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Game Analysis and Countermeasure of Internet Finance and Financing of Agricultural-related Small and Micro Enterprises

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Abstract. Agricultural-related small and micro enterprises play an important role in the national economy, but because of their small scale, weak financial strength, low turnover efficiency and other characteristics, they are facing difficulties in financing, thus limiting their development. The emergence of Internet finance relies on its low financing threshold, simple process, coverage and other advantages, greatly alleviating the financing difficulties of small and micro enterprises, but it cannot solve its financing difficulties in an all-round way. Through the analysis of game theory, it is concluded that if the small and micro enterprises concerned with agriculture want to really get out of the financing dilemma, on the one hand, they should strengthen their own management and enhance their internal competitiveness, on the other hand, they need the government to increase support and optimize and improve the financial system of the small and micro enterprises concerned with agriculture.

Introduction

With the deepening of China's reform and opening up, small and micro enterprises have risen rapidly in China and become an important force in China's economic development. According to the "National Report on the Development of Small and Micro Enterprises" published by the State Administration of Industry and Commerce in 2014, the proportion of small and micro enterprises in the registered market is 94.15%. The final value of products and services created by small and micro enterprises is equivalent to 60% of the gross domestic product (GDP) and 50% of the total national tax revenue.

Because of the characteristics of both agricultural enterprises and small and micro enterprises, the financing of small and micro enterprises is more difficult. Agricultural-related small and micro enterprises generally have the characteristics of imperfect enterprise management system, small scale of operation, weak capital strength, less collaterable assets and low risk resistance, which make it difficult for them to obtain funds from traditional financial institutions such as banks, thus restricting their development.

With the maturity of Internet technology, Internet Finance emerges at the historic moment. Compared with traditional finance, Internet finance, with its advantages of low financing threshold, simple process, wide coverage and low cost, greatly improves the financing difficulty and high financing cost of small and micro enterprises, and provides a powerful financial guarantee for the healthy development of small and micro enterprises.

Game Analysis of Internet Finance and Financing of Small and Medium-sized Enterprises

Internet financial model is a repeated game in which the participants are not fixed. The participants are rational brokers, the information of both sides is asymmetric, and the capital demanders are long-term fixed participants. Because of its information advantages, the demander of funds will only pursue immediate interests without repayment or delay repayment, which will affect the interests of the supplier of funds. At the same time, because of the information disadvantage, the supplier of funds will take negative measures to protect itself, that is, they will no longer provide funds, and the interests of both sides will be damaged, which is manifested as individual rationality but collective irrationality.

Model Establishment

Suppose there is only one demand-side to repay the loan, that is, the demand side will pay the debt and interest on time, and only one repayment service will be required for each fund supplier. At each stage of the game, the supply side decides whether to provide the funds, and the demand side chooses whether to repay principal and interest on time. The fund supplier does not know whether the fund demand side will repay on time, but knows whether the fund demand side has paid back on time before; If the demand side is able to repay the loan on time in the past, the supply side thinks it will be able to repay the loan on time, so the money will not be provided otherwise.

Table 1, Payment Matrix of Game between Supply and Demand of Internet Financial Funds

		Capital demand side N	
		Repayment	No repayment
Capital supplier S	Provide	t, c	v, w
	Not provide	0,0	0,0

Table 1 is the specific payment matrix of the model. If the fund supplier provides the funds, when the fund demand side repayments on time, that is, the capital supply side recovers the principal and interest, realizes the asset appreciation, its investment utility is t ($t > 0$); The demand side of capital can use the borrowed funds to realize the value-added income and repay on time, and obtain a greater return on investment, and its investment utility is c ($c > 0$). When the fund demand side fails to repay the loan on time, the fund supplier cannot recover the principal and interest on time, facing the possibility that the principal and interest cannot be fully recovered, and its utility is v ($v < 0$). The fund demand side can invest the capital into a project with higher returns. Or simply refuse to pay the debt. W ($w > c > 0$); if the transaction does not occur, the utility of both supply and demand is 0.

In a single game, neither side knows the action of the other party, and can get four kinds of payment (Provide, Repayment), (Provide, No repayment),(Not provide, Repayment) and (Not provide, No repayment).

Single Game

Pure Strategic Mode

For the capital demander, the utility of non-repayment is w ($w > c$), and non-repayment is its dominant strategy. Capital supplier can accurately foresee the strategy of capital demander. Rational capital supplier's optimal strategy is not to provide funds. Therefore, the equilibrium of single game is (Not provide, No repayment). In this balanced situation, payment meets the individual rational requirements, and no participants will try to change their behavior choices. The utility of both parties is 0.

Behavioral Strategy Equilibrium

Assuming that the supplier of funds distributes funds with the probability of α, and the demander of funds does not distribute funds with the probability of l-α, and the demander of funds repays with the probability of θ and does not repay with the probability of 1-θ.According to the payment matrix, the utility function of participants can be obtained. The expected utility of the fund provider is:

$$ES=\alpha[t\theta+v(1-\theta)]+(1-\alpha)[0\theta+0(1-\theta)]=\alpha[(t-v)\theta+v] \quad (1)$$

The expected utility of the capital demander is:

$$EN= \theta[c\alpha+0(1-\alpha)]+(1-\theta)[w\alpha+0(1-\alpha)]=w\alpha+(c-w)\alpha\theta \quad (2)$$

The first derivative of formula (1) can be obtained:

$$\frac{\partial ES}{\partial \alpha}=(t-v)\theta+v=t\theta+(1-\theta)v \tag{3}$$

Take the first derivative of (2) to rearrange itself:

$$\frac{\partial EN}{\partial \alpha}=(w-c)\ \alpha\leq 0 \tag{4}$$

It can be seen from formula (3) that the maximum expected utility of the capital supplier is related to the choice of the capital demander, and the strategy of the capital demander is the dominant one. No matter what strategy the capital supplier chooses, it will not change the choice; while formula (4) shows that the maximum utility of the capital demander is only related to his own choice, and the decision-making of the capital supplier depends on his own choice. Decision-making by the demander of funds. The utility function is a subtraction function of repayment probability θ, when θ=0, its utility is the largest.

Order $t\theta+(l-\theta)v=0$, Can solve $\theta^*=\frac{v}{t-v}>0$ (5)

The response of the capital supply side and the capital demand side is respectively:

Response of the funding provider $\alpha=\begin{cases} 0, & \text{if} \quad \theta<\theta^* \\ [0,1], & \text{if} \quad \theta=\theta^* \\ 1, & \text{if} \quad \theta>\theta^* \end{cases}$ (6)

The response of the demand side of capital is corresponding $\alpha=\begin{cases} 0, & \text{if} \quad \alpha=0 \\ [0,1] & \text{if} \quad \alpha>0 \end{cases}$ (7)

If such a game is one-time, under the influence of information asymmetry factor, the supplier of funds cannot determine whether the demander of funds repays on time, the final choice of the supplier of funds is not to issue funds, and the final choice of the demander of funds is not to repay, that is, not to issue, not to repay is the equilibrium of a single game. Influenced by individual risk preference, the two sides do not have enough motivation to cooperate. All of them only pursue the highest individual payment, which leads to collective irrationality and cannot reach binding agreements to coordinate the interests of participants. The interests of both sides suffer losses.

Repeated Game

In repeated games, the equilibrium result of collective rationality may appear. If the fund supplier and the fund demander coordinate their actions according to observable signals, the equilibrium result that benefits all participants may appear.

If the repeated game is repeated for a limited number of times, repeating the Nash equilibrium r times of the one-time game is the only refined Nash equilibrium result of the repeated game. Therefore, when the game is repeated once or for a limited number of times, (No provides, No repayment) is the Nash equilibrium of the game, and the participants are not motivated to break the equilibrium.

Assuming that both players have enough patience and make unlimited repetitive strategic choices, there must be a strategic combination to enable the participants to obtain collective rationality, but also to meet individual rationality. For the first fund supplier, as long as the demand for funds can repay on time, then the fund supplier will continue to provide funds. If the demand side fails to repay the loan on time once, then the fund supply will continue to provide funds. The responding party will no longer provide funds. Before the demander fails to repay on time, the equilibrium result is (Provide, Repayment). The supplier obtains the utility of t units and the demander obtains the utility of c units.

Because the demander of funds has a dominant strategy, its strategy directly affects the next action of the supplier of funds. If the demander fails to repay the money on time, it will get the effect of W units, which is greater than the effect of c units, but later it will get the benefit of - o

(o > 0) units, which may be the reputation loss caused by the prosecution of the supplier, exposure on the social network, or the delisting of the P2B platform.

Any enterprise with long-term planning will repay on time in order to obtain a better reputation in the supply of funds. Both parties will play repeated games indefinitely and indefinitely, and have the intention to become long-term participants in order to gain collective rationality while gaining individual rationality, that is, providing and repaying. But one-off opportunism of the demander of funds (failure to repay on time) will lead to the supplier of funds will never trust, and the impact on the credibility of enterprises is devastating. Sometimes the occasional mistakes, to make the supplier believe that they have a good reputation, need to pay a high price, if not strengthen the reputation maintenance will lead to business difficulties or bankruptcy.

Strategies for Optimizing Financing System of Agricultural-related Small and Micro Enterprises

Through the above model analysis, we realize that in order to promote the financing activities of small and micro enterprises involved in agriculture through Internet finance, we need to start from both internal and external aspects, and further improve the financing system of small and micro enterprises involved in agriculture.

Strengthen the Self-construction of Small and Micro Enterprises Involved in Agriculture and Enhance the Financing Strength of Enterprises

Firstly, small and micro enterprises involved in agriculture should change their organizational form to company-based enterprises as far as possible, construct a scientific and rational corporate governance structure, improve enterprise organizational rules and regulations, clarify the job responsibilities of each post, and improve the management efficiency of enterprises. In the financial aspect, we should establish and improve enterprise financial rules and regulations, improve the efficiency of enterprise capital turnover, strengthen financial budget work, do a good job of internal control, improve the profitability of the enterprise's overall assets, and make the enterprise enter a virtuous circle of rapid and steady development. In the process of enterprise operation, we should pay attention to the promotion of enterprise's credibility, always put the credibility first in front of interests and reputation, and establish a good reputation image of the enterprise. In the process of enterprise development, we should pay attention to the cultivation of scientific and technological innovation ability, establish abundant information channels of enterprises, pay close attention to the development trend of scientific and technological frontiers in the field of industry at all times, increase investment in scientific research, give full play to innovation potential, launch high-quality products, and improve the competitiveness of enterprises in the market.

Strengthen the Government's Support to Ensure the Healthy Development of Small and Medium-sized Agricultural-related Enterprises

The government plays an important guiding and leading role in the regional economic development of a party. For small and micro enterprises involved in agriculture, the development process needs the government's strong support in terms of funds and policies. The government can lead small and micro enterprises involved in agriculture to cooperate with the government's industrial development plan by issuing targeted financial subsidies, actively invest in vulnerable industries, and complete the upgrading of regional economic industries. The government can further reduce the financing cost of small and micro enterprises involved in agriculture by formulating tax preferential policies, and further enhance the enterprise's endogenous financing capacity. In addition, the government should improve legislation, strengthen the supervision of Internet financial enterprises, protect the legitimate rights and interests of small and micro enterprises involved in agriculture in financing activities, and protect the healthy development of small and micro enterprises involved in agriculture.

Optimizing Financing Environment and Broadening Financing Channels

In order to solve the financing problem of small and micro enterprises involved in agriculture thoroughly, it is necessary to establish a special financial system for small and micro enterprises involved in agriculture according to their operating characteristics. Firstly, under the guidance of the government, the state owned commercial banks should increase their support to the financing of small and micro enterprises involved in agriculture, and set up special institutions to provide efficient services for the financing of small and micro enterprises involved in agriculture. Secondly, it should give full play to the role of information transmission of Internet technology, establish a sound credit information system for small and micro enterprises involved in agriculture, provide effective channels for information exchange between fund demanders and fund providers, and provide convenience for smooth financing of small and micro enterprises involved in agriculture. Thirdly, we should establish and improve the insurance system for small and micro enterprises involved in agriculture, so as to provide a strong guarantee for small and micro enterprises involved in agriculture to fight against financing risks. Finally, we should establish a diversified, multi-level and multi-channel financing system that is in line with the modern agriculture related small and micro enterprises, breaking the current situation that small and micro enterprises can only rely on indirect financing, innovate the direct financing mode of agriculture related small and micro enterprises through the Internet plus mode, and further expand the financing channels for small and micro enterprises involved in agriculture.

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References

[1] Ze-fang Han. Comparative Analysis of financing methods of small and Micro Enterprises in the context of Internet Finance [J]. Era Finance, 2018 (02): 45-54.

[2] Rui-chi Feng.Analysis of financing problems of small and micro enterprises under the background of Internet: taking Ali Finance as an example [J] .Commercial economy, 2018 (2): 95-96.

[3] Yanling Hu, Chi Zhang. Research on the legal system of Internet Finance and small and Microenterprise financing Mode Innovation [M]. Press, Northeast normal University, 2017.

[4] Yu Wang, Cuixia Li. The financing difficulties of small and micro-enterprises involved in agriculture and the countermeasures to solve them [J]. Academic Exchange, 2016 (6): 149-154.

[5] Li Yue. A study on the improvement of Financial support for small and Micro Enterprises in China [D]. Northeast Petroleum University, 2016.

[6] Sai Wang. A study on the Financial support of Agricultural small and Micro Enterprises [D]. Wuhan University of Light Industry, 2013.