis (DEA) method to explore the efficiency status of several representative P2P network lending platforms in China.

## Method of Efficiency Measurement

In the present study, the frontier efficiency analysis method is more often used in the method of measuring the efficiency of the relevant organizations in the financial industry. Specific can be divided into two types of parameter methods and non-parametric methods, the difference lies in whether to assume the production function mathematical expressions and parameters in the estimated production function. The parametric methods mainly include Stochastic Frontier Approach (SFA), Distribution Free Approach (DFA), and Thick Frontier Analysis (TFA). The non-parametric methods mainly include Date Envelopment Analysis (DEA) and Free Disposal Hull (FDH) methods. Non-parametric methods represented by DEA do not need to presume mathematical expressions between input and output, but rely on sample data to evaluate the relative relativity of production units. This is easier to use and better handles multi-input and multi-output issues than parametric methods.

Currently, there are relatively few studies on the efficiency of P2P network lending platforms. In the past two years, only a few articles focused on the issue, which shows that the efficiency of the P2P network lending platform has gradually attracted the attention of more scholars. Ju BAI and Zuo-Ming HUANG used the input-oriented DEA method to measure the P2P network lending platform with different equity backgrounds. The results showed that the operating efficiency of the private and venture capital platforms was higher, followed by the listing department, and the state-owned capital department, banking department were relatively low [7]. Xian-Ling LI et al. estimated the efficiency of 207 sample platforms based on the three-phase DEA model. The results showed that the overall efficiency of the platform in the eastern region was higher than that in the central and western regions. This difference was due to the significant difference in pure technical efficiency [8].

## Study Design

### Source of Sample Data

In August 2017, the China Banking Regulatory Commission issued the "Guideline for Disclosure of Business Information on Internet Lending Information Intermediary Organizations." However, from the current perspective, the overall information disclosure status is not optimistic. Based on the research purpose and availability of key data, the research data in this paper comes from the internet financial registration disclosure service platform established by China Internet Finance Association. As of November 30, there were 113 P2P network lending platforms had access to the internet financial registration disclosure service platform. The platform information disclosed on September 30, 2017 was used as a cut-off point, excluding platforms that did not disclose overdue information and other key information. The remaining 32 platforms are the samples for this study.

### Input and Output Indicators

The current DEA method for efficiency measurement focuses on the selection of evaluation indicators. Reasonable selection of input and output indicators is directly related to the accuracy of efficiency evaluation. The existing methods for selecting evaluation indicators include "production method" and "mediation method." The evaluation unit is regarded as a producer of products or services under the production method. This method is often used for traditional financial institutions such as microfinance companies and commercial banks that for the purpose of providing interest on

deposits and loans, it needs to intervene itself in the transaction process. Regardless of whether the P2P network lending platform defines its role from the perspective of laws and regulations or academia, the platform is only used as an information intermediary to match the transactions between the lender and the borrower. It does not involve itself deeply in fund transactions and only charges the borrower or investors for service fees which is the main source of profit for the platform. The input and output indicators and data sources are detailed in Table 1.

Table 1. Details of input and output indicators

| Index Type | Index Name | Index Code | Data Sources |
|---|---|---|---|
| Input Indicators | Paid-In Capital | PC | Paid-in capital column |
| | Period Expenses | PE | Add the operating expenses, management expenses and financial expenses in the audited financial statements |
| | Number of Employees | NE | Number of employees in the organization column |
| Output Indicators | Total Transaction Amount | TTA | Total amount of transactions column |
| | Per Capita Cumulative Investment | PCCI | Divide the total transaction by total number of investors |
| | Reciprocal Rate of Overdue Amount | RROA | Overdue rate of the amount is obtained after the reciprocal |

This article is guided by the idea of mediation method. In terms of input indicators, according to western economics, labor, land, and capital are usually the basic production factors. Based on the information mediating attributes of the P2P network lending platform, this paper considers the labor force, initial capital, and operating costs are the main inputs of the platform. Among them, the labor input is based on the number of employees. There are great differences in the input of human resources between the platforms of different operating modes. For example, platforms that combine online and offline operations often require more labor input than pure online platforms, because in this model, a large number of employees are required to complete the work of linking the borrower's borrowing needs and reviewing credit information offline. The initial capital investment this article uses the existing research results to select paid-in capital as the input indicator. In the daily operation cost of the platform, the period expenses which including operating expenses, management expenses and financial expenses listed on the income statement audited by the certified public accountants are selected as input indicators. In terms of output indicators, this paper considers that from the perspective of the borrower, the P2P network lending platform should aim to meet the borrowing needs and provide the borrower with a stable source of funds. Therefore, the per capita cumulative investment is selected as one of the output indicators. This indicator can also reflect the ability of the P2P network lending platform to attract investors to invest in the platform for long-term investment. From the perspective of investors, under the background of the continuous progress of the interest rate liberalization process, the P2P network lending platform helps investors to obtain investment returns while ensuring the safety of investors' funds. It is an important goal to control platform risks at a reasonable level. Selecting the overdue amount, which can directly reflect the risk control level of the platform, is one of the output indicators. However, considering that this index is undesired output, this paper uses the mainstream method that converts undesired output into expected output, taking the reciprocal rate of overdue amount as one of output indicators. At the same time, the P2P online lending platform's main revenue comes from the fees charged by the lenders when they provide lending services. The amount of income is directly related to the amount of each transaction, and the total transaction amount can also reflect the market share and competition of the P2P lending platform. Therefore, this article selects the total transaction amount as one of the output indicators.

**Model Selection**

Data Envelopment Analysis (DEA) was started in 1978 by A. Charnes and W. W. Cooper et al. It is widely used in many fields to evaluate the relative effectiveness of the same type of departments or units with multiple inputs and multiple outputs. These evaluated departments or units are called Decision Making Unit (DMU). The essence of the DEA method is to use a mathematical planning model to construct "production frontier" based on the observed data of each DMU, and to see if the DMU is DEA effective by observing whether the DMU is located on the "production frontier."

The CCR model is the earliest and most basic DEA model, which is based on the assumption of constant returns to scale. Later, Banker et al. created the BCC model on the basis of the CCR model, which relaxes the assumption that the CCR model has constant returns to scale, and makes the BCC model more widely applicable based on the assumption of variable returns [9]. On this basis, Tone et al. proposed the Slack Based Measure (SBM) model based on slack variables. This paper will use non-oriented SBM model that take into account undesired outputs to overcome the slackness of input-output in the traditional model and to better address the efficiency calculations that include undesired outputs to obtain more accurate results.

**Empirical Analysis**

In this paper, the data is processed and analyzed by DEA-Solver software. Due to the significant differences in the scale of P2P network lending platform, efficiency values under variable returns to scale (VRS) conditions are more reflective of problems outside of scale factors, so this paper focuses on the results under VRS. After running, obtain the efficiency values of each sample under VRS conditions based on the non-oriented SBM model. The result is shown in Table 2.

Table 2. Rank and score of DMUs

| Rank | DMU | Score | Rank | DMU | Score |
|---|---|---|---|---|---|
| 1 | JinBank | 3.5242 | 17 | PP100 | 0.1367 |
| 2 | Yidai | 1.6679 | 18 | QIANNIUNIU | 0.1168 |
| 3 | HONGLING | 1.6153 | 19 | Hepai Online | 0.0703 |
| 4 | LIDIAN | 1.4706 | 20 | XYB100 | 0.0380 |
| 5 | TONGBANJIE | 1.4227 | 21 | SOUYIDAI | 0.0344 |
| 6 | LUp2p | 1.4174 | 22 | NIWODAI | 0.0336 |
| 7 | GZdai | 1.4052 | 23 | 51QIANBA | 0.0274 |
| 8 | HELLOAN | 1.2193 | 24 | JYLH | 0.0219 |
| 9 | DEZHONG | 1.1310 | 25 | PPmoney | 0.0157 |
| 10 | CreditEase | 1.0875 | 26 | TOUNA | 0.0143 |
| 11 | DaiNiWin | 1.0271 | 27 | XINXINDAI | 0.0142 |
| 12 | BJD | 1.0078 | 28 | VJINKE | 0.0139 |
| 13 | EBeBoo | 0.9997 | 29 | WEIDAI | 0.0085 |
| 14 | JIMUBox | 0.5585 | 30 | XIAONIU88 | 0.0080 |
| 15 | yyFAX | 0.1705 | 31 | ZPXINFU | 0.0030 |
| 16 | 5aitou | 0.1369 | 32 | DIANRONG | 0.0016 |

Among all the samples, there were 12 platforms that achieved DEA efficiency, the effective platform accounted for 37.5%, and the average efficiency of the sample platform was 0.6381. By using the platform efficiency value as an explanatory variable, other possible influencing factors are explanatory variables, and establish a regression model. The results show that there is a positive correlation between operating time, annualized interest rate, average investment period and efficiency, which is basically consistent with the existing research results. We also found that there are only 15 profit platforms, accounting for 46.88% of the total number of sample platforms, indicating that most of the platforms at this stage are still in a loss situation, which will affect the

ability of the platform to continue operations, and adversely affect the sustainable development of the industry.

In the background of sample platform equity distribution, the number of private background platforms reached 15, which is the largest number of the four kinds of platform background, which is consistent with the current situation of the largest proportion of private equity background platforms in China's P2P network lending platform. It can be seen from Fig. 1 that the average efficiency level of the platform with State-owned assets is the highest (0.7882), followed by the private background (0.6648), the VC background (0.5966), and the platform with the listing background is the lowest (0.5966). According to further analysis, the fact that the paid-in capital of the state-owned assets platform and the per capita cumulative investment amount index are close to the frontier are the main reasons for the higher average efficiency level. This may be related to the well-funded state-owned enterprises, natural endorsements of the government, and the ability to attract investors to invest relatively more money in their platforms. Moreover, the average investment term of the state-owned assets investment platform is also the longest, which allows the borrower to obtain a more stable source of funds. The private background platform is more reasonable in human capital investment, which may be related to the stricter cost control of private enterprises.
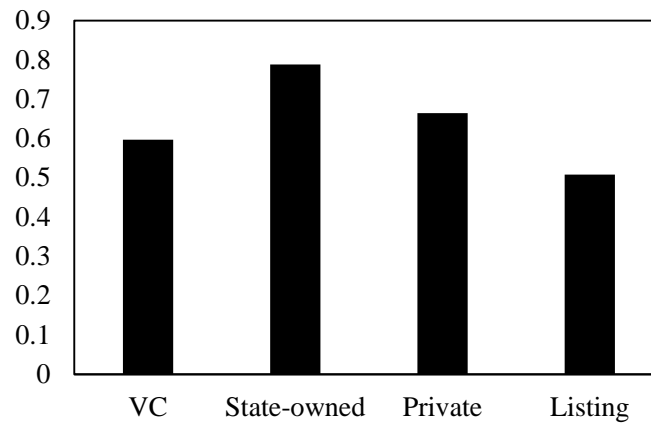


Fig. 1. Average of platform efficiency for different backgrounds

In terms of geographical distribution of the sample platform, there are 9 platforms in the economically advanced provinces and cities of eastern China that have reached DEA efficiency, accounting for 75% of the DEA effective platforms. Further, we found that the average of the reciprocal overdue rate of platforms in developed provinces and cities (6.4476) is significantly higher than that of other regional platforms (1.3455) in achieving DEA efficiency platforms. This may be related to the soundness of the financial infrastructure and regulatory environment in these more economically developed regions.

## Conclusion

In this paper, the empirical analysis results show that the overall operating efficiency of the sample platform is not high, and most of the platforms are in an inefficient state. Through regression analysis, we found that the operating time, annualized interest rate, average investment period and efficiency of the sample platform are positively correlated. This means that platforms with longer operating hours tend to have higher operational efficiency, which is related to the operational experience accumulated by the platform through long-term operations. At the same time, higher interest rates can attract more investors, and improve platform efficiency by increasing the per capita cumulative investment and trading volume, but excessively high interest rates do not improve platform efficiency. This phenomenon can be explained by the empirical results of Liao LI et al. in the context of non-complete marketization can partially reflect the default risk of borrowings, and investors can interpret different debt default risks identified by the borrower's public information

[10]. The longer average investment period can reflect the trust of investors on the platform on the one hand, and on the other hand it is conducive to providing borrowers with stable capital, attracting popularity and increasing trading volume. Further, through the analysis of the sample platforms with different equity backgrounds, the average efficiency of the state-owned assets background platform is higher than that of other background platforms because the initial capital investment and the average investment period are closer to the production frontier. In terms of geographical distribution, the operating efficiency of platforms located in the economically developed regions in the east is relatively higher, and the overdue rate is lower, which may be related to the improvement of local financial infrastructure construction and the regulatory environment.

Based on the above empirical analysis recommendations: Firstly, improve the platform's own operations and risk prevention capabilities. Using cloud computing and big data to collect and mine information, strengthen risk information identification and non-performing loan collection capabilities. Secondly, the external environment is one of the key factors affecting the efficiency of the Internet financial platform. Local government support and related supporting systems will have a profound impact on the development of the Internet financial platform. In addition, the regional economy, financial environment and information infrastructure are also the material basis for the operation of the Internet financial platform.

## Acknowledgement

## References

[1] Herzenstein, M., R. Andrews, U. Dholakia, and E. Lyandres, The Democratization of Personal Consumer Loans? Determinants of Success in Online Peer-to-peer Lending Communities. SSRN Working Paper, 2008.

[2] Herzenstein, M., S. Sonenshein, and U. M. Dholakia, Tell Me a Good Story and I May Lend You My Money: The Role of Narratives in Peer-to-peer Lending Communities, SSRN Working Paper, 2011.

[3] Ravina, E., The Effect of Beauty and Personal Characteristics in Credit Markets, Working Paper, Columbia University, 2008.

[4] Duarte, J., S. Siegel, and L. Young, Trust and Credit: The Role of Appearance in Peer-to-peer Lending, J. Review of Financial Studies, 5 (2012) 2455-2484.

[5] Xiao-Ni WEN, Xiao-Juan WU, An Analysis of the Factors to Influence Successful Borrowing Rate in P2P Network Lending: A Case Study of the Paipai Lending, J. Finance Forum, 3 (2014) 3-8.

[6] Wei-Hua SU, Jing-Yu WANG and Jian-He LIU, The Efficiency Valuation of the P2P Online Lending Platforms in Zhejiang Province: Based on DEA Method, J. Zhejiang Finance, 4 (2016) 17-22.

[7] Ju BAI, Zuo-Ming HUANG, A Study on Operational Efficiency of Different Types of P2P Network Lending Platform Based on DEA Method, J. Journal of Nanjing Audit University, 3 (2016) 89-97.

[8] Xian-Ling LI, Yan WANG and Hai-Yuan KANG, Study on the Efficiency of Online Lending Platforms Based on Non-oriental SBM-DEA Model, J. Journal of Financial Development Research, 6 (2017) 12-19.

[9] Banker R. D., Charnes A., Cooper W. W., Some Models for Estimating Technical and Scale

Inefficiencies in Data Envelopment Analysis, J. Management Science, 30 (1984) 1078-1092.

[10] Li LIAO, Meng-Ran LI and Zheng-Wei WANG, The Intelligent Investor: Not-Fully-Marketized Interest Rate and Risk Identify—Evidence from P2P Lending, J. Economic Research Journal, 7 (2014) 125-137.