Annex

Estimating cost of deposit protection

1. This annex outlines the methodology and assumptions adopted for estimating the cost of providing deposit protection under the Deposit Protection Scheme (DPS).

Cost of deposit protection

2. The cost of providing deposit protection should be distinguished from the funding requirements of the DPS for making compensation payments to depositors. When compensation under the DPS is triggered, the DPS will borrow from the Exchange Fund to meet its payment obligations to depositors. The DPS will seek recoveries of the compensation paid to depositors from the liquidated assets of the failed Scheme member for repaying the borrowings from the Exchange Fund. If the DPS fails to recover fully the compensation paid to depositors from the liquidation, for example, when the asset recovery rate of the failed Scheme member is very low, the DPS will suffer the shortfall as a loss, that is, the shortfall loss. On the other hand, the DPS will need to pay interest on the borrowings from the Exchange Fund, that is, the financing cost. The shortfall loss and the financing cost are therefore the two major sources of cost of providing deposit protection.

3. The DPS adopts an ex-ante funding approach in meeting the expected cost of providing deposit protection. An amount of funds sufficient for meeting the expected financing cost and shortfall loss in payouts is built up in advance, that is, the Deposit Protection Scheme Fund (DPS Fund). The Fund is accumulated through collection of annual contributions from Scheme members.

4. A statistical analysis model called Monte Carlo Simulation Analysis (MCSA) was adopted to estimate the cost expected to be incurred by the DPS based on conservative assumptions. The cost was estimated to be 0.3% of the total amount of protected deposits when the analysis was run for designing the DPS in 2001. The percentage was set in the DPS Ordinance as the target size to be reached by the DPS Fund. As part of the current exercise to review the DPS, the analysis was re-run to estimate the cost expected to be incurred by the DPS under higher protection limits.

Conceptual framework of the statistical model

5. Conceptually, MCSA is a method by which the distribution of possible outcomes of an equation, for example, the cost of DPS, is generated by a computer that recalculates the outcome over and over again, each time using different randomly selected values of input variables (failure probability and asset recovery for each bank). Input variables are defined by a distribution of expected values (also called probability distribution).

6. The computer tries all combinations of input variables within a given distribution to simulate all possible outcomes of an objective function. In effect, it is equivalent to running hundreds or thousands of "what if" analyses at the same time, each of which incorporates a degree of randomness in the input variables so that in effect no two iterations are the same.

7. The MSCA is based on the application of the Discrete Failure Loss Model, which allows for the repeated calculation of shortfall loss and financing cost based on probability-weighted, but random failure events of any combination of banks and of asset recoveries. The objective function for this model for each bank is as follows:

$$\text{DPS Loss}_{Bn} = FO_{Bn} \times (FC \times CD_{Bn}) + \textit{lesser of } 0 \text{ or } (\text{Assets}_{Bn} \times AR_{Bn} - CD_{Bn})$$

- Bn pertains to the specific result or variable for each bank. For example, $_{B1}$ represents the result for the first bank; $_{B2}$ represents the second bank

- FO is defined as the failure outcome for each bank. A value of 1 means the bank has failed. A value of 0 means no failure. FO is determined by the assignment of a default probability factor, which determines how many times a bank fails over a specific number of iterations.

- FC is an estimation of the financing cost associated with each payout. It represents the amount of interest cost and fees associated with any borrowings the DPS might have to take to make payouts to depositors. It is stated as a percentage of covered deposits in this function.

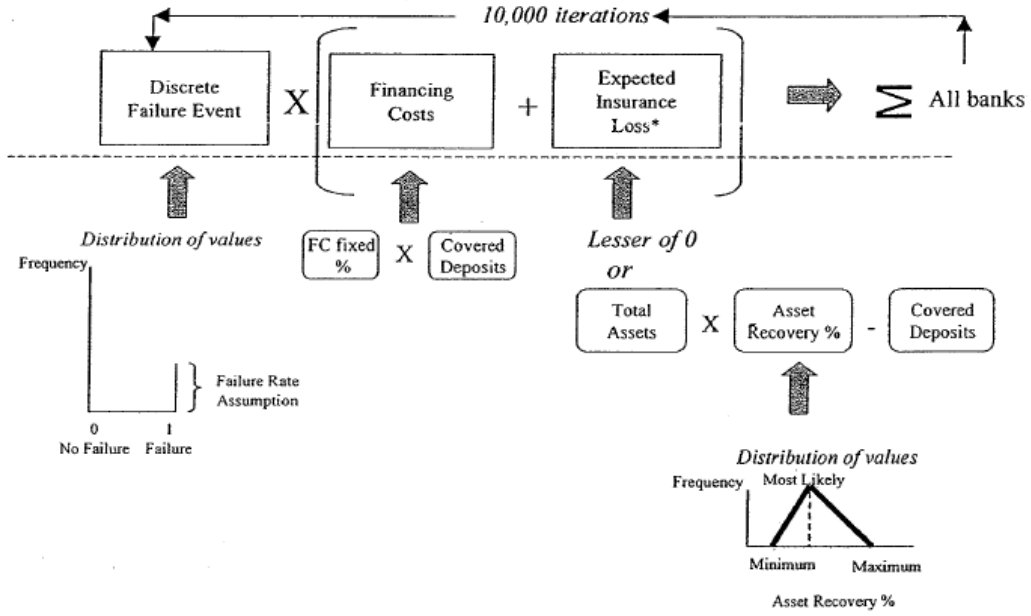
- CD is the estimated balance of covered deposits under a given protection limit.

- AR is recovery rate from the presumed sale of assets of a failed bank. It is stated as a percentage of total assets.

When FO is 0, there is no DPS loss. When FO is 1, the DPS loss for each bank is determined by the user-defined variables FC and AR, and by the balance of assets and covered deposits held by each bank. FC is a fixed percentage of CD, so that the model will record financing cost in any iteration a bank fails. But shortfall losses are only generated if CD

exceeds the recovery on assets (or AR x assets).

8. Each time the model is run (each iteration), values for default probability and asset recovery are randomly selected from their probability distributions and the objective function is estimated for all banks. The total sum of DPS Losses across the entire banking system are added together to obtain the total DPS loss for each iteration. A total of 10,000 iterations are run in each simulation to generate a statistical distribution of DPS loss, from which the expected amount of loss at different confidence levels can be identified. The following diagram illustrates how the estimations are done in a simulation.



Parameters and assumptions

9. The following assumptions were applied in setting the values and probability distributions of the parameters considered by the model:

- any bank failure simulated in the model is a discrete failure event, that is, in any iteration a bank will either fail or not fail according to a default probability assigned to each bank.

- the default probability of a bank is derived from the average annual default rate associated with the credit rating assigned to the bank by a major credit rating agency. Unrated banks were assigned ratings based on the ratings of their peer group banks.

- the Board conducted a survey on 21 retail banks on the value of customer deposits covered under different protection limits. These

21 retail banks accounted for about three quarters of all customer deposits in the banking industry. The survey results were applied to the remaining banks to estimate the values of customer deposits held with them and covered under different thresholds.

- the annual funding cost of the DPS Fund arising from drawdown of the liquidity back-up facility was assumed to be 8% per annum. It is expected that the DPS would be able to recover the amount paid to depositors and repay the borrowings from the Exchange Fund in about 7.5 months. Therefore, the actual financing cost to be borne by the DPS would be about 5% per dollar protected (i.e., 8% x 7.5 / 12).

- a triangular frequency distribution of 10%, 50% and 70% was assumed for the recovery rate in the liquidation of a failed bank, which results in an average asset recovery of 43%. Over the course of the simulation, however, the asset recovery ratio applicable to an individual bank was selected in random between 10% and 70%. Any amount of protected deposits in excess of funds recoverable from the failed bank's assets based on the recovery rate generated will result in shortfall loss.

- it was assumed that the DPS has priority over unsecured creditors to recover its claims from bank liquidations.

Simulation results

10. For each level of protection limit, a statistical distribution of DPS loss was generated from the model. The cost estimate at the 99.8% confidence interval was selected as the target amount of funds required to be accumulated in the DPS Fund for meeting the cost of providing deposit protection. The cost estimates under different protection limits in absolute terms and as a percentage of the total protected deposit are shown in the table below.

Protection limit	**99.8% Confidence Interval**	
	Cost of deposit protection (in HKD millions)	**Cost as a % of protected deposits**
HK$100,000	724	0.15
HK$200,000	1,582	0.21
HK$500,000	2,551	0.22
HK$800,000	4,981	0.36
HK$1,000,000	5,455	0.37

Hong Kong Deposit Protection Board
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