

# Analysis on China's Credit Card Risk Management and Preventive Measures Based on Game Theory

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**Abstract** –With the further development of Chinese credit card business, the risks which the credit card brings focus minds, mainly including credit risk, fraud risk, operational risk, legal risk, technical risk and system risk. Based on the game theory, the paper is analyzed on credit card risk management; put forward some advices to prevent the risks.

**Keywords** –Risk of credit card; Risk management; Repeated game; Static game

## 1. The status of the credit card in China

The root causes of the U.S. financial crisis, including a lot of the economic crises, is the excessive expansion of credit. According to the latest statistics show that the amount of bank card issuers continued growth accelerated year on year growth of debit cards, credit cards a year-on-year slowdown. As of the end of the first quarter of 2012, the country issued a total bank card 3.102 billion, an increase of 5.2% compared with the end of the fourth quarter of 2011, year-on-year growth of 21.5%, accelerating 3.8 percentage points year-on-year growth rate over the same period last year. Which had issued debit card 2.812 billion, an increase of 5.6% compared with the end of the fourth quarter of 2011, up 21.7% year-on-year growth rate of 4.8 percent compared to the same period last year to speed up; credit card volume of 290 million, an increase of 1.8% compared with the end of the fourth quarter of 2011, an increase of 20.0% year-on-year growth rate slowed down by 5.7 percentage points compared with the same period last year. Total credit card credit and credit card end should be subordinated to the total credit (credit card overdraft balance) to maintain rapid growth. Credit card overdue

for six months, total credit outstanding increased slightly, to account for the end of the period should be subordinated to a slight increase in the proportion of the total credit. As of the end of the first quarter of 2012, credit card credit total of 2.79 trillion yuan, a year-on-year growth of 33.2%, an increase of 184.785 billion yuan, an increase of 7.1% compared with the fourth quarter of 2011; ending should be subordinated credit totaling 752.086 billion yuan, a year-on-year growth of 58.7%, a decrease of 60.87 billion yuan, a decrease of 7.5% compared with the fourth quarter of 2011. As of the end of the first quarter of 2012, the credit card is six months overdue outstanding credit total of 12.035 billion yuan, an increase of 1.004 billion yuan, an increase of 9.1% compared with the fourth quarter of 2011; credit card overdue six months of total credit outstanding accounted for the end of the period should be 1.6% of the total amount of the subordinated credit, accounting for comparing the fourth quarter of 2011 increased by 0.2 percentage points. With the continuous expansion of the scale of China's credit card business, its risk control has become increasingly attracted attention. At the same time, China's luxury goods consumption is gradually heated up, and the gradual emergence of a

younger age and conspicuous consumption characteristics of German "Berliner Zeitung" June 11, 2011, reference to the latest report of the World Luxury Association said last year, the luxury of the Chinese Mainland The total consumption of goods market has reached \$ 10.7 billion, accounting for 1/4 of the global share. Is expected in 2012, China will surpass Japan to become the world's largest consumer of luxury goods. When the credit card ending total outstanding credit growth experienced luxury consumption growth, the banking system risk management capabilities will face a new test.

## 2. China's credit card risk classification

The current domestic credit card risk includes credit risk, fraud risk, operational risk, legal risk, technical risk and systemic risk.

### 2.1 The credit risk

Credit risk is the types of risks unique to the credit card business, the uncertainty of the economic conditions of the cardholder, the risks to the issuer. According to the definition of the Basel, card issuers and credit card customers side led to the loss of the possibility of default or is unable to perform its contractual breach here is the credit card customers. When customers apply for credit cards because the card issuer audit clients some of the first off based on the economic conditions and creditworthiness of the customer then. The customer after the leading card itself may may be due to the time change, when the change of certain conditions of its own economic credibility conditions have a significant negative impact, a direct result of not be able to repay the credit card has this customer payments events. Therefore, the credit risk is an important object of study of credit risk management system.

### 2.2 The fraud risk

The risk of fraud is mainly refers to the the lawbreakers with fake cards, consumer waste card merchants, malicious overdraft at the bank outlets, or they modify the relevant information directly into the banking network, bring economic losses to the corresponding legitimate subject. Specific performance:

lawless elements in the theft, as well as other ways to obtain credit card through imitation cardholder signature forged identity card, posing cardholder fraudulent spending and cash withdrawal; the lawbreakers merchants, or cashing outlets extraordinary molecular colluding by changing the validity of the report the loss of the card number or expiration card, to defrauding goods and cash; lawless elements forged credit card into the circulation, the real ones, so merchants suffered losses.

### 2.3 The operational risk

Operational risk refers to the risk of loss, the operation process is imperfect, system failures or mistakes and external events caused due to human negligence. At the current stage of development of China's credit card, because of the relatively weak status of the credit card business development, system problem occurs, staff negligence occurs frequently cause a lot of obstacles to the development of the credit card business substantive. Mainly in the form of operational risk: illegal operation, is not required to audit the applicant's materials; operator errors; overdraft agreements for the pursuit of high profits; merchants in the process of receiving bank card, intentionally or loss risks caused.

### 2.4 The legal risk

The legal risk is the lack of a "legal basis" in the event of risk conditions that lead to the absence of relevant laws and regulations dynamic. The credit card business in China to carry out relatively slow, especially the risk of legal rights, responsibilities and obligations of market relations is not clear, no legal basis for many business sectors and operating practices. Mainly reflected the lack of specific laws and regulations of the credit card business; credit legislation still vacant. Acts of dishonesty is not the appropriate punishment and intensity; caused by fraud risk behavior is not a high price to pay; lack of legal protection of the personal privacy of personal credit information; lack of legal responsibility Pavilion on Third Party Liability in the credit card business line institutions provisions; these are legal risks restrict the healthy development of the credit card business.

## 2.5 The technical risk

Technical risks in our core hardware and software used by the major banking institutions in the credit card business to rely on imports from abroad, the hidden once the international relations, the credit card system will be threatened. Domestic card issuers in the current situation has been the introduction of a variety of advanced technology and management experience, management level has improved to some extent, but these talents technical experience is still facing localization, historical transaction data accumulated enough problems. The trend of globalization of information, but also international cardholder information are leaked and have been infringed, technology risk is all the time there is a realistic risk.

## 2.6 The system risk

Systemic risk in China's personal credit system is not perfect, imperfect regulatory under realistic conditions, the event of the economic downturn will be revealed. It is a whole industry of risk, subject to national and global macroeconomic trends, and therefore more uncertainty. China's credit card business is facing explosive growth, thus the systemic risk in the short term is still a long way from the cardholder.

## 3. Game theory analysis of the credit risk management

The so-called game, explore rational behavior and interaction results in conflict of interest between the two and more than two individuals; it is a prominent feature of individual rationality.

### 3.1 The theory of repeated games

Nash game theory, non-cooperative prisoner's dilemma shows that individual rational strategies lead to collective irrationality paradox, prisoners A with prisoners B was arrested, the police suspect that they committed crimes, but did not grasp the conclusive evidence that they committed crimes of two suspects the identification of the people the facts of the crime and sentencing depends entirely on their own confession. Assume the police to

segregation for trial two suspects, each of the suspects are not observed in the other's choice. The same time, the police clear to inform the two suspects, they face the following consequences.

If A, B are not confess, the police can only be based on the evidence and sentenced to two suspects to two years in prison.

If A, B are frank. Both were sentenced to five years in prison.

If one of A, B Frankly the facts of the crime, and their associates refused to confess, then confess lighter will be sentenced to one year in prison for refusing to confess will be sentenced to seven years in prison.

**Table 1** Prisoner's Dilemma Game Model

Prisoner A \ Prisoner B	Confess	Do not confess
Confess	-5, -5	-1, -7
Do not confess	-7, -1	-2, -2

Source: Gao Hongye, Western Economics, Beijing, China Renmin University Press, 2000.

To A as an example: if B chooses Frankly, the above table it can be seen, the A to come clean, will be sentenced to five years, A choose not to confess, will be sentenced to seven years, so to come clean, A to select the optimal strategy ; if B chooses not confess, the above table it can be seen A to come clean will be sentenced to 1 year A choose not to confess, will be sentenced to two years, so the A to come clean.

Similarly, A can be introduced to choose what kind of strategy, B select the optimal strategy is frankly (A the Frankly, B frankly) is the dominant choice of A, B, (A frankly do not confess, B) A, B will be sentenced to two years in prison, is not the optimal strategy combination of A, B, A, B are rational people, everyone starting from the point of view of personal interest in choosing. Everyone in carrying out the agreement needs to take the enormous risk of default of the counterparty. For example, one of the suspects insist on carrying out the agreement, once the other breach of contract, he will be sentenced to seven years in prison, (A does not confess do not confess, B) cannot be balanced solution.

In case no personal credit information system, the parties to the transaction is similar to the "prisoner's dilemma" problem, the following analysis of the

commercial banks in the credit card business credit game.

Between the cardholder and the commercial banks in case of no personal credit information system was originally a "Credit Game" information asymmetry exists between the commercial banks and cardholders, commercial banks can choose credit or no credit, card can choose trustworthy or not trustworthy.

**Table 2** credit card business in the commercial bank credit game model

Cardholder Commercial banks	Non-payment	Repayment
Credit	-5, 15	10, 10
Not credit	0, 0	0, 0

Source: According to Hui-Yun Wang, guard against credit risk to see China's personal credit system construction [D]Foreign Economic and Trade University, 2006.4 finishing.

In this game, the participant is a commercial bank and cardholder, is clearly a dominant strategy equilibrium does not exist here, because the banks do depends on the cardholder's behavior, if the Bank believes that the cardholder repayment, the bank bound to credit, and made some gains, however, if the bank that the cardholder does not repayment, it certainly will not grant loans. Analyze cardholder behavior, if bank credit cardholders choose trustworthy get 10 unit revenue, but not trustworthy, will get 15 units of income, apparently out of individual rationality, the cardholder will choose not to repayment. If the bank does not credit cardholders do any choice. Cardholders inevitable choice for non-payment, the bank you choose not to credit, the sodium even balanced the game must be (non-payment, no credit).

The prisoner's dilemma reflects a very profound question, is the contradiction between individual rationality and collective rationality. In the case of asymmetric information, individual rational behavior leads to social irrational. Prisoner's Dilemma, two prisoners choose not to confess, everyone only sentenced to two years in prison, although than come clean, everyone is much better five-year sentence, but cannot reach the Pareto improvement, because it does not satisfy individual rationality requirements, (A not confess do not confess, B) is not a Nash equilibrium. Similarly, in the credit game (repayment of credit), both 10 unit revenue,

is clearly better than (non-payment, no credit) and the results are much better, but this Pareto improvement also reach because does not meet the requirements of individual rationality. Shows that, without the constraints of the personal credit system, trading due to lack of trust, has a very high credit risk. When credit information activities in the community served as a means of regulation can impact the credit activities of the economic entity, the economic entity more emphasis on standardized credit activities.

Game theory will bring adverse outcome of the game, when the social dilemma is a one-off game, the game is uncooperative. "Prisoner's Dilemma" was the result, there are two main reasons: First, the two prisoners serious information asymmetry, two prisoners before deciding deliberations, the results may be different. Second, the prisoner's dilemma is a single game. Game both from the immediate and short-term interests, making the entire market order is destroyed, the whole social credit is reduced to zero.

Game theory to change the rules of competition is the fundamental way to win the game. Be able to produce the effect of cooperation in the case of incomplete information, repeated games. Repeated game is a special case of the dynamic game. Indefinitely repeated games, deceit and breach of contract for any participant, other participants will always have the opportunity to give revenge. Many people through each game will gradually recognize that cooperation can make everyone gains are maximized, without cooperation; the two sides will be losses. After lessons and reflection time and time again, everyone will be more profound understanding of the other action may be taken and the results, recognize that actions now should be changed, so have the desire to cooperate. After multiple Game, the relationship between people will be stable in the cooperation area, maximize the transition from the pursuit of short-term interests for the pursuit of long-term interests to maximize, to the pursuit of individual interests to maximize the maximization of the collective interests. Credit transactions, the game between the individuals, often one or the finite number of times, then the optimal strategic choice is to lose the trust of fiduciary; Game between individuals or transformed into multiple between the individual and society repeated game, and trustworthy, it may become a a strategic choice fiduciary.

Economic game theory, repeated games is the only way out of the credit construction Paradox, the major factor in the impact of repeated game equilibrium outcome is the number of repetitions and completeness of the information. In the credit card business, in terms of the number of repetitions, the business transactions between the cardholder with commercial banks will always carry on commercial bank credit game can be seen as an infinitely repeated game. Everyone out of the pursuit of peace and reputation, in the case of repeated game has to go on, the cardholder for the future of their valuable reputation for honesty and cooperation at an early stage.

### 3.2 The construction of a bridge static game model

The model assumes that in a remote mountainous area in two villages, and each village has only one people, the villagers of the two villages, but meters away, but it is difficult to interact, because two villages a valley barrier Valley is raging running water. The villagers of the two villages in order to exchanges, had to bypass several mountains, but also early morning leg muscles a good night to get to the other side. Assumptions will be able to solve the problem of building a bridge, the bridge-building cost of 6, two villages each good for 4, then the two villages together build shared equally the cost for each good for 4, and a net profit of 1; if a village was built, another village, sit back and enjoy, then have to bear the cost of constructing the bridge village 6 -2 profit, the two villages are not built, the two villages profit 0. Specific strategies style as shown below:

**Table 3** Building bridge static game model

A Village \ B Village	Build	Do not build
	Build	Do not build
Build	1, 1	-2, 4
Do not build	4, -2	0, 0

Source: Wang Wei, Ma Qin Hai, create a personal credit system in China Game, Sichuan Institute of Business Administration, 2007.1, 34-36

Can be seen from the above table, B's building bridge inferior strategy because regardless A construction of a bridge or not, B's building bridge not better than the construction of a bridge. Specifically, the A built or not

built B of the benefits better than the built; A not build, do not build B, B of the benefits better than the built -2. Therefore, building bridge this choice may be removed. The same analysis also applies to A, so the choices between the two sides are not building. In credit transactions, the information is the most important factor of production. Credit information under fiduciary to develop credit program for every occurrence of a transaction, credit mastered fiduciary credit information, but no one wants to put their information on the initiative to share with others. Own information to share with others, the others do not do so, he did not harvest being an advantage, take a ride; And if someone else is willing to share information and not do their own account for the others cheaper. Optimal choice for everyone are not taking the initiative to share information and results are not guaranteed the benefit of all. So there have been some by letter in a credit with a bad credit history, but can easily be obtained from another credit credit, resulting in a credit transaction hidden risks.

We can see from the above two game model, cardholders and commercial banks in the credit risk management process to achieve a win-win game between the cardholder with individual commercial banks must become cardholders and commercial dynamic repeated game between the banks as a whole to solve the problem of information asymmetry, guide the cardholder and commercial banks towards a win-win cooperative game.

## 4. China's credit card risk prevention measures and policy recommendations

### 4.1 Strengthening legislation.

Countries to be enacted as soon as possible the implementation of the regulations and their supporting measures of the personal credit system, the legal form of the personal accounts system, personal credit record and transfer of personal credit file management level assessment, disclosure and use of personal credit, personal credit, subject and object clearly defined rights and obligations and codes of conduct to make a mandatory approach to the implementation of the national system of personal credit. The same time, it is necessary to increase the enforcement of existing committing credit card laws and regulations behavior,

increase the cost of credit card delinquency deterrent to the intensified credit card criminal behavior, play the role of a certain deterrent.

#### **4.2 The establishment of personal credit system suitable for China's national conditions.**

Developed countries engaged in a long history of personal credit business and legal environment to the specific operation management mode, have accumulated a lot of experience, the establishment of a mature individual credit system: personal credit registration system, personal credit rating system, personal credit risk early warning, personal system of credit risk management and personal credit transfer risk. But we learn at the same time should be combined with China's national conditions, the late start of the personal credit market, many ways is still immature, so we cannot simply apply foreign models, but should build our own personal credit system. This can be from two aspects, which, for a personal credit card risk, establish a good external business environment is the key.

#### **4.3 Strengthen cooperation.**

Information asymmetry between the issuing bank and the relevant departments, the card-issuing bank. This is mainly because the commercial banks and external stakeholders cooperation mechanism is yet to be established. Taxation, public security and other related departments of holding a great deal of valuable credit information, but because of the separation of departments, the lack of information sharing mechanism makes the integration of the use of the information is difficult to achieve. In addition, if the commercial banks to share customer credit history, a more comprehensive Understanding of the applicant's liabilities, reducing the borrowers bulls borrowing brought excessive lending risks. However, the status quo was non-sharing of risk information between the issuer and risk management standards are not unified.

#### **4.4 The tightening of the approval and issuance of a new card.**

The credit card business is a very short history in China, and the early release very confusing, each bank using

various means in order to seize the market, a wide range of open cards, easing management approval and issuance process, porous, so do not have repayment ability people have a credit card, As the vetting process - open card - consumption - bad debt process lag, bad debts in the near future have looked up the trend. The method of controlling the risks are as follows: (1) improve the quality of the credit card salesman. Change of the clerk of the original assessment mechanism. Has been the major banks are in issuance volume of salesman assessment, the system caused by the salesman did everything it could to open the card, the huge amount of waste card bad card. A change in the original appraisal system, the amount of "first brush" assessment as well as the business of the introduction of high quality cardholder reward. Can effectively avoid the occurrence of this situation. (2) to handle the process, strict examination and approval can prove the repayment ability of valid documents, such as proof of income, proof of assets, social relations. Credit card payment early, many the salesman only need to provide identity cards and business cards, and did not accurately reflect the financial ability of credit card applicants. (3) control the amount of new cards do not have a credit card to use the record and no credit history, the amount of the first open card can be controlled in a million, well-qualified and good credit repayment in a certain period of time to improve its successive credits can be used.

#### **4.5 Follow-up services in the process of credit card use.**

- (1) Increase the dunning efforts, as appropriate to expand the artificial reminders scale, poor repayment records of credit card users can be provided in advance to remind businesses to ensure their timely repayment.
- (2) Provide appropriate incentives to repay on time customer, such as increased integration, or mail small gifts to make it for a long time to maintain a good repayment habits.
- (3) For customers with bad credit, can develop standards to reduce the credit to reduce the risk of bad debts.

#### **4.6 Increase joint punish malicious overdraft.**

Malicious credit card overdrafts way and become more

and more complex, at the same time, credit card fraud, crime increasing trend addition to monitoring data, the bank introduced a survey mechanism, conducted a survey of a larger amount of the special case of the situation, and if necessary, civil or criminal prosecution in accordance with the appropriate laws and regulations.

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