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# Analysis on Risk Prevention Mechanism for Farmers' Default in Small Amount Credit

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**Abstract** Through analysis, it is believed that major reasons for default risks in operation of small amount credit include low management level and vacancy of normative system, vacancy of risk sharing mechanism, rating distortion due to imperfect credit investigation system, and uncertainty of borrower's credit. On the basis of these, static and dynamic models are established to analyze the prevention mechanism for default risk in small amount credit. It is concluded that we must establish a restriction mechanism during operation of small amount credit as long as three values increase, namely,  $N$  (potential loss of bad credit record due to farmers' default),  $Q$  (probability of successful recovery by small amount credit institution), and  $S$  (cost of small amount credit institution punishing farmers after successful recovery). Finally, following countermeasures and suggestions are put forward: perfect laws and regulations and credit reward and punishment mechanism for risk management of small amount credit; bring into play proper function of loan officer in small amount credit practice; widely promote rural "Group Credit Union" system.

**Key words** Farmers, Default risk, Small Amount Credit, Comparison Analysis, China

Small amount credit plays an important role in solving farmers' financing difficulty, promoting increase of farmers' income, and pushing forward development of rural finance. Along with change of rural economic situations, small amount credit is also faced with some new problems. The most outstanding problem is credit vacancy of small amount credit, making its high risk operation directly influence sustainable development of small amount credit institutions. This shows that credit is an important issue for survival of small amount credit institutions. Therefore, it is required to regulate small amount credit model through seeking a feasible mechanism. We analyze major reasons for default risks in operation of small amount credit. Through comparing the prevention mechanism for default risk in small amount credit through establishing static and dynamic models, corresponding countermeasures and suggestions are presented.

## 1 Reasons for default risks in operation of small amount credit

**1.1 Low management level and vacancy of normative system** The development of non-governmental small amount credit is still at early stage of exploration, and various organizations of small amount credit have not obtained legal status. The vacancy of such legal status causes that small amount credit institutions pay little attention to institutionalized management, which is not favorable to smooth implementation of aiding poor households. In hardware facilities, staff qualification and management level, the small amount credit institutions are lower than that of commercial institutions. These can be manifested

in following aspects. Firstly, infrastructure and staff of small amount credit institutions are not complete. Secondly, there is no well-established top-down management mechanism. Thirdly, non-standard management leads to low working efficiency and high risk of small amount credit, and consequently hinders sustainable development of small amount credit institutions to some extent.

**1.2 Lack of risk sharing mechanism** Major loan pattern of small amount credit is unsecured individual credit loan. In other words, farmers' small amount credit relies on personal hidden credit, without actual collateral. On one hand, farmers do not have personal credit record. They live in a scattered way. The number of farmers who borrow money is large, while the amount of credit is small. These bring a big trouble for small amount credit institutions to collect information of borrower. On the other hand, human resources are deficient in small amount credit institutions. It is hard to collect personal information of borrower. Credit risk evaluation made by small amount credit institutions for borrowing farmers is greatly different from actual conditions. Therefore, small amount credit institutions need paying higher cost than general financial institutions in information collection and credit management<sup>[1]</sup>. In case the small amount credit is unsecured, when borrowing farmers make higher risk investment with lower risk expectation, small amount credit institutions will be subject to losses due to lack of risk sharing mechanism.

**1.3 Rating distortion due to imperfect credit investigation system** The construction of farmer credit investigation system is still faced with some difficulties, and lending transaction is not frequent or common between farmers and general financial institutions. General financial institutions only have basic identification information and repayment information of borrowing farmers. However, they fail to collect such information as whether farmers comply with laws, whether the product quality

is adequate, and the gain or loss of operation condition, and they cannot provide clear inquiry. Besides, credit rating of farmers mostly adopts preliminary review of village Party Branch and village committee, and approval of credit cooperatives. Evaluators often assess farmers' credit on the basis of subjective opinions, so it is very arbitrary and the rating is not objective<sup>[2]</sup>. For example, false data, excessive credit evaluation, and inflated credit rating. As a result, it is impossible to bring into full play functions and actions of credit investigation system, and potential safety hazard is generated for small amount credit institutions.

#### 1.4 Default risk due to uncertainty of borrower's credit

Prospective borrowers of small amount credit are mainly poor farmers, most of whom are lower at education level, lack of financial knowledge, low in application ability of funds and adaptability to changes, and low in return of capital. On one hand, in the course of operation of small amount credit, it is difficult to collect such information of borrowers as honesty, diligence, and family conditions, so the uncertainty of borrowers' credit increases default risk of small amount credit. On the other hand, for poor farmer borrowers, their daily living needs are still not satisfied, so they may use the loan obtained from small amount credit for other purposes. Considerable part of funds will not be invested to declared items. As a result, the recovery rate of funds will be affected, and the default risk will be increased.

## 2 Comparative analyses on prevention mechanism for default risk of small amount credit

Small amount credit institutions play a significant role in alleviating shortage of farmers' funds and promoting development of rural economy. However, default problem of farmers seriously restricts effective operation and sustainable development of small amount credit. In this situation, it is urgently necessary to seek a proper mechanism to solve farmers' default problem to ensure sustainable development of small amount credit. Here, a comparative model is established to analyze the feasibility of operation of small amount credit.

### 2.1 Static comparative analyses on default risk of small amount credit

#### 2.1.1 Establish a simple "full information" static model of comparative analysis.

(1) Participants of comparison: {small amount credit institutions and farmers};

(2) Combination of comparative analysis strategy: ① strategy of small amount credit institutions in providing loan for farmers: (provide loan; not provide loan); ② strategy of farmers in performing the loan contract: (perform; fail to perform);

(3) Constraints of comparison:  $\{(b-a) > c; a(1+v) > b+c\}$ . Assumption:  $a$  stands for the loan fund provided by small amount credit institutions for farmers' production and living needs;  $b$  stands for the sum of principal and interest payable by farmers when loan fund is due;  $c$  refers to the transaction cost (payable by both parties) for both lending and borrowing parties reaching loan contract; and  $v$  represents the return rate obtained by loan fund for production activities.

① Prerequisite condition for small amount credit institutions issuing loan:  $(b-a) > c$ .

② Essential condition for farmers obtaining loan:  $a(1+v) > b+c$ . To obtain loan, farmers shall ensure that the income from loan fund invested in production is enough to cover cost of loan. This is also the prerequisite condition for small amount credit institutions providing loan for farmers.

**2.1.2 Comparative analyses.** If farmers perform the loan contract and repay the loan, small amount credit institution can obtain the income  $(b-a-c)$ , while farmers can obtain income  $[a(1+v)-b-c]$ . If farmers fail to repay the loan, small amount credit institution will obtain income  $(-a-c)$ , while farmers will obtain income  $[a(1+v)-c]$ . As long as farmers prepare for repaying small amount credit, they have to invest cost  $c$ . If small amount credit institutions fail to provide loan, farmers will receive income  $(-c)$ . If farmers are unwilling to repay the loan and small amount credit institutions are unwilling to provide loan, both parties will receive zero income. In situations of different strategies, the income of both parties can be indicated by "prisoner's dilemma" model in Fig. 1<sup>[3]</sup>.

|                                  |                  | Farmers             |                    |
|----------------------------------|------------------|---------------------|--------------------|
|                                  |                  | Repay the loan      | Not repay the loan |
| Small amount credit institutions | Provide loan     | $b-a-c, a(1+v)-b-c$ | $-a-c, a(1+v)-c$   |
|                                  | Not provide loan | $0, -c$             | $0, 0$             |

Fig. 1 "prisoner's dilemma" model for small amount credit

In full information static comparison, if there is no effective supervision and restraint mechanism, farmers will not repay. In this situation, the optimum strategy for small amount credit institutions is rejection of loan application. Nash equilibrium solution of this is "prisoner's dilemma" (not provide loan and not repay the loan). This problem should not be ignored. It is required to find a new mechanism to guide the operation of small amount credit, so as to reduce or even eliminate farmers' default risk in the credit.

### 2.2 Dynamic comparative analyses on default risk of small amount credit

On the basis of dynamic comparative model, we should adjust comparative subjects and influence factors, to analyze the effective prevention of small amount credit model from default risk of farmers.

#### 2.2.1 Establishment and assumption of dynamic comparative model.

(1) Essential elements for establishing dynamic comparative model.

① Participants of comparison: {small amount credit institutions and farmers}.

② Sequence of comparison: {small amount credit institutions → farmers → small amount credit institutions}.

③ Combination of comparative analysis strategy: strategy of small amount credit institutions in providing loan for farmers: {provide loan; not provide loan}.

Strategy of borrower farmers in performing the loan contract: {perform the loan contract and repay the loan; fail to perform and repay the loan}.

Strategy of small amount credit institutions in farmers' non-compliance with loan contract: {recover, not recover}.

④ Information set of comparison participants; completely open. Comparison participants know selection of the counterparty, their different income, and probability of various conditions.

⑤ Payoff function of comparison participants; use  $Z_1$ ,  $Z_2$ ,  $Z_3$ , and  $Z_4$  to respectively stand for income of comparison participants after completion of actions.

(2) Assumptions of dynamic model:

Assumption 1: all comparison participants are rational men who will make rational selection when making decisions to pursue maximizing economic benefits.

Assumption 2: inflation and opportunity cost are not considered in the entire comparative analysis.

**2.2.2 Theoretical analysis of dynamic model.** Apart from the above assumption of complete static analysis ( $a$ ,  $b$ ,  $c$  and  $v$ ), we assume: if farmers violate the loan contract, the cost for small amount credit institution recovering loan is  $\lambda > 0$ ;  $Q$  stands for the probability of success of small amount credit institution in recovering loan, and the failure probability of recovering loan will be  $1 - Q$ ;  $S$  represents the cost of small amount credit institution in punishing farmers once the recovery is successful;  $M$  stands for the income of farmers from loan;  $N$  (set as constant) refers to potential loss from bad credit record due to farmers' default. Indispensable conditions for comparative analysis: ( $S - \lambda < b$ ); ( $M > b > a$ ), namely, the utility value is greater than sum of principal and interest. This is shown in following Fig. 2<sup>[4]</sup>.

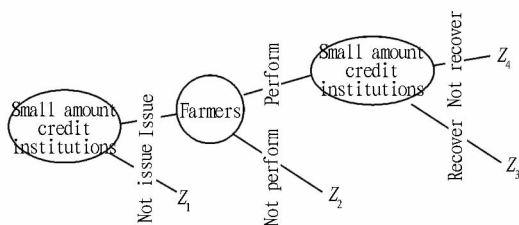


Fig. 2 Extension model of comparative analysis of small amount credit

Use  $Z_i(A, B)$  to represent income of small amount credit institutions and farmers from final decisions, where  $Z_1$  refers to the income of both parties when small amount credit institutions do not issue loan,  $Z_1 = \{0, 0\}$ ;  $Z_2$  stands for the income of both parties when small amount credit institutions issue loan and farmers repay the loan,  $Z_2 = \{b - a, M - b\}$ ;  $Z_3$  refers to the income of both parties when small amount credit institutions recover the loan,  $Z_3 = \{Q(b - a - \lambda + S) + (1 - Q)(-a - \lambda), Q(M - b - S - N) + (1 - Q)(M - N)\}$ ;  $Z_4$  refers to the income of both parties when small amount credit institutions give up recovering the loan,  $Z_4 = \{-b, M - N\}$ .

Based on analysis of dynamic comparative model, we adopt converse inductive method to analyze current situations as follows:

(1) On the condition of farmers' default, we compare the income of whether small amount credit institutions recover the loan:

$$Q(b - a - \lambda + S) + (1 - Q)(-a - \lambda) > -a \Rightarrow Q(b + S) > \lambda \quad (1)$$

where,  $\lambda$  ( $\lambda > 0$ ) to the right of inequation (1) stands for invariable cost for small amount credit institutions recovering amount in arrears in case of default of farmers; while the left side of in-

equation (1) refers to expected income of small amount credit institutions if they successfully recover the amount in arrears. Since  $S$ ,  $M$ , and  $N$  gradually increase, in case of default of farmers, the income of small amount credit institutions from recovering the amount in arrears will be greater than cost for recovery, thus the optimal strategy for small amount credit institutions is to recover the amount in arrears.

(2) Farmers' strategy for loan from small amount credit institutions includes performance and default. Comparison of income from these two types of strategy is as follows:

$$M - b > Q(M - b - S - N) + (1 - Q)(M - N) \Rightarrow N > b - Q(b + S) \quad (2)$$

where, the right side of inequation (2) represents expected income from default of farmers, while the left side of inequation (2) stands for losses possibly suffered from default of farmers. Similarly,  $N$ ,  $Q$ , and  $S$  will increase, and the inequation will hold true. In other words, when small amount credit institutions adopt strategy of issuing loan, the optimal strategy of farmers is to perform the loan contract. Farmers know that the income from default is greatly less than that from repayment. In addition, no matter farmers perform the contract or not, small amount credit institutions will recover the loan, so this is a threat to farmers. In this situation, the optimal strategy of farmers is to perform loan contract.

(3) Whether small amount credit institutions choose to issue loan;  $b - a > 0$ . The sum of principal and interest payable when the loan is due will be greater than the initial principal, so the inequation will hold true.

**2.2.3 Conclusions of analysis of dynamic comparative model.** The process of comparative model turning to dynamic from static contains a credibility threat. In other words, the small amount credit institutions will certainly recover the loan from default farmers, which will lead to increase of  $N$ ,  $Q$  and  $S$ , then the above derivation will hold true. Farmers will also certainly select the strategy that is most favorable to them, namely, the strategy of perform the loan contract. In this way, we can obtain Nash equilibrium solution (small amount credit institutions issue loan; farmers perform loan contract; and small amount credit institutions recover the amount in arrears)<sup>[5]</sup>.

### 3 Countermeasures and suggestions

From the above analyses, we can reach following conclusions. As long as increase of  $N$ ,  $Q$  and  $S$  is ensured, it is required to add a constraint mechanism (credibility strategic threat) in the course of operation of small amount credit. To reduce farmers' moral hazards and ensure successful operation and sustainable development of small amount credit institutions, following policies and suggestions are put forward.

**3.1 Establish and perfect laws and regulations and credit rewards and punishment mechanism for risk management of small amount credit** It is required to perfect laws and regulations for risk management of small amount credit, protect farmers' rights and interests in credit investigation, and remove farmers' worry from the legal aspect. Firstly, law enforcement agency should cooperate with small amount credit institutions in strengthening punishment of default farmers, to make them realize that their default action will bring them more costs. Besides, to urge farmers to actively repay the principal and interest, government should resort to laws to make clear punish-

ment method. For example, it is proposed to promote credit score loan. Through collecting and sorting out farmers' credit information to take as basis, and include those farmers with certain scores into VIP customers and provide those with low interest loan. Such method will not only encourage farmers to actively perform the loan contract and repay the loan, but also reduce costs for post-loan management and recovery of principal and interest. Finally, it is proposed to assess or establish credit file for members with reference to credit rating of banks in loan mechanism, and determine whether next loan can be obtained and fix the upper limit of loan according to rating result. This credit institution system established with proper intervention of government not only improves borrowers' credit awareness, but also restrains default actions of farmers, and effectively prevents risks.

### 3.2 Strengthen functions of loan officer in practice of small amount credit

It is required to strengthen functions of loan officer in small amount credit and establish credit monitoring system, including accounting system, credit and deposit monitoring system, and customer impact follow-up system<sup>[5]</sup>. Accounting system can obtain key indicators from financial analysis report, to monitor operating conditions of small amount credit institutions, and take financial analysis by necessary indicators, including quality of small amount credit assets, financial situations, income, and capital adequacy, etc. The credit and deposit monitoring system includes amount credit follow-up situation and other related information, including types of credit model, methods for calculation of interests and costs, frequency and combination of loan repayment, arrearage condition, customer structure, and deposit transaction. It is proposed to make regular follow-up information analysis report and flexible analysis statement for managers, investors, small amount credit officers, auditors, and customers, to evaluate demand information, supply conditions and operating conditions of small amount credit institutions. The customer impact follow-up system; it is possible to make analysis report for customer impact follow-up system according to influence of small amount credit institutions on local social economy, and make evaluation and feedback for social benefits of small amount credit.

**3.3 Widely promote rural "group lending" system** With reference to GB model, it is recommended promoting "five households group lending", "forced saving", and technical

service systems<sup>[6]</sup>. Specific operation of small amount credit group lending system: firstly, "five households group lending". Five households voluntarily form a lending group. Within the group, democratic management is adopted; joint liability should be taken; and credit risk is jointly shared. Any bad credit action of any group member will tarnish reputation of the whole group. Secondly, it is required to carry out regular communication among group members and to reduce risks resulted from improper selection of projects. Several groups form a farmer center, where technical training activities are carried out. Besides, it is proposed to overcome reverse selection and reduce the high transaction cost through regular meetings and installment payment. Finally, "forced saving" means that loan farmers will be forced to save a small amount at each time of repayment, including group fund and user deposit. The group fund is generally 5% of principal amounts of loans and will be deducted at the time of issuing the loan. The group fund will play a role of loan guarantee. In case some one in the group fails to repay the loan, the group fund will be used to offset. This "group lending" system effectively prevents default risk of farmers.

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administrative efficiency through simplifying grass-roots government organs, and establish more economic development centers in a county, to promote development of rural areas. The current county-wide economy is generally development of the county and fails to push forward economic development of the whole county. In future, we should concentrate on building small towns, to make rural economy have larger radiation areas from the center. As the lowest level of state power, the grass-roots government has a direct interest relationship with farmers. Therefore, it is required to strengthen organizational system at township level.

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