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ABSTRACT

The purpose of this paper is to evaluate the Japanese deposit insurance scheme by contrasting the flat insurance rate with a market-determined risk-adjusted rate. The model used to calculate the risk-adjusted rate is that of Ronn and Verma (1986). It utilizes the notion of Merton(1977) that the deposit insurance can be based on a one-to-one relation between it and the put option; this permits the application of Black and Scholes(1973) model for the calculation of the insurance rate. The risk adjusted premiums are calculated for the thirteen city banks and twenty-two regional banks. The inter-bank spread in risk-adjusted rates in Japan is found to be as wide as in the United States. But the insurance system is only one component of the safety network for a county's banking system. The difference in the American and Japanese networks is described and its implications for the evaluation of the insurance system is discussed.

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I. INTRODUCTION

The necessity for public institutions to bolster the liquidity and the solvency of the commercial banks even in economies committed to unregulated markets, is recognized by all but a small minority of scholars committed to free banking. The justification offered is that there is a beneficial externality to the vitality of the banking sector that must be preserved from contagious runs created by public suspicion of its solvency.

A recurrent theme in this literature is the consequences of the support and supervisory responsibilities of the central bank (as the controller of currency and the lender of the last resort) overlapping that of the deposit insurance corporation. The American model of deposit insuarance has been widely adopted elsewhere [McCarthy (1980)], but the system cannot be judged independently of the nexus of banking relationships. Though the objective of this paper is the use of Ronn and Verma(1986) model to rank the city banks and a twenty-two regional banks of Japan by risk- adjusted insurance premium, we shall begin with a selective review of the literature on deposit insurance and the characteristics of the Japanese banking system.

In this context, it is common to differentiate between the macro-functions (pursuit of monetary policy) and the micro-functions (supervision and control of individual banks) of the central bank. Even though the insolvency of an individual bank would reduce the money supply by making its deposits illiquid, it is in itself no justification of interfering with the market. Bentson (1983, p.5) points out that the loses to depositors from

bank failures were not excessive before the Great Depression. It was only 0.10 percent of the total deposits per year from 1900 to 1920 and 0.42 percent per annum between 1921 to 1929. Such losses to liquidity can be rectified easily by a central bank through its open market operations. Another argument is that insolvencies will disrupt the payment system and increase the cost of transaction for the rest of the economy. An individual's use of the means of payment has a positive effect on the system as this will facilitate other people using the same means. The individual will only consider his private benefit and ignore the greater social return. Bentson (1983) is skeptical of the argument that the banks should be given a Pigovian subsidy for the optimal exploitation of this positive externality. He notes that the use of checks spread considerably before the introduction of deposit insurance and that the check anyway carries with it the danger of inadequate funds. Goodhart(1988, p.102) goes further in arguing: "Monetary payment services not only could be provided, and are increasingly being provided, by other collective-investment funds but could also be thus provided more safely than by banks".

Another argument that had a wide circulation in historical literature and has received support in recent theoretical analyses is that there is an informational asymmetry which prevents the depositors from enforcing the normal market discipline on the banks. Assuming risk aversion, depositors will require riskier banks to provide a higher return; but they are numerous, small and possibly ill-educated and do not have the necessary information which is very expensive to acquire. Even brushing aside Henry Thonton's comment of bank credit being used by persons of lower

class as snobbishness of his times, an early advocate of deposit insurance in New York legislature put the matter rather eloquently [quoted in Karekan (1983, p.2)]:

> The loss by insolvency of banks generally falls upon the farmer, the mechanic, and the laborer, who are least acquainted with the condition of banks and who, of all others, are most illy able to either guard against or sustain a loss by their failure.

The informational asymmetry is common to the provision of many other professional activities including medical and legal services. But the special relevance of the problem for banking was analyzed by Diamond and Dybvig (1983, 1986) and Hirsch (1987). Commercial banks as financial intermediaries do more than arbitrage between lenders and borrowers. In the process, they create a mismatch between the maturities of their assets and their liabilities. The banks issue liabilities that are redeemable on demand but their assets consists of loans to "idiosyncratic borrowers" [Federal Deposit Insurance Corporation (1989, p.44)]. The loans have not only longer maturity but are also illiquid in the sense that they cannot be sold except at severe capital loss as any hands-off purchaser would discount it for the limited information he has about the borrower (as compared to the bank).

> The creation of the liquidity by the commercial bank makes it very hard for an individual depositor to evaluate the soundness of the bank's assets. It is extremely hard to determine whether the higher returns offered reflect the greater efficiencies attained by the bank or a trade off for the higher risk it is taking [Goodhart(1988, p.64)].

In the case that the individual suspects the solvency of an uninsured bank, he has every reason to seek an expeditious withdrawal of his deposits. This would enable him to receive the full value of the deposits as against the prorated amount. If this

opinion is shared by many, then the resulting withdrawal is adequate to create a liquidity crisis for the bank. Also the public would at times of suspected crisis show a preference for lower risk, higher quality and more liquid assets like legal tender or gold, creating a further need for "fire sales" of assets by commercial banks. Banks runs are not the act of frenzied mobs but the doing of rational individuals (in the economists sense) with incomplete information [Karekaen (1983, p.4)].

Technically liquidity crisis must be separated from the solvency problems. An individual commercial bank with assets whose equilibrium value (value under normal conditions of sales) well in excess of its immediate liquidity needs, can rediscount some of its assets either with other commercial banks or the central bank. The central bank as the lender of the last resort is responsible to provide liquidity in times of crisis. One common problem faced by all central banks is that they have difficulty in separating the run on an individual bank from run on the system. Federal Reserve has been criticized for its failure to act decisively and effectively during the crises of 1920s and 1930s. Recent criticisms tend to accuse the central banks of being too solicitous about the solvency of individual banks. A deposit insurance, by reducing the probability of a run on the individual bank, reduces the pressures on the lender of the last resort in making these awkward choices.

The deposit insurance is not a costless or distortion free system. All insurance schemes must be address the twin problems of adverse selection and moral hazard and various voluntary insurance programs have devised schemes to classify risks. But schemes to do

so depend on actuarial estimations of normally occurring events whose temporal trends are fairly predictable. But bank failures depend on non-recurring economic trends. Another difference is that the emphasize in deposit insurance is on avoiding losses due to insolvency of banks than in compensating the insured for the losses. The Federal Deposit Insurance System adopted a flat rate of one-twelfth of one percent with rebates for revenues in excess of osts so that the actual cost comes to 0.03 to 0.04 percent of total deposits. The individual deposit covered was increased from $5000 in 1930s to $40,000 in 1974 and to $100,000 in 1980. Another characteristic is that the insurance fund of less that 1.2% of insured deposits maintained by FDIC is far below that would be considered prudent for a private insurer; it is their public character and tax-payer backing that make the system credible [Kane (1986, p.176)].

The flat rate scheme is shown to encourage the banks to take excessive risk-taking as it biases the firm's risk-reward trade-off. The depositors not concerned with the riskiness of the their deposits, do not demand a higher return from the banks that undertake riskier investment. But such firms receive a higher return associated with the higher risk. Relieved from the market discipline, so the argument goes, the banks as profit maximizers will seek a higher risk portfolio of assets than they would otherwise do. This in turn increases the risk of insolvency in the future and adds to the expected cost of FDIC. To minimize this distortion, the banks are subject to a number of regulations that can be classified under four categories: asset limitations, capital adequacy, bank holding company permissible activities and

interest rate ceilings [Flannery (1982) for a simplified exposition].

Karekan and Wallace (1978) argued that if bank deposit are insured under the FDIC-type scheme, then bank regulations were in a sense necessary. Subsequent discussion led to identification of further distortions created by the "implicit" insurance given by FDIC through their failure-resolution techniques. If the failing bank is purchased by another bank with the assistance from FDIC and FRS, then all the deposits are protected to the full amount and not to the legal limits. Also the banks could believe, as with LDC loans, that such protection will be more easily available when the central bank thinks that the risk is widespread and will affect the entire banking system. Hence they will have a tendency to convert as much of their idiosyncratic risks to systemic risks [Penati and Protopapdakis (1988), Spiegel(1989)].

The deposit insurance is but one component of a network of supports offered to commercial banks and the interrelationships within the network must be taken into account in evaluating the system. Hence we shall review those features of the Japanese system that is of interest to the study of the deposit insurance. But what is striking, even to a casual observer, is that the Japanese banks are, in contrast to their American counterparts, unwilling to publicize the existence of a deposit insuarance scheme.

II. BANKING SYSTEM AND DEPOSIT INSURANCE IN JAPAN

The modern financial system of Japan is generally considered to be the creation of the Meji restoration of 1868 which sought to transform the economy from the feudal to a modern capitalist society. The American national banks system was the preferred model and a large number of national banks with issuing rights were established [Federation of Bankers Associations of Japan (1984, p.1)]. This system collapsed by 1882 when the Bank of Japan became the bank of issue.

The commercial banks followed the European than the British pattern and played an important role in providing long-term industrial funds. The number of banks increased to attain a peak of 1867 in 1901 and then declined rapidly. The minimum bank capital requirement of the Bank Law of 1927 disqualified half of the 1400 banks then existing; most of them preferred amalgamation with other small and medium sized banks. This brought about the dual structure in Japanese banking with the city banks concentrating on providing to national corporations and international commerce and regional banks serving the rest of the country.

On the basis of historical origin, the city banks can be divided into four distinct groups[Bronte (1982)]. In the first group are four major *zaibatsu* banks that had a dominant role in the Japanese economy till the end of Second World War; they are Sumitomo, Mitsui, Mitsubishi and Fuji. Six city banks - Sanwa,

Tokai, Toiyo Kobe, Kyowa, Daiwa and Saitama - were formed by amalgamation of regional banks. Dai-ichi Kangyo and Hokkaido Takushoku were the products of privatization of state banks during the US occupation. Finally the Bank of Tokyo began as Yokohama Specie Bank, half owned by the Emperor, and changed its name after the end of the war.

Legally there is no distinction between city banks and regional banks. They perform all the functions permitted under the Banking Law but they have developed over time certain special functions. City banks act as "main banks" for large corporations with whom they maintain close relation. The loans to the corporations are technically short term but they are regularly renewed and so are in effect long-term. In addition they are among the largest holders of securities of different maturities. They also assist corporations in times of difficulties.

The regional banks are based on a prefecture though they frequently extend their activities to neighboring prefectures. The increasing economic integration of the country since the Second World War has provided an inducement to the regional banks to expand their activities to the big cities like Tokyo and Osaka. The regional banks provide services to the local enterprises and to local governments. They are important suppliers of funds to the money markets.

The Japanese banking system is said to have four distinctive characteristics [Susuki (1980)]. *Overloan* is the funding of loans and investment from sources other than deposits and equity capital. Part of this is financed by borrowing from the central bank. While overloans existed from the Meji restoration, more

recently it has been a city bank phenomenon; the bank rate in Japan in post-war years was below the short-term money-market rate and the banks had no incentive to reduce or repay the central bank credit. In England and Germany, the penalty rate charged on such loans provided a price mechanism to restrict their demand; here it was achieved through credit rationing by the Bank of Japan[Suzuki 1980, pp. 12, 57-58)].

Another characteristic is *overborrowing* resulting from low internal financing and limited issue of securities by the commercial corporations. Related to this is the propensity of these corporations to resort to *indirect financing* defined as resources provided by financial institutions through the purchase of securities or other means. In recent years, major corporations have resorted to a greater use of internal funds than in the immediate post-war years and their dependence on main banks has been reduced to that extent. Finally the *imbalance of bank liquidity* refers to city banks being short of reserve assets while regional banks have an excess; as noted earlier, regional banks are significant lenders in the money market.

The Ministry of Finance and the Bank of Japan have both supervisory powers over the banks.

The Ministry of Finance acts as the Japanese equivalent of the US Treasury, the Securities and Exchange Commissions and the state banking commissions. In so far as it has oversight over the deposit insurance system, it also has some of the supervisory powers of the Federal Deposit Insurance Corporation. The bulk of the Ministry's authority comes from the Banking Law which permits it to license and supervise all banks. It has powers to approve or

deny mergers, acquisitions and other changes in the operation of the bank including the opening of new branches.

The Ministry can enforce its policies in two ways. It can issue an "administrative guidance" either orally or written; given the extensive powers the Ministry of Finance have, the administrative guidance is universally obeyed even though it is not legally binding. Most of the supervisory powers rest with the Banking Bureau but the international operations of a bank are under the oversight of the International Finance Bureau.

The Bank of Japan was established by an act in 1882; some scholars contend that it was modeled on the National Bank of Belgium though Goodhart (1988, p.150) questions it. It undertakes all the standard micro- and macro- functions of the central bank. Its discount rate is the reference point for most interest rates in Japan; in 1981 the Bank introduced the new lending facility similar to the Bundesbank's Lombard rate.

The overloan position of the city banks was mentioned earlier. Hence the loan policies of the Bank of Japan have a tremendous impact on these banks and the economy. It also permits the Bank to use the "window guidance" which sets the bank-by-bank quotas on customers in periods of monetary restraints. Window guidance also has no legal basis and again depends on the close relation between the city banks and the central bank. Recent financial deregulation, the reduction in the dependence of corporations on bank loans and the rise of postal savings are all considered to have diluted this interdependence.

The Deposit Insurance Corporation was established in 1971 and was originally capitalized at 450 million yen of which the

government, the Bank of Japan, the private financial institutions each contributed one-third. Regular deposits, installment savings and money in trust with principle guaranteed, are covered by the insurance originally to an amount of 3 million of yen. Interbank deposits and deposits of Japanese branches of foreign banks are not covered. Until 1988, the Corporation charged a premium of 0.008 percent of the insured deposits during the previous year. It can also borrow up to 50 million yen from the Bank of Japan with the permission of the Ministry of Finance.

On the recommendation of the Committee for Financial System Research that the deposit insurance system should be strengthened to maintain orderly credit conditions in the face of financial deregulation, the following revisions were made in May 1986: (1) The protection per depositor was raised to 10 million yen; (2) the premium was increased to 0.012 percent of the deposits; and (3) the limit on the the borrowing from the Bank of Japan was increased to 500 million yen and the Corporation was allowed to borrow from other financial institutions to repay the loans to the Bank.

The system was tested when the Heiwa Sogo Bank ran into problems in 1986 and had the potential of being the first bank failure in fifty years. Sumitomo Bank agreed to absorb all the uncollectible loans estimated to 170 billion yen. Thus, in contrast to the rescue efforts in United States in recent years, neither the Bank of Japan nor the Deposit Insurance System suffered any loss. However, the difference may be due to the "shadow price" that Sumitomo Bank attached to the branches of the Heiwa Sogo Bank.

Hirsch (1977, p.243) argues that, due to limitations and asymmetries of information, the dependence of well functioning markets on certain individual behavioral characteristic can be regarded as a collective intermediate good which will not be produced in socially optimal quantity by maximization of individual welfare. Without implicit or explicit co-operation, the insurance element in central banking is an example of this type of markets.

The moral hazard issues can be in theory resolved by one of the two methods. The central bank can take the 'English" route of inculcating a club arrangement among the commercial banks by which they receive extra-market facilities in return for submitting to a paternalistic and moral leadership. The alternate strategy is to a enforce market discipline by treating equity and large deposits as deductibles from the insured risk. The cost of this approach is that the public may believe this rule will not be applied uniformly to banks of different sizes. They would consider larger banks to be safer as the central bank will consider their failure to be disruptive of the entire financial system and will so intervene in its capacity as the lender of the last resort. Hence the market would move the system to an oligopoly. Hirsch (1977, p.252) argues that the predominance of large banks in Germany is the result of this policy.

The question naturally arises which of these systems prevail in Japan and what its impact on the deposit insurance system is. The short survey of the Japanese banking has shown the prevalence of a small number of city banks that work closely with the Bank of Japan and subjecting themselves to administrative guidance from

the Ministry of Finance to an extent unheard of in western countries. Further the smaller regional banks have a cash surplus which makes them net lenders in the money markets. Accepting the argument of Karekan and Wallace (1978) that flat-rate deposit insurance will only work in conjunction with administrative oversight of the banks, it is reasonable to conclude that the inefficiencies of not having a risk adjusted insurance system may be less in Japan than in a country like the United States. But one should bear in mind the structural changes taking place in the Japanese financial system and also the fact that, in spite of the controls, the Heiwa Sago bank had to be rescued.

III. DEPOSIT INSUARANCE PRICING

While there is unanimity about the sub-optimality of flat rate premium, there is less consensus about an alternative. In general, the various proposals could be divided into those that use market information and those that continue to rely on implicit administrative pricing. Among the market pricing models a distinction must be made between those that seek to generate *ex ante* and *ex post* risk measures. The literature was reviewed in a recent FDIC study (1989). The purpose of this paper being the use of Ronn and Verma(1986) model to evaluate the Japanese deposit insurance system, we shall confine to a review of the option pricing model of deposit insurance. Merton (1977) argued that the pricing of the deposit insurance can be based on the one-to-one relation between deposit insurance and put option which permitted

the application of the Black and Scholes (1973).

If the value of banks assets, V, is greater than the value of the liabilities to depositors, B, then the depositors will receive B and equity of the bank is worth V - B. However, if the asset value is less than that of the liabilities, then the equity holders will receive nothing and the insurer will have a net pay out of B - V. In other words, if the value of assets fall below that of liabilities, then the bank has purchased a put option to sell the assets to the insurer at the value of its liabilities. If G(T) is the value to the firm of the guarantee T years from now when solvency of the firm is evaluated, then

$$G(0) = \text{Max}[0, B - V] \qquad (1)$$

The following assumptions are made [Smith(1979)]: (1) homogeneous expectations (about the dynamics of the value of the insured assets) prevails, with the distribution of the end value of any finite time integral being lognormal with constant variance; (2) the constant instantaneous riskless rate for borrowers and lenders is r; (3) capital market is perfect; (4) trading takes place continuously; and (5) the insured asset generates no pecuniary or non-pecuniary flows. Then the value of the guarantee can be written as

$$G(T) = Be^{-rT}\Phi(x_2) - V\Phi(x_1) \qquad (2)$$

where

$$x_1 = \left\{\log\left(\frac{B}{V}\right) - \left(r + \frac{\sigma^2}{2}\right)T\right\}(\sigma\sqrt{T})^{-1}$$

$$x_2 = x_1 + \sigma\sqrt{T}$$

Here Φ is the cumulative normal density function, V the current value of the assets of the firm, σ^2 the variance rate per unit time for the logarithmic changes in the value of the assets and B is the face value of the liabilities at time T. Since most bank deposits are encashable on demand, a model with term-debt issue is not strictly valid. Merton, however, argues that the time of maturity should be equated to the length of time till the next audit.

The advantage of the formulation is that the pricing of deposit insurance is based on five observable variables: (1) the value of bank assets; (2) the variability of the value of banks assets; (3) the exercise price as measured by the total amount of insured deposits; (4) the constant risk free interest rate; and (5) the time of maturity or lifetime of the option. Like all models, this one is also dependent on the realism of the assumptions.

An empirical assessment of risk adjusted deposit insurance premium was made by Ronn and Verma (1986). Unlike some earlier studies, they concentrate on the interbank differences in estimated rates. The equity of the firm is represented as a call option on the value of the assets of the firm with the same maturity as that of the debt of the firm and a striking price equal to the maturity of the debt. But FDIC does not liquidate a bank when the net worth becomes negative; rather by an infusion of funds or Purchase and Assumptions options, FDIC tries to sustain the bank in the interest of avoiding the disruption created by a bank failure. It

is assumed that there is a limit to this tolerance of the resource drain that FDIC exposes itself to and the limit is expressed as a percentage of the total debt of the bank. Thus when the value of the bank falls between B and ρB, the insuring agency infuses up to $(1 - \rho)B$. On the other hand, if the value falls below ρB, then it takes steps to dissolve the bank.

Given the closure condition, the value of the firm is related to the equity by the equation

$$E = V\Phi(x) - \rho B\Phi(x - \sigma_v\sqrt{T}) \qquad (3)$$

where

$$x = \frac{\ln(V/\rho B) + \sigma_v^2\sqrt{T}/2}{\sigma_v\sqrt{T}}$$

$$\sigma_v = \frac{\sigma_E E}{V\Phi(x)}$$

σ_E = the instantaneous standard deviation of the return of E.

Under the assumption that all pre-insurance debt is of equal seniority, holders of the debt are entitled to either the future value of their deposits, or the prorated fraction of the value, whichever is less. Thus they will receive

$$\min\left\{ FV(B_1), \frac{V_T B_1}{B_1 + B_2} \right\} \qquad (4)$$

where FV(.) denotes the future value operator, V_T is the terminal value of the bank at time T, and B_1 and B_2 are the face value of

insured and all other debts respectively. The presumption of equal seniority can be justified on the ground that the bail-out practices of the FDIC is equivalent to a *de facto* insurance of all debt.

The value of an insurance is equivalent to the value of a put, written with striking price equal to total debt, and then scaled down by the proportion of demand deposits to total debt, B_1/B where $B = B_1 + B_2$. Hence d, the per dollar deposit insurance premium is

$$d = \Phi(y + \sigma_v\sqrt{T}) - (1 - \delta)^n(V/B)\Phi(y) \qquad (5)$$

where

δ = dividend per dollar of value of the assets, paid n times per period

$$y = \frac{\ln[B/V(1 - \delta)^n] - \sigma_v^2 T/2}{\sigma_v\sqrt{T}}$$

It will be noticed that the per dollar insurance premium does not depend on the risk free interest rate. It is only the *present value* of the striking price that is relevant for the Black-Scholes option pricing; here the present value of the debt is B and so there is no need to enter the rate explicitly. Second, the insurer is concerned with the future stochastic behavior of assets and the model does not compare the pre-insurance and post-insurance values of assets. Finally, the per-dollar premium depends on the total debt and not on the insured deposits; this,as pointed out earlier, is to reflect the policies of the Federal Reserve in protecting all the creditors of the bank. These assumptions differentiate the

Ronn and Verma (1986) model from some of the other papers on risk adjusted insurance models. Deposit insurance based on the option pricing models suffer from the sensitivity to measurement errors in the value and riskiness of assets and the misspecification due to effect of forbearance (supervisory restraint on institutions that fail soundness criteria).

IV. ESTIMATION OF DEPOSIT PREMIUM FOR THE JAPANESE BANKS

The Ronn and Verma model is applied to determine the premiums of all the thirteen city banks and selective list of twenty-two regional banks; no specific scientific criteria was used in choosing the regional banks though many of them are among the largest in this group. Stock market data were gathered from the Nikkei Telecom Japanese news and Retrieval on-line database for the period of January to March 1988. The daily rate of return were calculated from the stock prices for these months; then the standard deviation of the rate was calculated. Under the assumption that the daily returns were independently and identically distributed with normal distribution, the annualized standard deviation was taken to be $\sqrt{275}$ times the daily standard deviation. Other financial and accounting data such as the face value of the total liabilities, the number of shares outstanding and dividend information were found from the quarterly Japan Company Handbook (Winter 1988) published by the Tokyo Keizai Shinposa.

We calculated the deposit premium using the equation (5) for

two values of ρ in the equation (3). The value of ρ = 0.97 was chosen to compare the results with those in the Ronn and Verma (1986) paper. ρ, it will be recollected, is a policy parameter and reflects the willingness of the deposit insurance corporation to save banks at a loss to itself. To test the implications of the conjecture that the Japanese deposit insurance system may tolerate a higher risk and to check the sensitivity of the results to the value of the parameter, the rates were recalculated for ρ = 0.94. The results are given in the appendix, tables 1 to 4.

To evaluate the results, we normalized the premium by taking, among city banks, that of the Saitama Bank and, among regional banks, that of the Ogaki Kyoritsu, to be unity. Notice the absolute values of the premiums of the Saitama Bank and the Ogaki Kyoritsu are very close to each other when ρ = 0.97 but the premium of the latter is about four times that of the former when ρ = 0.94. The values of the relative premiums are given in textual tables 1 and 2 (pp. 20 & 21). For comparison 12 U.S. banks form Ronn and Verma (1986) was chosen and similar table prepared for them and given in table 3 (p. 22)

Table 1

RELATIVE PREMIUMS OF CITY BANKS

Bank	Insurance Rate when $\rho = 0.97$	Insurance Rate when $\rho = 0.94$
Dai-ichi Kangyo	3.00	0.0803
Hokkaido Takushoku	1348.33	13.9427
Bank of Tokyo	211.33	2.4510
Mitsui	1.33	0.0367
Mitsubishi	79.50	0.8033
Fuji	0.17	0.0060
Sumitomo	18.00	0.2288
Daiwa	1302.50	6.4312
Sanwa	34.33	0.4384
Tokai	5.17	0.2190
Kyowa	87.17	1.8420
Taiyo Kobe	264.50	3.2038
Saitama	1.00	1.0000

TABLE 2

RELATIVE PREMIUMS OF SELECT REGIONAL BANKS

Bank	Insurance Rate when $\rho = 0.97$	Insurance Rate when $\rho = 0.94$
Chiba	1044.9	38.729
Bank of Yokohama	217.1	10.194
Joyo	3276.3	77.339
Gunma	522.3	20.253
Ashikaga	3072.7	74.980
Musashino	4442.4	131.834
Chiba Kogyo	46.0	15.847
Kanto	2274.7	152.411
Tokyo Tomin	672.0	31.137
77 Bank	139.0	14.165
Aomori	845.0	113.744
Yamagata	961.4	38.692
Bank of Iwate	144.4	52.794
Toho	1403.3	51.028
Hokkaido	1560.0	81.011
Shizuoka	701.1	23.819
Juroku	0.1	0.783
Hokuriku	390.0	28.863
Sugura	2346.3	69.270
Hachjuni	0.6	0.234
Yamanashi	1053.9	31.033
Ogaki Kyoritsu	1.0	1.000

TABLE 3

RELATIVE PREMIUMS OF SELECT AMERICAN BANKS

Banks	Normalized annual premiums
Continental Illinois Corp.	43.20
Wells Fargo & Co	40.84
Marine Midland Banks Inc	31.22
Manufacturers Hanover Corp.	28.20
First Interstate Banccorp.	19.02
Citicorp	9.78
Chemical NY Corp	6.00
Security Pacific Corp.	3.60
Bank of New York, Inc	1.00
Morgan J.P. and Co., Inc	0.02

Source: Ronn and Verma (1986),pp. 892 - 893.

The tables show that, among city banks, Hokkaido Takushoku and Daiwa Banks have the highest risk related premium. At the other extreme, Fuji and Mitsui have the lowest. These groupings are not affected by the change in the value of ρ from 0.97 to 0.94. The other banks fall in the middle and their ranking change with the value of the parameter ρ.

There is even greater instability in the ranking of the regional banks. The two banks Shizuoka and Suruga, have the lowest premiums though their relative ranking changes with ρ. There is no invariant ranking of banks with high premiums.

Both in United States and Japan, the interbank variation in the risk adjusted deposit rate seems to be quite large. It is reasonable to say that this range is beyond the realm of what is politically feasible in a democratic society. Also, as pointed out in earlier studies, the actual numbers seems to be sensitive to the parameter value assumed and any misspecification of risk.

If the risk adjusted measures are correct indicators of the riskiness of the banks, then it is clear that the use of a flat rate could create serious distortions. Yet it is not clear why the banks with low risk adjusted premiums did not choose a riskier portfolio for higher returns. On the other hand, if a risk adjusted deposit premium is introduced, it is probable that the banks with the higher premiums would abandon some of the intermedation they are now doing. Would institutional innovations arise in the market to offer these services outside the banking system or would the economy be adversely affected by the absence of such services even at higher cost? More fundamentally, if the

service offered by the banks is the bearing of idiosyncratic risks which cannot be evaluated by an outsider, can the stock market correctly measure the aggregate risk born by an individual bank? The option pricing model throws a number of challenges to the study of the safety nets offered by the banks.

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Bank	σ_E	σ_V	V	B	d
DAI-ICHI KANGYO	0.24986	0.04061	52701820	45555712	0.0000018
HOKKAIDO TAKUSHOKU	0.41267	0.03523	9877987	9325576	0.0008090
BANK OF TOKYO	0.33695	0.04219	22648814	20469390	0.0001268
MITSUI	0.23865	0.04056	23895550	20469390	0.0000008
MITSUBISHI	0.31647	0.05153	47905920	41531892	0.0000477
FUJI	0.20785	0.03538	49325348	42284180	0.0000001
SUMITOMO	0.28500	0.05084	50751376	43148564	0.0000108
DAIWA	0.44859	0.06895	14500066	12697296	0.0007815
SANWA	0.29639	0.04801	45531512	39428728	0.0000206
TOKAI	0.24540	0.03201	30341354	27211686	0.0000031
KYOWA	0.29883	0.03318	14466365	13267993	0.0000523
TAIYO KOBE	0.33828	0.03979	23419866	21372480	0.0001587
SAITAMA	0.27213	0.03081	12696297	11300773	0.0000006

Table 1: Estimation of Deposit premium of city banks when ρ is 0.97

Bank	$\bar{\sigma}_E$	$\bar{\sigma}_V$	V	B	d
DAI-ICHI KANGYO	0.24986	0.04169	51335148	45555712	0.0000280
HOKKAIDO TAKUSHOKU	0.41267	0.03626	9587194	9325576	0.0048632
BANK OF TOKYO	0.33695	0.04336	22034734	20469390	0.0008549
MITSUI	0.23865	0.04163	23281466	20469390	0.0000128
MITSUBISHI	0.31647	0.05290	46660004	41531892	0.0002802
FUJI	0.20785	0.03631	48056796	42284180	0.0000021
SUMITOMO	0.28500	0.05217	49456924	43148564	0.0000798
DAIWA	0.44859	0.07080	14119196	12697296	0.0022432
SANWA	0.29639	0.04928	44348124	39428728	0.0001529
TOKAI	0.24540	0.03289	29524992	27211686	0.0000764
KYOWA	0.29883	0.03412	14068324	13267993	0.0006425
TAIYO KOBE	0.33828	0.04090	22778578	21372480	0.0011175
SAITAMA	0.27213	0.03168	12014247	11300773	0.0003488

Table 2: Estimation of Deposit premium of city banks when ρ is 0.94.

Bank	$\overline{\sigma_E}$	$\overline{\sigma_v}$	V	B	d
CHIBA	0.42088	0.04723	6537897	6194408	0.0031409
BANK OF YOKOHAMA	0.35592	0.04924	10733274	9840827	0.0008267
JOYO	0.53471	0.06183	5775213	5455316	0.0062722
GUNMA	0.39435	0.05083	3652025	3386084	0.0016425
AHIKAGA	0.51108	0.05998	5080297	4785281	0.0060809
MUSASHINO	0.55016	0.04290	1529318	1505252	0.0106917
CHIBA KOGYO	0.25568	0.02150	1277864	1245137	0.0012852
TOKYO TOMIN	0.39519	0.04206	1674750	1592691	0.0025252
KANTO	0.37859	0.02259	678747	679145	0.0123605
77 BANK	0.31340	0.03218	3011657	2875056	0.0011488
AOMORI	0.39221	0.05076	1202451	1167613	0.0092246
YAMAGATA	0.41889	0.04451	1135853	1080776	0.0031373
BANK OF IWATE	0.27223	0.02291	1247225	1230952	0.0042816
TOHO	0.44522	0.04548	1596533	1526766	0.0041384
HOKKAIDO	0.42428	0.03219	2807588	2762080	0.0065700
SHIZUOKA	0.41387	0.05479	5527893	5106311	0.0019317
JUROKU	0.15817	0.01421	2679487	2594373	0.0000635
HOKURIKU	0.27208	0.03205	6219265	6004897	0.0023407
SURUGA	0.49313	0.05054	2295823	2197072	0.0056178
HACHIJUNI	0.21833	0.03029	4299621	3939244	0.0000190
YAMANASHI	0.44126	0.05893	1381545	1275146	0.0025168
OGAKI KYORITSU	0.20900	0.02275	1909731	1810449	0.0000811

Table 4: Estimation of deposit premium of regional banks when ρ is 0.94

Bank	σ_E	σ_V	V	B	d
CHIBA	0.42088	0.04593	6723701	6194408	0.0007314
BANK OF YOKOHAMA	0.35592	0.04792	11028505	9840827	0.0001520
JOYO	0.53471	0.06014	5938844	5455316	0.0022934
GUNMA	0.39435	0.04946	3753603	3386084	0.0003656
AHIKAGA	0.51108	0.05834	5223826	4785281	0.0021509
MUSASHINO	0.55016	0.04250	1576923	1505252	0.0031097
CHIBA KOGYO	0.25568	0.02088	1315220	1245137	0.0000322
KANTO	0.37859	0.02193	699121	679145	0.0015923
TOKYO TOMIN	0.39519	0.04093	1722498	1592691	0.0004704
77 BANK	0.31340	0.03128	3097915	2875056	0.0000973
AOMORI	0.39221	0.03362	1238271	1167613	0.0005915
YAMAGATA	0.41889	0.04328	1168257	1080776	0.0006730
BANK OF IWATE	0.27223	0.01911	1284158	1230952	0.0001011
TOHO	0.44522	0.04421	1642354	1526766	0.0009823
HOKKAIDO	0.42428	0.03127	2890448	2762080	0.0010920
SHIZUOKA	0.41387	0.05330	5681097	5106311	0.0004908
JUROKU	0.15817	0.01381	2757307	2594373	0.0000001
HOKURIKU	0.27208	0.03117	6394374	6004897	0.0002730
SURUGA	0.49313	0.04914	2361717	2197072	0.0016424
HACHIJUNI	0.21833	0.02949	4417765	3939244	0.0000004
YAMANASHI	0.44126	0.05737	1419803	1275146	0.0007377
OGAKI KYORITSU	0.20900	0.02212	1964045	1810449	0.0000007

Table 3: Estimation of deposit premium of regional banks when ρ is 0.97