

Moral Hazard of Regional Banks and Bailout Policy

Shinya Shimoda *

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1 Introduction

Financial institutions, for example, banks, are expected to play an important role in the economy. Due to the strong influence on the economy, there are many policies of regulation and protection for banks by the government. Especially, the bankruptcy of banks make serious damage for the economy, so the government tends to avoid such social loss.

Since 1999, several regional banks have become bankrupt in Japan. A main case was that of the Ashikaga-bank (the regional bank in Tochigi Prefecture), which was the first case of bankruptcy of a “regional bank” in Japan. ¹ It is believed that the Ashikaga-bank’s major loans were made to hotels of a hot springs resort, the liabilities of which surpassed its assets. The bank also repeated additional loans to these firms.

Why did the manager of the bank make such futile additional loans? It appears that this question is common to most regional banks. It is often suggested that the manager of the regional bank obtains rent from firms as long as the firms are in business, ² therefore, the manager does not change the plan of management. Furthermore, the managers believe that

*Graduate school of Economics, Kyushu University e-mail:shimoda@en.kyushu-u.ac.jp

¹In Japan, there are two kinds of banks that use the prefecture as an operating base. One of these is the “regional bank” and the other is the “second regional bank”.

²For example, after retirement, the managers will find new jobs as officers of the firms.

the government will certainly help the banks in a crisis.³ As the result, the bank fails and social efficiency is impaired.

Such a moral hazard problem appears to occur often, particularly, when there is a lack (or shortage) of a suitable policy from the regulator; therefore, we will focus on the problems of “bank moral hazard” and “bailout policy” in this article.

Studies on bank bailout policy have mainly been conducted since the 1990s. In Aghion et al. [1999], the tough bailout policy and the soft bailout policy were compared using a model with asymmetric information regarding the financial situation of the bank. They pointed out that the former policy results in financial concealment by the bank while the latter policy results in a moral hazard problem; therefore, they suggested a compromise policy. Cordella and Yeyati [2002] analyzed the efficiency of the central bank’s lender of last resort function by comparing the value effect and moral hazard under an uncertain economic environment. They then showed that although the soft bailout policy raises a moral hazard problem, the central bank lowers bank risk by announcing and committing ex-ante to bail out insolvent banks under a worsening economic environment. Osano [2002] analyzed that an optimal regulatory policy in the presence of managerial compensation contracts with stock options. In that study, he pointed out that the regulator cannot necessarily attain the social optimal allocation by injecting cash funds into an insolvent bank; however, it can be attained by a non-linear injection scheme: The regulator injects cash funds with less stringent repayment conditions for banks with safer investments and nationalizes banks with riskier investments.

This paper is organized as follows: The model is presented in Section 2, Section 3 analyzes the policy without bank bailout, and Section 4 analyzes the policy with bank bailout and examines both the tough bailout and the

³In Japan, financial assistance is provided by the Deposit Insurance Corporation of Japan, and the Bank of Japan (in its role as the “lender of last resort”) provides emergency liquidity.

soft bailout policies. Section 5 determines the optimal bank bailout policy.

2 The Model

There are three players in this economy: the bank owner, the bank manager and the government. They are assumed to be risk neutral.

2.1 The Timeline of the Game

In this article, the game is conducted in the following timeline.

1. The government determines the bailout policy, either tough or soft.
2. The bank manager determines whether to make the additional loan or not and chooses the effort level.
3. If there is a bailout, the government investigates the assets of the bank.
4. The result of the project for which an additional loan was made, and the entire payoff that results from it is determined.

2.2 The Bank Owner and the Bank Manager

In this article, it is assumed that the corporate governance of the bank is not effective; hence, the bank manager makes all the decisions.

In the first period, the bank has an insolvent loan of 1; therefore, the bank manager decides to either liquidate the borrower (henceforth referred to as “the firm”) or to make the additional loan. If he/she liquidates the firm, the bank incurs a loss of 1 and becomes insolvent; however, if he/she makes the additional loan, the bank accepts the deposit of $L(> 0)$. The bank supports the firm so that it succeeds in its new project. The level of support is e and the cost is $(1 + L)e$ with the amount of loan being $(1 + L)$.

The manager gains a private benefit of $\lambda(1 + L) < 1$ when the firm is solvent in the third period. He/she also makes an effort that costs e for an effort level e .

With support from the bank and its manager, the firm succeeds in the new project with a probability $p(e)$. It is assumed that $p'(e) > 0, p''(e) < 0$, $\lim_{e \rightarrow \infty} p(e) \rightarrow 1$.

If the project is a success, the bank is able to collect the entire loan; however, if the project fails, the bank loses the entire amount.

2.3 The Government

The government determines whether or not to implement the bailout policy, and whether to apply the tough or the soft policy.

We assume that the government's purpose is to maximize social welfare, which is the sum of the bank benefit and government cost.

The Tough Bailout Policy

Under the tough bailout policy, the government injects cash funds into the insolvent bank only when the insolvent loan is discovered by an investigation. Instead of injecting cash funds into the bank, the government fires the incumbent bank manager, and a new manager is chosen by the government.

⁴ In this case, the government injects the cash funds only once; furthermore, if the bank manager hides the insolvent loan and becomes bankrupt, the government imposes a penalty m on the manager.

The Soft Bailout Policy

When the government chooses the soft bailout policy, it injects the cash funds whenever the insolvent loan is discovered, and the bank manager is never fired. In other words, the government compensates the entire loss of the bank.

The Government Investigation

If the bank bailout is carried out, the government investigates the bank's assets in order to discover the insolvent loan. The investigation is successful

⁴We assume that the new manager hired by the government is sensitive to the evaluation from the government; therefore, the moral hazard problem does not occur.

with a probability α and fails with a probability $1 - \alpha$. The cost of the investigation is g , and the government also pays a cost δ when the bank fails.

3 The Case without Bank Bailout

In this section, we analyze the case in which the government does not adopt the bank bailout policy as a benchmark. In this case, the government does not investigate the bank.

3.1 The Bank Manager

The bank manager determines whether or not to make the additional loan to the firm by comparing the benefits in the cases when the additional loan is made and the firm is liquidated. First, when the firm is liquidated, the loss of 1 of the bank is realized and the bank fails; therefore, the bank manager's benefit is equal to 0.

On the other hand, when the additional loan is made, the effort levels of the bank and the bank manager determine the probability of success of the new project. If the new project succeeds, the private benefit of the bank manager is $\lambda(1 + L)$; however, if the bank fails this value is 0. Therefore, the expected private benefit of the bank manager is ⁵

$$\Pi_M^{NB} = p(e)\lambda(1 + L) - e, \quad (1)$$

and from its first order condition as follow

$$\frac{\partial \Pi_M^{NB}}{\partial e} = p'(e)\lambda(1 + L) - 1 = 0,$$

he/she chooses the effort level as

$$p'(e_M^{NB}) = \frac{1}{\lambda(1 + L)}.$$

⁵From the assumption described later, $\Pi_M^{NB} \geq 0$; therefore, the bank manager chooses to make the additional loan.

3.2 The Bank

In this case, since the bank manager always chooses to make the additional loan, the bank incurs no cost if the new project is a success; however, it loses all the loans if the project fails. Therefore, the expected benefit of the bank is

$$\Pi_B^{NB} = -(1-p)(1+L) - (1+L)e. \quad (2)$$

3.3 The Government and Social Welfare

The government, like the bank, incurs no cost if the new project is a success; however, it pays the cost of liquidating the bank if the project fails. Therefore, the expected profit of the government is

$$\Pi_G^{NB} = -(1-p)\delta(1+L), \quad (3)$$

and the social welfare is

$$SW^{NB} = \Pi_B^{NB} + \Pi_G^{NB} = -(1-p)(1+\delta)(1+L) - (1+L)e. \quad (4)$$

From the first order condition of the expression (4) as follows

$$\frac{\partial SW^{NB}}{\partial e} = p'(e)(1+\delta)(1+L) - (1+L) = 0,$$

the optimal effort level for social welfare is calculated as

$$p'(e_{SW}^{NB}) = \frac{1}{1+\delta}.$$

Therefore, it is not equal to e_M^{NB} , which is determined by the bank manager.

4 The Case with Bank Bailout

Under the bank bailout policy, each player's expected profits change according to the selected policy.

4.1 The Tough Bailout Policy

When the government adopts the tough bailout policy, it fires the incumbent bank manager and injects cash fund of 1 if it finds the insolvent loan to be a part of the bank's assets. Further, if the new project executed by the additional loan is a success, the cash fund is repaid from the bank; however, the bank loses the entire assets and the government incurs the bank liquidation cost.

Furthermore, in a situation where both the government investigation and the new project fail, the bank manager is burdened with a penalty $m(> 0)$ on the charge of concealing the insolvent loan from the government investigation.

4.1.1 The Bank Manager

Under the tough bailout policy, the bank manager gains a private benefit of $\lambda(1 + L)$ when the government investigation fails, instead of 0, when it is a success. Therefore, he/she gains the expected private benefit, which is equal to

$$\Pi_M^{TB} = (1 - \alpha)\{p(e)\lambda(1 + L) - (1 - p(e))m\} - e. \quad (5)$$

Now, we define the effort level that maximizes the expected private benefit of the new project for the manager as e^{TB} and assume $(1 - \alpha)\{p(e^{TB})\lambda(1 + L) - (1 - p(e^{TB}))m\} - e^{TB} > 0$. Then, the bank manager always makes an additional loan to the firm.

Under these conditions, from the first order condition of the expression (5) as follows

$$\frac{\partial \Pi_M^{TB}}{\partial e} = p'(e)(1 - \alpha)\{\lambda(1 + L) + m\} - 1 = 0,$$

the effort level of the bank manager is

$$p'(e_M^{TB}) = \frac{1}{(1 - \alpha)\{\lambda(1 + L) + m\}}.$$

4.1.2 The Bank

The benefit of the bank in this case, as in the case where there is no bank bailout, is 0 when the new project is a success; however, all the loans are lost when it fails. Although the government investigation is a success and the incumbent bank manager is fired, the additional loan is lost⁶ because the incumbent bank manager has already decided to lend it.

Therefore, the expected benefit of the bank is

$$\Pi_B^{TB} = -\alpha(1-p)L - (1-\alpha)(1-p)(1+L) - (1+L)e. \quad (6)$$

4.1.3 The Government and Social Welfare

In this case, although the additional loan is made whether or not the government investigation is a success, the government burden increases when the new project fails. If the government investigation is successful, cash funds are injected before bankruptcy; therefore, the bank liquidation cost is only δL . In contrast, the government has to pay $\delta(1+L)$ as the bank liquidation cost instead of injecting the cash fund if both the new project and the government investigation fail.

Based on the above discussion, the expected benefit for the government is

$$\Pi_G^{TB} = -\alpha(1-p)(1+\delta L) - (1-\alpha)(1-p)\delta(1+L) - g, \quad (7)$$

and the social welfare is

$$SW^{TB} = \Pi_B^{TB} + \Pi_G^{TB} = -(1-p)\{(1+\delta)(1+L) - \alpha\delta\} - (1+L)e - g. \quad (8)$$

4.2 The Soft Bailout Policy

When the government adopts the soft bailout policy, it injects the cash funds without firing the incumbent bank manager if the insolvent loan is discovered by the government investigation. Furthermore, if the new project

⁶The original loan of 1 is compensated by the government's cash fund.

carried out using the additional loan fails, the government injects the cash funds again. In other words, the government compensates the entire loss of the bank and pays the bank liquidation cost.

4.2.1 The Bank Manager

In this case, the bank manager never loses his/her position and is not burdened with the penalty. Therefore, his/her expected private benefit is

$$\Pi_M^{SB} = p(e)\lambda(1 + L) - e, \quad (9)$$

which is unrelated to the probability of the government investigation. The first order condition of expression (9) is

$$\frac{\partial \Pi_M^{SB}}{\partial e} = p'(e)\lambda(1 + L) - 1 = 0$$

and the effort level of the bank manager is

$$p'(e_M^{SB}) = \frac{1}{\lambda(1 + L)}.$$

It is at the same level as in the case without bailout.

4.2.2 The Bank

Under the soft bailout policy, since the government compensates the entire loss of the bank, the bank only pays the effort cost. Therefore, the benefit of the bank is

$$\Pi_B^{SB} = -(1 - L)e. \quad (10)$$

4.2.3 The Government and Social Welfare

The government has to compensate the entire loss of the bank and pay the bank liquidation cost. However, if it injects the cash funds earlier, then the latter cost is reduced.

The expected benefit to the government is

$$\Pi_G^{SB} = -\alpha(1 - p)\{1 + (1 + \delta)L\} - (1 - \alpha)(1 - p)(1 + \delta)(1 + L) - g, \quad (11)$$

and the social welfare is

$$SW^{SB} = \Pi_B^{SB} + \Pi_G^{SB} = -(1-p)\{(1+\delta)(1+L) - \alpha\delta\} - (1+L)e - g, \quad (12)$$

which is equal to that in the case of the tough bailout policy.

By comparing the expected social welfare of the cases with and without bailout, which are analyzed above, we obtain the following lemma 1.

Lemma 1. The expected social welfare is the same in the cases of the tough and the soft bailouts. Further, if the cost of the government investigation is sufficiently low ($\alpha(1-p)\delta \geq g$), ⁷ the bank bailout policy increases social welfare.

5 Determination of the Bailout Policy by the Government

5.1 Comparing the Effort Level and Determination of the Policy

As shown in lemma 1, the expected social welfare is the same whether the government adopts the tough or the soft bailout; therefore, from the first order condition of the expression (8) and (12) as follows

$$\frac{\partial SW^{TB(SB)}}{\partial e} = p'(e)\{(1+\delta)(1+L) - \alpha\delta\} - (1+L) = 0,$$

the optimal effort level for social welfare in both cases is

$$p'(e_{SW}^*) = \frac{1+L}{(1+\delta)(1+L) - \alpha\delta}.$$

On the other hand, the effort level made by the bank manager is

$$p'(e_M^{TB}) = \frac{1}{(1-\alpha)\{\lambda(1+L) + m\}}$$

⁷This equation demonstrates that the expected decrease in the bank liquidation cost due to the government investigation is greater than the investigation cost.

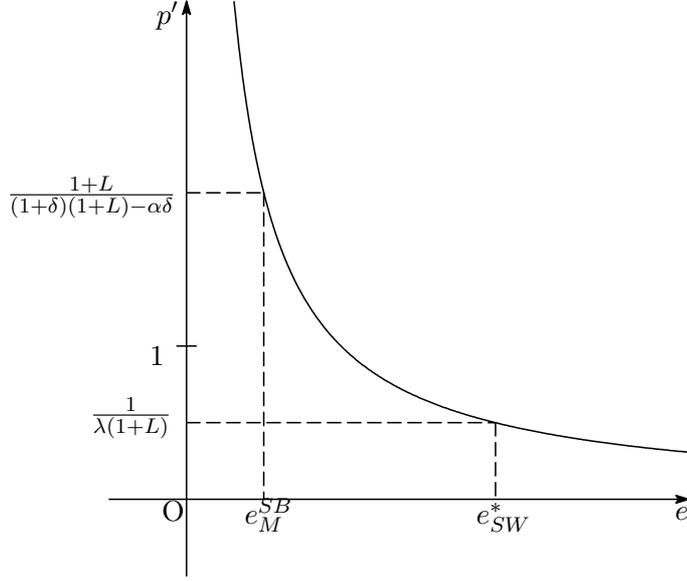


Figure 1:

under the tough bailout policy and

$$p'(e_M^{SB}) = \frac{1}{\lambda(1+L)}$$

under the soft bailout policy.

Therefore, we obtain $p'(e_{SW}^*) < 1$,

$$\begin{aligned} p'(e_{SW}^*) &= \frac{1+L}{(1+\delta)(1+L)-\alpha\delta} \\ &< \frac{1+L}{(1+\delta)(1+L)-\alpha\delta(1+L)} \\ &= \frac{1+L}{1+\delta-\alpha\delta} < 1, \end{aligned}$$

based on the assumption that $\alpha < 1$, $L > 0$, and $\delta > 0$. Furthermore, we obtain $p'(e_M^{SB}) > 1$ based on the assumption that $\lambda(1+L) > 1$. As shown in figure 1, the government adopts the tough bailout policy if $p'(e_M^{SB}) > p'(e_M^{TB})$ is satisfied.

Summarizing the above data, we obtain the following lemma 2.

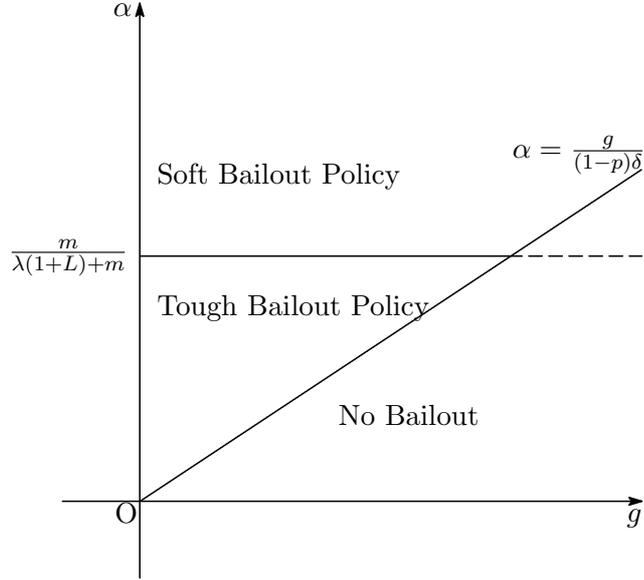


Figure 2:

Lemma 2. If the government decides to bail out the bank, it adopts the tough bailout policy when $\alpha < \frac{m}{\lambda(1+L)+m}$, and the soft bailout policy when $\alpha > \frac{m}{\lambda(1+L)+m}$.

5.2 The Cost of the Investigation and Probability of Success

We obtain the threshold of α that determines which policy the government should adopt based on lemma 2. Figure 2 is obtained by considering lemma 1 and lemma 2, and we also obtain the following proposition.

Proposition. If the cost of the government investigation g and the probability of success α satisfy,

1. $\alpha < \frac{g}{(1-p)\delta}$, the government does not adopt any bailout policy.
2. $\alpha > \frac{g}{(1-p)\delta}$ and $\alpha > \frac{m}{\lambda(1+L)+m}$, the government adopts the soft bailout policy.

3. $\alpha > \frac{g}{(1-p)\delta}$ and $\alpha < \frac{m}{\lambda(1+L)+m}$, the government adopts the tough bailout policy.

6 Conclusion

In this article, it is shown that in the case where the bank manager gains private benefit from continuing the firm, the additional loan, which is not optimal for the bank, is made. Further, it is also shown that although both the bank bailout policies result in the same social welfare consequences, the government adopts the soft bailout policy when the probability of success is high, and it adopts the tough bailout policy (or does not bail out the bank) when the probability of success is low.

However, it is possible to extend this model by:

- introducing a decision-making factor in the government investigation;
- changing the penalty m into a policy variable;
- introducing the probability of bank insolvency or loan default.

It is also necessary that the model reflects reality, for example, the financial assistance provided by the Deposit Insurance Corporation of Japan, or the emergency liquidity provided by the Central Bank (Bank of Japan).

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