

# Bank Credit Risk Management Based on Big Data

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## Abstract

In order to improve the risk management mode of bank credit, the existing problems in the credit status, risk expression and credit risk control of the small and micro enterprises in traditional commercial banks are analyzed. Then, based on the comparative analysis of traditional credit mode and big data credit reporting mode, the advantages and challenges of large data collection model to small and micro credit risk control of commercial banks are obtained. In addition, through two cases of Ali small loan and Jiangsu bank, the application of large data credit in the credit risk control of small and micro enterprises is analyzed in detail. Finally, rational suggestions are put forward for commercial banks to improve credit risk control of small and micro enterprises by using big data credit.

## Keywords

Risk management; bank credit, small and micro enterprises; traditional commercial banks.

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## 1. Introduction

In recent years, relevant government departments have actively introduced relevant policies to support the development of small and micro enterprises and promote the construction of inclusive finance. Therefore, the scale of small and micro credit has a certain development, alleviating the problem of financing demand for some small and micro enterprises. However, small and micro enterprises are facing problems such as difficulty in financing, high cost and difficulty in risk control [1]. The main reasons are as follows: On the one hand, the pressure of the economic downturn is increasing. The operating conditions of small and micro enterprises are not good, the mortgages are insufficient and the source of repayment is unstable. The applicable financial and credit information are less, and the risk coefficient is high. Therefore, many commercial banks have produced the mentality that are afraid of the loan [2]. On the other hand, under the double attack of interest rate marketization and Internet finance, the performance growth of commercial banks is slowing down and operating efficiency is declining. In order to occupy the market share, the social phenomenon "relying on a rich man and focusing on a tycoon" often exists. Therefore, the favor of small and micro enterprises is ignored. In addition, the risk control model of commercial banks is too old. In the face of small and micro enterprise management, risk control appears to be a bit overstretched [3]. With the development of Internet and large data cloud computing technology, the traditional mode of credit service has been broken through, and a new model of large data credit risk control has been opened up. Based on the existing customer and data advantages, the Internet financial enterprises have carried out large data marketing and risk control. In this way, it has a piece of soup in the small and micro enterprise loan market. The development and application of large data credit investigation technology also brings opportunities for business innovation and risk management. The commercial banks re-excavate and integrate the customer data information with the help of large data technology [4]. The bank accurately understands the customer's needs and provides credit funds for small and micro enterprises in a timely manner. At the same time, it also reduces business risk, thus expanding the scope of service and service depth. The whole process and batch credit management can be

realized, which can effectively alleviate the problems such as financing difficulty and slow loans faced by small and micro enterprises [5].

At present, with the rapid development of Internet technology and e-commerce platform, e-commerce companies constantly use their platform's big data advantage to innovate the financial products and service mode of small and micro enterprises. For example, Ali small loan company founded by Alibaba group provides pure credit microfinance services to Alibaba and Taobao's small-micro businesses and self-startups. The Jingdong launches Jingdong loans and "supply chain finance" services to the Jingdong mall and the small-micro enterprises [6]. These businesses have broken the traditional concept of financial services, and timely alleviated the financing needs of small and micro enterprises. Facing the arrival of the big data age, commercial banks cannot meet the small and micro financing needs based on the traditional artificial investigation and examination and approval model. Only by using large data credit investigation technology can we solve the cost problem and improve the effectiveness and scientificity of the loan decision. As a result, commercial banks can manage risk control, product marketing and business innovation with the help of panoramic views built by large data.

## 2. The present situation of credit business and the problems of risk control

### 2.1 Development of credit business

At present, the credit market of small and micro enterprises in China is still a blue sea. According to the Statistical Report of Financial Institutions Lending in 2016 released by the People's Bank of China, at the end of December 2016, the RMB in small and micro businesses loans is 20.84 trillion yuan. The loans of small and micro enterprises increased by 3 trillion yuan for the whole year, up 19.8% from the same year. The loan balance of small and micro enterprises accounts for 32.1% of enterprise's loan balance, which is 0.9 percentage points higher than the last year. As shown in table 1, under the strong support of the state and governments at all levels, the credit market of small and micro businesses has been fully developed, effectively alleviating the capital demand of small and micro businesses [7]. Whether it is the credit line of small and micro enterprises or the total amount of enterprise loans, the proportion of small and micro enterprises is increasing year by year. Small and micro enterprises have a large scale of capital demand, and the market has a broad prospect for development. It has gradually become the target of all financial institutions [8].

Table 1. Small and micro enterprise loans from 2012 to 2016 year

Loan indicators	Year				
	2012	2013	2014	2015	2016
Loan balance (%)	11.58	13.21	15.46	17.39	20.84
The proportion of small and micro enterprise loans in enterprise loans	28.60	29.40	30.40	31.20	32.10

The data source is compiled by a Statistics Report of Financial Institution Loans of People's Bank of China from 2012 to 2016 year.

With the slowdown of economic growth and the promotion of interest rate marketization, the competition in the financial industry has gradually intensified. The financial risks faced by commercial banks are also gradually increasing.

Non-performing loan balances and non-performing loan ratios are important indicators to measure the credit business risk status of commercial banks. According to the CBRC statistics, since 2012, non-performing loan balance and non-performing loan ratio of commercial banks showed a "double up" phenomenon. By the end of 2016, the non-performing loan balance of commercial banks was 1512.2 billion yuan, and the non-performing loans was 1.74%. The non-performing loan balance and non-performing loan rate of urban commercial banks is relatively low, 149.8 billion yuan and 1.48% respectively. Because of the unsound risk constraint mechanism and the lack of risk awareness, the non-performing loan rate of rural commercial banks has been the highest from 2012 to 2016. By 2016, the non-performing loan rate has reached 2.49%, more than 2% of the regulatory red line. The non-performing loan balance and the non-performing loan rate of commercial banks are increasing

gradually, and the quality of the loan is decreasing. The risk control is particularly important in the case of increasing economic down-descending pressure and the reduction of profit margin [9].

Table 2. Non-performing loan balances of various commercial banks from 2012 to 2016

Unit: billion yuan

Types of commercial banks \ Year	2012	2013	2014	2015	2016
Large commercial banks	3095	3500	4765	7002	7761
Joint-stock commercial bank	797	1091	1619	2536	3407
Urban Commercial Bank	419	548	855	1213	1498
Rural Commercial Bank	564	726	1091	1862	2349
Foreign banks	54	56	96	130	103

The data source is derived from a List of Major Regulatory Indicators for Commercial Banks of Bank of China from 2012 to 2016.

Table 3. Non-performing loan rate of various commercial banks from 2012 to 2016

Unit: %

Types of commercial banks \ Year	2012	2013	2014	2015	2016
Large commercial banks	0.99	1	1.23	1.66	1.68
Joint-stock commercial bank	0.72	0.86	1.12	1.53	1.74
Urban Commercial Bank	0.81	548	1.16	1.4	1.48
Rural Commercial Bank	1.76	726	1.87	2.48	2.49
Foreign banks	0.52	0.51	0.81	1.15	0.93

The data source is derived from a List of Major Regulatory Indicators for Commercial Banks of China Banking Regulatory Commission from 2012 to 2016.

## 2.2 Problems of risk control

Facing the multiple risk characteristics of small and micro enterprises, such as opaque assets, non-standard management, insufficient guarantee capability and weak credit consciousness, commercial banks have obvious deficiencies in information recognition, measurement, early warning mechanism and credit rating. The rate of non-performing loan rate has increased.

The aggregation of risk information is incomplete. Risk identification is the starting point of the commercial bank's small and micro credit risk control, and it is also the source of the risk [10]. Moreover, information acquisition is the beginning of risk identification. Because of the limitations of its own conditions, for a long time in the past, the information collection of small and micro enterprises by commercial banks mainly comes from four aspects: the application information submitted by the customer to the commercial bank, the verification information obtained from the customer manager's investigation, the customer's historical transaction information accumulated inside the commercial bank, and the information provided by the PBC's credit information center and other external institutions.

The means of risk quantification are not advanced. The credit risk measurement of small and micro enterprises is mainly based on the qualitative expert system model analysis method and the quantitative credit scoring model analysis method. The former is mainly used in the stage of customer access, and the commercial banks measure the credit risk of enterprise loans by subjective analysis or qualitative analysis. Among them, 5C and 5P analysis are the representative of this kind of expert analysis method.

The risk early warning mechanism needs to be perfected. Because small and micro businesses change rapidly and life cycle is short, we should further strengthen the continuous dynamic monitoring for small and micro businesses, and improve the risk early warning mechanism of commercial banks.

The credit rating system is unscientific. At present, the credit rating of small and micro enterprises is still adopted by commercial banks in China. By selecting the financial and non-financial indicators of the enterprises, each index is given a certain weight, and a comprehensive score is made to get the credit level of the customer.

### 3. Case analysis of credit risk control based on large data credit investigation

#### 3.1 Case analysis of the credit risk control of Ali's small goods

Since the Alibaba set up small loan company in 2010, it has effectively relieved the financing needs of the vast majority of e-commerce. In the first half of 2014, the total amount of loans was over 200 billion, providing loan services to over 800,000 small and micro businesses and individual local businesses. By the end of 2016, the total amount of loans was over 800 billion, providing loan services to over 5 million small and micro enterprises, individual industrial and commercial households. Its growth rate is far beyond the interbank institutions. At the same time, the non-performing loan rate of Ali's small loan has been kept below 1%, which is far below the non-performing loan rate of the traditional commercial banks. Relying on its unique e-commerce platform and data advantages, Ali small loan has formed a closed management system in the aspect of customer collection, pre-loan, in-loan and post-loan.

Ali loan is different from the traditional commercial bank on the customer's choice. Depending on the Ali trading platform, Ali has accumulated a large number of business information. Based on this, the loan object of Ali small loan is divided into two categories: One is based on the B2C platform, the main customer group is the Taobao and Tmall customers. The other is based on the B2B platform, mainly for the registered VIP members of the Alibaba website. No matter which type of loan customers, there is a certain transaction or operation record in the Ali trading platform. For example, Taobao and Tmall order loans require businesses to operate effectively in the last 2 months and have effective trading volumes each month. In addition, the Ali credit loan also has a rigid regulation on the registered address of the loan company. The specific requirements are shown in table 4:

Table 4. The main loan product of Ali's small loan

Loan object	B2C platform - customers of Taobao and Tmall		B2B platform - Alibaba customers
Product type	Taobao's credit and order loans	Tmall's credit and order loans	Credit loan
Loan limit	Credit loan: 1 -1,000,000	Credit loan: 1 -1,000,000	The maximum loan is up to 1 million.
Loan term	Credit loan: 3, 6, 12 months Order loan: no more than 60 days	Credit loan: 6 and 12 months Order loan: no more than 60 days	The longest period is up to 12 months.
Exercise rate	Credit loan: the date rate of 3 and 6 months is 0.06% The date rate of 12 months is 0.05%. Order loan: the date rate is 0.05%.	Credit loan: The date rate on loan is 0.0483%. The date rate of the equivalent capital is 0.0433%. Order loan: The actual daily rate is based on the contract.	Date rate is 0.03%

The data source is collected by Ali small loan official network.

**Pre loan risk assessment:** When Taobao merchants have a loan demand, they can log in to the official website of Ali finance. At the same time, they can fill in and submit the information of the loan application. After receiving the loan application, using the advantages of its own e-commerce platform, the financial information is judged by the transaction data of the enterprise and the fund flow. At the same time, non-financial information is evaluated through customer evaluation, return and exchange situation and business credit rating.

In addition, the commissioner or third party organizations will be arranged to investigate the enterprises' actual operation and prospects. The information on the line and under the line is used for cross testing. Therefore, these will improve the transparency of information to the greatest extent and reduce the risk of information asymmetry. Finally, the anti-fraud identification technology is used to screen and match the order quantity and customer evaluation of merchants, effectively identifying malicious sellers and fraudulently obtaining loans.

**Risk monitoring in loan:** During the use of the loans, based on its own e-commerce platform and Alipay system, Ali small loan can monitor the funds flow and income of enterprises at any time.

Moreover, through the Aliyun big data cloud system, the platform can determine whether the loan funds are used for normal production and operation. At the same time, it can make timely warnings on the possible risks. If the company does put money into production and operation, the volume and review of Taobao's customers will be improved. Accordingly, the amount of the transaction and praise of the Alipay system will increase. On the contrary, if Alipay trading volume do not change significantly, variation and litigation system of evaluation results is increasing. Then, the system will make timely warning, and relevant personnel will be timely recover the loans.

Post loan risk solution: In the post-loan warning stage, if it is found that Taobao merchants may have a default risk, the Ali small loan platform will urge the enterprise to repay the money in time. If the Taobao business has been a breach of contract and forms a non-performing loan, Ali small loans form a loan auto-recovery through Alipay system of Taobao merchant. At the same time, it will cut off the payment system between Taobao merchants and customers, close the online store on the Ali platform, and prevent the possibility of second default. Moreover, it will regularly announce the "whitelist" and the "blacklist" of trustworthy businesses, achieving the trustworthy incentives and dishonesty disciplinary effect. In addition, Ali cloud data system will access Taobao business information to credit system of Bank of China, and credit information sharing is achieved.

### **3.2 Case analysis of credit risk control of small and micro enterprises in Jiangsu bank**

Ali small loan has obvious "gill fish effect" to the financial market. At the same time, some financial institutions including commercial banks have also made great progress in developing small and micro credit products by using big data credit technology, and won the market's popularity. The following is the specific case analysis of Jiangsu bank:

Infrastructure construction for large data: As early as the beginning of 2015, Bank of Jiangsu had already made a plan for big data construction. In a short period of half a year, the big data platform of "think tank" was set up in Jiangsu bank risk management department. The platform integrates financial, social, Internet and all kinds of data in the bank, such as intra bank core system, credit management system, online banking system, personal loan system and dozens of business transaction data, account data and customer basic data, forming multiple internal data mart. In addition, by building Hadoop platform, after legally authorized or actively purchased, the external data is introduced, including more than 20 enterprises such as taxation, courts, social security, environmental protection, Union Pay and operators. There are as many as thousands of external data fields. At the same time, web crawler, real-time mirroring and other Internet data collection technologies and methods are used to catch public network media and public opinion information such as forum and micro-blog in time, and form massive external data mart.

Development status of "tax e" business (an online credit business) in Bank of Jiangsu: Based on the big data platform of "think tank", it not only realized intelligent control for credit risk of small and micro enterprise, but also innovated the credit service mode of small and micro businesses. Taking the online credit business as an example, this paper introduces the concrete application of the large data collection technology in the credit of small and micro enterprises in Bank of Jiangsu. In exchange for "credit rating of the bank" by "tax credit rating", the credit support model for small and micro enterprises is changed by commercial banks. Based on the tax credit and data information provided by the tax departments, commercial banks relay on the Internet and big data credit technology to cross integration. In addition, online loan amount is issued. It has realized the loan mode of "online application, online use, borrowing and repayment in sync."

The risk control process of the "tax e" business of the Bank of Jiangsu: If small and micro enterprises have the demand for funds, they can take loan application through the National Tax Bureau of Jiangsu Province or online tax halls of Local Taxation Bureau, the Bank of Jiangsu mobile phone banking and Internet banking, small and micro businesses financing window. After filling in the basic information and submitting the valid documents, the lending procedures are finished. As a result, client can achieve 7x24 hours loan and repayment at any time. In the loan business process, it is divided into five steps, which are accurate acquisition of customer resources, business application,

credit examination and approval, loan issuance and post loan management. As shown in the following figure, figure 1 is the flow chart of the accurate acquisition of customer resources. Figure 2 is a flow chart of the business application. Figure 3 is a flow chart of credit examination and approval.

Table 5. Product introduction

Loan object	The normal tax payment is more than two years, and the total tax amount in the first 12 months is more than 20 thousand yuan. There is no bad credit record and unpaid record. The tax rate level is B or above.
Product type	The loan is unsecured, and it is based on the historical record of tax.
Loan limit	The loan limit with pure credit is up to 2 million yuan. There are other guarantees that a hundred high loans can be obtained by combination.
Loan term	The maximum duration of one credit limit is 12 months, and the longest term of a single loan is 6 months.
Exercise rate	Based on the daily interest rate, the date rate interval is 0.20%-0.5%.
Repayment method	By way of daily interest, borrowers should repay in time after borrowing, and the interest and principal will be liquidated together after the expiration. The borrower may choose to pay part or all in advance.

The data source is collected by the official network of Bank of Jiangsu.

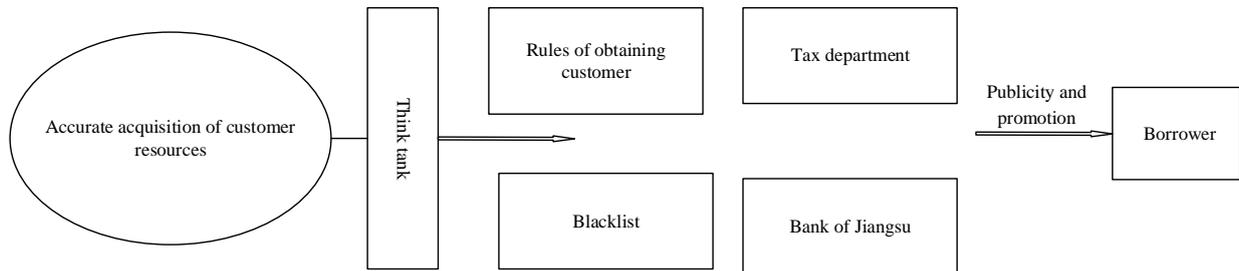


Figure 1. Specific process of accurate acquisition of customer resources

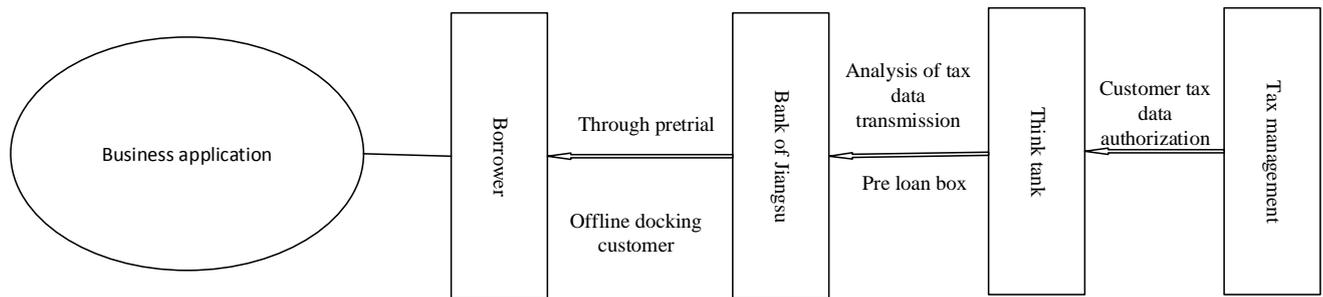


Figure 2. Specific process of business application

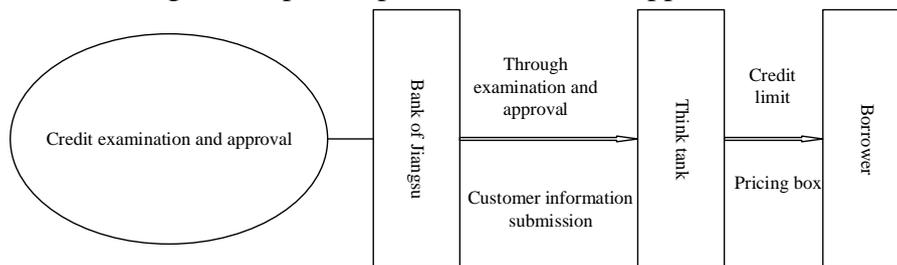


Figure 3. Specific process of credit examination and approval

#### 4. Conclusion

In recent years, the state has issued a series of policies to support the development of small and micro enterprises, and promote "mass entrepreneurship and innovation". The major commercial banks have also launched small and micro enterprise loan products. The loan balance of small and micro enterprises is increasing, which alleviates the difficulty of financing for small and micro enterprises to a certain extent. But at present, there are many problems in small and micro enterprises, such as confused operating management, unsound finance and weak credit consciousness. As a result, the credit business of commercial banks is facing more and more risk. According to the current situation and problems faced by commercial banks, the following conclusions are summarized. First, the current situation of small and micro credit risk control of traditional commercial banks is analyzed to

find out the existing problems. Through the case analysis, it is concluded that commercial banks use large data credit to carry out credit risk control advantages of small and micro enterprises. This way has broken the traditional financial risk control concept, and can better improve the credit risk control system of commercial banks. Second, commercial banks use big data credit technology to control small and micro credit risk, which not only reduces the risk of credit business, but also improves the efficiency of credit approval. Therefore, this measure can alleviate the shortage of funds in small and micro enterprises in time, and help the enterprises to seize the investment opportunities.

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