Mini-Review on Optimal Capitalization and Deposit Insurance Strategies with Regard to Moral Hazard

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Abstract

In this article, we make a brief review of the paper. We focus on discussion the objective function we establish and why we use minimizing total social loss rather than total loss of insured banks as the objective. We also summarize our numerical analysis and illustrate what we find.

Keywords: Deposit insurance • Capitalization • Optimization • Moral hazard

Introduction

In this note, we make brief review of main ideas, the main method and the key results of our numerical analysis on our paper titled "Optimal Capitalization and Deposit Insurance Strategies with Regard Moral Hazard".

Credit risk is the main risk faced by banks: a borrower will default on any type of debt by failing to make payments which they are obligated to do. The general method to transfer this kind of risk is to purchase deposit insurance. However, purchasing deposit insurance is expensive and is subject to moral hazard, especially when the methods for determining insurance premiums are not always actuarially fair. An alternative way for banks to moderate the impacts of credit risk is to raise capital to a sufficiently high level, which may also be very expensive because capital is a kind of very expensive resource. Banks thus need to assess tradeoff between these two methods [1]. Examine the conditions that deposit insurance and capitalization is substituted. They establish objective to minimize the total loss of insured banks to optimize capital and proportion of deposit insurance while deposit insurance and capitalization is complementary. They assume that there is no moral hazard. The values of assets and liabilities follow geometric Brownian motions. In general speaking, the insured bank prefer full insurance rather than partial insurance and low rate of capitalization but take more risks if considering the minimizing of the loss of itself. We believe that this is not the best strategy and even it is a worse strategy from the perspective of whole society. Over risk taking will cause moral hazard of the insured banks and thus greatly increase the bankruptcy risks so as to result in the loss of both consumers and insured banks.

The closet paper to ours is Bond and Crocker [2]. who investigate the complementary relationship between bank capitalization and deposit insurance as two measures that reduce the exposure of risk-averse depositors to a bank's random portfolio returns. They assume that deposit insurance and capitalization are not perfect substitutes because of the presence of monitoring costs. However, they analyze optimal deposit insurance and its associated premium under the assumption that capital levels are predetermined. Our article establishes an objective of insured banks that is assumed to minimize total social loss. The total social loss is defined as the sum of total capital cost, expected loss of banks' bankruptcy and opportunity loss of partial deposit insurance resulting from expected loss of deposit principal and interest which is not insured when banks' bankruptcy happens. It is important to consider the

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opportunity loss of partial deposit insurance if maximizing total social benefit. Optimization of capitalization and deposit insurance from the perspective of regulatory can make capitalization and deposit insurance strategy optimal from social aspect. Only in this way, can the economic resource of banks be distributed most effectively and the benefit of consumers can obtain best protection.

Our paper contributes to the literature in two important ways. First, we examine optimal strategies of capitalization and deposit insurance by taking account of total social loss rather than only shareholders' loss. Second, we include partial deposit insurance as a potential aspect of banks' bankruptcy.

Results of our Numerical Analysis

The most important task for the insured banks to carry out their risk management are to determine optimal capital and deposit insurance strategy by optimizing objective function. In the paper, first, we use Vasicak [3]. To model the values of asset and liability of four main banks in U.S.. Our results show that Vasicek model is a rather good model to fit the value of assets and liabilities of insured banks because of not great fitting errors [4]. And then we establish our objective function as minimizing the sum of capital cost,bankruptcy const and the opportunity loss of partial deposit insurance defined as the expected loss of depositors resulting fromthe expected loss of deposit principal and interest which is not insured when banks' bankruptcy happens [5]. It is inversely related to the ratio of deposit insurance. Using total social loss as the decision objective can greatly help protect both the shareholders' and depositors 'benefits through incentive and compensation mechanism of regulation. Finally, we use the data of four main banks in U.S. to carry out our numerical analysis [6-8].

Figures 1-4 display the change patterns of optimal capital rate and optimal ratio of deposit insurance with time for the four banks selected by setting sensitivity factors, α_1=0.10 and α_2=0.30 where α_1 express the increased proportion of risk due to the increase of volatility of the value of net assets of the insured banks and α_2 express the increase proportion of benefit resulting from the increase of the net assets of the insured banks. Figures 1-4 indicate that the change patterns of optimal capital rate and optimal ratio of deposit insurance with time are very different across the four banks. The optimal capital rates are extremely high for all four banks. Therefore, the banks should raise a great amount of equity capital to prevent the insolvency risk. Figures 1-4 also indicate that the optimal capital rate decreases but the optimal ratio of deposit insurance increases with increase in capital cost rate. The optimal ratio of deposit insuranc is smaller than 1 in most situations except for No. 2 bank in which the optimal ratio of deposit insurance is equal to 1 when t ≤ 3. It indicates that partial deposit insurance is the most favorable strategy in most situations and higher capital cost rate will encourage insured banks to increase the ratio of deposit insurance instead of raising more equity capital in order to reduce the insolvency risk, and vice versa. Therefore, the insured banks should try to find a most favorable balancing point between how much

$$\alpha_1 = 0.10, \alpha_2 = 0.30.$$
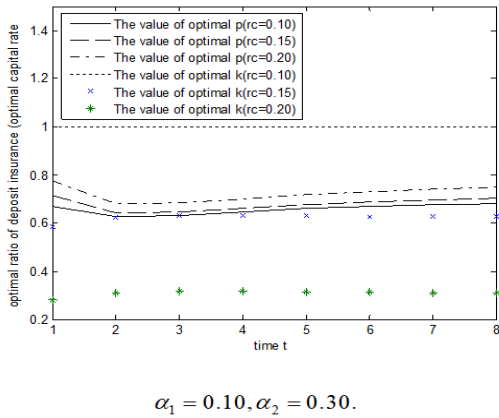
Figure 1. The change patterns of optimal capital rate and the ratio of deposit insurance with time (No 1. Bank).

$$\alpha_1 = 0.10, \alpha_2 = 0.30.$$
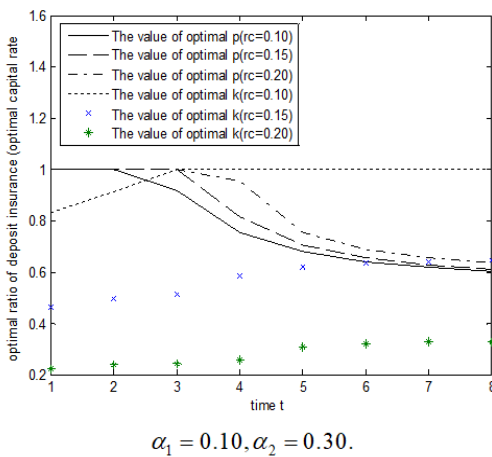
Figure 2. The change patterns of optimal capital rate and the ratio of deposit insurance with time (No. 2 Bank).

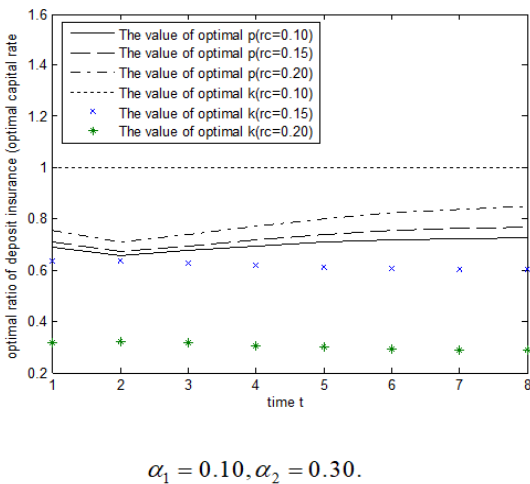$$\alpha_1 = 0.10, \alpha_2 = 0.30.$$

Figure 3. The change patterns of optimal capital rate and the ratio of deposit insurance with time (No. 3 Bank).

capital they should raise and what is most suitable part of deposit insurnace they should purchase [9,10].

Figures 5-7 display the change patterns of total social loss of Bank 1 when the sensitivity factors α_1 and α_2 take different values. In Figure 5, we set α_1=0.1, α_2=0.3 which corresponds to the situation that the speed of the increase of the value of net assets is greater than that of its volatility if considering moral hazard. In Figure 6, we set $\alpha_1 = \alpha_2$ =0.15 which corresponds to the situation that the speed of the increase of the value of net assets is equal to that of its

volatility if considering moral hazard. In Figure 7, we set α_1=0.3, α_2=0.10 which means the the speed of the increase of the value of net assets is smaller than that of its volatility. Figures 5-7 shows that the greater the sensitivity coefficient α_1 and the smaller the sensitivity coefficient α_2, the greater the total social loss it has. It means that over taking risk will increase total social loss. Therefore,
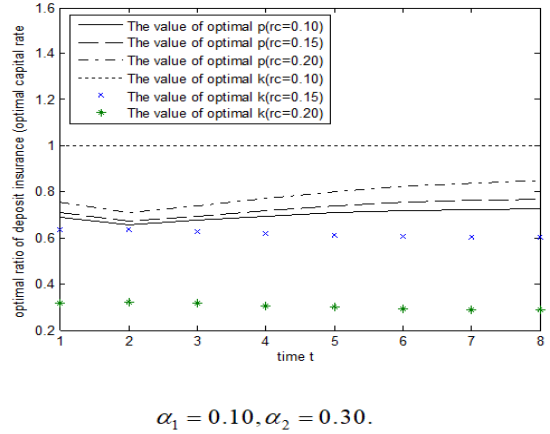

$$\alpha_1 = 0.10, \alpha_2 = 0.30.$$

Figure 4. The change patterns of optimal capital rate and the ratio of deposit insurance with time (No. 4 Bank).

$$\alpha_1 = 0.15, \alpha_2 = 0.15, t = 4, r_c = 0.15$$
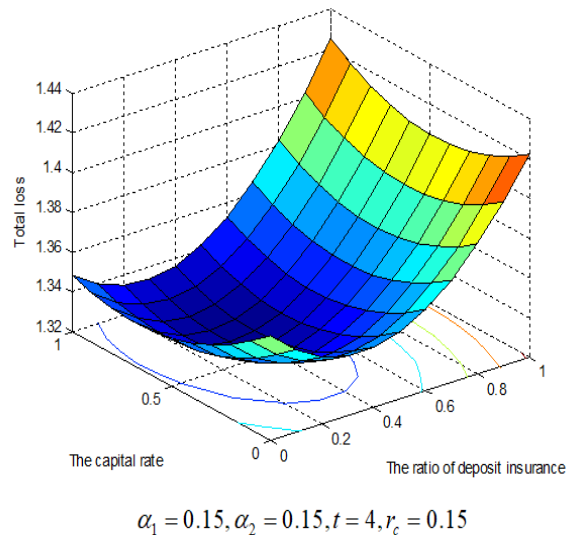
Figure 5. The change patterns of total loss with different capital cost rate.

$$\alpha_1 = 0.15, \alpha_2 = 0.15, t = 4, r_c = 0.15$$

Figure 6. The change patterns of total loss with different capital cost rate and the ratio of deposit insurance (No.1 Bank).
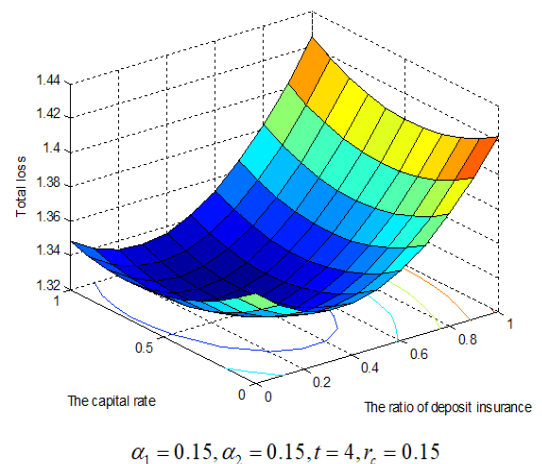
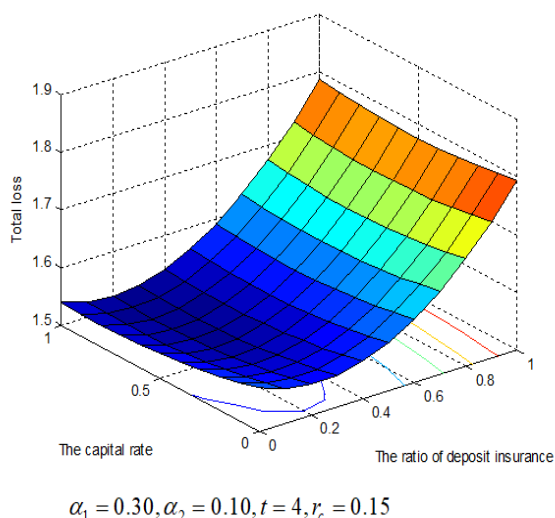$$\alpha_1 = 0.30, \alpha_2 = 0.10, t = 4, r_c = 0.15$$

Figure 7. The change patterns of total loss with different capital cost rate and the ratio of deposit insurance (No.1 Bank).

the best strategy of risk management of insured banks should increase net asset values and decrease the behavior of overtaking risk.

Conclusion

In this article, we make a mini-review of our paper titled "Optimal Capitalization and Deposit Insurance Strategies with Regard to Moral Hazard". The paper discusses the joint optimization of capitalization and deposit insurance strategies under cyclically economic environment and by considering moral hazard inherent in deposit insurance. The objective is to minimize total social loss define as the sum of capital cost, the expected bankruptcy loss and the opportunity loss of partial deposit insurance caused by expected loss of deposit principal and interest which is not insured when insured banks' bankruptcy happens. The numerical analysis illustrates that the optimal capital rate, the optimal ratio of deposit insurance and minimal total social loss are dependent on the balancing among capital cost, expected loss of banks' bankruptcy, and opportunity loss of partial deposit insurance. Our results also denote that deposit insurance and capitalization are mutually complementary. They are dependent on both the speed of the increase of

values of net assets resulting from deposit insurance and the increase of the risk of asset and liability portfolio because of moral hazard of deposit insurance. While the former is greater than the latter, higher ratio of deposit insurance and relevant lower capital is more favorable to the banks, especially when the capital cost rate is higher, and vice versa. Finally, our results show that the increase of moral hazard in deposit insurance will increase total social loss due to increased risk of asset and liability portfolio. Therefore, the best strategy for the banks is perhaps to reduce the moral hazard of deposit insurance but to increase the value of net assets as much as possible so as to reduce total social loss. Moreover, fairly pricing of deposit insurance and partial deposit insurance instead of full deposit insurance can help insured banks reduce moral hazard inherent in deposit insurance and thus, reduce total social loss.

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