

Korean Deposit Insurance Fund: Some Risk Management Issues

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Section 1. Introduction

The Proliferation of banking and financial crises in the 1980s and 1990s has led a large number of countries to institute an explicit system of deposit Insurance. In fact, 30 of the 72 countries now known to have an explicit deposit insurance system established it during the past decade. Countries implement deposit insurance systems to provide consumer protection for small depositors by providing a mechanism for the immediate pay-out or transfer of the insured portion of their deposits, and to enhance public confidence and systemic stability by establishing a framework for the resolution of failed institutions to prevent individual bank failures from spreading.

The Korean government also established a deposit insurance corporation in 1996 and it started insuring deposits for member financial institutions in 1997. However, due to the financial crisis in the late 1997, all the available resources of the deposit insurance corporation have been used to finance the financial sector restructuring and the deposit insurance fund set up for the business of insuring deposits of the member financial institutions has been insufficient in providing consumer protection for small depositors and enhancing public confidence and systemic stability.

This paper studies the estimation of the appropriate level of the deposit insurance fund for depositor protection and financial stability in Korea and the disciplinary role of the markets and prudential regulation and supervision to counter the incentive problems and excessive risk taking that accompany deposit insurance. Section 2 discusses the current status of the Korean deposit insurance fund. Using a credit risk modeling technique, section 3 estimates the adequate size of the deposit insurance fund and examines the effects of changes in credit ratings or losses given default of member financial institutions. Section 4 discusses policy implications for the fund viability.

Section 2. The Current Status of the Korean Deposit Insurance Fund

The KDIC (Korea Deposit Insurance Corporation) started to insure deposits for member banks in 1997. In 1998, KDIC started to insure deposits non-bank financial institutions, such securities companies, insurance companies, merchant banking corporations, mutual savings banks, and credit unions. The revenue sources and uses of the Deposit Insurance Fund are indicated in the Depositor Protection Law.

According to the Article 24 of the Depositor Protection Law, the deposit insurance fund is established by the KDIC and its sources of the revenue are contributions from insured financial institutions; contributions from the government; funds raised through issuance of Deposit Insurance Fund Bonds; state property granted by the government to the KDIC; borrowings from member financial institutions; insurance premiums; funds recovered from those funds provided for the resolution of failed financial institutions; and operating profits of the DIF and other revenues. The expenditures of the Fund consist of insurance payments, repayment of the principal and interest of Deposit Insurance Fund Bonds, payments to depositors, capital contributions, funds and related incidental expense supported for the resolution of failed financial institutions, redemption of borrowed funds and interest thereon, and funds transferred to the KDIC operation account for the operation of the KDIC.

However, after the 1997 financial crisis, all the resources of the deposit insurance funds were devoted to the restructuring of the financial industry. By the end of 2003, the deposit insurance fund had spent 104 trillion 571 billion Korean won to support the financial restructuring in Korea. Most of the funds was financed by issuing the deposit insurance fund bonds. By the end of 2003, the accumulated DIF bond issuance amounted to 87 trillion 160 billion won, which covers 83.4 percent of the total financial restructuring support by the DIF. As a result, the liabilities of the Deposit Insurance Fund were much greater than the assets. With its net worth being negative, the deposit insurance fund would have difficulty in protecting the small depositors and enhancing the stability of the financial system.

<Fig. 5 - 1> Issuances of Deposit Insurance Fund Bonds

(unit: Billions of Korean Won)

1998	1999	2000	2001	2002	2003	Total
21,015	22,485	8,941	31,059	3,660	-	87,160

<Fig 5 - 2> Deposit Insurance Fun: Insurance Premium Income and Restructuring Expenditure (2003. 1~ 12)

(unit: Billions of Korean won)

	Bank	Securities	Insurance		Merchant Banks	Mutual Savings	Credit Unions	Total
			Life	Casualty				
Premium Income	356	31	2,580	535	61	67	60	832
Expenditure	-	-	-	-	-	74	73	147

The National Assembly amended the Depositor Protection Law in December, 2002 to transfer the net liabilities of the deposit insurance fund to the newly created Public Fund. The Public Fund will receive special premiums from member financial institutions through 2027 to cover expenses. The deposit insurance fund is now responsible only for the expenditures occurred in 2003 and thereafter. Thus, the deposit insurance fund for depositor protection and enhancing systemic stability may be considered to start doing the deposit insurance business in 2003 in Korea. By the end of 2003, the total revenue for the fund was 832 billion won and the total expenditure was 147 billion won. Therefore, the current fund balance at the end of 2003 was about 700 billion won and it seems too little for the deposit insurance fund to carry out its objectives.

There are many ways to determine the optimal size of the deposit insurance fund. Most countries maintain a target level for the fund, which is often expressed as a desirable percentage of insured deposits. Target in funded systems ranges from a low of 0.4 per cent in Poland to the very high levels of 20 per cent in Kenya. The U.S. has a target of 1.25 per cent of insured deposits. Recently, many have questioned the rationale for such targets and have used the techniques developed by the credit risk management literature to answer questions related to fund adequacy. The U.S. Federal Deposit Insurance Corporation (FDIC) is in the process of developing an econometric model to estimate the optimal deposit insurance fund size. In the next section, this paper attempts to estimate the appropriate size of the deposit insurance fund for Korea also using the credit risk model.

Section 3. The Adequate Size of the Deposit Insurance Fund: a Credit Risk Modeling Approach

Credit risk model is developed to measure risk in a portfolio of individual loans. Applying credit risk models to evaluate risk to the deposit insurance funds requires viewing funds as a portfolio of risks. The components of the portfolio are not individual loans but exposures to individual insured institutions. A deposit insurance corporation's exposure to individual banks can be aggregated to arrive at a cumulative loss distribution. By creating an explicit link between the potential for loss and reserves, a deposit insurance corporation may consider the appropriate level of fund adequacy in terms of both a stated confidence interval and market equivalents. For example, just as individual bank chooses to capitalize according to a desired credit rating, so too can the deposit insurance corporation chose to capitalize insurance fund to a desired rating.

The first step in analyzing the KDIC's risk profile is to recognize that the deposit insurance funds are portfolios of counterparty risks. These portfolios consist of individual exposures to insured banks and thrifts, each of which has a small but non-zero chance of causing a loss to the funds. Such a portfolio is similar to a bank loan portfolio, although the nature the underlying risks in the FDIC funds raises unique issues. The KDIC portfolio effectively consists of the sum of the "tail" risks of individual banks defaulting.

Expected loss (EL) is simply the (unconditional) mean of the loss distribution; its standard deviation is often called unexpected loss (UL). We will be interested in tail probabilities, say 99.9% (corresponding to roughly an A-rating), of this loss distribution., and the distance, either from the origin or EL , to that critical point. In fact, that distance will be the amount of reserves (funded or callable) needed to insure solvency of the fund. To the extent that there are insufficient funds available to repay insured deposits, then the excess deposit losses will be borne by the deposit insurance corporation. That is, it assumes the residual tail risk of loss to insured deposits.

The first papers that estimate the adequate size of the deposit insurance fund or the credit rating of the deposit insurance fund according to the actual size is "Options Paper" (FDIC, 2000) by Oliver, Wyman and Company. Afterwards, Bennett (2002) and Kuritzkes et al.(2002) continued to study on the adequacy of the deposit insurance fund of the FDIC. Blinder and Wescott (2001) indicated the appropriateness of estimating the adequate size of the fund using the credit risk modeling technique.

1. Derivation of the Loss Distribution

Let PD_i = probability of default for bank i over a one-year horizon. Then the expected loss for bank i will be the product of PD , exposure (X_i) in the form of insured deposits and the proportion of X_i that will actually be lost, often called severity, S_i :

$$EL_i = PD_i \cdot X_i \cdot S_i \quad (1)$$

Because default is a Bernoulli random variable, its standard deviation is $\sqrt{PD_i(1-PD_i)}$, and if we make the standard assumption of no correlation between PD_i , S_i and X_i , we obtain the following formulation for unexpected loss, UL_i

$$UL_i = \sqrt{(PD_i - PD_i^2)\mu_{S_i}^2 X_i^2 + PD_i X_i^2 \sigma_{S_i}^2} \quad (2)$$

where $S_i \sim f(\mu_s, \sigma_s)$ and is often taken to be a draw from a beta distribution. The formulation further simplifies when severity is a constant (i.e. $\sigma_{S_i} = 0$) :

$$UL_i = \sqrt{(PD_i - PD_i^2)\mu_{S_i}^2 X_i^2} \quad (3)$$

The KDIC's exposure to individual banks can be added together to create a cumulative loss distribution. Just as with a bank's credit loss distribution, the KDIC's cumulative loss distribution will reflect the expected loss of the individual insured banks, the size of individual exposures, and the correlation of losses in the portfolio. Typically the distribution will be heavily skewed. There will likely be some "lumpiness" in the distribution which reflects the contribution of individual large banks, each of which imposes a discrete, non-zero probability of a sizeable loss to the fund. Because expected loss is unaffected by correlation, portfolio EL is a summation of N individual institution EL 's, just as the expected return on an equity portfolio is a simple weighted average of returns to the individual holdings in a portfolio :

$$EL_p = \sum_{i=1}^N EL_i \quad (4)$$

This is especially useful when we consider expected loss pricing. By charging individual institutions expected loss pricing, the additivity of the individual EL 's implies that the KDIC is charging for its overall expected loss.

Calculating portfolio unexpected loss must consider the correlation between individual losses, ρ_{ij} . For a portfolio with N institutions, portfolio unexpected loss, UL_p , is :

$$UL_p = \left[\sum_{i=1}^N UL_i^2 + \sum_{i=1}^N \sum_{j=1}^N \rho_{ij} UL_i UL_j \right]^{1/2} \quad (5)$$

2. Data and Simulation Procedure

This paper estimates the appropriate size of the deposit insurance fund of which member financial institutions are commercial banks only. For credit risk exposure of each member bank, this paper uses the daily average of insured deposits over the second quarter of 2003. The data are supplied by the Korea Deposit Insurance Corporation. At the end of June, 2003, there were 58 member banks which consisted of eight commercial banks, six regional banks, four specialized banks, and 40 foreign banks. The daily average of insured deposits of all those banks over the second quarter of 2003 was 483 trillion and 500 billion won. The daily average of insured deposits of those foreign banks over the same period was 6 trillion and 900 billion won. Since it was about 1.4 per cent of the total, the foreign banks were excluded. The daily average of insured deposits of those banks considered here was 476 trillion and 600 billion won, and it was about 98.6 per cent of the total.

<Fig. 5 - 4> Credit Rating and Default Probabilities

(unit: per cent)

	S&P Rating	Default Prob.	Moody's Rating	Default Prob.
Investment Grade	AAA	0.01	Aaa	0.01
	AA+	0.02	Aa1	0.02
	AA	0.03	Aa2	0.03
	AA -	0.04	Aa3	0.04
	A+	0.05	A1	0.05
	A	0.07	A2	0.07
	A -	0.09	A3	0.09
	BBB+	0.13	Baa1	0.13
	BBB	0.18	Baa2	0.18
BBB -	0.32	Baa3	0.34	
Speculative Grade	BB+	0.53	Ba1	0.63
	BB	0.93	Ba2	1.21
	BB -	1.57	Ba3	2.25
	B+	2.64	B1	4.21
	B	4.46	B2	7.86
	B -	7.52	B3	12.95

Source : FDIC, Options Paper, 2000, p.29.

To estimate the default probabilities of individual financial institutions, this paper uses the long term deposit rating data for each financial institution, published by Moody's in June 20, 2002 and the table indicating the relationship between credit ratings and default probabilities in FDIC's "Options Paper" (2000). For instance, Kookmin Bank was rated A3, the highest rating among the Korean banks according to the Moody's publication in 2002.

This implies that for the following one year period, Kookmin Bank would default with 0.09 percent probability. Similarly, Cheil Bank was rated Baa3 and this implies that for the following one year period, Cheil Bank would default with 0.34 percent probability. Moody's did not rate some regional banks such as Kyung-Nam, Kwang-Ju, Jun-Buk, Je-Ju Banks, and some specialized banks such as Su-Hyub and Nong-Hyub banks. For those banks, this paper uses Baa3, the lowest rating among the Korean banks.

After the financial crisis, Kookmin Bank received a support amounting to 4 trillion and 100 billion won from KDIC and KDIC recovered 600 billion won so far. Cheil Bank received a support amounting to 13 trillion 500 billion won from KDIC and KDIC recovered 5 trillion 900 billion won from the sales of Cheil Bank stock shares and other assets. The banking industry as a whole received a support amounting to 43 trillion and 600 billion won, and KDIC recovered 10 trillion 500 billion won.

<Fig. 5-5> Credit Ratings, Insured Deposits, Size of KDIC Support and Recovery

(unit: billions of won)

	Credit Rating	Insured Deposit	KDIC Support	Recovery
Cho-Heung	Baa2	37,379	2,718	0
Woori	Baa2	54,314	8,737	338
Cheil	Baa3	18,067	13,465	5,962
Foreign Exchange	Baa2	30,779	-	-
Kookmin	A3	117,940	4,199	580
Shin Han	Baa1	30,998	2,872	350
Han Mi	Baa2	17,274	2,718	254
Ha Na	Baa2	45,501	6,497	867
Dae-Gu	Baa3	10,781	-	-
Busan	Baa3	9,975	-	-
Kyung-Nam	(Baa3)	6,461	353	27
Kwabg-Ju	(Baa3)	4,660	442	19
Jun-Buk	(Baa3)	2,204	-	-
Je-Ju	(Baa3)	968	218	24
Su-Hyub	(Baa3)	4,546	1,158	0
Nong-Hyub	(Baa3)	48,736	183	1
Ki-Up	A3	29,288	-	-
San-Up	A3	6,748	-	-
Total		476,617	43,559	84,208

Sources: Financial Supervisory Commission, Ministry of Finance and Economy, Korea Deposit Insurance Corp.

Asset returns are hard to observe directly. However, for publicly traded banks, equity return information is available. Note that for those banks whose stocks are not traded on the Korea Stock Exchange or Kosdaq, this paper classified them into two groups. More

specifically, judging from their size and credit ratings, Kwang-Ju, Jeju, Su-Hyub, Nong-Hyub Banks and Jun-Buk Bank are grouped together, and San-Up Bank and Ki-Up Bank are grouped together.

<Fig. 5 - 6> Correlation Matrix of Daily Stock Returns among Banks

	CHO	WooRi	ForEx	KB	ShinHan	HanMi	HaNa	Cheil	DaeGu	BuSan	JunBuk	KyungNam	KiUp
CHO	1												
WooRi	0.52	1											
ForEx	0.67	0.59	1										
KB	0.56	0.53	0.54	1									
ShinHan	0.52	0.51	0.49	0.70	1								
HanMi	0.36	0.44	0.45	0.50	0.52	1							
HaNa	0.60	0.53	0.52	0.51	0.49	0.44	1						
Cheil	0.80	0.75	0.80	0.79	0.77	0.68	0.78	1					
DaeGu	0.59	0.60	0.61	0.60	0.55	0.43	0.51	0.72	1				
BuSan	0.48	0.55	0.57	0.57	0.53	0.40	0.43	0.65	0.81	1			
JunBuk	0.50	0.52	0.59	0.50	0.52	0.39	0.43	0.64	0.70	0.68	1		
KyungNam	0.58	0.61	0.65	0.61	0.59	0.45	0.51	0.74	0.91	0.90	0.90	1	
KiUp	0.57	0.46	0.55	0.60	0.50	0.31	0.51	0.65	0.63	0.55	0.48	0.61	1

This paper estimates daily stock return correlation matrix and generate synthetic returns to build up the loss distribution, using daily stock returns for the period starting January 20, 2003 through October 20, 2003. With the correlation matrix, correlated multivariate standard normal returns are generated. Then, check for each iteration if the bank default threshold has been passed, and if yes, compute a loss given default. This paper repeats this for 65000 times.

3. Simulation Results

According to <fig. 5-7>, if the target credit rating of the deposit insurance fund is BBB-, the lowest investment grade, then this paper's Monte Carlo simulation result indicates that the appropriate reserve ration must be 2.10 per cent and the size of the deposit insurance fund must be 10 trillion won. In case the target credit rating of the deposit insurance fund is A or A-, then the respective reserve ratio is 4.20% or 3.91%, and the corresponding size of the deposit insurance fund must be 20 trillion won or 18 trillion 600 billion won.

<Fig. 5-7> Baseline Simulation

(unit: trillion won)

Target Credit Rating		Capital Levels	
A	(99.93%)	20.0	(4.20%)
A-	(99.91%)	18.6	(3.91%)
BBB+	(99.87%)	15.9	(3.33%)
BBB	(99.82%)	13.8	(2.90%)
BBB-	(99.70%)	10.0	(2.10%)

Note : 1) the numbers in parentheses are reserve ratio

The appropriate size of the deposit insurance fund is affected by a change in credit ratings or loss given default ratios of member financial institutions. According to the sensitivity analysis reported in <fig.5-8>, if individual bank credit rating improves by one step, for example from BBB- to BBB, and the target credit rating of the deposit insurance fund is BBB-, then there is little change in the appropriate fund size. However, if the target credit rating of the deposit insurance fund is A or A-, then the appropriate fund size decreases by more than 600 billion won.

<Fig. 5-8> Sensitivity Analysis: One Step Higher Credit Rating

(unit: trillion won)

Target Credit Rating		Capital Levels	
A	(99.93%)	19.4	(4.07%)
A-	(99.91%)	17.9	(3.76%)
BBB+	(99.87%)	15.6	(3.27%)
BBB	(99.82%)	15.4	(3.23%)
BBB-	(99.70%)	10.2	(2.14%)

Note : 1) the numbers in parentheses are reserve ratio

If the loss given default of each member bank decrease by 10 per cent and thus, potential recovery by KDIC increases, then the appropriate fund size decreases by 1 trillion won in case the target credit rating of the deposit insurance fund is BBB-. (See<fig. 5-9>.) If the target credit rating is A or A-, then the corresponding fund size would decrease by about 2 trillion won. Finally, if each member bank credit rating improves by one step and its loss given default decrease by 10 per cent, and the target credit rating of the deposit insurance fund is BBB-, then the corresponding fund size decreases by 1.6 trillion won. If the target credit rating of the deposit insurance fund is A or A-, then the corresponding fund size decreases by more than 4 trillion won. See <Fig. 5-10>.

<Fig. 5-9> Sensitivity Analysis: 10% Reduction in Loss Given Default

(unit: trillion won)

Target Credit Rating		Capital Levels	
A	(99.93%)	18.0	(3.78%)
A-	(99.91%)	16.8	(3.52%)
BBB+	(99.87%)	14.3	(3.00%)
BBB	(99.82%)	12.4	(2.60%)
BBB-	(99.70%)	9.0	(1.88%)

Note : 1) the numbers in parentheses are reserve ratio

<Fig. 5-10> Sensitivity Analysis: One Step Higher Credit Rating and a 10% Reduction in Loss Given Default

(unit: trillion won)

Target Credit Rating		Capital Levels	
A	(99.93%)	15.9	(23.52%)
A-	(99.91%)	14.2	(21.07%)
BBB+	(99.87%)	12.0	(18.72%)
BBB	(99.82%)	10.0	(14.31%)
BBB-	(99.70%)	7.5	(11.18%)

Note : 1) the numbers in parentheses are reserve ratio

Section 4. Policy Implications for the Fund Viability

Deposit insurance system has the conflicting objectives of protecting bank customers and reducing banks' incentives to engage in risky activities. In several countries including the U.S., the deposit insurance system, structured to reduce the vulnerability of the financial system, appears to have had quite the opposite results. Indeed, Kane (1989) identifies the U.S. deposit insurance with fixed rate and belated bank closures, as the most important factors in explaining the Savings and Loan crisis of the 1980s.

If the Korean government wants to maintain the target credit rating of BBB- for the deposit insurance fund and wants to reduce the corresponding fund size, the credit rating of each member financial institution must improve and its loss given default must decrease. Thus, member financial institutions must be provided strong incentives to improve their credit ratings and to reduce their loss given default. That is, each financial institution must have ample incentives to improve its profitability, enhance capital adequacy ratio, and

reduce excessive risk taking. To provide such incentives, we need to implement corporate governance structure that ensures the bank management responsible for the bank performance. We also need to implement the system of risk adjusted insurance premiums, which reflects the bank credit rating and its loss given default, and other variables such as capital adequacy and excessive risk taking.

To restrain bank risk taking, the effectiveness of market discipline and bank regulation must be enhanced. Market discipline means that a firm has private sector stakeholders who are at risk of financial loss from firm's decisions and who can take actions to discipline the firm, that is, to influence its behavior. Transparency in banking is a measure of the degree to which equity holders, debt holders, and other counterparties as well as securities analysts and rating agencies are able to assess an institution's current financial condition, prospects for future earnings and risk.

That assessment depends, in turn, on the extent and quality of disclosure, which refers to the public release of information on individual institutions about their financial condition and performance, the current value and collectibility of assets, and the value and cash flow requirements associated with liabilities, as well as information on risk exposures, risk-management processes, control procedures, and business strategies.

Understandably, market discipline is often equated with oversight by debt holders because their motives and actions tend to mitigate risk-taking. The ex ante (before debt issuance) actions that debt holders can take, such as demanding higher rates on riskier debt and withholding funding, provide a check on risk-taking. In addition, ex post, the value of debt holders' claims declines as their default risk increases. Therefore, if the risk of a firm increases, the secondary market rate on its outstanding debt would be expected to rise, providing a signal to other potential debt holders.

For publicly held firms, shareholders, too, are a source of market oversight of management. The effectiveness of monitoring by shareholders also depends on the extent and quality of disclosures. Greater shareholder monitoring can result in better risk-management procedures and controls. More generally, however, shareholders want firm to attain an appropriate risk-return tradeoff, not to limit risk per se. Indeed, for a leveraged firm, an increase in risk has the effect of transferring wealth from debt holders to shareholders. This problem of private-market moral hazard makes the discipline from debt holders imperative for an unregulated firm.

The market discipline that flows from enhanced disclosure should limit ex ante risk-taking of individual banks but that the net effect on systemic risk also depends on the effects of improved market discipline on behavior during financial crises. The potential for market discipline to have adverse effects during periods of financial stress points up the importance of effective policies to resolve problems, particularly at large banking organizations. That is, greater reliance on market discipline supported by efforts to improve disclosure should be viewed as part of a comprehensive approach to supervising and regulating large banking organizations.

Another potential benefit from more-effective market discipline through improved transparency is greater accuracy of market assessments of risk and value. More-precise market assessments of risk and value should provide better signals as to where supervisory efforts should be focused. An uninsured long term debt instrument such as a subordinated debt would provide the most straightforward information. To allow this, the infrastructure for the long term debt market must be developed in order to have more active and deeper secondary markets for long term debt instruments. The signal from shorter term uninsured debt such as three month CDs also would be useful but the relevant period for assessing risk for CD holders would not span the entire period relevant for bank supervision. Note that Canada Deposit Insurance Corporation (CDIC) has already incorporated market signals in bank supervision and FDIC is examining ways to do it.

Finally, The supervisory authorities should force the strict resolution of problem banks, using a swift application of a spectrum of enforcement actions to be taken as soon as a bank becomes undercapitalized or shows other signs of weakness. Prompt corrective action/SEIR should allow supervisors to intervene in a problem bank *before* it becomes book-value insolvent and provide the basis for the prompt closure of the bank should it become necessary. Delay in closure almost always deepens the costs of a bank's insolvency, partly because owners can abuse the deposit insurance system, loot the bank, and/or gamble for recovery with those deposit funds that remain in place and with new deposits that are attracted by higher interest rates and the fact that they are guaranteed. Thus, the government must ensure the effective workings of prompt corrective actions and the least cost principal to reduce the potential loss to the deposit insurance fund.

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