

Research on the Credit Collusion Prevention in Chinese Commercial Banks

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Abstract The credit collusion is the main form of internal fraud and will lead to the wrong decision on loan-issue and further worsen the operation risk as well as the default risk. At present, the loan initiated by commercial banks in China is surging and challenges the loan management. This paper adopts the P-S-A model to study the collusion between loan officers and lending firms. Finally, it derives the collusion-free conditions and proposes some measures to reduce the collusions, which includes imposing harsher penalty on bribes to deter any collusion for increasing individual welfare, launching more sophisticated remuneration for loan officers to develop long relationship with commercial banks and making more efforts on monitoring the larger sized loans.

Key words Collusion; P-S-A model; Bad loan ratio; Commercial bank

1 Introduction

Figure 1 indicates that the financial structure in China has mainly been fueled by the commercial banks' loans, rather than the stock market and bond market that have not been well developed. During the period of 1990s, the commercial banks in China had accumulated a large amount of non-performing loans, which gradually undermined the stability of financial system. Due to the government, who implemented a series of reforms to write off those bad loans, the ratio of non-performing loans to total gross loans in China fell from 29.8% in 2001 to 2.4%^① in 2008. It is much costly and time-consuming to digest the bad loans for the economy. When the subprime mortgage crisis broke out in 2007 and started to exert negative influence on China's economy, the government had launched a RMB¥4 trillion investment plan and encouraged commercial banks to issue loans to ensure the continuous development of the economy. And the total amount of loans leapt by RMB9.6 trillion in 2009. Although credit expansion had enhanced the market liquidity and kept the panic economy in confidence, it may also arouse the problem of bad loans. The financial crisis that arose from bad loans in the United States spread worldwide and aggravated into global financial crisis. And the American economy as well as global economy has been severely assailed since then. Meanwhile, the financial crisis still lingered on the world economy and the Chinese government may initiate another wave of loan stimulus. Therefore, it is significant to pay more attention to the loan risk management and related research, so as to hinder the surge of bad loans.

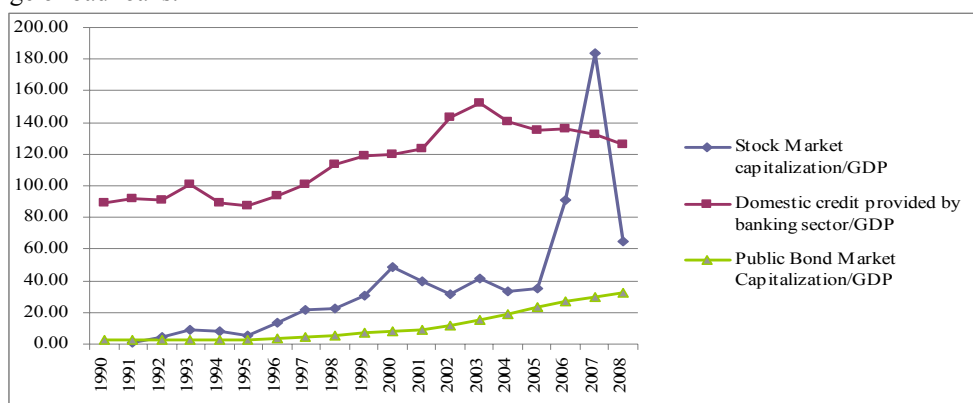


Figure 1 The Financial Structure of China's Financial System (%)

Sources: the World Bank Database and Financial Structure Dataset (2010)

The credit collusion is the main form of internal fraud. And it will lead to the wrong decision on

^① Statistics are from the World Bank Database.

loan-issue and further trigger the operation risk as well as the default risk. (Wan Jie & Miao Wenlong 2005), (Li Zhihui & Fan Hongbo 2005) argued that the internal fraud is the major reason for operation risk in Chinese commercial banks, while the external fraud in foreign commercial banks. And (Zhang Cheng & Liu Wen 2009) analyzed the 171 fraud cases in Chinese financial institutions during the period from 2000 to 2007 and concluded that the internal fraud has caused substantial losses in Chinese commercial banks. Therefore, it should pay more attention to the credit collusion and the approaches to reducing them.

Since 1979, the Chinese government authorities have launched three waves of reforms in the banking industry (Alicia García-Herrero et al., 2009). And the domestic commercial banks now have made great improvement on the risk management^①. In the past, the loan officer was qualified to grant a credit, while now most domestic banks have established the credit review committee, and even the regional evaluation center to completely isolate the credit investigation and credit review. The new mechanism in the credit issuing process is helpful to ensure the quality of bank credit assets. However, there are still potential risks that lie in the collusion between the loan officer and the loan applicants. It can cause the operation risk as well as default risk when the loan officer makes a side-contract with the loan applicants and hide some information. Therefore, it needs profoundly study to perfect the mechanism.

The remainder of this paper is organized as follows: Section 2 makes a brief review of the related literature on the credit collusion. Section 3 presents assumptions and models used in this paper. Section 4 concludes the results, while Section 5 proposes some advices for collusion-proof.

2 Literature Review

The collusion is one of the important problems faced by an organization. Before 1980's, the scholars mainly focused on the research of collusions among organizations, namely the Cartel intending to seize the monopoly power. And later Jean Tirole and Jean-Jacques Laffont etc. started the study on collusions within a hierarchical organization, which includes the horizontal collusion (eg. collusions among the agents) and the vertical one (collusions between the supervisor and the agent). Jean Tirole (1986) proposed a general framework "Principal- Supervisor-Agents" (P-S-A) for collusion analysis. And collusions within an organization could be a double-edged sword that may promote the cooperation as well as induce the corruption.

There is little literature related with the credit collusion, especially the collusion between loan officer and loan applicants. Scheepens (1997) analyzed the situation that the loan manager granted loans to unprofitable firms when took bribes. Meanwhile Mitusch (1998) studied the positive effects of credit collusion which could help the loan officer to acquire more private information of the firms. Jinyong Hwang et al. (2003) studied the collusion between a low-type borrowing firm and loan decision-making party with a model and found that the collusion will be deterred when the economic environment deteriorates. Nan Xuguang (2009) made a systematic research on the credit collusion and concerned financial corruption problems. It consisted of collusions between the credit reviewer and the loan officer, one between the head office and the branch, one between the loan officer and the lending firm. And he argued that the collusion lied in loan officer and the lending firm was the severest problem in commercial banks' loan-business, and the collusion equilibrium could not be reached unless the loan officer was partially honest. Meanwhile, Dai Ying-kun (2005) paid close attention to the collusion that might occur between the loan officer and the internal supervisor by use of four different models in static game with in-perfect information, dynamic game with in-perfect information and perfect information respectively. And he concluded that when imposing higher penalty, raising the loan officer's remuneration and increasing the check frequency, there will be less collusion and loans in violation of rules.

The aforementioned literature basically applied the game theory to analyze the credit collusions. However, they failed to make a more elaborated research on credit collusion within commercial banks under the framework "P-S-A". Moreover, the study on the collusion between the loan officer and the lending firm should make allowance for the situation of the credit market in China. Therefore, this paper intends to make a supplementary research to shed light on the optimum contract design for credit management.

^① Li Fuan. China banking capital quality "best". Financial Times Chinese, 2009-06-08 (In Chinese)

3 Assumptions and Models

3.1 Assumptions

Consider the Tirole’s framework “Principal-Supervisor-Agent (P-S-A)” in static state. In this three-tier hierarchies, the principal is affect by the activity of the agent and lacking either time or knowledge to supervise the latter, and the supervisor collects the agent’s private information to assistant the principal to control the agent (Tirole, 1986). In practice, the private information of lending firms is unknown by the credit reviewer, who is influenced by the former’s repayment of loans and takes advantage of the information collected by loan officer to approve applicants of lending firms. Therefore, the principal in the model is the credit reviewer consisting of a group of experts, and the agent is the lending firm, while the loan officer is assumed as the supervisor (Seen in Figure 2).

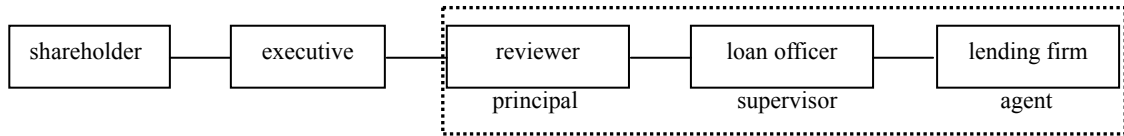


Figure 2 The Principal-Agent Relations in Chinese Commercial Banks

In this paper, there is only a principal, a supervisor and an agent involved into a loan in a single gaming playing by hypothesis. Lending firms that applicant loans must appear to have certain creditworthiness matching the amount of loans. The creditworthiness is expressed by the supervisor’s signal and some firm’s information is forged for collusion. Hence, the private information can take two values, namely the creditworthiness above the loan quantity and the creditworthiness under the loan quantity, which occurs with probability of η_1 and η_2 , respectively. And the supervisor’s signal only takes one value, i.e. the creditworthiness under the loan amount. Moreover, when submitting a loan applicant report through the supervisor, the agent is assumed to be granted a sum of loan by principal for reducing the complexity of models.

3.2 The models

In short term, the situation that whether the agent can be initiated a loan or not and the quantity of granted loan (q) is depended on its financial standing and the bribes (b) it offered, which is the side transfer for collusion between supervisor and agent. However, when the loan officer being penalized for manipulating private information that leads to bad loans, the agent will be blacklisted by the commercial bank and suffer the bad effect $G(e)$ in monetary terms. Then the utility of agent is $U_a = q - b - G(e)$. And $dG/de > 0$.

The supervisor can distinguish the agent’s financial standing through investigation^① and offer hard information to principal. And the supervisor’s income includes two parts, namely the remuneration provide by the bank and the possible bribes (b) offered by the agent. The former is kq ($k \in (0,1)$), while the latter significantly affects the authenticity of agent’s private information when the supervisor reporting to principal. And once the loan disobeyed the rule is unveiled, the probable penalty (p) will be levied on the supervisor and cause negative effects by function $F(p)$ in monetary terms. Therefore, it supposes that the utility of supervisor is $U_s = kq + b - F(p)$ and $dF/dp > 0$.

The principal is responsible for checking and approving loan applicant reports according to the private information about the agent that collected by the loan supervisor. And the revenue (r) of the principal is dependent on both the loan quantity (q) and bad loan ratio (θ). Furthermore, the bad loan ratio is affected by many factors, such as the authenticity of the private information about lending firms, the morality of loan officer, the economic environment, the experience and effort of the principal and so on. In this paper, it just focuses on the variables that influence the first factor, namely the bribes and penalty imposed on the agent and supervisor. Hence, the principal’s revenue is $r_p = r(q, \theta(b, e, p))$. And $\partial\theta/\partial b > 0$, $\partial\theta/\partial e < 0$, $\partial\theta/\partial p < 0$.

Meanwhile, the order of play is not the typical one in the traditional “P-S-A” and there are only

^① In fact, the supervisor has to exert efforts in investigation that will reduce his utility. However, it assumes the supervisor can acquire the whole private information about lending firms with ease.

hidden grand contracts^① between principal and other two participants. As for the commercial bank, the most important problem to solve is designing the collusion-proof contract. It assumes that the lending firm can be initiated the quantity of loans q_1 when offering bribes while q_2 when not offering bribes. Once the loan is initiated, the next step is its reimbursement. When lending firms fail to repay the loan and the bad loan being confirmed, the inquiry will be arose and the loan officer will be facing penalty if he have taken bribes and misled the credit reviewer. And the probability of the collusions being detected is $m(m \in (0,1))$ by hypothesis.

Finally, the individual rationality constraint (IR), the incentive compatibility constraint (IC) and the collusion incentive constraint (CIC) must be satisfied to reach collusion-free solutions, which is as follows:

$$\begin{aligned} & \max_{q_1, q_2, b, e, p} [\eta_1 r(q_1, \theta(b, e, p)) + \eta_2 r(q_2, \theta(0))] \\ \text{s.t. (SIR)} & \quad -\eta_1(kq_1 + b - mF(p)) - \eta_2 kq_2 \leq -\bar{U}_s \\ \text{(AIR)} & \quad -\eta_1(q_1 - b - mG(e)) - \eta_2 q_2 \leq -\bar{U}_a \\ \text{(IC, CIC)} & \quad (kq_1 + b - mF(p)) + (q_1 - b - mG(e)) - (kq_2 + q_2) \leq 0 \\ & \quad q_1, q_2, b, e, p > 0 \end{aligned}$$

Where, the reservation utility of the supervisor and agent are supposed to be \bar{U}_s and \bar{U}_a , respectively, and the inequality $q_1 > q_2$ exists for fake information.

4 Analysis and Results

The Lagrange's function is:

$$L = \eta_1 r(q_1, \theta(b, e, p)) + \eta_2 r(q_2, \theta(0)) + \lambda_1 \{ \eta_1 [kq_1 + b - mF(p)] + \eta_2 kq_2 - \bar{U}_s \} + \lambda_2 [\eta_1 (q_1 - b - mG(e)) + \eta_2 q_2 - \bar{U}_a] - \lambda_3 \{ [(kq_1 + b - mF(p)) + (q_1 - b - mG(e)) - kq_2 - q_2] \} \quad (1)$$

Taking the derivatives of L with respect to q_1, q_2, b, e and p as follows to obtain Kuhn-Tucker conditions.

$$\left\{ \begin{aligned} \frac{\partial L}{\partial q_1} &= \eta_1 \frac{\partial r}{\partial q_1} + \lambda_1 \eta_1 k + \lambda_2 \eta_1 - \lambda_3 (k + 1) \leq 0, q_1 \geq 0, q_1 \frac{\partial L}{\partial q_1} = 0 \\ \frac{\partial L}{\partial q_2} &= \eta_1 \frac{\partial r}{\partial q_2} + \lambda_1 \eta_2 k + \lambda_2 \eta_2 + \lambda_3 (k + 1) \leq 0, q_2 \geq 0, q_2 \frac{\partial L}{\partial q_2} = 0 \\ \frac{\partial L}{\partial b} &= \eta_1 \frac{\partial r}{\partial \theta} \frac{\partial \theta}{\partial b} + \lambda_1 \eta_1 - \lambda_2 \eta_1 \leq 0, b \geq 0, b \frac{\partial L}{\partial b} = 0 \\ \frac{\partial L}{\partial e} &= \eta_1 \frac{\partial r}{\partial \theta} \frac{\partial \theta}{\partial e} - m \lambda_2 \eta_1 \frac{dG}{de} + m \lambda_3 \frac{dG}{de} \leq 0, e \geq 0, e \frac{\partial L}{\partial e} = 0 \\ \frac{\partial L}{\partial p} &= \eta_1 \frac{\partial r}{\partial \theta} \frac{\partial \theta}{\partial p} - m \lambda_1 \eta_1 \frac{dF}{dp} + m \lambda_3 \frac{dF}{dp} \leq 0, p \geq 0, p \frac{\partial L}{\partial p} = 0 \\ \frac{\partial L}{\partial \lambda_1} &= \eta_1 (kq_1 + b - mF(p)) + \eta_2 kq_2 - \bar{U}_s \geq 0, \lambda_1 \geq 0, \lambda_1 \frac{\partial L}{\partial \lambda_1} = 0 \\ \frac{\partial L}{\partial \lambda_2} &= \eta_1 (q_1 - b - mG(e)) + \eta_2 q_2 - \bar{U}_a \geq 0, \lambda_2 \geq 0, \lambda_2 \frac{\partial L}{\partial \lambda_2} = 0 \\ \frac{\partial L}{\partial \lambda_3} &= (kq_2 + q_2) - [(kq_1 + b - mF(p)) + (q_1 - b - mG(e))] \geq 0, \lambda_3 \geq 0, \lambda_3 \frac{\partial L}{\partial \lambda_3} = 0 \end{aligned} \right. \quad (2)$$

According to the assumptions and models, the constraint conditions must be binding and all the Lagrange multipliers are positive, i.e. $\lambda_1 > 0, \lambda_2 > 0$ and $\lambda_3 > 0$. When the aforementioned Kuhn-Tucker conditions are satisfied, collusions between the loan officer and the lending firm are not apt to take place. Meanwhile, several equations that feature the collusion-proof contract can be inferred as follows,

^① The payoff of supervisor and agent is indirectly determined by the principal.

$$\frac{\partial r}{\partial q_1} + \frac{\partial r}{\partial q_2} = -\frac{\lambda_2 + k\lambda_1}{\eta_1} < 0 \quad (3)$$

$$\frac{\partial \theta}{\partial e} \bigg/ \frac{dG}{de} = m \frac{\partial \theta}{\partial b} + \frac{\partial \theta}{\partial p} \bigg/ \frac{dF}{dp} \quad (4)$$

$$q_1 = q_2 + \frac{m(F(p) + G(e))}{k+1} \quad (5)$$

And the equation (3) suggests that the marginal revenue for initiated loans under the condition that the bribes have caused bad loans must be negative and its absolute value must be higher than the one under the condition without bribes. In other words, it implies that the principle should take more strict measures to hinder the bribes and the corresponding bad loans. As for the equation (4), it demonstrates the insight into the relation among the penalty measures and bribes. Because $\partial \theta / \partial e$, $\partial \theta / \partial p$ are both

negative, and $\partial \theta / \partial b$, dG/de , dF/dp are all positive, the inequality $\frac{\partial \theta}{\partial e} > \frac{\partial \theta}{\partial p} \left(\frac{dG}{de} \bigg/ \frac{dF}{dp} \right)$ must exist and only when the loan officer is more penalty-averse than the lending firms, the increased penalty on loan officer can be more helpful to improve loan quality than the one on lending firm for $\left| \frac{\partial \theta}{\partial p} \right| > \left| \frac{\partial \theta}{\partial e} \right|$.

The equation (5) implies that the extra loan that gained through bribes must sterilize the possible penalty. Hence, once the penalty is strict on loans in violation of rules, the loans in larger value will be more suspicious for bribes.

5 Conclusion

From the collusion-proof equations and their implications, the commercial bank should take some measures to effectively reduce the collusions and the harmful effects. First, the commercial banks should impose harsher penalty on bribes to gain loans broken the rules, so as to deter any collusion for increasing individual welfare. Second, the commercial banks should launch more sophisticated remuneration for loan officers and make them more rely on long relationship with banks and more penalty-averse. Then the loan quality can be effectively improved by the penalty set for loan officer taking bribes from lending firms. Third, the commercial banks should spend more efforts on the larger sized loans, which are more prone to be arisen by bribes, especially when the penalty mechanism is drastic.

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