Risk Research of Internet Finance from the Perspective of Law of Large Numbers

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Abstract: Internet finance promotes the development of inclusive finance and provides great convenience for the financing of small and micro enterprises and individuals, but it also increases the stakeholders and complexity of financial risks. This paper discusses the credit risk, operation risk and information security risk of internet financial products. Based on the law of large numbers, this paper suggests the introduction of insurance companies, the determination of loan interest rates and the control of credit risk to stimulate the healthy development of internet finance.

1. Connotation of Law of Large Numbers

The law of large numbers is a law describing the probabilistic properties presented when the number of experiments is large. The law of large numbers is not an empirical law, but a theorem strictly proved on some additional conditions. In the large number of repeated occurrences of random events, there is an almost inevitable law, which is the law of large numbers. Generally speaking, this theorem is that the frequency of random events approximates its probability under the condition that the experiment is invariable and repeated many times.

Jakob Bernoulli (1654-1705, Switzerland) put forward a law in volume 4 of his book named *Ars conjectandi*. The present representative of this law is as follows: in the n-repeated Bernoulli experiment, the number of times of success is Y_n, and the probability of success in each experiment is p (0<p<1). For any ε>0, we have: $\lim_{n \to \infty} P = \left(\left| \frac{Y_n}{n} - P \right| \geq \varepsilon \right) = 0$ [1].

Poisson (1781-1840, method) studied the sex ratio of French newborns in 1817-1826, pointed out the stability, and gave the first description of the law of large numbers. Observing a large number of events that change in another way at the same time, we will find that the ratio between these times is almost constant. With the increase of observation times, the fluctuation range is smaller and smaller. Poisson believes that the law of large numbers can be applied to explain various phenomena, and that frequency stability can be found with enough patience [2].

Chebyshev (1821-1894, Russia) was the first mathematician in history to give Bernoulli's law of large numbers and Poisson's law of large numbers. In 1866, Chebyshev gave his law of large numbers in his paper. Assume X_1, X_2, …, X_n, … are independent random variable sequences. If there is a constant number C to make $D(X_i) \leqq C$ (i=1, 2…), for any ε>0, we have: $\lim_{n \to \infty} P \left[\left| \frac{1}{n} \sum X_i - \frac{1}{n} \sum E(X_i) \right| \geq \varepsilon \right] = 0$ or $\lim_{n \to \infty} P \left[\left| \frac{1}{n} \sum X_i - \frac{1}{n} \sum E(X_i) \right| < \varepsilon \right] = 1$ [3].

2. Main Risks of Internet Finance

2.1 Credit Risk.

Credit is the core content of financial risk. From an economic point of view, credit refers to the value activities in which the trustee fully trusts the trustee in commodity exchange or other economic activities to realize his promise, lends money to the trustee by contractual relationship, and guarantees the return of his principal and value-added. Credit is the basic guarantee for the normal operation of the whole financial system. Traditional financial institutions can investigate the credit degree of

applicants through various ways, such as credit rating of applicants, selecting high-quality customers, or requiring applicants to mortgage and appoint guarantors. In this way, if default occurs, the risks of financial institutions can be mitigated through these two ways. Although Internet finance can evaluate the applicant's credit by means of big data statistics and cloud computing, it is still unable to connect with personal credit information system. In addition, the traditional credit risk analysis and evaluation model is not suitable for the development of Internet finance, which will lead to certain risks in the primary link of credit information. Moreover, Internet credit also has the risk of leaking user information. Comparatively speaking, the operation modes of P2P platform and third-party payment are more likely to generate credit risk, both of which lack the identification of the user's identity and cannot evaluate the user's credit situation in all aspects, so there are potential risks. Taking P2P as an example, if the platform is unable to evaluate credit, it has no risk guarantee fund and no capital constraint, which will lead to Ponzi fraud [4]. The third-party payment platform because of the temporary existence of housing funds platform, will also make the deposit funds in the absence of funds guarantee and supervision of the risk.

2.2 Operation Risk.

Traditional financial institutions are more prepared to guard against liquidity risk. For example, deposit margin should be retained in accordance with the prescribed proportion. There is also relatively sound risk reserve, deposit insurance system and risk assets reserve system. In the case of short-term liabilities and unexpected outflows of funds, these Regulations are conducive to reducing the possibility of liquidity risk. Internet finance is poorly prepared for the liquidity of funds. When there are security risks in funds, it is easy to run liquidity because of the lack of coping mechanism and liquidity risk management. In general, borrowers want to borrow for a long time and at a low cost, while investors want to borrow for a short time and with high returns. Internet finance will split up a long-term and slow-yielding mark, making it a few short-term and fast-yielding mark. Such an approach has been sought after by investors, but the lack of liquidity management of funds results in higher potential risks because short-term tenders require higher liquidity of funds. If the Internet financial platform does not have enough funds to cope with the difficulty of withdrawal, it is very easy to break the capital chain and then the risk of investment failure. Some enterprises use the platform to implement illegal fund-raising, or even fraud, touching the legal bottom line. This requires that small and micro enterprises should consider comprehensively when financing and choose a formal internet financial platform. For the Internet financial operation enterprises, on the one hand, they need to export the collected funds as efficiently as possible to generate the highest possible revenue; on the other hand, they need to retain certain funds for emergency and other possible investments. How to ensure the reasonable turnover and efficient dispatch of funds is a complex problem. It will threaten the operation of enterprises at a certain time.

2.3 Information Security Risk.

Internet finance was born under the support of Internet technology, so there will inevitably be technical risks. Integrating big data and information technology into Internet finance can provide more convenient services for small and micro enterprises, but there are also some security risks. Internet finance is to use big data and cloud computing technology to provide services for enterprises. If some part of it fails, it will have a negative impact on the overall credit evaluation results of enterprises. The accuracy of the results will be impaired, which will make the financing of small and micro enterprises more difficult. At the same time, if the trading system is attacked by hackers or viruses, the information of small and micro enterprises is leaked. Under the condition of rapid network transmission, there are likely to be bad phenomena such as piracy, which pose a serious threat to the financial and technological security of enterprises and make enterprises bear irretrievable losses. Therefore, the Internet finance of small and micro enterprises should pay more attention to the problem of network information security. To some extent, the Internet has solved the problem of information asymmetry. But in actual operation, information asymmetry can be solved by cloud computing or big data, but the virtualization of the Internet also causes the occurrence of information untruthfulness, which to some extent aggravates the information asymmetry. Domain name system

has become a weak link and shortboard that affects the stable and sustainable operation of information network infrastructure. The hijacking of broadband access routers reflects new risks in the development of Internet services carried by basic networks. The explosive growth of malicious attacks on smartphone platforms has become the biggest obstacle to the healthy development of mobile Internet finance. With the increasing threat of economic information security, information consumption is facing cross-platform risks.

3. Risk Aversion Strategies of Internet Finance from the Perspective of Law of Large Numbers

3.1 Introduce Insurance Companies.

The credit risk of small and micro enterprises has not been effectively controlled, but simply transferred to the third-party credit guarantee institutions, mainly insurance companies. From the perspective of both borrowers and lenders, the introduction of third-party credit guarantee institutions can effectively enhance the credit of enterprises and solve the financing paradox of small and micro enterprises. The law of large numbers requires banks to first study the characteristics of small and micro enterprises and their industries, and make systematic planning to intervene in relevant small and micro enterprises in a planned way on the premise of prior planning. The law of large numbers will play an effective baton role. Systematic risk will be effectively reduced. Based on the law of large numbers, the business development goal of small and micro enterprises at this stage should be batch, process and scale. In short, we should focus on batch marketing, adhere to the process of business development, and realize the scale of business development as soon as possible with scientific development principles and risk management concepts. Therefore, in the choice of credit modes for small and micro enterprises, we should base on the mode of mass development of cluster projects, and locate cluster projects in industries with national industrial policy support, obvious regional advantages, less affected by economic fluctuations and inflation, relatively stable business cycle and closely related to public life. On this premise, it is easier to make the finance of small and micro enterprises bigger and stronger by developing and credit in batches and systematically around the industrial chain cluster. The insurance method established according to the law of large numbers can reduce the average risk value of the insured by increasing the subject of risk-taking and allocating the credit risk faced by the credit insurance products to more risk units. In order to ensure financial stability, insurance companies must require that the number of defaults of small and micro enterprises be controlled within the expected number, or that the actual amount of compensation does not exceed the expected amount of compensation. If the probability and extent of exceeding the expected financial constraints are small, it shows that the financial stability of insurance companies is better. If insurance companies want to achieve the goal of financial stability, they can only achieve it by increasing risk units based on the law of large numbers.

3.2 Determine Loan Rate.

Because of the large number of small and micro enterprises and their complex operation, it is difficult for commercial banks to carry out risk rating and credit rating for each small and micro enterprise. It is not only difficult to unify the rating standards, but also difficult to control the labor cost of commercial banks. However, under most laws, the average loan risk of small and micro enterprises tends to the expected loan risk, so the expected loan loss rate of each small and micro enterprise loan can be replaced by the overall expected loan loss rate of small and micro enterprises, which can greatly reduce the difficulty of developing interest rate determination model. Commercial banks should tolerate a slightly higher loan default rate for small and micro enterprises than for large customers, which is determined by the operation nature of small and micro enterprises. Financing of small and micro enterprises belongs to high-risk business. Risk and income should match. High risk inevitably requires high return. In the traditional business of large and medium-sized enterprises, banks are at a disadvantage relative to customers, have no equal bargaining position, and often have no final decision on the level of interest rates. On the contrary, the credit business of small and micro enterprises is the opposite. Banks have the right to set their own prices. Their business pricing level

and return should be significantly higher than that of the general large and medium-sized enterprises and housing mortgage business. This requires banks to charge slightly higher lending rates when granting credit to small and micro enterprises to compensate for higher risks than big customers. A large number of effective customers of small and micro enterprises can also disperse and reduce the overall credit risk of small and micro enterprises in quantity. Industrial, regional and macroeconomic risk premium refers to the compensation for the unexpected risks that cannot be hedged by the loan portfolio of small and micro enterprises caused by industrial, regional and macroeconomic factors. Loan design adjustment premium refers to the adjustment measures taken because of the different risks caused by the amount of loan, the way of guarantee, the term of loan and the way of repayment.

3.3 Control Credit Risk.

At the beginning of small and medium-sized enterprise's loan, we must strengthen market investigation, clarify market access factors such as industry, region and macro-economy, and not copy the set of credit standards used to serve large and medium-sized enterprises. After planning the contents of the investigation, the method of determining the loan interest rate and the method of post-loan inspection, the pilot project will be carried out step by step. In practice, we constantly explore and summarize the relationship of mutual trust in the cooperation between banks and enterprises, and gradually expand the pilot content and scope. Strict access standards for small and micro enterprises, pay attention to customer actual operation survey. The investigation of small and micro enterprises should follow the criterion that content is more important than form. On the basis of tax report forms and combined with other information, the real situation of enterprises is sorted out. On the basis of industry division and other information, the assets and liabilities of enterprises are sorted out. Based on the actual needs of customers and combined with other aspects of information, we can rationalize the actual loan demand. According to the information obtained from the survey, the bank credit risk can be accurately assessed. The law of large numbers points out that the number of small and micro enterprises receiving credit is enough. Therefore, standardized and specialized operation procedures must be established to shorten the application time of credit for small and micro enterprises and improve the quality of credit approval and loan for small and micro enterprises. Only by realizing batch and large-scale business expansion, can the credit business of small and micro enterprises cover costs and generate benefits. According to the law of large numbers, in the early stage of credit business development of small and micro enterprises, we should not overemphasize profit creation, but pay attention to the cultivation and accumulation of existing and new customers. Scientific development of small and micro enterprises credit business should take the initiative to set certain risk tolerance indicators, allowing a certain range of non-performing assets.

4. Conclusion

The law of large numbers requires that each portfolio is independent of each other. In this way, the risks between portfolios are naturally dispersed and the risks left to the whole portfolio pool are reduced. In fact, it is only when each portfolio is small enough and each portfolio comes from different fields that it is possible to be more easily independent of each other. Internet finance has a small number of customers, a wide range of distribution, and relatively independent of each other. In this case, in principle, there is no need to screen customers with special fineness, resulting in a large number of laws applicable conditions, forming a natural dispersion of risk.

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