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Lessons from the U.S. Savings and Loan Crisis.

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Abstract

This paper reviews the Japanese experience with "put guarantees" recently offered in the sale of several failed banks. These guarantees, meant to address information asymmetry problems, are shown to create moral hazard problems of their own. In particular, the guarantees make acquiring banks reluctant to accept first-best renegotiations with problem borrowers.

These issues also arose in the U.S. Savings and Loan crisis. Regulators in that crisis turned to an alternative guarantee mechanism known as "loss-sharing arrangements," with apparently positive results.

I introduce a formal debt model to examine the conditions determining the relative merits of these guarantees. The results show that both forms of guarantees reduce expected regulator revenues, but that the impact of economic downturns on the relative desirability of the two guarantees is ambiguous.

Keywords: Banks; Failures; Asset disposition

JEL classification : G21, G38

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1. Introduction

The Japanese government closed the failed Long-Term Credit Bank (LTCB) and Nippon Credit Bank (NCB) in 1998. These failures occurred during a turbulent period in Japan, and there was a strong desire to dispose of the assets of these banks quickly to avoid the possibility of further regulatory losses. In both cases the Financial Reconstruction Commission (FRC) invited bidders for these banks under the conditions that sale was to take place too quickly for standard due diligence investigations concerning the underlying value of the failed banks' assets.

LTCB was sold to an American investment group, Ripplewood Holdings. Because of the inability to conduct due diligence investigations, Ripplewood demanded that the Japanese Government include put guarantees on the assets of the failed bank, allowing the purchaser to return the assets to the government for liquidation if their value fell sufficiently low. Such guarantees had been used in the United States in the Savings and Loan (S&L) crisis in the late 1980s and early 1990s [Rosengren and Simons (1992),(1994)].[1]

The Japanese regulators quickly discovered that the extension of these guarantees influenced the management of the failed banks' loans subsequent to purchase. In particular, the acquiring banks demonstrated a reluctance to grant major concessions in an effort to avoid the liquidation of problem loans. This reluctance appears to have been motivated at least in part by the compensation from the put guarantees under liquidation.

In this paper, I review the circumstances surrounding the sale of LTCB and

[1] In the absence of any guarantees, it would expected information asymmetry problems, dsicussed in more detail below, would deteriorate the terms of sale. Indeed, the preponderance of empirical evidence suggests that the bids in P&A transactions are low, in the sense that winning bidders in failed bank auctions experience positive abnormal returns [James and Wier (1987), Balbirer, et al (1992), Gupta, et al (1993)]. However, Gupta, et al (1997) and Stover (1997) fail to find statistically significant abnormal returns for acquiring banks.

NCB and the subsequent behavior of their acquirers. I then review the experience of the United States with put guarantee sales in the S&L Crisis.

I argue that the difficulties experienced by the Japanese with the acquirers of LTCB and NCB matched those of the United States ten years earlier. During this crisis, the FDIC and the Resolution Trust Commission (RTC) offered put guarantees similar to those offered by the Japanese regulatory agencies in the LTCB and NCB transactions.

The U.S. regulatory agencies also noted difficulties with put guarantee transactions: First, acquiring banks responded to the guarantees by what was referred to as "cherry-picking," by retaining only assets with market values that exceeded their book values and returning the rest to the Federal Deposit Insurance Corporation (FDIC). Second, the acquiring banks appeared to be failing to put the usual level of effort into the monitoring and administration of loans covered by the put guarantees [Bean, et al (1998)].

Put guarantees were abandoned in 1991, after which the FDIC implemented loss sharing arrangements in selected P&A transactions. Under these arrangements, the FDIC agreed to absorb a portion of the losses on covered assets, typically 80 percent, and the acquiring bank was responsible for remaining losses. These arrangements were implemented in 16 agreements involving 24 failed banks between 1991 and 1993. As loss-sharing arrangements were typically involved in the failures of larger banks, these agreements involved 40 percent of the total failed bank assets resolved over this period [Gallagher and Armstrong (1998)].

As I demonstrate below, it appears that the United States' experience with loss-sharing arrangements was positive. In particular, loss-sharing arrangements appeared to reduce the regulatory burden of the resolution of bank failures in the S&L crisis, even after adjusting for bank size. It appears likely that Japanese government could also benefit from implementing loss-sharing arrangements in resolving the its bank failures.

To evaluate the advantages of loss-sharing arrangements over put guarantees, and the conditions that influence their relative advantages, I introduce a model of the disposition of failed bank assets. The model is a simplification of that in Spiegel (2001). There is a regulatory agency who auctions off the assets of a failed bank to a set of competitive potential acquiring banks. The regulator is assumed to lack credibility in his designation of asset quality, and instead extends either put guarantees or loss-sharing arrangements to ensure the representative acquiring bank against loss.[2]

As in Hart and Moore (1998), it is assumed that the acquiring bank can profitably renegotiate with a problem debtor while the regulatory authority cannot. This implies that there are assets which are more valuable inside the banking system than they would be to a non-bank, such as the regulatory authority. Under this assumption, liquidating certain assets prior to sale is likely to be costly. Evidence in favor of this assumption is provided by James (1991), who argues that even after controlling for asset quality, the value of assets is higher in the banking system than under the receivership of the regulatory authority. This loss is also known in regulatory circles, and is commonly referred to as the "liquidation differential," [Carns and Nejezchleb (1992)]. This condition implies that the exercise of a put guarantee in this environment is costly, because it takes these assets out of the banking sector and thereby reduces their value.

In this simple model where the extension of such guarantees fails to influence regulator credibility and all agents are risk neutral, the results demonstrate that both put guarantees and loss-sharing arrangements reduce the expected revenues to the regulatory authority. In the case of the put guarantees, the loss is directly

[2]Spiegel (2001) allows regulator credibility to vary with an exogenous penalty function that measures the reputation cost of designating assets improperly. Under this more general model, desingations by the regulator may or may not be credible. Moreover, the credibility of the regulator can be infuenced by the extension of put guarantees and loss-sharing arrangements.

attributable to the deadweight loss associated with the probability-weighted retirement of assets for liquidation that would be more valuable under renegotiation in the banking sector. In the case of the loss-sharing arrangement, the loss stems from the higher administrative costs associated with maintaining this arrangement.[3]

I also examine how changes in underlying economic conditions may influence the relative desirability of put guarantees and loss-sharing arrangements. Below, I derive an expression for the difference in administrative costs that leaves the regulatory authority indifferent between offering the put guarantee and the loss-sharing arrangement. I then conduct comparative static exercises on this difference with respect to parameters that are likely to change as economic conditions worsen.

One might expect that the loss-sharing arrangement would become more attractive as economic conditions worsen. The reasoning would be that as conditions worsen, the losses associated with unnecessary liquidation would increase, making the put guarantees relative more costly to the regulator. Below I demonstrate that this is the case. However, it is also likely that the share of loans which should be liquidated would also increase in an economic downturn. This effect favors put guarantees over the loss-sharing arrangements. Below, I demonstrate that this is also the case, leaving the net impact of economic downturns on the relative desirability of loss-sharing arrangements to put guarantees ambiguous.

The remainder of this paper is divided into five sections. Section 2 reviews Japan's experience with the disposition of the assets of LTCB and NCB. Section 3 reviews the historical experiences by the United States during the S&L crisis, including its experiences with put guarantees and its eventual turn to loss-

[3]In a richer model where the credibility of the regulator is in question, such as Spiegel (2001), either of these guarantees can potentially increase expected regulatory authority revenues if the extension of such guarantees moves the regulator from lacking credibility to enjoying credibility.

sharing arrangements. Section 4 introduces a formal model of the determinants of the relative desirability of put guarantees and loss-sharing arrangements in the disposition of failed bank assets. Section 5 concludes.

2. The Disposition of Assets held by Long-Term Credit Bank and Nippon Credit Bank

2.1. Long-Term Credit Bank

LTCB was declared insolvent and closed in 1998. According to common practice, the Financial Reconstruction Commission (FRC) evaluated the assets to determine their suitability for sale to an acquiring bank. Loans were given five grades: 1 "Normal," 2 "Needs attention," 3 "In danger of bankruptcy," 4 "Effectively bankrupt," and 5 "Bankrupt." See Table 1 for details. Loans in category 1 were automatically classified as suitable for sale, while loans in categories 3,4, and 5 were automatically classified as "not suitable" for sale. Those loans were absorbed by the Deposit Insurance Corporation (DIC) for liquidation.

The marginal loans from the point of assessing suitability for sale were then those in category 2. Loans in category 2 were considered unsuitable for sale if the borrower's capital account was negative (i.e. its assets fell short of liabilities) or if its carried-forward earnings were negative. However, there was a provision that the latter criterion could be waived if the borrower had an acceptable plan for financial recovery within 2 years.

LTCB's total assets in book value at time of sale equalled 24.6 trillion yen. Of these, 19.4 trillion in yen were initially classified as "suitable" and included in the sale. The initial outlays of the government in assisting the resolution of LTCB amounted to 6.4 trillion yen (see Table 2).[4]

[4] Actual losses would fall below this figure. Losses would be mitigated by returns on purchased

It has since become clear that government overstated the share of suitable assets on LTCB's balance sheet. Recently-released minutes of 1998 FRC meetings reveal that the FRC deviated from the formal criteria described above in assessing assets. For example, officials considered potential support from main banks or local government in assessing loans risks of failures, although such considerations were not in the formal rules. Moreover, much of the anticipated support did not materialize.

There were a number of potential acquiring banks bidding for the rights to the LTCB. These included a foreign group, headed by the Ripplewood Holdings Corporation of the United States. This group was formally referred to in the proceedings as the United States Investment Group (USIG).

The USIG bid was higher than those of the domestic groups, but the group demanded that the government back the LTCB assets with a put guarantee. As such guarantees were commonly extended in the sale of failed bank assets in the United States, the USIG claimed that it would be "common sense" to include such guarantees in the transaction. At that time, however, there was no formal mandate for the FRC to include such provisions in the sale of failed Japanese bank assets. However, ex ante estimates suggested that the regulatory losses from selling the bank with the loss-coverage provisions included to USIG would be significantly less than those that would be incurred by selling to the highest-bidding Japanese group with the required write-offs. Consequently, the FRC decided to sell to USIG, inclusive of the put guarantees. It stressed the minimization of the "public burden" as its motivation for choosing USIG.

The put guarantee allowed the "new LTCB," as it was originally known, to cancel a portion of the sale of the loans if a defect was found and a 20 percent or greater reduction in book value was recognized. A loan was considered defective if the "basis for judgement" used in classifying the asset as suitable for sale turned

assets and equity as well as the lack of losses in preferred stock underwriting.

out to have initially been mistaken or subsequently become untrue.

The details of the put guarantee offered to new LTCB were as follows: Loans whose sale were cancelled were returned to the DIC. The DIC was required to reimburse new LTCB the value of the loan minus its initial loan loss reserves (also minus any repayments that had taken place). The provision lasted for three years, expiring in March 2003. The guarantee was limited to loans exceeding 100 million yen. However, all assets exceeding this value were fully covered. The guarantee required the new LTCB to inform the DIC of its claims on a quarterly basis. Finally, the guarantee provided some protection to the DIC against systemic losses: Losses that could be attributed to a "major event" were not to be fully covered by the DIC. Instead, the parties were to negotiate in good faith over the extent to which a loan becoming defective was attributable to this major event.

There were three major channels through which a loan could be found to have a defect. First, the loan could be classified as defective if its borrowing firm was more than 30 percent below the targets of his financial recovery plan. Second, a loan could be reclassified as defective if strong financial support from the borrowing firm's parent company, anticipated in classifying a loan as appropriate, did not materialize. Finally, loans were considered defective if they suffered more than a 3 month payment delay, the firm was bankrupt, or the firm requested a renegotiation of its credit terms. The bulk of reclassifications were done under the first criterion.

The criterion of a 20 percent loss in book value was calculated as follows: The initial value of a loan was equal to its book value minus its loan loss reserves. For example, suppose that a loan carried initial loan-loss reserves equal to 10 percent of its book value, and collateral equal to 70 percent of its book value. Because of its loan loss reserves, its initial value would be calculated as 90 percent of book value, including 70 percent collateral and 20 percent own risk.

Now, suppose that the debtor went bankrupt. If the debtor went bankrupt,

the loan's own-risk value would be reduced to zero and the loan's present value would be reduced to its collateral value, or 70 percent of book value. The decrease in loan value, Φ, would then be calculated as the percentage change in initial value

$$\Phi = \frac{initialvalue - presentvalue}{initialvalue}$$

In this example, the decrease ratio would satisfy

$$\begin{aligned}\Phi &= \frac{0.90 - 0.70}{0.90} \\ &= 0.22\end{aligned}$$

As 22 percent exceeds 20 percent, the loan in this example would be a candidate for sale cancellation if the acquirer could demonstrate that the loan was defective.

In June 2000, new LTCB was launched as Shinsei Bank. Almost since its inception, Shinsei bank has been a controversial figure in Japanese financial markets. The company has been actively introducing Western business practices, including Western management techniques and the promotion of women employees in management positions, the most controversial aspect of Shinsei's behavior is its relative unwillingness to roll over loans of problem debtors. The contract that Shinsei had signed with the Japanese government was widely interpreted as suggesting that the bank would be expected to pursue standard Japanese banking practices. In particular, the contract agreed that Shinsei would "respond to funds demand, including rollover and seasonal funds, for three years." However, the contract also contained a loophole which stated that Shinsei Bank could deny rollovers if there were reasonable expectations of losses.

In what was widely considered a departure from standard Japanese banking practices, Shinsei has been aggressive in demanding restructuring plans from problem debtors and has indicated that it would not shy away from collateral seizure in the event of default. By September 2001, it was revealed that 558 billion yen

in loans had been returned by Shinsei to the DIC, at an initial outlay to the government of 312 billion yen [Nihon Keizai Shimbun (2001)].[5]

Two of Shinsei's most controversial decisions included its denial of the request for debt forgiveness by Sogo Department store and its take over of the failed consumer credit company, Life Co. Sogo's plan to avoid liquidation in July 2000 included $5.96 billion dollars in debt forgiveness by 72 banks, including Sogo's main bank, Industrial Bank of Japan (IBJ). In addition, IBJ agreed to provide Sogo with $272 million in new lending. Shinsei Bank disapproved of the debt forgiveness plan and instead requested that the DIC take over its assets. The DIC eventually agreed to repurchase Sogo's debts at 80 cents on the dollar [Stover (2000)].

Shinsei had been Life Co's main bank, and would have been expected to provide it with financial assistance under standard Japanese practices. However, Shinsei refused to provide additional assistance to Life, to the disappointment of other creditors who had extended funds to the firm. Many speculated that Shinsei's desire to take over Life was motivated by the potential positive impact the takeover might have on Shinsei's credit card business [Nikkei Weekly (2000)].

It is clear that the loss-coverage provisions included in LTCB's takeover contract played a role in Shinsei's unwillingness to roll over the debt of existing problem debtors, such as Life Co's debt. Shinsei announced that it would return all 120 billion yen in debt owed to it by Life Co to the DIC, rather than reschedule with the debtor. However, the DIC refused a request by Shinsei to repurchase the bad loans owed by Life Co. The DIC defended its decision on the basis that Life has been servicing more than 50 percent of its debts, a figure far higher than that paid by other failed firms whose assets were covered, such as Sogo.

[5] The outlay mentioned above represents the DIC's purchase price. The ultimate cost of the guarantee will be reduced by the recovery on the repurchased loans.

2.2. Nippon Credit Bank

The terms of the sale of Nippon Credit Bank (NCB) were similar to those of LTCB. In November of 1999, the FRC received initial proposals from a number of competing groups. The FRC held 9 meetings over the next three months, after which two groups, Softbank Group, a Japanese group, and the group known as the US Investment Fund were invited to give 2nd bids.[6] These finalists were instructed to give more details about their proposals for NCB's recovery plan. They were also informed that all of their initial bids were insufficient. Because of the precedent set by the LTCB sale, it was assumed throughout that the ultimate deal would include a put guarantee.

In February 2000, the FRC chose the Softbank group as the priority party for negotiation. The transaction was delayed by controversy over the put guarantee in the agreement, partly because of the adverse experiences the government had with the LTCB transaction. Nevertheless, the loss-coverage provision remained intact.

Because of time constraints, Softbank was not given time to perform due diligence inquiries. The FRC placed a premium on completing the sale of NCB as quickly as possible after completing its assessment of NCB's assets to prevent the deterioration of its assets and minimize the taxpayer burden. Because of the short due diligence period, Softbank was effectively limited to conducting interviews concerning asset quality.

Relative to the LTCB decision described above, the decision criteria used in choosing Softbank appears to have given less weight to the consideration of mitigating taxpayer burden. The FRC gave five reasons for choosing Softbank: 1. The Group had a strong small business customer base and ties with regional financial institutions; 2. The Group would actively support new financing techniques for

[6] The Softbank group included Orix Corporation and Tokyo Marine and Fire Insurance Company.

venture companies; 3. The Group would use new technologies, including internet transactions; 4. The acquiring Group was led by financially strong companies; and 5. The terms of the purchase satisfied the basic concept of "minimizing public burden."

NCB was sold to Softbank on September 1, 2000 for 101 billion yen. At the time of sale, NCB had assets totalling 11.4 trillion yen in book value. The FRC designated 6.6 trillion yen of these assets as suitable for sale to Softbank. Initial outlays of government assistance for the resolution of NCB amounted to over 4.4 trillion yen (see Table 2).

The bank was renamed Aozora Bank in January 2001. After the fact, it was revealed that over a fourth of the assets designated as suitable for sale by the FRC were actually problem loans. Again, the FRC revealed that its designation was based on "other factors," such as potential main bank support, which was outside the formal terms of its initial memorandum of understanding. It was clear that the regulator's desire to protect borrowers from foreclosure influenced the improper designation of these assets. While the FRC appears to have followed the letter of its memorandum of understanding with Softbank in its designation of assets, it is clear that the regulatory agency utilized some of the discretion allowed in the memorandum. In particular, the FRC factored non-standard considerations, such as potential support for problem borrowers from other lenders. It also exhibited a reluctance to liquidate loans from firms in sensitive industries [Shukan Bunshun (2000a),(2000b)].

As a result, Aozora found itself immediately facing bad loan problems. Roughly 32 percent of its loans were to the troubled real estate sector, while an additional 6 percent were to construction firms. It was generally agreed that NCB's balance sheet was weaker than that of Shinsei at the time of its launch. The initial bank president, Tadayo Honma, committed suicide on September 20, 2000, reportedly partly due to NCB's formidable bad loan difficulties.

In general, Aozora bank has not appeared to be as aggressive as Shinsei in refusing to roll over problem loans and returning assets to the DIC. Nevertheless, by September 2001, Aozora Bank had also returned 42.8 billion yen in loans to the DIC, at a cost to the government of 23.9 billion yen [Nihon Keizai Shimbun (2001)].

2.3. Summary

The Japanese experiences with the sale of LTCB and NCB revealed both the motivation for guarantees and the problems the extension of those guarantees create: Because of its reluctance to foreclose on problem borrowers, the FRC systematically overstated the quality of assets it sold to the acquiring bank [Shukan Bunshun (2000a),(2000b)]. This resulted in an asymmetric information problem between the seller and its potential buyers, which was addressed through the extension of a put guarantee. However, the put guarantee created problems of its own. In particular, it gave the acquiring banks the incentive to deviate from what was commonly considered standard banking practices to maximize the benefits of the guarantees that had been extended.

3. The Disposition of Assets During the U.S. Savings and Loan Crisis

As discussed above, the Ripplewood Group that won the bid for LTCB demanded the inclusion of the put guarantees in its sale because such guarantees had been commonly used in the disposition of failed bank assets in Western transactions. In this section, I review the United States' experience with such guarantees during its financial crisis in the 1980's and early 1990's.

Between 1980 and 1994, 1,617 banks with $302.6 billion in assets were closed or received assistance from the FDIC. At the same time, 1,295 Savings and

loan institutions, carrying $621 billion in assets were closed by the FSLIC or RTC, or received FSLIC assistance. These accounted for roughly one out of every six federally insured financial institutions and 20.5 percent of assets of these institutions. During the height of the crisis period, 1988-1992, an average of one bank or savings and loan was closed every day [Bean, et al (1998)].

The method of asset disposition used by the FDIC changed over time. In the 1970's and early 1980's, the FDIC typically was more concerned about the health of the newly created bank than the sale of the assets of the failed bank. It typically only included cash and cash equivalents in sales known as purchase and assumption (P&A) transactions.[7] Under these transactions, due diligence was not required. Indeed, due diligence was often avoided to maintain secrecy about impending bank closures to avoid instigating runs [Bean, et al (1998)]. However, as the number of failures grew in the 1980's, limiting sales to cash and cash equivalents quickly left the FDIC with unmanageable levels of asset holdings. In response, the FDIC began using put guarantees to facilitate the sale of all assets of a failed bank to a healthy acquiring bank. Under these agreements, the acquiring bank was allowed to return any assets they did not desire to the FDIC for reimbursement for a limited period of time after acquisition.

The RTC was established in 1989, immediately assuming responsibility for 262 banks in conservatorship with assets of $115 billion. Because of the large numbers of bank failures during its operation, as well as chronic funding difficulties, the emphasis in the RTC was quick disposal of assets. These were done in P&A transactions that quickly moved to selling the assets of failed banks separately from their deposit franchises. Of the 747 failed institutions resolved by the RTC, 497 institutions were handled through P&A transactions. These institutions represented 73 percent of the failed institution assets handled by the RTC. The RTC

[7] Cash equivalents included widely quoted assets, such as the bank's securities holdings, and were transacted at quoted prices.

also used put guarantees during its first year. However, it quickly became clear that an undesirably large portion of assets were being returned. Over half of the $40 billion in assets that were sold by the RTC subject to put options were returned to the regulatory authority.

It was also clear that the acquiring banks were "cherry-picking," choosing only assets with market values above book values while returning other assets. Moreover, there was some perception that acquiring banks tended to neglect assets during the period where they were covered by the put option, implying that the guarantee led to moral hazard in the form of sub-optimal monitoring activity. The put option structure was discontinued in 1991.

In 1991, the FDIC turned to loss-sharing transactions to sell the problem assets of large bank failures at superior terms. These arrangements were offered on failed banks' commercial loans and commercial real estate loans, but not on family mortgage and consumer loans.

The typical terms of the loss-sharing arrangement were that purchasers had a set period of time, typically three to five years, to return assets to the FDIC in return for 80 percent of net charge-offs plus reimbursable expenses. There was a "shared recovery period", during which the acquiring bank paid the FDIC 80 percent of any recoveries on loss share assets previously experiencing a loss. This period ran concurrently with the loss share period and lasted one to three years beyond the expiration of the loss sharing period. The remaining 20 percent of losses were assumed by the acquiring bank.

The agreement also guarded acquiring banks against large downside losses. At the time of sale, the FDIC projected a "transition amount" of ultimate losses the acquired assets should face. Losses exceeding this transition amount were covered at a 95 percent rate.

There were a number of perceived benefits of the loss-sharing arrangement relative to the put guarantee framework: First, the arrangement facilitated the

fast sale of as many assets as possible to the acquiring bank. In particular, like the put guarantee, the loss-sharing arrangement mitigated the information difficulties that arose from the need to dispose of assets quickly. The assets under the loss-sharing arrangement were also sold too quickly for the acquiring banks to conduct standard due diligence inspections.

Second, it was perceived that the loss-sharing arrangement resulted in non-performing assets being managed in a way that aligned the interests of the FDIC and the acquiring bank, as each held a partial equity stake in the underlying assets. Since banks did not need to liquidate their claims on borrowers to activate their guarantees from the FDIC, the guarantees did not encourage the early liquidation of loans. To the extent that bank loans could be more profitable under a renegotiated settlement, the equity stake held by the acquiring bank in the outstanding loan gave the bank an incentive to undergo such renegotiation. This reduced the need for oversight of the acquiring bank by the FDIC.

The FDIC entered into 16 loss-sharing agreements to resolve 24 bank failures between 1991 and 1993 (see Table 3). These included many of the largest bank failures of the period, as loss-sharing arrangements were only offered if the pool of eligible assets exceeded 100 million dollars. However, as most large failures were covered, the arrangements were offered on a substantial share of disposed assets: While only 10% of banks that failed over this period had loss-sharing agreements, these agreements covered 40% of total failed bank assets.

The FDIC generally characterizes the loss-sharing experience as successful, and the method is still used today in the resolution of large failed bank assets.[8] Loss-sharing arrangements are perceived to satisfy the criteria of minimizing the taxpayer burden in the resolution of failed bank assets. For example, there were

[8] For example, a loss-sharing arrangement was used in the resolution of Mutual Federal Savings Bank of Atlanta in 2000.

175 P&A transactions in 1991 and 1992 involving $62.1 billion dollars worth of bank assets. These failures were resolved at a cost of $6.5 billion, or 10.4 percent of asset value. In contrast, the 24 loss sharing banks had assets worth $41.4 billion and were resolved at a cost of $2.5 billion, or 6.1 percent of asset value [Gallagher and Armstrong (1998)].

As loss-sharing arrangements were limited to the largest bank failures, it is likely that some of the discrepancy can be explained by economies of scale in the resolution of failed bank assets. As shown in Table 4, the average resolution cost as a percentage of failed assets with or without the use of loss-sharing arrangements is greater for failed banks with less than $500 million in assets. Nevertheless, Table 4 clearly also demonstrates that loss-sharing arrangements were associated with reduced resolution costs for both banks with more and less than $500 million in assets.

The limited number of loss-sharing arrangements suggests that there must be disadvantages to the resolution method as well. First, it is well-documented that these arrangements are administratively costly to implement, particularly for small bank failures [Gallagher and Armstrong (1998)]. Second, there is also a perception that some potential acquiring banks do not want to be involved in a loss-sharing arrangements. There is a fear that these banks will refrain from bidding on failures that contain such arrangements and reduce the proceeds from their asset sales.

Nevertheless, the successful experience of US banks during the S&L crisis, as well as the continued use of loss-sharing arrangements today, suggest that they are perceived in practice to be a desirable form of asset disposition, particularly for larger bank failures. In the following section, I introduce a model of asset disposition and formally investigate the conditions under which a loss-sharing arrangement may dominate a put guarantee as a resolution method.

4. A Simple Model of the Disposition of Failed Bank Assets

4.1. Setup

In this section, I introduce a simple model that examines the conditions determining the outcomes of failed bank asset sales in the presence of put guarantees and loss-sharing arrangements. The setup closely follows Spiegel (2001), with the simplification here that the regulatory authority always lacks credibility, as discussed below. There are three players: The regulatory authority who is selling the assets of the failed bank, the representative acquiring bank, and the representative borrower. All agents are assumed to be risk neutral, discount at the market rate which is set to 0 for simplicity, and be interested only in maximizing period 3 wealth.

The structural form of the model is shown in Figure 1. There are four periods, 0, 1, 2, and 3. In period 0, the regulatory authority is endowed with the assets of a failed bank that is assumed to be small relative to the banking sector. These assets are all debt contracts calling for a fixed contractual payment from the borrower to its creditor equal to $\overline{D}$ in period 2.

The borrowers underlying these assets are assumed to have cash positions, C, that are unobservable to either the regulatory authority or the acquiring bank. These cash positions are assumed to be protected from seizure by creditors. However, as shown below, they can influence loan payoffs under renegotiation. C is assumed to be distributed on the interval $(0, \infty)$ with density function $f(\cdot)$ and cumulative distribution $F(\cdot)$.

There are two types of loans in the population from which the bank's assets are drawn: A share $1-\pi$ $(0 < \pi < 1)$ of the assets are "good" loans, while the remaining π share of the assets are "bad" loans. Good loans and bad loans are identical ex-ante, and the analysis is conducted in terms of representative good and bad loans. For simplicity, I normalize the asset size of the bank to one, so

that it is expected to have $(1-\pi)$ good loans and π bad loans.

Good loans and bad loans are assumed to differ in their investment opportunities. In particular, good loans are assumed to behave similarly to the Hart and Moore [HM (1998)] model. Renegotiation on a good loan is profitable ex-post because the value of ongoing investments left in place exceeds their value under liquidation. In contrast, bad loans face a return on reinvestment which is below the market rate. This implies that liquidation is a first-best outcome for bad loans.

The sale of the failed bank assets also takes place in period 0. The regulatory authority designates a share of the assets of the failed bank as good loans. These loans are then auctioned off. Competitive bidding is assumed to insure that assets designated as good loans are sold to the acquiring bank at its reservation price.[9] Loans designated as bad are immediately liquidated. The acquiring bank is assumed to face a fixed cost b of administering an asset.

In the spirit of a rapid asset sale, the potential acquiring banks are not allowed to conduct due diligence examination of the failed bank's assets prior to acquisition. this is modeled as the acquiring bank lacking knowledge about the share of good and bad loans in the failed bank's asset portfolio. This leads to an asymmetric information problem between the regulatory authority and the potential acquiring banks because the regulatory authority lacks credibility concerning its designation of loans as good or bad. Below, I confirm that when the regulatory authority lacks credibility, its optimal response is to designate all of the loans as "good" and offer them for sale. The acquiring banks' optimal response is then to assume that the probability that a loan actually is good matches to the population probability, or $1-\pi$.[10]

[9] James and Wier (1987) find a significant relationship between the number of bidders in a failed bank auction and the abnormal returns to the winning bidder after the auction, suggesting that in practice competition among acquiring banks may not be perfect.

[10] The primary distinction between this model and the more general model in Spiegel (2001)

To mitigate the asymmetric information difficulties, the regulatory authority can offer either a "put-guarantee" or a "loss-sharing arrangement." These are offered in period 0 and are discussed in more detail below.

In period 1, the acquiring bank learns each asset's true type as well as its cash position. At that point, the acquiring bank can exercise its put guarantee if one has been extended.

Loans have divisible underlying assets that last two periods, and are worthless in period 3. These asset yields uncertain return R_2 in period 2 and R_3 or 0 in period 3, depending on the loan's type. Good loans are assumed to have investments that yield constant return R_3 in period 3 ($R_3 > 0$), while bad loans earn return 0 in period 3. R_2 is also assumed to be normally distributed, with density function $h(\cdot)$ and cumulative distribution $H(\cdot)$. These funds are also assumed to be under the control of the borrower, and not subject to seizure by the bank. In addition, any funds retained by good loan borrowers at the end of period 2 can be reinvested in the project at rate of return s, where s is a constant that satisfies

$$1 < s < \frac{R_3}{L} \tag{4.1}$$

where L represents the liquidation value of the asset, which is assumed to be a constant.[11] The above condition implies that the going-concern value of the project exceeds its liquidation value, so that liquidation is costly.

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is that the latter allows for the possibility that the regulatory authority enjoys credibility by assuming that it faces an exogenous penalty for designating assets incorrectly. Under sufficiently high penalties, the asymmtric information problem does not arise, which affects the desirability of both put guarantees and loss-sharing arrangements.

[11] If L was allowed to be uncertain, Hart and Moore show that the assumption that its realization is nonverifiable would be necessary to prove that a debt contract is optimal. Since loss-sharing agreements require that losses are verifiable, that assumption cannot be used here. Therefore, I take L as constant.

As stated above, the loans call for a fixed contractual payment from the borrower to its creditor equal to $\overline{D}$ in period 2. The borrower has assets equal to $C + R_2$ which are not exposed to seizure. It follows that the borrower is solvent if and only if

$$C + R_2 + L \geq \overline{D} \tag{4.2}$$

If the borrower is solvent, he can either make the payment $\overline{D}$ or choose to default. If the borrower is insolvent, he defaults with certainty.

If the borrower services his debt obligations or reaches a renegotiation agreement with his creditor, he remains in operation with its remaining investment in place. All period 3 investment proceeds must go to the borrower, as its creditor no longer has any bargaining power in period 3.

If the solvency condition holds with inequality, the entire project need not be liquidated to service the borrower's outstanding debt obligations in full. Assumption 4.1 implies that the borrower would always prefer to draw down his cash position fully before beginning to liquidate his project.

If the borrower defaults on his loan obligation, the acquiring bank has the option of liquidating his investment. In the event of default and no renegotiation, the project is completely liquidated. In this case, the bank gets L, the liquidation value of the asset, while the borrower gets $C + R_2$. In practice, bad loans will be completely liquidated.

However, for good loans, both sides can do better through renegotiation, since the rate of return on even reinvested funds by the good borrower exceeds the market rate of interest. As in HM (1998), I assume that with probability α the bank would get to make a take-it-or-leave-it offer to the borrower, while with probability $(1 - \alpha)$ the borrower would get to make a take-it-or-leave-it offer to the bank. Moreover, I assume that the outcome of the renegotiation process is that the borrower makes an offer prior to the start of the game equal to the expected

value of the payoffs to the creditor, which is always accepted. This payment is then paid in period 2.

In period 3, the borrower earns the full proceeds of his remaining investment in place. If the regulatory authority has extended a loss-sharing arrangement guarantee, the acquiring bank is partially compensated for his asset losses in period 3.

The expectation of the acquiring bank concerning its period 2 earnings will influence both the initial value it places on the loans of the failed bank and the value it places on these loans in period 1, subsequent to the realization of C. The details of the renegotiation process are shown in the appendix. The expected payoff from a good loan subsequent to the realization of C is shown to be equal to $G(C) - b$, where $G(C)$ satisfies

$$G(C) = \overline{D} \int_{R_2^*}^{\infty} h(R_2)\, dR_2 + \int_{-\infty}^{R_2^*} D(C, R_2)\, h(R_2)\, dR_2 \tag{4.3}$$

where R_2^* represents the realization of R_2 at which equation 4.2 is just binding and $D(C, R_2)$ represents the payment by the borrower after renegotiation. As shown in the appendix, $D(C, R_2)$ satisfies

$$D(C, R_2) = (1-\alpha) L + \alpha \left[\begin{array}{c} C + R_2 \\ + \min\left\{ -\left(\frac{C+R_2-R_3}{s}\right), \left(1 - \left(\frac{C+R_2}{R_3}\right)\right) L \right\} \end{array} \right] \tag{4.4}$$

which represents the probability-weighted payoffs when the borrower and the bank are allowed to make take-it-or-leave-it offers respectively. I also demonstrate in the appendix that $G'(C) > 0$ and $G"(C) < 0$.

As it is clear that $D(C, R_2) > L$ when $R_3 > 0$, the acquiring bank would always choose renegotiation with borrowers of good loans.

In contrast, since the return on investments in period 3 is 0 for bad loans, borrowers always default on bad loans subsequent to the realization of R_2 and then are liquidated. The returns to the acquiring bank of a bad loan then satisfy $L - b$.

4.2. No guarantees

To provide a benchmark to evaluate the proceeds of sales under the different guarantees considered in the paper, I first evaluate the proceeds that the sale of the failed bank would generate without any guarantees. Let Π represent the payoff to the regulatory authority when no guarantees are extended. As discussed above, since the regulatory authority lacks credibility, it attempts to sell all of the assets and the representative acquiring bank assumes that the share of unsuitable assets is equal to that in the population, or π. The acquiring bank is therefore only willing to bid $\pi(L-b)$ for these assets. Π therefore satisfies

$$\Pi = \pi L + (1-\pi) G - b \tag{4.5}$$

where G represents the expected return on good loans in period 0. G satisfies

$$G = \int_0^\infty G(C) f(C) dC.$$

4.3. Put Guarantee

I next consider the extension of a put guarantee. I assume that the acquiring bank can return its loan for a fixed payoff equal to Λ in period 1, where $\Lambda > L$, the loan's liquidation value. Since $\Lambda > L$, the acquiring bank will obviously choose to exercise its put option for all bad loans.

However, it is possible that it may also choose to exercise the put options for some good loans. Recall that in period 1 the acquiring bank also learns the cash position of each borrower, C. A low realization of C has adverse implications for expected loan payoffs. This raises the possibility that the acquiring bank may wish to return a good loan with a sufficiently low realization of C. Since $D(C, R_2) > L$, the exercising of the put option on good loans would result in a deadweight loss, because good loans are more valuable within the banking sector under renegotiation than under liquidation.

To make the problem non-trivial, I assume that the put guarantee is sufficiently valuable that the acquiring bank would prefer to exercise it under some states of the world. Since the minimum level of cash holdings, C, is 0, the required assumption is that the put guarantee Λ is sufficiently large that the acquiring bank would choose to return the asset upon discovering that the borrower's cash position was 0 if she could, but not as large as $\overline{D}$, the asset's contractual rate of return.

It is straightforward that the acquiring bank will choose to return a loan when its expected payoff falls short of the put guarantee, i.e. when

$$\Lambda \geq G(C).^{12} \tag{4.6}$$

The assumption that the put guarantee is sufficiently large that it would be exercised in some, but not all, states for good borrowers is then

$$\overline{D} > \Lambda > G(0) \tag{4.7}$$

which I adopt.

Define C^* as the borrower cash position under the put guarantee for which condition 4.6 is just binding. I demonstrate in the appendix that C^* exists and is a unique function of Λ, the size of the put guarantee. It follows that loans will be returned if $C < C^*$ and retained if $C \geq C^*$.

Let V^p represent the acquiring bank's valuation of a good asset under the put guarantee. V^p satisfies

$$V^p = \Lambda F(C^*) + \int_{C^*}^{\infty} G(C) f(C) dC - b. \tag{4.8}$$

Let Π^p represent the payoff to the regulatory authority when a put guarantee of magnitude Λ is offered. As above, since the regulatory authority lacks credibility, all assets are offered for sale and the acquiring bank places the population probability $1 - \pi$ that loans are good. Π^p satisfies

$$\Pi^p = [\pi(\Lambda - b) + (1 - \pi) V^p] - (\Lambda - L)[\pi + (1 - \pi) F(C^*)] \tag{4.9}$$

The first bracketed term represents the proceeds from the sale of the assets of the failed bank. It is equal to the probability-weighted payoffs of bad and good loans respectively in the presence of the put guarantee. The latter term reflects the expected cost to the regulatory authority of servicing the put guarantee. Simplifying and substituting for V^p, Π^p satisfies

$$\Pi^p = \pi L + (1-\pi)\left[LF(C^*) + \int_{C^*}^{\infty} G(C) f(C)\, dC\right] - b \tag{4.10}$$

I next turn to the question of the implications of the put guarantee on the expected net proceeds to the regulatory authority from the sale of the failed bank. By equations 4.5 and 4.10 the loss to a regulatory authority from introducing a put option guarantee satisfies

$$\Pi^p - \Pi = -(1-\pi)\left[\int_0^{C^*} G(C) f(C)\, dC - LF(C^*)\right] < 0. \tag{4.11}$$

The above expression is negative because the extension of the put option has no impact on the assets that are sold by the regulatory authority. Both in the presence of the put option and in its absence the regulatory authority offers all of the assets of the failed bank for sale. The net loss is then the sum of the probability-weighted expected losses from the acquiring bank returning good loans which have had an adverse cash position realization.[13]

4.4. Loss-sharing arrangement

I next consider the extension of a loss-sharing arrangement. I assume that the purchaser of the asset is guaranteed a reimbursement of ϕ times the magnitude by

[13] Put guarantees may increase the expected revenues to the regulatory authority, even under risk neutrality, if they are of sufficient magnitude to alter the behavior of the regulatory authority. In particular, Spiegel (2001) demonstrates that put guarantees may increase the expected revenues of the regulatory authority when the extension of such guarantees moves the regulatory authority from the no credibility to the credibility case.

which the loan payoff falls short of its face value $\overline{D}$, $\phi\epsilon\,(0,1)$. Let b' represent the acquiring bank's administrative costs of maintaining the loss-sharing arrangement. In keeping with the literature, I assume that $b' > b$, i.e. that the maintenance of the loss-sharing arrangement raises the acquiring bank's administrative costs.

Let V_b^l represent the expected return to the acquiring bank of a bad loan inclusive of the loss-sharing arrangement. Unlike the put guarantee case, under the loss-sharing case, the acquiring bank does not return assets to the regulatory authority. Bad loans are liquidated by the bank itself, and hence yield revenues of $L - b'$ to the acquiring institution. V_b^l therefore satisfies

$$V_b^l = L - b' + \phi\left(\overline{D} - L\right) \tag{4.12}$$

where $\phi\left(\overline{D} - L\right)$ is the payoff on bad loans under the loss-sharing arrangement.

Let V_g^l represent the expected return to the acquiring bank of good loans inclusive of the loss-sharing arrangement. Moreover, let $\overline{R}_2\,(C)$ represent the realization of R_2 at which the borrower is indifferent between paying the debt service in full and default. $\overline{R}_2\,(C)$ satisfies

$$D\left[C, \overline{R}_2\,(C)\right] = \overline{D}. \tag{4.13}$$

V_g^l then satisfies

$$V_g^l = G - b' + \phi \int_0^\infty \left[\int_{-\infty}^{\overline{R}_2(C)} \left[D - \overline{D}\,(C, R_2)\right] h\,(R_2)\, dR_2 \right] f(C) dC \tag{4.14}$$

where the final term represents the expected payoff from the regulatory authority under the loss-sharing arrangement.

Let Π^l represent the expected payoff to the regulatory authority under a loss-sharing arrangement. As above, the regulatory authority lacks credibility so that all loans are sold and the acquiring bank believes that the share of unsuitable assets is equal to that in the population, or π. Π^l satisfies

$$\Pi^l = \pi L + (1 - \pi)\, G - b' \tag{4.15}$$

I next turn to the implications of the introduction of the loss-sharing arrangement for the expected revenues of the regulatory authority. By equations 4.5 and 4.15, the gains from offering the loss-sharing arrangement, $\Pi^l - \Pi$, satisfy

$$\Pi^l - \Pi = b - b' \leq 0. \tag{4.16}$$

Again, the term is negative because the loss-sharing arrangement fails to alter the behavior of the regulatory authority. The only change from offering a loss-sharing arrangement is then the increase in administrative costs to the acquiring bank.[14]

4.5. Comparison of Put guarantee and loss-sharing arrangement

I next turn to comparing the payoffs from offering the loss-sharing arrangement to those obtained under the put guarantees. By equations 4.15, 4.8, and 4.10, the net gain from offering a loss-sharing arrangement relative to offering a put guarantee, $\Pi^l - \Pi^p$, satisfies

$$\Pi^l - \Pi^p = (b - b') + (1 - \pi)\left[\int_0^{C^*} (G(C) - L)\, f(C)\, dC\right]. \tag{4.17}$$

There are two components to the difference in revenues between the loss-sharing arrangement and the put guarantee. The first term is negative, reflecting the additional administrative costs under the loss-sharing arrangement. The second term is positive, reflecting that under the loss sharing arrangement suitable assets are never liquidated as they are under the put guarantee. The relative merits of the two policies is then dependent on the relative size of these two features.

Finally, I turn to some comparative static exercises to examine how changes in economic conditions can affect the relative desirability of the put guarantee

[14] As in the put guarantee case, Spiegel (2001) also demonstrates that the extension of a loss-sharing guarantee can increase the expected revenues of the regulatory authority if it moves the regulatory authority from the no credbility regime to the credibility regime.

and the loss-sharing arrangement. Define b'^* as the administrative cost of the loss-sharing program that leaves regulatory revenue exactly equivalent to the put option guarantee under credibility. By equation 4.17, b'^* satisfies

$$b'^* = b + (1-\pi)\int_0^{C^*} (G(C) - L)\, f(C)\, dC. \tag{4.18}$$

Changes that increase the relative desirability of the loss-sharing arrangement can then be interpreted as changes that increase b'^*. Differentiating b'^* with respect to L yields

$$\frac{db'^*}{dL} = (1-\pi)\left[\frac{dC^*}{dL}(G(C^*) - L)\, f(C^*) + \int_0^{C^*}\left(\frac{dG}{dL} - 1\right) f(C)\, dC\right] \tag{4.19}$$

By equations 4.2, 4.3 and 4.4 dC^*/dL satisfies

$$\frac{dC^*}{dL} = -\frac{\left(\overline{D} - D\right) h(R_2^*) + \int_{-\infty}^{R_2^*} \frac{\partial D}{\partial L} h(R_2)\, dR_2}{\left(\overline{D} - D\right) h(R_2^*) + \int_{-\infty}^{R_2^*} \frac{\partial D}{\partial C} h(R_2)\, dR_2} < 0 \tag{4.20}$$

It follows that a sufficient, but not necessary condition for $db'^*/dL < 0$ is then

$$\left(\overline{D} - D\right) h(R_2^*) + \int_{-\infty}^{R_2^*} \frac{\partial D}{\partial L} h(R_2)\, dR_2 < 1 \tag{4.21}$$

Since $\partial D/\partial L \leq 1$ by equation 4.4, the above condition is relatively weak, suggesting only that the sensitivity of the value of the asset under intermediation to the liquidation value can't exceed one. Under this condition, an increase in the liquidation value of the asset increases the relative desirability of liquidation.

Given satisfaction of this condition, a decrease in L, the liquidation value of the asset raises b'^*, the loss-sharing administrative cost that leaves the regulatory authority indifferent between the put guarantee and loss-sharing arrangements under credibility. In other words, a decrease in L, which may be expected to accompany a deterioration in economic conditions, would raise the relative desirability of the loss-sharing arrangement over the put guarantee.

On the other hand, it is also likely that a deterioration in economic conditions would increase π, the share of bad loans in the failed bank's portfolio. Differentiating b'^* with respect to π yields

$$\frac{db'^*}{d\pi} = -(1-\pi)\int_0^{C^*} (G(C) - L) f(C)\, dC < 0. \tag{4.22}$$

An increase in π reduces b'^* because it lowers the share of good loans. When there is a smaller share of good loans in the economy, the losses from the put guarantee associated with the return of good loans are reduced.

It is therefore difficult to make a general statement about the marginal impact of a decline in economic conditions on the relative desirability of put guarantees and loss-sharing arrangements because these two effects go in opposite directions: First, a deterioration in economic conditions should reduce the liquidation value of assets. This would raise the relative desirability of the loss-sharing arrangement because it would raise the cost of liquidation of good loans under the put guarantee. However, one would expect that a deterioration in general conditions would also reduce the overall share of good loans. This effect acts to reduce the relative desirability of the loss-sharing arrangement because it directly mitigates the severity of the problem associated with the liquidation of loans that are more valuable within the banking system.

5. Conclusion

This paper examined the circumstances surrounding the sale of two failed Japanese banks, LTCB and NCB, and the historical lessons provided by the US experience during the Savings and Loan Crisis. In both cases, problems were created by the provision of put guarantees. These guarantees, introduced to address information asymmetry difficulties created by the need for quick asset sales, created moral hazard difficulties of their own. In particular, both in the Japanese and in the United

States cases, acquiring banks were seen to be reluctant to work with problem borrowers when they possessed the alternative of exercising the put guarantee. It was argued that the United States experience with loss sharing arrangements suggests that these arrangements provide a relevant alternative mechanism for addressing the information asymmetries caused by the need for quick sales of failed bank assets.

I then introduced a formal model of both put guarantees and loss sharing arrangements. The overall superiority of either form of guarantee was shown to depend on the relative magnitude of the losses associated with loans being inappropriately liquidated from banking sector under the put guarantee and the higher administrative costs experienced under the loss-sharing arrangement. In addition, the impact of a deterioration of economic conditions on the relative superiority of put guarantees and loss sharing arrangements was shown to be ambiguous.

6. Appendix

6.1. Renegotiation

As in HM (1998), I assume that with probability α the bank would get to make a take-it-or-leave-it offer to the borrower, while with probability $(1-\alpha)$ the borrower would get to make a take-it-or-leave-it offer to the bank. Moreover, I assume that the borrower makes an offer prior to the start of renegotiations equal to the expected value of the payoffs to the creditor.

The borrower's take-it-or-leave-it offer is equal to L, the amount the bank could obtain by liquidating the entire firm.The bank's take-it-or-leave-it offer requires payment sufficient to reduce the payoff to the borrower to its status quo value of $C + R_2$.

There are two possibilities for the bank's payoff depending on the wealth of the borrower in period 2: First, suppose that the borrower is relatively wealthy. In particular, suppose that $C + R_2 \geq R_3$. In this case, the bank will demand a cash payment from the borrower equal to

$$C + R_2 - \left(\frac{C + R_2 - R_3}{s} \right).$$

Alternatively, suppose that the borrower is poor, i.e. that $C + R_2 < R_3$. In this case, some amount of liquidation will be required to reduce the borrower's period 3 payoff to $C + R_2$. In particular, the bank will demand all of the borrower's cash, $C + R_2$, plus the proceeds of sale from a partial liquidation of the asset. The bank will demand that the borrower liquidate a share of the assets equal to $1 - (C + R_2)/R_3$. The payoff to the bank in this case satisfies

$$C + R_2 + \left(1 - \left(\frac{C + R_2}{R_3} \right) \right) L$$

The payoff when the bank gets to make the take-it-or-leave-it offer then satis-

fies

$$C + R_2 + \min\left\{-\left(\frac{C + R_2 - R_3}{s}\right), \left(1 - \left(\frac{C + R_2}{R_3}\right)\right) L\right\}$$

The payoff to the creditor under renegotiation then satisfies equation 4.4

$$D(C, R_2) = (1 - \alpha) L + \alpha \left[\begin{array}{c} C + R_2 \\ + \min\left\{-\left(\frac{C+R_2-R_3}{s}\right), \left(1 - \left(\frac{C+R_2}{R_3}\right)\right) L\right\} \end{array} \right]$$

Defaults occur if and only if $\overline{D} \geq D(C, R_2)$. It follows that the payoff will be exactly like a debt contract. If the bank does not liquidate the loan in period 1, it receives $\overline{D}$ in period 2 and D if he cannot. The expected payoff to a loan to a good borrower then satisfies equation 4.3, where R_2^* represents the realization of R_2 for which equation (4.2) holds with equality.

To evaluate the model, it is useful to consider how realizations of the borrower's cash position, C, influence the expected payoff to the acquiring bank. It is easy to show that G is increasing and concave in C. Differentiating equation 4.3 with respect to C yields

$$\frac{\partial G}{\partial C} = \int_{-\infty}^{R_2^*} \frac{\partial D}{\partial C} h(R_2)\, dR_2 > 0$$

over the values of C for which $\partial D/\partial C$ is defined. This includes all values of C except $C = R_3 - R_2$. At this value of C the payoff when the bank makes the take-it-or-leave-it offer is kinked. When $C > R_3 - R_2$,

$$\frac{\partial D}{\partial C} = \alpha\left(1 - \frac{1}{s}\right) > 0,$$

and when $C < R_3 - R_2$

$$\frac{\partial D}{\partial C} = \alpha\left(1 - \frac{L}{R_3}\right) > 0.$$

The second derivative satisfies

$$\frac{\partial^2 G}{\partial C^2} = -\frac{\partial D}{\partial C} h(R_2^*) < 0$$

6.2. Existence and uniqueness of C^*.

Since cash holdings cannot be negative, existence follows directly from assumption 4.7 and the result in the appendix that $G(C)$ is strictly increasing in C. Suppose that $C = 0$. By assumption 4.7, the acquiring bank would choose to return the asset to the regulatory authority at $C = 0$. Now consider the payoffs as C approaches infinity. By equation 4.2, as $C \to \infty$ the probability of default goes to zero. It follows that $G(C) \to D$ as $C \to \infty$. Since $D > \Lambda$ by assumption, it follows that the acquiring bank would not return the asset if C approached infinity. It follows that a unique value of C^* exists. Moreover, C^* is the value of C under which the constraint in equation 4.6 is just binding.

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Figure 1
Extensive Form of Model

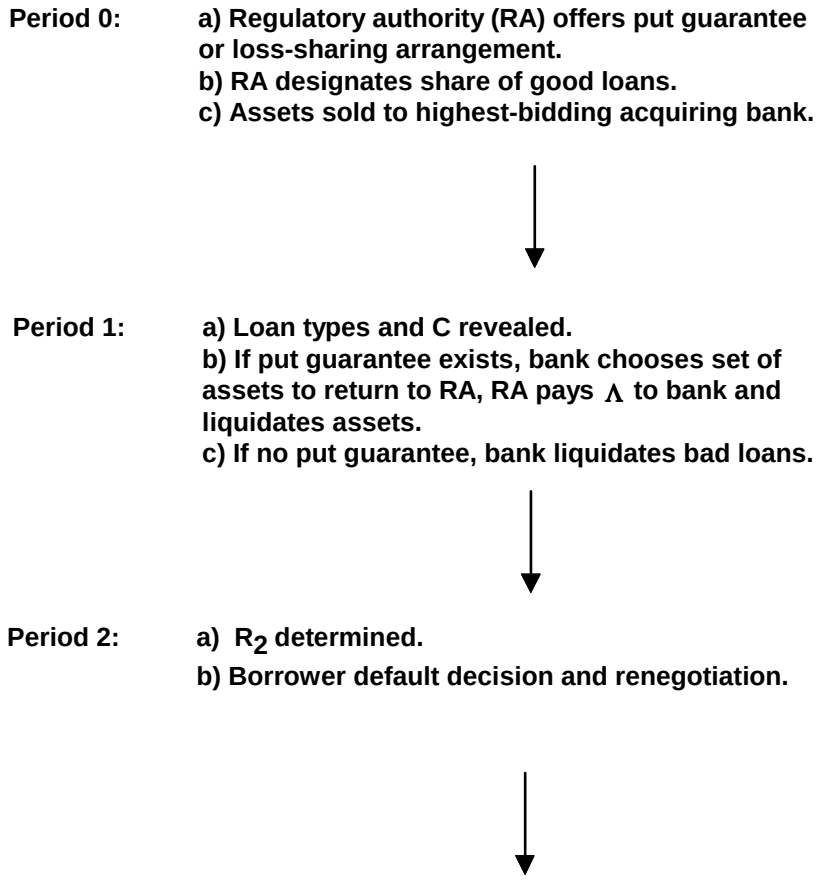

Table 1

Borrower Classification Guidelines[1]

1. "Normal"	Strong results and no particular problems with its financial position.
2. "Needs Attention"	Problems with lending conditions, with fulfillment, has poor results or is unstable, has problems with its financial position, or otherwise requires special attention and management.
3. "In danger of bankruptcy"	Not bankrupt now, but is facing business difficulties and has failed to make adequate progress on its business improvement plan etc., so that there is a large possibility of it falling into bankruptcy in the future.
4. "Effectively Bankrupt"	Not yet legally and formally bankrupt, but is in serious business difficulties from which it is considered impossible to rebuild.
5. "Bankrupt"	Legally and formally bankrupt.

[1]Source: Deposit Insurance Corporation

Table 2

Initial Resolution Costs of LTCB and NCB Failures [1]

billions of yen.

	LTCB[2]	NCB[3]
Initial Grants[4]	3,235	3,141
Compensation for Losses After Failure	355	95
Asset Purchases by the DIC	305	319
Equity Purchases by the DIC	2,276	650
Underwriting of Preferred Stock	240	260
Total Initial Outlays	6,411	4,465

[1] Figures represent initial outlays. Actual resolution costs will be mitigated by recoveries on purchased assets and equities.

[2] Source: Financial Reconstruction Commission.

[3] Source: Financial Reconstruction Commission.

[4] "Initial Grants" category refers to government contributions at the time of the bank failure, while "Compensation for Losses After Failure" refers to government contributions while bank was under public management.

Table 3

FDIC Loss Sharing Transactions

1991-1994

($ in Millions)

Transaction Date	Failed Bank	Total Assets	Resolution Costs	% of Total Assets
09/19/91	Southeast Bank, N.A. +	$10,478	$0	0.00
10/10/91	New Darthmouth Bank	2,268	571	25.19
10/10/91	First New Hampshire	2,109	319	15.14
11/14/91	Connecticut Savings Bk.	1,047	207	19.77
08/21/92	Attleboro Pawtucket S.B.	595	32	5.41
10/02/92	First Constitution Bk.	1,580	127	8.01
10/02/92	The Howard Savings Bk.	3,258	87	2.67
12/04/92	Heritage Bank for Savings	$1,272	$21	1.70
12/11/92	Eastland Savings Bank ++	545	17	3.30
12/11/92	Meritor Savings Bank	3,579	0	0.00
02/13/93	First City, TX-Austin, N.A.	347	0	0.00
02/13/93	First City, TX-Dallas	1,325	0	0.00
02/13/93	First City, TX-Houston, N.A.	3,576	0	0.00
04/23/93	Missouri Bridge Bk., N.A.	1,911	356	18.62
06/04/93	First National Bk. of Vermont	225	34	14.97
08/12/93	CrossLand Savings, FSB	7,269	740	10.18
Total		$41,384	$2,511	6.07

+ Represents loss sharing agreements for two banks: Sourtheast Bank, N.A., and Southeast Bank of West Florida.

++ Represents loss sharing agreements for two banks: Eastland Savings Bank and Eastland Bank.

Source: FDIC (1998)

Table 4

FDIC's Resolution Cost as Percentage of Assets 1991-1992

Failed Banks with Total Assets over $500 million.

	Average Cost of Resolution (%)	Median Cost of Resolution (%)
With Loss Sharing	5.38	7.77
Without Loss Sharing	8.66	12.21

Failed Banks with Total Assets under $500 million.

	Average Cost of Resolution (%)	Median Cost of Resolution (%)
With Loss Sharing	9.55	6.06
Without Loss Sharing	15.82	17.10

Source: FDIC (1998)