

# Multidimensional Research on Credit Risk of P2P Network Credit based on Big Data

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**Abstract:** The most research of the P2P network loan and lending industry mainly focused on the risk with qualitative analysis and factors method. However, the problems and the measures would be diverse in different regions and P2P network credit platform environment. There were 1357 P2P network credit platform which was more active in china; the trading volume of P2P network loan and lending reached 147 billion Yuan, which had already been the largest P2P loan and lending trading market in the world. Selected the Guangdong P2P network loan and lending company in China as the research object, through detailed data investigation on the credit risk of Guangdong P2P company in china, analyzed the background, current situation and existing problems of Guangdong P2P network loan and lending company, carried out the modeling and analysis on the basis of the theory of asymmetric information, big data and the information economics theory of data mining analysis. The supervision system model of P2P network credit had been established from risk prevention perspective, and its implement shown that the risk supervision system model of P2P network credit had reference value for the risk management of regional P2P platform.

**Keywords:** Big data, credit risk management, P2P network credit.

## 1. INTRODUCTION

The P2P network loan and lending was born in 2005 in the United Kingdom. Banker, Mohamed Yunus, studied the Grameen Bank and its research on microfinance had formed the ancestor of the modern P2P network credit. Founded the way to deal with the negative influence caused by credit risk of network loan and lending, had become a core problem in the research of micro finance field [1]. It was easy to produce adverse selection and moral risk in the asymmetric information environment and induce network credit market crisis. The tool of the Internet, such as blogs, twitter, personal communication, chat and other Internet technology could remedy the defect of the information asymmetry; the borrower's social networks could also reduce P2P network credit risk [2]. The large part study of P2P net loan were focused on risk of P2P net credit analysis, prevention and supervision. P2P network lending was a new financial service pattern based on the Internet, essentially a small private lending which is useful complement to the existing banking system [3]. And that the Chinese P2P net loan industry faced the problem that personal credit system was not mature lacked relevant laws, regulations and industry self-discipline. It should use the Internet to improve the transparency of information and set up the mechanism of risk diversification, while the government should play the role of guidance and supervision. The research on P2P net loan and lending mainly focus on network lending behaviour, influence

factors and feature analysis. The most research on P2P net credit risk was stayed at the surface level, through factors affecting qualitative analysis P2P net credit risk to put forward the risk management policy recommendations. In P2P net credit industry, risk management was a hot research issue. In China, P2P net credit risk management technology was relatively backward, far from being able to meet P2P net credit transaction participant requirements on the credit transaction security, and it had important practical significance to research the risk management of P2P net credit industry. Therefore, this paper selected P2P net credit company in Guangdong province as the research object to study the characteristics of P2P network credit industry and risk management problems, and put forward relevant prevention measures.

## 2. THE P2P NETWORK CREDIT AND THE RELATED SUPPORT THEORY

The P2P network loan and lending was that the lender and the borrower directly signed loan contract and understood of identity information and credit information, timely informed lender and borrower repayment schedule. And then lenders could evaluate the creditworthiness of borrowers in many aspects to make a selection. Good credit borrowers would have priority to meet and get more preferential interest rates. Lenders would distribute funds to multiple borrower objects, at the same time, loan amount was small and the risk was the best dispersion.

The asymmetric information theory of information economy and data mining, analysis and integration of technology, laid the foundation for establishing scientific credit evaluation standard of lenders repayment ability level.

**Table 1. The ratio distribution of net credit platform of comprehensive income.**

Platform Type	Comprehensive Income Rate	The Represent Platform
the grassroots camp	>15%	paipaidai, renrenmoney
financial institutions camp	5.7%~7.5%	ppmoney, xiaomabank, touna
the listing Corporation camp	12%~14%	ideal finance, yinhu
The national endowment camp	8.19%~9.48%	Kaixin loan, kingkaid, dezhong finance

With the fast development of information technology, China had entered the information age. As the penetration and application of information technology in communication and economic field, economic form was undergoing a significant structural change; it made the information economy became an important form of economy. Economist fully grasped the information would be in a favourable position in economic activities to maximize the profits. And people lacked of information would in a disadvantageous position, had to spend more money to acquire information. The information in P2P net credit platform was asymmetric; the platform party held a lot of information on both sides of trade, and the participants clearly at a disadvantage party. Information asymmetry was likely to cause adverse selection and moral hazard; it would lead financial market inefficiencies.

In order to reduce the risk of adverse selection and moral hazard of P2P net loan industry, it should make full use of information technology included the main transaction, "big data" carries on the depth excavation, analysis and integration to constructed the model.

### 2.1. The Network Economic Theory Provides an Efficient Tool for Information Resources into Economic Benefits

The narrow sense of network economy refers to all economic activities of modern communication network, computer network and other various network departments and within the Department, including the cost and income of network construction, production, exchange and consumption of network goods, the supply and demand of cyber source and reasonable development and utilization. Network economy represented the development of future economic trends; it provided an efficient tool to transfer information resources into economic benefits. As a new economic form, network economy had the following obvious characteristics: fast, high permeability, self-expansion, increasing marginal benefit, external economy, sustainable and direct. P2P net credit as one of the Internet financial innovation mode both had the Internet and financial dual attribute led the network economy is developing rapidly [4].

### 2.2. Analysis of the Development of the P2P Net Credit in the Background of P2P Net Credit Platform

As an innovative financial form, The Internet finance was developed rapidly in recent years, especially the P2P net credit platform was growing at an explosive rate, at the same time, since 2014, the "Run away" craze let the society saw the risk. Along with the regulation gradually clear, various capitals began to pour funds into P2P net credit industry, P2P net credit platform would gradually move toward stan-

ardization and rationalization. According to the background of P2P net loan, it could be divided into four big camps platform, Table 1 statistic distribution part of the background net credit platform of comprehensive income [5].

The grassroots campaign P2P net credit platform provided service of private lending, solved the retail fragmented capital financial needs and Small and micro businesses microfinance demand.

Financial institutions camp P2P net credit platform had advantages in information technology, customer resources and data reserve. But the loan review was more complex, slow, high demand for borrowing the user qualification conditions. The annual rate of return was about 6% to 8%.

The listing Corporation camp P2P net credit platform, with strong financial strength and credit endorsement, was able to effectively exploit investor market.

The national endowment camp P2P net credit platform had the advantages in the context of state-owned public credibility, brand, and resources could be very easy to obtain the trust of investors, its interest rates were generally lower than the grassroots P2P platform, therefore, so it could effectively reduce the borrower's loan financing cost.

## 3. INDEX ANALYSIS OF P2P NET CREDIT INDUSTRY IN GUANGDONG CHINA

The P2P net loan industries did not have the admittance threshold, industry standards, and regulatory policy. According to the latest data, net credit issued a number of national P2P display, net credit platform had steadily increased, a total of about 1375 months of operation platform compound average growth rate of 6.83%, surpassed the amount of USA, became the largest trade market and the number of net credit platform P2P was expect to 1750 at the end of 2014. The number of about P2P net credit platform in Guangdong province was about 330, the total national P2P net credit platform 24%.

According to the first net loan data, at the end of the 2014, the national P2P net credit transaction amount was about 14 million Yuan, Guangdong Province P2P net credit transaction amount was about 4.7million Yuan, accounting for 32.06% of the national total.

P2P net loan average comprehensive annual interest rate of continuous decline, the analysis of its causes could be summed up as following: firstly, interest rates continue to maintain the trend down, probably because the supply of funds was currently still much larger than the demand for funds on the market; secondly, with regulatory P2P net credit

industry policy approaches, the need for each platform, to circumvent the policy and legal risk regulate the operation, the initiative of using interest rates to reduce the operation cost, make the interest rate continuously decreased; thirdly, some operation time was longer , larger scale of operation platform and the "State Department", "bank" the platform because there was less strict risk control system, platform of interest rate was generally low, pull the entire industry entered the low level of interest rates. In the Guangdong Province, the more actively platform borrowing more than 1000 was only red hill VC, all enrichment and casting which network platform, the remaining loan numbers were in the 400, the borrower was mainly concentrated in a handful of platform; the investment of more than 10000 people platform only the Red Hill VC and everyone known, The brand effect had been initially apparent platform to attract investors and borrowers into the platform, the establishment of acceleration platform ecosystem [6].

The entire P2P agent added together to get the subject elements of the matrix, in addition, in each element added to the corresponding  $F_i$ , so that the generated sequence element  $F'_D$  is convergent

$$F_D(n_i) = R_{1(n_i)} - \sum X_{ji} \tag{1}$$

$$F'_D = \frac{R_1(n_i)}{g-1} \tag{2}$$

$$F' = (F^{(\infty)}i, j) = \sum_{p=1}^{\infty} \frac{F^p}{2^p (N-1)^p} \tag{3}$$

$$F_i = \sum_{i=1}^n F^{(\infty)}i, k + \sum_{i=1}^n F^{(\infty)}k, i \tag{4}$$

The overall trend of the transaction amount net credit industry can be seen in Table 1, the second half of the industry turnover will far exceed the first half of the year, nearly 4 months of growth was particularly evident, analyses its reason, mainly include: one was the net credit industry regulatory policy increasingly clear, investor confidence in the net loan industry more and more sufficient, the operation pattern the net credit platform more approval; two was the listing Corporation, bank system, the state owned assets supervision and administration department had established the net credit platform, expand loan business, promote the trading volume growth; three was the bank, trust institutions such as the tightening of funds in the real estate industry, made its steering net credit company; four is the net credit company provide innovative services. Meet the needs of different investors demand product development.

### 3.1. Analysis Model of Multidimensional P2P Network Credit Risk Information Problem

With the rapid development of Internet finance, the number of P2P net credit platform was increased faster and all kinds of risk was gradually exposed. P2P net loan industry in China had gone through more than 7 years. Recently, the negative news of P2P net loans could be heard such as net loans overdue, platform runs or bankruptcy. Turnover

reached record high in 2014 August; the national P2P network of our country credit transactions was to a new record of 27.5 billion Yuan. By Used a big data analysis technology, the Multidimensional P2P network credit risk analysis models of information problem had been established.

The Fig. (1) showed the Multidimensional P2P network credit risk analysis model.

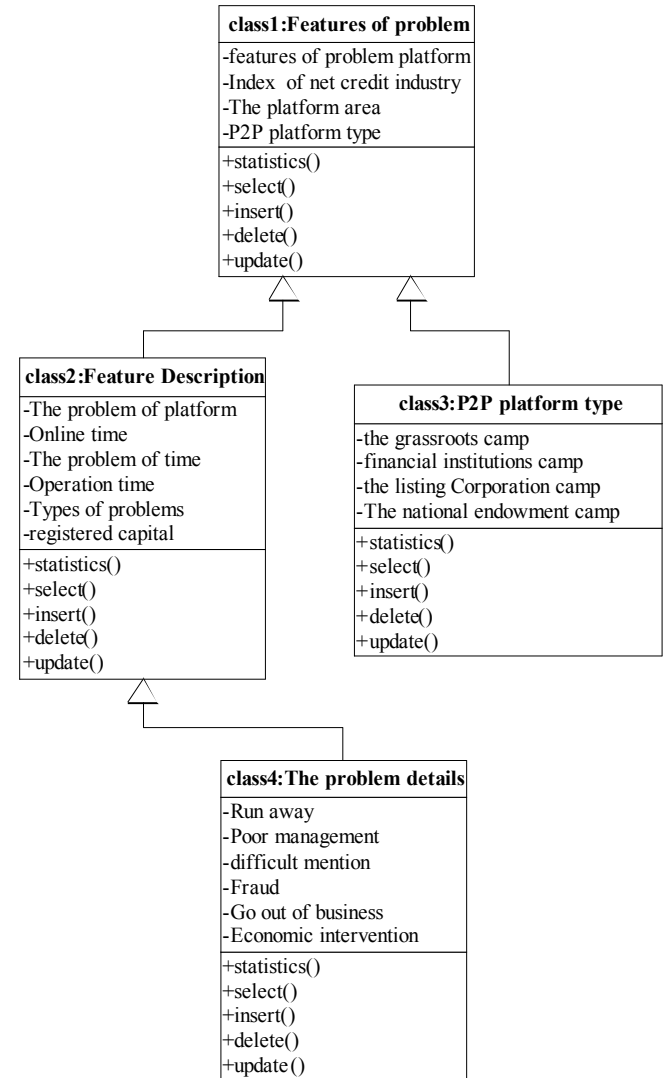


Fig. (1). Analysis Model of multidimensional P2P network credit risk information problem.

### 4. PREVENTION MEASURES TO P2P NETWORK CREDIT RISK

P2P net loan industry was developing rapidly, but regulatory pace was very slow, the non-balance further increased the risk of P2P net loan industry, "run road tide" were still frequently staged, so the establishment of credit supervision system of P2P network had become an important guarantee for the healthy development of the industry. P2P network lending was financial innovation, it was different with the traditional financial industry, and some of the current financial industry regulatory system was not applicable to the combination of P2P net credit industry development characteristics [7].

Recommended establish supervision system was construct in the Fig. (2): set up departments to supervise P2P net loan industry on P2P net credit platform registration, the establishment of industry associations supervision department general regulation of the National Association of each of the P2P industry to prevent funds misappropriated. Eventually formed regulation led by government, legal regulation and association self-discipline.

$$rgs_i = c_i g s_i \tag{5}$$

$$u_i = p_i + d_i \tag{6}$$

$$vgs_i = u_i rgs_i = (p_i + d_i) c_i g s_i \tag{7}$$

$$V_i = \frac{vgs_i}{\sum_{i=1}^n vgs_j} \tag{8}$$

if all p2p agent are belong to the latter case, it is a fully connected social network, trust will achieve maximum common process ,in this case, the link density index R, matrix associated in addition to the main diagonal elements of the value of 0, all element values for 1.

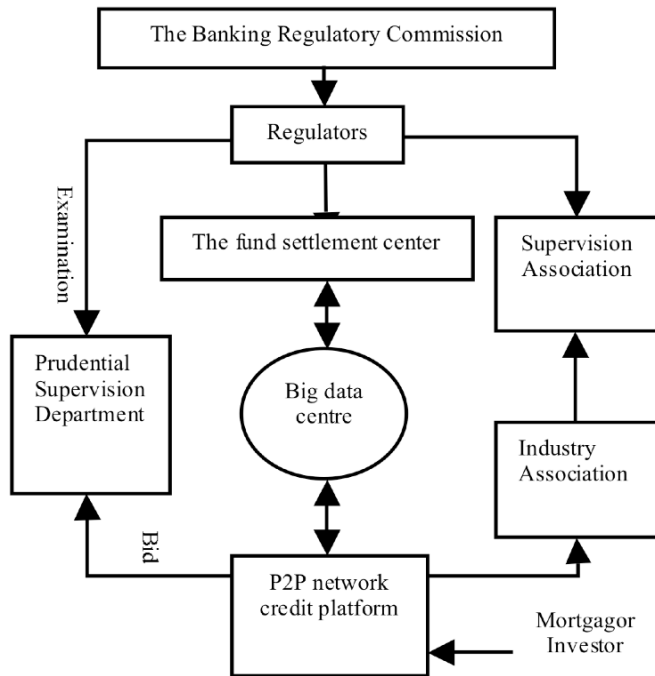


Fig. (2). Supervision system model of P2P network credit.

**4.1. The Legal Supervision of the P2P Network Credit**

Both the quantity and the loan transaction amount of P2P network lending platform industry in china were more than other countries .The net credit platform volume increasing in the absence of definite laws and regulations promulgated, the inherent risk could not be ignored. The governments had established the laws and regulations on the P2P industry as soon as possible, according to the existing laws and regulations to reduce the overall risk of P2P net credit industry. For example, the net credit platform business scope must be

clear. In the process of transaction net credit platform, improved the net lending index system [8].

At present, Chinese Internet Finance Association had strengthened the guiding role of the local government to promote effective of communication and connection, to drive the healthy development of industry self-regulation. At the same time, due to the shortage of central bank credit system, some of the platform hope led by the government establishes credit system of cooperation between the net credit platforms, to achieve customer credit information sharing. With reference to the international mode of operation, promote the market operation of the personal credit system. The establishment of personal credit rating companies and other commercial agency would come from government departments, public institutions, the private sector and other scattered information through classification processing, the formation of professional and efficient credit analysis report. For example, in 2013 the Shanghai information Limited announced the first national provide services based on Internet Credit System -- network financial credit information system [9]. The goal is to the net credit platform credit data many into the system, to achieve the net credit platform credit information sharing.

**4.2. The P2P Platform Capital Safety Supervision**

Safety and health development of P2P credit industry were depended largely on the money, so for the platform sedimentation funds supervision, including short-term capital flow and risk reserve, it needed the help of third party funds custodian. First of all, the third party agency set up a cross platform P2P account for each investor and the borrower, each account and bank card docking, investors from the bank card bound into the funds to the P2P account, P2P account independent records of customer funds to, and for customers to inquire at any time; secondly, intermediate account investors bid funds into the third party funds trusteeship institutions established, until after the success of the transaction of funds to enter the borrower's account, otherwise the return of funds to the accounts of investors; finally, supervision departments to monitor the borrower of funds towards the platform, to avoid fraud behaviour, cash only from investors account withdrawals to bind the bank card, mobile phone and implement dynamic the password, password and other multiple authentication methods was provided to prevent the platform funds illegally occupied, supervision intermediate account and its associated account, money in and out according to the user instruction execution, made each capital flow had been recorded, to stop the risk of misappropriated funds, eventually the legitimate rights and interests will help protect investors [10].

**4.3. The P2P Platform to Strengthen Management**

Most of the P2P company, the key data of its own, such as loan volume, the rate of bad debts, was still not open to the public, such information was not open, resulting in the operation of the enterprise itself was opaque, the operation condition could not response to the vast number of investors, the asymmetry of information and the risk of investors increased. Therefore, in order to reduce the unnecessary loss of investors, the platform must strengthen its information dis-

closure, effective help regulators to supervise, provide convenience for the formulation of regulatory indicators.

A lot of P2P platform run the beginning and did not run will, but at the time of the platform appears unable to resist the risk, and no exit mechanism clear, so many platforms run away to escape legal liability. Therefore, from the establishment of the mechanism of the P2P platform was very meaningful. First of all, when the risk first appeared, the platform should implement measures prior to the development of both lenders and borrowers, and inform the platform problems. Secondly, when the risk was too big for loan losses of the two sides, should start the risk reserve in advance. Finally, the risk could not resist, should seek industry support and judicial power to intervene, properly solve the problem.

## CONCLUSION

This paper drew the following conclusion: P2P network credit industry of Guangdong province were rapid developed in all aspects, the platform number, turnover, term, interest rate and loan balances were linearly rising state, leading the country. At the same time, the problems of platform also were frequent and almost reached the red line of regulation. From the melting of fraud, and even run away, the whole industry reputation influenced. In view of the above problems, the risk analysis of the net credit industry from P2P net lending model, background and risk management mode, and puts forward the related risk prevention measures.

Because of the limited data, the paper focused on P2P net credit company in the Guangzhou city and Shenzhen city, not more comprehensive grasp of Guangdong province P2P net credit company situation. P2P net loan as a new thing, the risk was still in the initial stage. Although the problem of platform industry occurred more and more, but with the regulatory policy approaches, bank, securities, funds had advanced P2P net loan industry, more joint-stock banks, urban commercial banks had shown a willingness to enter the P2P industry, the entire industry was moving in the direction of health, further study of the risk on the P2P network credit industry, promote the healthy development of China's P2P net loan industry, protected the interests of investors, to solve the financing problem of central enterprises, forced the

marketization of interest rate, perfect the construction of China's financial system.

## CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

## ACKNOWLEDGEMENTS

The research work was supported by the national natural science foundation of china(NSFC) under Grant No. 71273067 and the planning projects of humanities and social science ministry of education under Grant No. 11YJA790089. The research work was supported by the Natural Science Foundation of Guangdong Province under Grant No. 10151032001000001.

## REFERENCES

- [1] Robinson, Marguerite, "The Microfinance Revolution: Sustainable Banking for the Poor. Washington, DC: The World Bank", 2001 p.38
- [2] Sven C. Berger, Fabian Gleisner, "Emergence of Financial Intermediaries in Electronic Markets: The Case of Online P2P Lending. BuR-Business Research", 2001 p.116
- [3] Slavin, B, "Peer-to-peer lending: an industry insight. BradSlavin, " 2007 No 17
- [4] Heng, S. Meyer T, and Stobbe A. Implications of Web 2.0 for Financial Institutions: " Be a Driver, Not a Passenger. Deutsche Bank Research, Economics", 2007 p.14
- [5] Everett, C.R. Group membership, relationship banking and loan default risk: "The case of online social lending .Social Science Research Network,2008 No.18
- [6] Seth Freedman, Ginger Zhe Jin. "Do Social Networks Solve Information Problems for Peer-to-Peer Lending? Evidence from Prosper.com," Working Paper University of Maryland & NBER, 2008 p. 87.
- [7] Agarwal,S., and Hauswald,R. The choice between arm's-length and relationship debt: Evidence from loans. Social Science Research Network, November 24, 2008.
- [8] Lepro, Sara, "The Price of Entry Rises in P2P Lending. American Banker", 2010 No. 39.
- [9] Weiss, GN., Pelger, K., and Horsch, A. "Mitigating adverse selection in P2P lending: Empirical evidence from Prosper.com.TU Dortmund,Germany", 2010 p.432
- [10] Alexander Bachmann, Alexander Becker. *Online Peer-to-Peer Lending –A Literature Review*. JIBC August 2011 p.143.

Received: September 16, 2014

Revised: December 23, 2014

Accepted: December 31, 2014

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