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# FROM RISK ASSESSMENT TO FINANCIAL INSTRUMENTS, SIZE AND PRICING CONSIDERATIONS IN DEPOSIT INSURANCE

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# From Risk Assessment to Financial Instruments, Size and Pricing Considerations in Deposit Insurance[1]

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*Abstract*

Discussions about the role of deposit insurance within financial stability architecture neglected an impact that the choice of deposit insurance fund's (DIF's) financial instruments may have on banks' incentives to take risks. This paper argues that DIF should borrow against a portion of its exposure which can be expected to recover in distress under reasonable assumptions. DIF should accumulate own funds (equity) only in proportion to expected loss in distress. Creating credit exposure of sound banks and/or other creditors towards deposit insurance institution will increase monitoring incentives. Also it may lead to creditors' demands to participate in a decision making process in a mixed deposit insurance system. This will help to align public and private incentives and increase likelihood of optimum pricing of deposit insurance. Application of this principle of financial management requires continuous risk assessment and stress testing on a bank by bank basis. Short time series and analytical difficulties should not discourage deposit insurers in SEE in applying these methods. Methods can be adjusted in order to be useful at a given level of development of their statistical and analytical systems. Therefore this paper is a plea for an early adoption of financial planning and modeling techniques in deposit insurance in SEE. Application of these techniques is a prerequisite for incentive compatible use of debt in deposit insurance funding.

## Introduction

Deposit insurance systems differ across countries in terms of governance (public, private, mixed), scope of activities (pay-boxes vs. risk minimizers)[5] and funding (ex ante, ex post, combined[6]; an additional distinction is related to flat vs. differential premium). Evolution of systems has been largely country-specific so there is no comprehensive "best-practice" view shared by financial economists and practitioners. However, there is agreement that coverage (insured amount) should be limited because overly generous insurance evokes moral hazard, reduces market discipline and leads to excessive risk taking by banks

[1] This paper builds on and expand operational experience I have made as part of the Convergence Program with one South-East European Deposit Insurance Fund. It has been prepared for Convergence for discussion in the Tirana Technical Seminar.
[2] I am thankful to Mr Luigi Passamonti and Mr Marko Škreb for their useful inputs and comments. Nevertheless, the responsibility for any errors and omissions belongs to author only.
[3] Velimir Šonje is Director of Arhivanalitika, consulting company from Zagreb, Croatia.
[4] Final version of this paper has greatly benefited from discussions with Seminar participants.
[5] Risk minimizers have extended authority which usually involves mandates to supervise, manage, administrate and support problem banks if such actions may lead to minimizing loss for deposit insurance fund.
[6] For the purpose of this paper, combined system is defined as a system which is primarily designed as an ex ante system, however, ability to charge supplementary premium at times of distress introduces an ex post element.

(Demirguc-Kunt and Detragiache, 2002; Demirguc-Kunt and Huizinga, 2004; Beck and Leaven, 2006). Although some recent pieces of literature show that risk minimizing deposit insurance systems are conductive for banking system stability (Beck and Leaven, 2006), optimum design of deposit insurance system within financial safety net is still an open issue.

Open issues are not related to problems of system design only. They are also reflected at operational level. This paper deals with one of key operational aspects of deposit insurance: how to work out financial planning and financial management in deposit insurance systems in developing countries in order to determine optimum size, premium and best combination of financial instruments that will support achievement of financial stability. It is shown that seemingly operational ("second-order" of importance) issues of financial planning and financial management have far reaching systemic implications because they influence monitoring incentives and market discipline.

Financial planning and financial management problems are often neglected because most of time there is no immediate pressure to pay out insured deposits. During periods of financial peace, political focus shifts away from deposit insurance. Research and analytical efforts follow this shift, thus incentives to innovate the system weaken substantially. This problem is present especially if Deposit Insurance Law rigidly regulates main financial parameters of the system (insured amount, premium and/or size of deposit insurance fund). Rigid financial setup reduces incentives for financial planning and financial modeling. The cost of negligence may be high, especially in developing countries where financial know-how is limited. Negligence of system's development during "good times" weakens its effectiveness during the "bad times," as problem generation mechanisms change and show up in ever innovative forms. For that reason, this paper is a plea for an early build-up of analytical capacities and adoption of modern financial planning and modeling techniques in deposit insurance institutions in South East Europe (SEE). Such techniques would help anticipate and prepare for any potential problems. Without such techniques in place, there is a high probability that funds available for deposit insurance would be either seriously inadequate at a detrimental cost to the society, or far too high at a cost to the banking industry and/or depositors.[7]

While operational contribution of improved financial planning and modeling may be substantial for the robustness of DIF the most important positive effect will be created by an

[7] Distribution of cost of deposit insurance depends on the interest elasticity of demand for deposits. Depositors shall pay relatively more if their demand is inelastic.

impact on banks' behavior. Incentive-focused deposit insurance literature has been mainly dealing with issues of moral hazard (e.g. Gropp and Vesala, 2001; Cull et al., 2004) and differential premiums (e.g. Freixas and Rochet, 1998; Leaven, 2002; Prescott, 2002; Galac, 2004). Literature was recently enriched by considerations of incentives for deposit insurance schemes to monitor, supervise and even resolve problem banks (Beck and Leaven, 2006). Additionally, this paper points out that if an ex ante or combined deposit insurance scheme is viewed at and managed as any other financial institution, implied combination of financial instruments in use will have an impact on banks' incentives to monitor stability. This impact is borne by the specific use of debt in funding deposit insurance.

The first section explains motivation for this paper in more detail. The second section contains discussion about risk assessment techniques that may be best suited to meet the needs of SEE countries at their current level of development. It is shown that the choice of analytical technique is not invariant to other important financial considerations, such as financial instruments (section three) and DIF's size and pricing i.e. choice of premium (section four). The fifth section includes discussion about policy implications and the sixth section concludes.

## I Motivation for Paper

A common feature of deposit insurance schemes in SEE countries is that funds are small. Deposit insurance institutions are in the process of strengthening their financial and institutional capacities. For that reason, it is widely believed that funds still need to grow. However, as premiums are relatively high, the banking industry representatives complain about disparity between high pricing and low risk (after consolidation and internationalization of banking systems in most of SEE countries). Therefore, one of the motivations for this paper is to present an analytical framework for the determination of optimum DIF size and premiums.

In theory, funding of ex ante or combined deposit insurance schemes should be based on expected loss calculation. This means that premiums should be set to cover expected losses of deposit insurance fund (DIF) and operational expenditures of the system over the

long run[8]. This principle holds irrespective of the premium system (flat or risk adjusted differential premium).[9]

If deposit insurance analysts manage to work out expected loss calculations at reasonable degree of precision, present value of inflows to DIF should be approximately equal to the present value of outlays. Occasional DIF surpluses or deficits should be of transitory nature and easy to manage either by prudent investment of excess funds or by borrowing at times of shortage.

In the real world, however, lack of know-how and/or structural instabilities in the banking system make expected loss calculations cumbersome if not impossible. As a consequence, either a premium would be set too high, leading to unnecessary accumulation of funds at DIF at a cost to industry and/or depositors, or it would be set too low, leading to a continuous lack of funds and declining financial resources as well as diminishing credibility of the insurance scheme.

Funds available to DIFs in SEE countries most probably depart from the optimum trajectory. By and large, DIFs' financial parameters are set rigidly in the region - either a base premium is fixed and/or, as in some countries, a target coverage ratio is determined by law.[10] It seems that there is not much point in executing sophisticated financial calculations of expected losses if the result cannot influence DIF's financial parameters that are embedded in the law, unless insured amount is flexible. Unfortunately, flexibility of insured amount is limited in countries that are forerunning EU accession[11]. In general, if covered amount is exogenous, either premium or size (defined in terms of the coverage ratio), or preferably both, should vary. If either premium or size is rigidly set by the law, DIF size will depart from optimum trajectory at an unnecessary social cost to the system as a whole.

Additional problem which is present in SEE countries is that any application of econometric analysis or statistical stress-testing which would attempt to estimate parameters such as probability of default and expected loss is limited by the lack of historical data. Even

[8] It is assumed that the Fund is charged for operational expenditures of an organisation which manages the scheme. If operational expenditures are funded by the government or donnors it has no implications on main arguments presented here.

[9] In the remainder of the paper I shall ignore the difference between flat and differential premium since this distinction is not important for presenting the main argument.

[10] Coverage ratio is a ratio of DIF's usable assets over total value of insured deposits (i.e. insured portion of guaranteed deposits). It is a synonim of deposit reserve requirement (DRR) as defined by FDIC (2000).

[11] Contrary to the experience in Baltics where countries managed to delay application of 20.000 EUR coverage amount, Bulgaria and Romania did not negotiate 20.000 EUR insurance coverage and it is highly unlikely that Croatia, by far the most financially developed country in the region, will negotiate delay in complying with EU Directive.

if the overall data sample is large enough, including a reasonably large sample of failed banks, interpretations of statistical results would suffer from structural instabilities in the region during the last decade. Estimated parameters at the basis of historical statistical data may be irrelevant for decisions about the future.[12] One should always bear in mind that use of statistical methods started in schemes like in the United States, with several decades of available time series and hundreds of banks' defaults registered in the data sample.

Despite the obvious technical difficulties, there are five arguments in favor of early attempts to apply expected loss calculations in SEE DIFs: (i) build-up of DIF's assets at more advanced stages calls for better analytical justification for continuation of high premium (tax on depositors); (ii) in some countries there is legally embedded automatic trigger which calls for consideration of lower premium when coverage ratio reaches legally determined target value; (iii) declining interest spreads, credit portfolio diversification and progress in risk management techniques which followed privatizations and consolidations around the region, make inherited financial parameters set at early stages largely irrelevant for the future; (iv) a need to build modern financial stability architecture cannot be met without sophisticated analytical basis shared among main stakeholders; (v) finally, statistics based on historical data inputs are not the only available analytical technique; expert based scenario analysis in conjunction with sound financial reasoning supported by tested theory may do at least as good as statistical analysis.

For these reasons, this paper is a plea for an early build-up of analytical capacities and early adoption of financial modeling techniques in deposit insurance schemes around the SEE region. The main message is to invest heavily in human capital and analytical know-how. Hence, the nature of this work is largely normative. It is based on author's experience in helping build analytical capacities of the Deposit Insurance Fund in one SEE country under umbrella of the Convergence[13] Program for SEE.

[12] Please mark the word „may". This criticism of statistical methods should not be interpreted as a message not to apply them. On the contrary, using more methods shall make decisions more informed and better.
[13] Administered by the World Bank, Convergence is a public-private financial sector development program for South-East Europe.

## II Risk Assessment

*Fundamental formula of deposit insurance*

Assessment of risks in the banking system is the cornerstone of the expected loss calculation. Fundamental formula of deposit insurance finance is given by (1):

$$K = PD \times ID \times LGD, \qquad 0 \leq LGD \leq 1,\ 0 \leq PD \leq 1 \qquad (1),$$

where K stands for DIF's own funds measured in monetary units, which should be built up to cover expected losses that are given at the right hand side of equation: PD stands for probability of banks' default, ID stands for insured deposits in failed banks (which is de facto nominal exposure of DIF, equal to liquidity demand i.e. obligation to pay out insured deposits in failed banks) and LGD stands for loss given default (percentage of DIF's exposure at default that cannot be recovered in any circumstances).

Note that the most popular measure of DIF's size, coverage ratio, is directly derived from (1):

$$K/ID = PD \times LGD \qquad (2)$$

If there are i=1,...,N banks, DIF target size can be determined by calculating:

$$\frac{K}{ID} = \sum_{i=1}^{N} PD_i LGD_i S_i \qquad \text{where } S_i = \frac{ID_i}{ID} \text{ and } ID = \sum_{i=1}^{N} ID_i \qquad (2')$$

Deposit insurance literature rarely shows an explicit link between bank LGD and DIF LGD. Even the most prominent pieces of literature only mention the difference between the two by pointing out that DIF's LGD is smaller than banks' LGD (FDIC, 2000). Therefore, in order to be precise, one has to note that LGD in (1) and (2) is related to DIF's, not banks' LGD, here defined as % of insured deposits:

$$\frac{K}{ID} = \sum_{i=1}^{N} PD_i LGD_i^{DIF} S_i \qquad \text{where } S_i = \frac{ID_i}{ID} \qquad (3)$$

DIF's and banks' LGDs are interrelated, but their relationship is quite complex and non-linear. DIF management has to take this complexity into account while making financial decisions. If a failed bank was deeply insolvent but bank's loss is borne by owners and non-insured creditors and depositors, DIF is in the position to collect all of its claims which arose due to pay out of insured deposits. If a failed bank was marginally insolvent but there are not any non-insured creditors and depositors, DIF will take a portion of a loss. For that reason,

overall balance sheet structure of a bank in the wake of distress matters. Financial planning and financial management without deep insight into the balance sheet structure of each individual bank would be incomplete and prone to errors. Since balance sheet structures are very dynamic, especially in countries undergoing structural changes, rigid setting of financial parameters such as target size, premium and/or insured amount are inaccurate. Estimations of model (3) have to be worked out on a periodic basis in order to calibrate financial parameters of the system in face of rapid structural change.[14]

*Balance sheet view*

The starting point is a stylized version of a bank's balance sheet. It presents factors which make a difference between bank's and DIF's final losses. Here the term final loss represents a numerator of LGD. Concepts are now measured in monetary units, not in percentage of insured deposits, like in equations (2) and (3) above. Furthermore, we will use the term *expected (for loss and recovery in distress)*, but not to emphasize statistical interpretation. *Expected* is used here to emphasize the fact that financial planners have to take a look at balance sheets of living banks and *assess* or simulate different crises scenarios in order to check if a bank is resistant to different types of shocks. They have to perform this analytical exercise for individual banks (bottom-up approach) in order to calculate size (coverage ratio) as defined by equation (3). An immediate association is to do the stress-testing since it provides forward looking information on the impact of possible extreme events on the financial system (CGFS, 2000).

Structure of liabilities is shown in the first row of the figure below. Here we define *DIF nominal pay out exposure* which is equal to insured deposits i.e. the total potential pay-out obligation in the case of default. Structure of bank's assets is shown in the second row, and the third row shows the structure of *DIF exposure*. Note that only a fraction of DIF nominal exposure (insured deposits) translates into *DIF risk exposure* which is equal to bank's risk exposure minus non-insured liabilities (including pre-distress accounting value of bank's capital and other non-insured liabilities such as inter-bank credit, subordinated debt and non-insured deposits). The remaining part of DIF nominal exposure is riskless exposure which depends on the size of required reserve and eventual holdings of excess reserve and

[14] Doing periodic (e.g. annual) analysis does not mean that premium has to have large variations in the short run. Overly large variations will have an unnecessary impact on banks' profit and loss volatility. Also it may distort incentives, as any systematic behavioral impact occurs only in the predictable environment. See section IV for further discussion.

riskless tradable instruments. The fourth and fifth row show the derivation of expected loss from DIF perspective. DIF risk exposure is composed of expected final loss (which is critical for determination of LGD from DIF's point of view) and expected recovery, whereas expected recovery has two stylized probability layers: safe recovery and risky recovery. Note that these are not statistical concepts, rather experience-based ones adjusted for use in deposit insurance analysis.

*Figure 1*

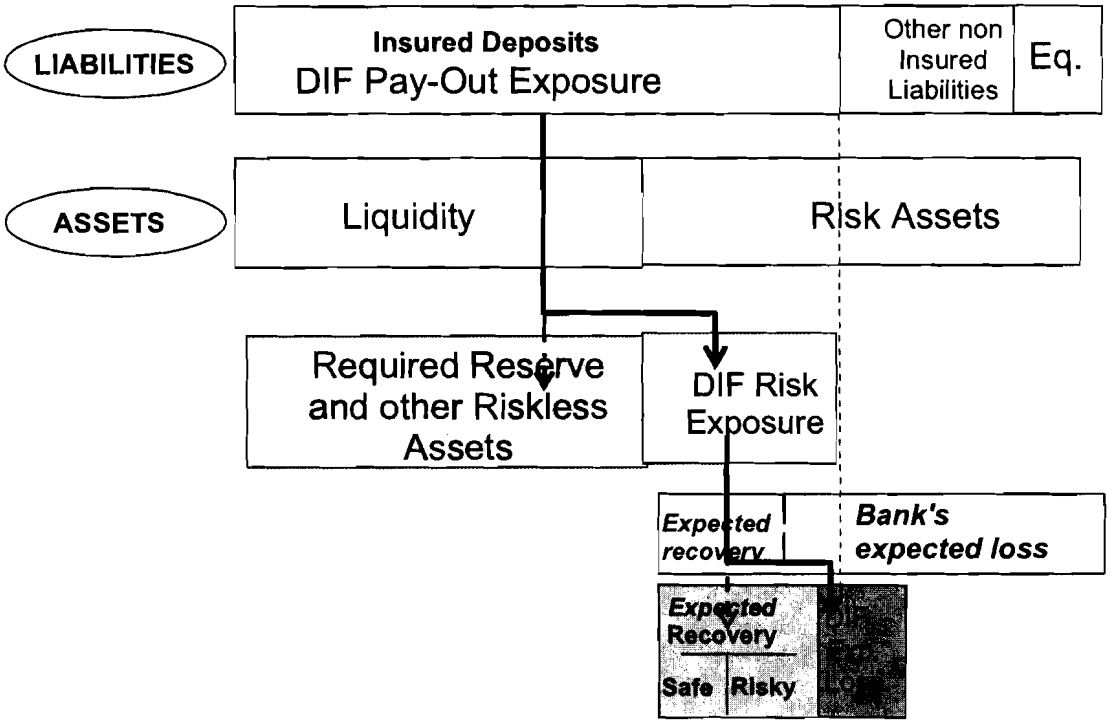
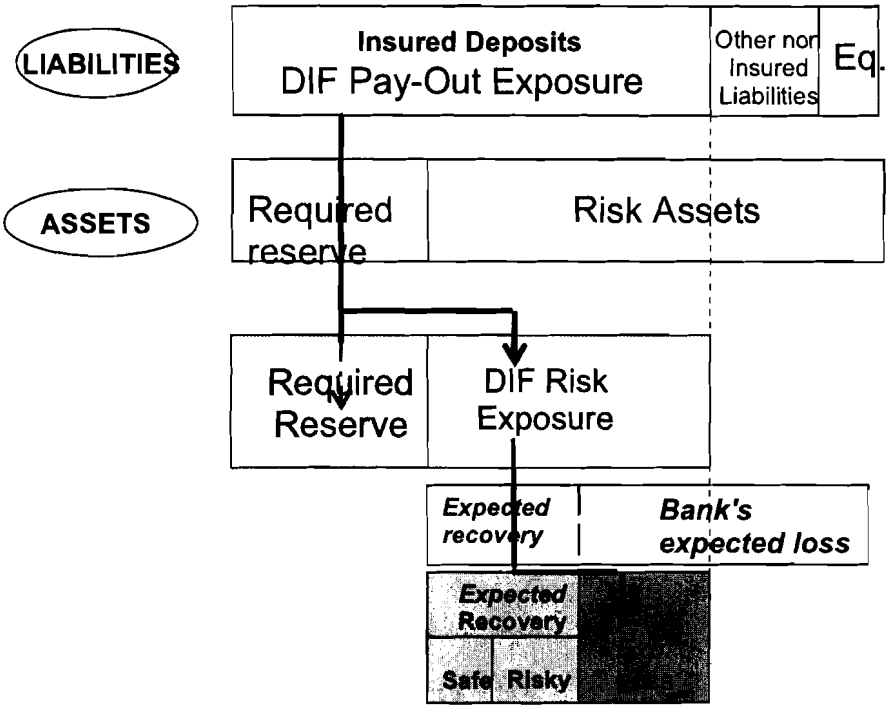



Figure 1 shows that there are two intermediary layers which alleviate loss transmission onto DIF. Firstly, bank's own funds and other non-insured liabilities make DIF's risk exposure substantially smaller than bank's risk assets. Secondly, assets that are expected to be recovered under distress (during bankruptcy process) represent a cushion against DIF's final loss if DIF is positioned as a preferred creditor in the case of bankruptcy. In such case, which is presented in figure 1 above, even an extremely large credit risk shock (bank's expected loss) will create a relatively small loss for DIF in comparison to pay out exposure (notice that bank's expected loss represents more than 50% of risk assets while DIF's expected loss represents a tiny part of pay out exposure in figure 1).

Structure presented above is not realistic. This scenario shows how a large loss is absorbed under assumption of an unchanged balance sheet structure. However, structures of

assets and liabilities change rapidly in the wake of distress, especially if the banking supervision is weak. In order to come up with realistic estimates, analysts have to assume combined shocks: some insured depositors shall withdraw their deposits; some or all of non-insured creditors shall collect all or parts of their claims. Generally speaking, there will be a large demand for liquidity as bad information would spread. In an extreme case it may lead to a run on a bank. As a result, cushions will be thinner at times of distress, and DIF's loss higher.

*Figure 2*




Balance sheet in figure 2 has squeezed in comparison to figure 1 due to liquidity withdrawals. Only remaining required reserve[15] is left on the side of riskless assets. The bank's risk assets are the same in nominal terms, so DIF's risk exposure and expected loss are higher than in figure 1. Hence, analysts would have to make assumptions regarding liquidity withdrawals, taking into account possible differences (due to informational asymmetries and legal abilities) in recovery of credits and deposits in the wake of distress among insured depositors, non-insured depositors and other creditors.

[15] For more details about the required reserve see discussion further in the text.

*Cooperation with banking supervision*

Residual maturity of liabilities is an important input for making assumptions about liquidity withdrawals. However, information required for this kind of assessment has to be richer. Related persons' claims to banks have to be watched with great scrutiny as related persons have more information about banks' performance and may be the first to collect their claims while bank is still liquid. In addition, as many banks in developing countries are owned and/or financed by foreign agents, analysts will have to make assumptions regarding behavior of foreign owners and creditors. Details of bond, loan and deposit contracts are important. It would be interesting to check if there are cross-default and pre-payment clauses or options to collect claims before maturity in case of adverse business events. Additional useful information would be how foreign owners and creditors behave in similar situations in other countries, or during other distress episodes in the same country (if any such historical experience exists).

It is hard to imagine that deposit insurance analysts will monitor such contracts and international banking groups' behavior. Banking supervision usually does so. Hence, it is important to cooperate with banking supervision in developing liquidity withdrawals and risk shock scenarios.

Cooperating with banking supervision in creating this kind of analysis is needed for additional reasons. Losses may not be related to credit risk only. Loss can occur due to market and operational risk as well. Cooperation with banking supervision may be important for development of plausible risk scenarios for banks on an individual case basis.

Beyond cooperation, deposit insurance analysts will have to make an independent assessment of the quality of supervision in order to anticipate depth of loss that can occur before supervisory intervention (e.g. appointment of provisional administrator). Strong supervision intervenes promptly, before large losses in excess of bank's capital accumulate and insiders strip the assets. DIF's risk exposure may be relatively small in a failed bank if intervention happens at an early stage of distress. Therefore, strong supervision should be viewed as a gatekeeper against DIF's losses even if a bank is technically insolvent.[16] Moreover, if the supervisors know that they are being constantly assessed by a strong and independent analytical DIS team and if they absorb aforementioned DIF's perspective on losses, that may create some inter-institutional tension. This may prove to be productive,

[16] See Beck and Leaven (2006) for empirical proof of a negative relationship between strenghth of supervision and banks' problems measured by the distance to default.

leading to an improvement in inter-regulatory monitoring and cooperation. For developing countries, where inter-regulatory cooperation and institutionalized monitoring are practically non-existent, this is a very important issue.[17]

*Institutional environment: reserve requirement system, bankruptcy process and governance*

In addition to combined loss and liquidity shocks, analysts will have to take into account key features of the institutional environment. Importance of the preferred creditor position of DIF in bankruptcy has been already mentioned. If DIF is legally positioned as any other claimant, DIF's expected loss will be higher, because recovered value of assets under distress will be distributed proportionally among the remaining creditors.[18]

Two additional institutional aspects of the reserve requirement system are of critical importance for derivation of DIF's final loss. In a pure averaging system a bank complies with reserve requirement regulations by keeping period average excess liquidity at a transactions account with the central bank. Since funds at the very same account are used to pay out non-insured creditors and to buy cash to meet the liquidity demand at tellers and ATMs, liquidity can vanish in a couple of days during panic. If required reserve or a portion of it is kept at a separate blocked account, there will be a time lag (usually 30 days) between liquidity withdrawal and freeing-up of liquidity due to lower base for the required reserve calculation. If a bank will not be in the position to meet depositors' demand within 30 days, it will become illiquid while still having substantial potential liquidity at reserve requirement accounts left to repay creditors in the bankruptcy process.[19]

The second institutional problem related to liquidity reserve is its treatment in the bankruptcy process. This treatment largely depends on country-specific regulations. In some countries, it is possible that bankruptcy administrator uses remaining liquidity to quickly pay

[17] Note that the type of questions raised in cooperation with banking supervision change dramatically as banking systems become more and more internationalised. At early stages of transition, key questions were related to discovery of related persons and connected lending. Nowadays, the key issues are related to cross-border ownership and international transactions, such as how would foreign owners behave in the face of the crisis. Hence it is not possible to dissolve deposit insurance problems from cross-border banking supervision problems and problems of winding-up international banking groups in the case of distress. These discussions rest beyond the scope of this paper.

[18] Some authors think that preferred creditor position may be detrimental for authorities' incentive due to high degree of DIF's protection against losses (Bliss and Kaufman, 2006), nevertheless the author of this paper tends to see the preferred position in a more positive light.

[19] Note that this condition will not be met if a bank can borrow against required reserve and/or if the central bank lends to a distressed bank and positions before DIF in the order of collection under bankruptcy. This fact points out that it is of critical importance that the central bank and DIF act in a coordinated manner during resolution process.

out preferred creditors, DIF being one of them. The figure 2 reflects this situation, indicating author's recommendation to build-in such a regulatory solution in deposit insurance and bankruptcy regulations. However, in most countries, remaining reserve funds are treated as any other remaining asset value and it is kept until final disbursements to remaining creditors. In some countries administrators can use these funds to pay for operational expenses of the bankruptcy process. Since this is an indication of inefficient bankruptcy regulation which usually takes many years to complete the process, it is obvious that these seemingly riskless liquid assets may actually be at risk from DIF's perspective in a weak institutional environment. Consequently, analysts have to make a thorough assessment of bankruptcy regulation and practices.

Practices are even more important than regulation itself, as behavior of DIFs in some countries has shown that sometimes they do not maximize value of asset recovery or minimize cost to the system. Rather, they show readiness to compromise some political or commercial goal by swapping assets and giving up some claims in exchange for uncertain future benefit. For that purpose, watching the governance aspect and taking it into account while making financial forecasts is critical for realistic assessments of expected recovery.

*Beyond statistical estimates*

Up to this point we have used individual bank's balance sheet structures and shocked them under different liquidity and credit/market/operational hypothetical risk scenarios. There is no econometrics or statistical historic stress-testing (e.g. VAR) in this approach, because liquidity and risk shocks scenarios are defined on an expert basis. This may be useful for simplicity, but it may also present a limitation because loss generation is not based on the existing behavioral or statistical models.

The statistical stress-testing literature progressively expanded in the last couple of years, both in terms of scope and complexity. Even the most complex models involving endogenous reaction functions suffer from three deficiencies: short time series, inappropriate capture of contagion effects and limited relevancy (as all models are partial equilibrium models based on comparative static). In consequence, most macro tests performed to date have shown that static effects of macroeconomic shocks are very small compared to bank capitalization (Sorge, 2004: 16). The use of hypothetical scenarios within the bottom-up approach presented here, allows the analysts to generate bank-specific shocks of the size and

type never seen before. They are free to combine these shocks with macro scenarios and contagion effects. Such analytical freedom can be very useful given the fact that problem generation mechanisms change and show up in ever innovative forms. Although endogenous reactions cannot be captured properly, ability to generate and combine very large shocks which lie outside historical statistical distributions may extend timeframe relevance of analysis as more time may be needed to create very large losses. Moreover, having the information at hand about related persons, cross-ownerships and details of financing contracts (due to cooperation with banking supervision), may increase ability to predict the spillover across banks. If the analysts are not constrained by estimated behavioral parameters, they may step out of the relevant domain easily. In order to prevent this, the analysts should continuously expand information set by cooperating with the financial stability analysts in other regulatory institutions. Their communication should serve as an ongoing consistency check.

When probabilities of default are estimated without behavioral inputs, the relevance of PDs may be at stake. For that purpose, analysts should combine models of probability of default with scenario analysis described above. The analysts can employ any distance to default measure and take ratios of indicators to the average value of indicators of failed banks in order to compute PDs. They may do the same with some more complex composite of financial indicators which proved to be good predictors of failure in a similar country, for a similar group of banks in another country, or during respective country's history if the number of failures was significant. That is why early warning financial indicators approach may complement crisis scenario hypothetical simulation to determine a list of vulnerable banks.

The reader should note that there are non-parametric analytical methods that can be employed to improve the quality of decisions for determination of probabilities of default even if there are no reliable statistical estimates. Any vector of ranks (scores) R produced by any risk assessment methodology can be used to approximate probabilities of default by taking a reference value $R_R$ for which PD=1 is assumed, so that the probability of default of bank "i" is determined as a function of score:

$$PD_i = f\left(\frac{R_i}{R_R}\right) \text{ where } R_i = g(I_{i,n}) \qquad (4)$$

and $I_{i,n}$ is a set of n financial indicators for bank i .[20]

*Illustrative Example*

Given the fact that analysts will not be working with well-grounded statistical estimates, the banks are divided into "low risk", "watch" and "risk" groups on the basis of PD approximations. "Watch" and "risk" group banks' balance sheets should be subject to the hypothetical combined liquidity and credit/market/operational risk shocks generated by the experts. Using our balance sheet approach described above, a result after this analytical step should look similar to the one presented below (data represent hypothetical numbers for illustrative purposes only).

***Table 1***

| | ***Risk*** | ***Watch*** | |
|---|---|---|---|
| Starting point (before bankruptcy) | | | Remarks |
| No. of banks | **2** | **2** | |
| Risk score | **7** | **4** | on a scale 0 - 10 |
| Risk assets | **253** | **393** | in monetary units |
| Non insured liabilities (NIL) | **382** | **484** | Non insured deposits, loans & equity |
| Liquid assets | **166** | **304** | |
| Insured deposits | **37** | **213** | |
| DIF Pay-Out Exposure (% of ID) | **0,8%** | **4,5%** | |
| Min Loan Loss (LGD) for insolvency | **32%** | **23%** | Equal to equity / risk assets ratio |
| NIL/Risk Assets | **1,5x** | **1,2x** | |
| Liquid Assets/Insured Deposits | **4,5x** | **1,4x** | |
| At insolvency | | | |
| LGD / loans | **40%** | **31%** | Team assumption |
| Withdrawal of insured deposits | **20%** | **20%** | Team assumption |
| Withdrawal of non insured liabilities | **44%** | **50%** | Team assumption; 44% for high risk banks because of liquidity limitation |
| DIF Pay-Out Exposure (as % of ID) | **0,6%** | **3,6%** | After withdrawals |
| Liquidity (as % of ID) | **0,0%** | **1,4%** | |
| DIF Risk Exposure (as % of ID) | **0,6%** | **2,2%** | Nom.Exp. minus liquid assets |

The upper section of the table shows balance sheet indicators as they are at the moment of analysis (while banks are still not under distress). The lower part of the table shows results obtained after balance sheets of selected banks have been exposed to hypothetical liquidity withdrawals. Note that experts can "play" with a number of different assumptions about liquidity withdrawals. In the illustration above, it is assumed that insured

[20] See e.g. presentation of Alessio Veccia (2006) at this Seminar for details of a possible starting methodology. Also, keep in mind that the inverted Z-score (sum of ROA and equity over assets over standard deviation of ROA) represents probability of default if profits are normaly distributed.

depositors withdraw less than non-insured depositors/creditors (20 percent and 50 percent respectively). This is due to the weaker incentive and asymmetric information (non-insured depositors are better informed about the true status of a bank and withdraw larger lots of liquidity per transaction).

The reader should note that in the table above we calculated risk exposure, but not DIF's expected final loss. All we see is that DIF's risk exposure (as a percentage of insured deposits) is smaller than nominal pay out exposure after withdrawals of liquidity. However, among the indicators in the "starting point" segment there is an indicator called "minimum loss given default for insolvency" which is equal to the ratio of bank's capital over risk assets. This is equal to the size of bank's LGD which makes banks technically insolvent. The first line in the lower part of the table shows expert assumption about the size of loss that would actually push the banks into default. This risk shock has to be stronger than a minimum LGD for insolvency, and in the next step the analysts will look at derivation of expected loss given combined effect of risk and liquidity shock in order to obtain result like the one below.

***Table 2***

| | | ***Risk*** | | ***Watch*** | |
|---|---|---|---|---|---|
| | | Before insolvency | At insolvency | Before insolvency | At insolvency |
| Risk assets | 1 | **253** | **152** | **393** | **272** |
| Liquid assets | 2 | **166** | **0** | **304** | **65** |
| Non insured liabilities | 3 | **382** | **115** | **484** | **166** |
| Insured deposits | 4 | **37** | **30** | **213** | **171** |
| DIF Risk Exposure | 5=4-2 | **-129** | **30** | **-91** | **106** |
| DIF Loss if collection of risk assets less than (in % of risk assets) | 6= 5/1 | | **19,7%** | | **39,0%** |
| Minimum expected risk assets collection (in % of risk assets) | 7 | | **20,0%** | | **20,0%** |
| Minimum expected risk assets collection in % of risk exposure | 8=7/6 | | **102,0%** | | **51,3%** |

Non-insured liabilities, which were higher than risk assets before insolvency (implying negative risk exposure of DIF) turned out smaller than risk assets at insolvency i.e. after liquidity withdrawals (implying positive risk exposure of DIF). One can calculate DIF's loss threshold which is equal to the percentage of risk assets at insolvency that will be lost on top

of the part of loss borne at a cost to owners, in order to calculate DIF's final loss.[21] If the loss on risk assets is smaller than the threshold, non-insured creditors carry the entire loss.

Taking all the institutional variables and supervisory information into account, analysts will assume a portion of safe recovery at default in percentages of risk assets at default (20% here). Comparing the minimum expected safe recovery with threshold value shows if DIF can expect any loss to occur. In the case of "risk" banks, the expected loss is zero because the minimum expected safe recovery covers total DIF's risk exposure at default. In the case of "watch" banks, the expected loss may be positive because the expected safe recovery is smaller than the threshold.

If the expected safe recovery is smaller than the threshold, there is still an issue of differentiation between risky recovery and expected loss. In many cases, information set and experience will not allow for meaningful distinction between the two. For that reason, the final result is presented by grouping expected loss and risky recovery under common title "uncovered collection risk."

***Table 3***

| % of ID | | *Risk* | *Watch* | *Total* |
|---|---|---|---|---|
| DIF Pay-Out Exposure | 1 | **0,6%** | **3,6%** | **4,2%** |
| Liquid Assets Recovery | 2 | **0,0%** | **1,4%** | **1,4%** |
| DIF Risk Exposure | 3=1-2 | **0,6%** | **2,2%** | **2,8%** |
| 20% risk asset collection | 4 | **0,6%** | **1,1%** | **1,7%** |
| **"Uncovered" collection risk** (eventual collections plus final loss) | 5=3-4 | **0,0%** | **1,1%** | **1,1%** |
| ("Safe" Collections) | 6=2+4 | **0,6%** | **2,5%** | **3,1%** |

The main purpose of this exercise was to show the nature of distinction between nominal pay-out exposure and expected final loss (here grouped together with risky recovery under heading uncovered collection risk). This distinction lies at the heart of the following discussion about financial instruments, which also reflects on determination of the safe recovery component.

[21] The difference between risk assets before insolvency and at insolvency is equal to pre-insolvency risk assets minus capital equivalent value of risk assets (because capital absorbs the first loss piece). In terms of numbers, using data for risk banks, 40% (risk shock – see Table 1) of 253 is 101 is equal to capital. The difference of non-insured liabilities before and at insolvency (267) is composed of loss absorbed by capital (101) and the amount of liquidity withdrawal (166).

III How is Risk Assessment Related to Choice of Financial Instruments

Traditionally, debt was used in deposit insurance finance as a last resort borrowing when DIF runs out of funds in the face of bank's distress. The logic described above opens an alternative view towards more refined definition of equity and debt instruments in the deposit insurance finance. Since DIF funds (equity) should serve as the cushion against DIF's expected losses, and debt should be used for solving liquidity problems, our balance sheet suggests that DIFs should combine the equity (capital) and debt finance depending on expected balance sheet structure of the intervened bank in the wake of distress. It is important to underline that the debt finance will be drawn down for each bank intervention, regardless of whether there is enough liquidity in the DIF to handle it. The proportion between equity and debt financing is discussed further below. Conceptual approach is shown in the table 4.

***Table 4***

***Equity and Debt in Funding Deposit Insurance***

| ***Balance Sheet Component*** | ***Instrument*** |
|---|---|
| Quick Recovery of Remaining Reserve* | Short-term Debt |
| Safe Recovery | Long-term Debt |
| Risky Recovery | Equity |
| Loss from DIF's Perspective | Equity |

* Quick recovery of this part is possible in a regulatory environment where bankruptcy administrator can pay out remaining reserve to preferred creditors (DIF being one of them) in a reasonably short period of time after initiation of the bankruptcy process. If such regulation does not exist, DIF would have to borrow long term against this part of the remaining value of assets in a distressed bank because assets will be collected in the long run.

Financial structure is based on the assumption that it is possible to divide the risk exposure into three components. One of these components is the safe recovery which does not require to be covered by equity, but rather, by long-term debt. Since this portion of recovery is safe, money will be repaid to DIF in the long run and there is no need to finance this portion of pay outs of insured deposits out of own funds (e.g. out of premium).

Estimation of safe recovery part should not be based only on DIF's past experiences with collections, because effect of safe recovery part is endogenously determined by the interplay of three factors: (i) the size of non-insured liabilities (including the bank's pre-

distress accounting value of equity), (ii) the size of bank's assets at risk and (iii) the size of bank's expected loss. These three factors are very much bank specific, so calculations should be forward looking and based on a broadened information set shared with banking supervision. Only if analysts notice striking similarities between presently weak banks and banks that had failed in the past, some lessons (coefficients) learned from history may apply.

In many practical applications it will not be possible to clearly differentiate between the risky recovery and the final loss. In this case, to be on the safe side, it is recommended to create an aggregate of *uncovered collection risk*, as shown above. This way DIF will build equity coverage for the whole amount of risk exposure minus safe recovery. If analysts decide to differentiate between risky and safe recovery, a number of factors that have an impact on the severity of loss, such as strength of banking supervision and bank's internal risk management and controls,[22] would have to be assessed. It is important to emphasize the critical importance of cooperation with banking supervision, though the analytical tools applied by two agencies should not be the same. In many practical applications, the division between safe and risky recovery, and their financing implications, would critically depend upon the supervisors' information. One could conceivably assign partial debt funding to risky recovery if one believes that the institutional environment is safe, sound and well developed in terms of creditor protection. In such environment, even risky recovery component may be associated with higher probabilities of recovery. Its debt funding instrument will have subordinated or mezzanine debt features.

[22] If the banking group has well developed risk management and internal controls and audit functions, the loss may not be dramatic though the bank may fail. By the same token, developed banking supervision may be seen not as a guarantee against failure, but as a guarantee against dramatic losses which would wipe-out all of depositors' money (similar to defaults we have seen around SEE and CEE at early stages of transition).

IV Determination of Coverage Ratio and Premium

The first implication of financial logic described above is that coverage ratio has two components which should be treated differently: *equity coverage ratio* and *debt coverage ratio.*

*Equity* can be accumulated on the basis of initial capital,[23] DIF's net income i.e. premium plus income from investment plus net extraordinary income minus operational expenditures and cost of financing. Each component which affects DIF's equity requires careful consideration.

*Cost of financing* is related to the interest and fee payments on debt. The higher the debt is, the lower the equity base is, because of higher interest payments to debt holders. This leads many practitioners to conclude that raising debt is detrimental to the fund. However, this is not an appropriate logic. Firstly, if debt is standby, there is no interest payment as long as there is no use of debt. In addition, a standby fee may be symbolic while standby may bring much needed confidence to the system. Thus, the practitioners should incorporate social cost/benefit point of view in their thinking about debt. Secondly, if debt is raised for precautionary reasons but not used for pay outs, funds will be invested and investment income may cover or exceed interest cost which should be negotiated at a lower end of the market interest rates since creditors will be lending against low risk.[24] Thirdly, debt serves as a substitute for a supplementary premium which would otherwise represent an overly high burden for surviving banks. Therefore, debt can be an important element of overall financial stability architecture. This argument is even stronger if a standby exposure requires bank's risk provisioning in order to smooth out cyclical effects on creditor bank's stability. By the same token, extending debt raises monitoring incentives on the side of creditors which improves self-regulatory mechanisms within the banking system. Finally, we will show below that premium determination works in a way which offsets costs of debt financing, making this portion of the cost neutral as to financial position of the DIF.

*Net extraordinary income* is an ex post difference between actual post-distress recovery and amounts borrowed. If actual recoveries of assets under distress are higher than borrowed amounts, DIF has an extraordinary income and vice versa. By default, this

[23] Some countries in SEE received substantial amounts of donnors' funds for the purpose of capitalization of DIF.
[24] Which may sound paradoxical because underlying risk is risk of banks under distress. Nevertheless, lending occurs against conservatively estimated portion of safe recovery. If assessment is realy conservative, the true risk shall be very low.

difference should be equal to zero ex ante, so it should be disregarded in financial calculations. However, it is relevant to the extent that past differences between actual and expected collections have an impact on the initial size of the fund which matters for calculations of premium (discussed further below).

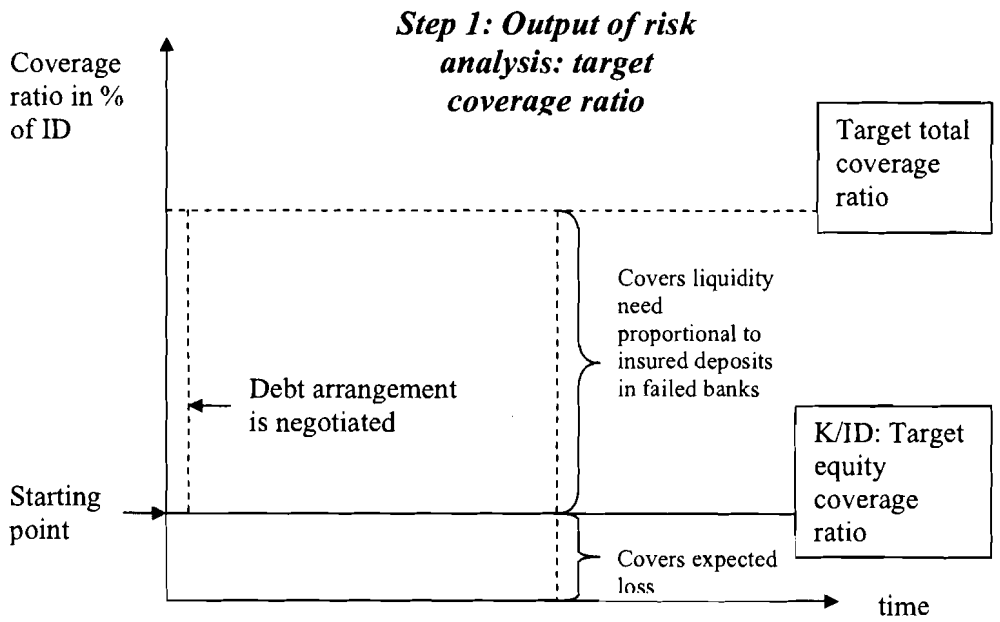
*Income from investment* should ideally be equal to zero because present value of receipts should equal that of outlays. However, net cash flows do depart from zero in the real world. For that purpose, income from investment has to be taken into account in financial planning. Analysts should assess asset allocation policy, anticipate some changes if imprudent portfolio management practices are employed, forecast yields and take into account the initial size of the fund..

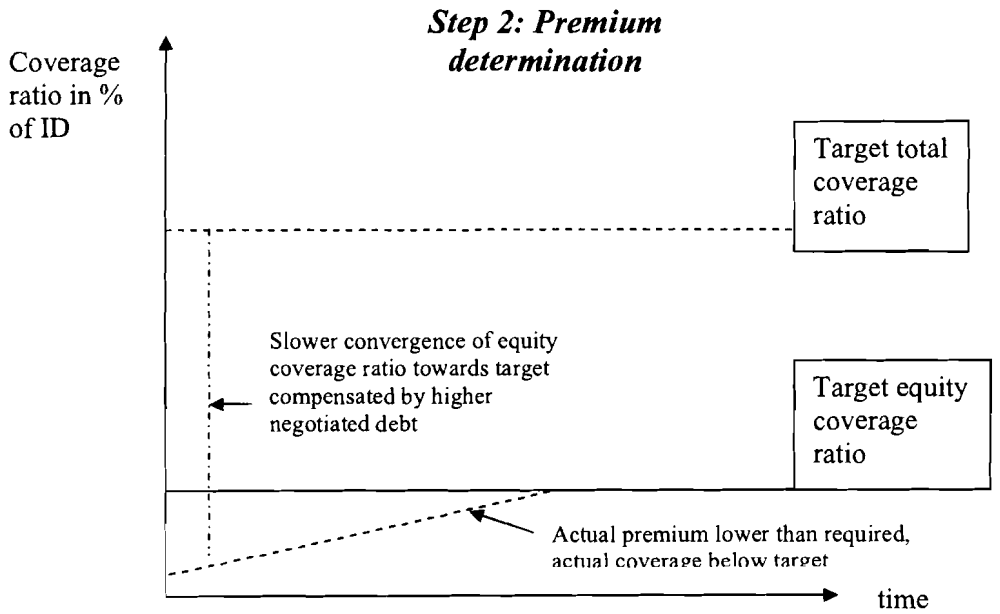
In summary, risk calculations will show how much funds (equity) and standby debt DIF has to raise in order to cover for expected losses and to be liquid respectively. Having in mind the initial DIF size and given forecasted deposits and yields, *premium* should be calculated in order to achieve target size of DIF within a reasonable planning period (3 years recommended).

This financial policy principle calls for ex ante premium funding for all expected losses and ex post debt funding for recoverable amounts in intervened banks. It is more prudent than the generic hybrid funding which envisages funding with ex-post premium of a portion of expected losses. This prudent design aims at avoiding the situation of surviving banks having to pay for the share of losses, in excess of past premiums, that the intervened bank obviously can no longer afford.

Analysts should start by forecasting base for premium calculations (usually insured or guaranteed deposits) and shall vary premium until they obtain target coverage ratio given other calculation components listed above. If the immediate achievement of target equity coverage ratio would require substantial increase in premium (or charging one-off supplementary premium), analysts have to calculate the costs and benefits of immediate surge in premium, having in mind that bank's distress is just an analytical hypothesis while additional cost to deposit taking may become an immediate feature of reality. Keeping in mind the dynamic setting (unless there is an immediate distress just about to emerge), the analysts should recommend a gradual increase of premium/build up of DIF's assets. Assuming the target equity coverage ratio has been achieved, analysts should be reluctant in recommending a premium holiday because premium has an impact on economic incentives and may distort market competition (e.g. premium holiday disregards the fact that older banks

may have been contributing to build-up of DIF's assets for a longer period of time while younger banks may exploit equal protection benefits at lower price).



## V Policy Discussion

There are four key policy issues emerging within this framework and we discuss them in turn:

1. Since simulations are hypothetical and pricing implications are real, should decision makers strictly follow analytical advice or should they enjoy some degree of freedom?
2. Will there be anyone willing to lend to DIF at times of distress (lender of the last resort problem)?
3. What are the implications of this approach on DIF governance and scope of activities?
4. Which debt instruments to use?

*Simulations are hypothetical but pricing is real*

Informed decision making takes into account limitations of analytical outputs. Following this approach, it is of critical importance that analysts explain their risk assumptions in plain language to decision makers. Decision makers should have a right to introduce some corrections if they feel that risk scenarios are overly optimistic or overly pessimistic. Table 5 is an example of informed decision making where decision makers may decide to discount a need for debt funding for watch banks by 50 percent because they feel that analysts have employed very conservative risk assumptions. Such decision may also be inspired by a conviction that, in the case of distress, DIF can easily increase use of debt. Also, if decision makers feel that the distance to default for watch banks is high, they should enjoy discretion of introducing correction factor for the equity part.

***Table 5***

***Equity and Debt in Funding Deposit Insurance: Frame for Decision Making***

| *Balance Sheet Component* | *Amount in % of Insured Deposits* | | *Correction Factor* | | *Decided Amounts in % of ID* | *Instrument* |
|---|---|---|---|---|---|---|
| | *Risk* | *Watch* | *Risk* | *Watch* | | |
| Quick Recovery of Remaining Reserve | - | 1.4% | - | 50% | 0.7% | Short-term Debt |
| Safe Recovery | 0.6% | 1.1% | - | 50% | 1.15% | Long-term Debt |
| Uncovered collection risk | - | 1.1% | - | - | 1.1% | Equity |

| | | | | |
|---|---|---|---|---|
| *TOTAL coverage ratio* | *4.2%* | - | *2.95%* | *All instruments* |

*Is there anybody out there?*

Before one considers debt financing, the key questions are: who will extend debt, and will creditor(s) stand ready to disburse loans in the case of distress when money is most needed? This problem should not be overemphasized, since it is widely accepted that deposit insurance cannot prevent or mitigate systemic crises or failure of the largest institutions. Even if DIF can absorb losses, liquidity demand would be so high in such cases to require public sector intervention. Therefore, approach to debt finance presented in this paper may extend the financial power and incentive compatibility of DIF, but it is also subject to liquidity problem in the case of extreme systemic events. However, in "normal" times there should always be much larger sector of sound financial institutions that may be willing to lend to DIF as a part of their regular business.

Perhaps the following classification of severity of distress (table 6 below) can be useful as a framework. When banks' failures are cyclically driven and idiosyncratic ("normal times"), sound banks should be able to meet DIF's demand for debt funding, probably asking for some degree of control over DIF. This is consistent with some recent findings in the literature, which point out that "funding and administration of the deposit insurance scheme by the banking industry can increase the incentives of the deposit insurer to minimize insurance losses." (Beck and Leaven, 2006: 4).

If crisis intensifies, sound financial institutions may face liquidity problems while still be willing to support the system. In this case, they would need additional liquidity support that may come from (i) mother banks, if banks are members of the international banking groups (which is the case in SEE countries), (ii) local central bank, (iii) international financial institutions (IFIs). In this respect, the role of IFIs is especially interesting. Usually IFIs do not get involved with LOLR activities because of moral hazard. Under severe distress they do get involved, subject to strong policy-correction conditionalities. However, the systemic design is such that moral hazard is substantially reduced, since banks lend against safe recovery exposures, not against DIF's expected loss. Fears of unnecessary bailout (of DIF in this case) are minimized in the spirit of the Bagehot rule: extend unlimited liquidity to solvent institutions. This makes this system attractive for any potential lender of the last resort.

*Table 6*

*Severity of Crisis and Lenders' Identity*

| *Severity of Crisis* | *Who is going to lend?* | *Features* |
|---|---|---|
| *1 „Financial peace" (no failures)* | - | - |
| *2 -„Normal times" (cyclically driven and idiosincratic failures)* | *Sound institutions / capital markets* | *Sound institutions asking for some degree of control over DIS* |
| *3 „Severe times" (crisis intensifies compared to „normal times")* | *Sound institutions supported by the lender of the last resort* | *Cooperation between sound institutions and LOLR* |
| *4 „Fully blown systemic crisis"* | *Government / central bank with a help of IMF and World Bank* | *Unilateral public sector action* |

However, high degree of internationalization of banking systems, high degree of unofficial dollarization/eurization and prospective EU and EMU entry substantially limit LOLR function in most SEE countries. Montenegro and Kosovo officially euroized several years ago. Bosnia and Herzegovina and Bulgaria have limitations due to currency board arrangements. Croatia, Serbia and Albania to some extent are limited due to a high degree of unofficial eurization which ties hands of domestic monetary policy makers. Similar to currency board countries, any large liquidity injection to mitigate the crisis would lead to currency depreciation, so a country would have to decide either to let the nominal anchor of stability go (at a huge cost to the economy), or to loose substantial amount of FX reserves, which is equally detrimental and may destroy confidence for years to come.

In this respect, SEE is in a paradoxical situation. LOLR component of the financial safety net is weak. Everything works well as long as foreign banks do their job properly, but it is highly uncertain how would a crisis of the mid-strength ("severe" type no. 3 in the table above) develop. Without well-established containment mechanisms, countries of SEE may not be in the position to mitigate this crisis in cooperation with LOLR. Strong, well-regulated and well-managed fiscal stabilization fund can represent a solution. However, there is not any such fund in the region. For that reason, IFIs may have a role to play in crisis type 3, not only in crisis type 4 from the table above. The moral hazard problem which is associated with too early/too much intervention or signaling may be substantially reduced if financial principles presented here would be applied, because creditors' exposures would be backed up by safe recoveries of assets in institutions under distress.

It is important to note that thinking about the potential role of LOLR (be it international bank(s), local central bank or IFIs) should not be limited to direct lending to DIF only. As private creditors may be perfectly willing to lend at "normal times" (problem situations type 2), the role of LOLR may be activated in crisis type 3 situations in order to provide liquidity support to DIF's private creditors, not to DIF directly. In order to structure such a liquidity backup instrument, note that private creditors who are members of the deposit insurance scheme do not need special collateral: If they record a credit loss (because safe recovery was estimated overly optimistically), this loss will be an equivalent of higher (supplementary) premium and vice versa. Since LOLR is not a member of the deposit insurance scheme, LOLR has a different incentive structure, and will ask for additional collateral to cover for potential losses in case the safe recovery was overly optimistically estimated. Higher (future) premium inflow represents potential collateral. For that purpose, institutional design of the deposit insurance system should allow flexibility for such a solution to be put in place.

*Governance and scope of activities of DIF*

In order to make this system work according to the principles shown above, sound banks or any other type of creditor (potentially LOLR) would probably ask for some participation in the decision mechanism of DIS. Willingness to lend and incentives to monitor the system will increase if creditors exert some degree of control over DIS. If this mixed system proves to be working well, it may lead to considerations to broaden the scope of risk minimizing activities which would strengthen financial safety net (Beck and Leaven, 2006). Sound creditors obviously have incentives to promote monitoring and prompt corrective actions because their money is at stake. Their motivation can serve as a new pillar of extended financial safety platform which would overcome present problems of weak elements of financial safety net.

*Which debt instrument?*

The last point to consider is more of a technical nature: what debt to use and how? The answer should be country specific, depending on the degree of development of overall financial system and local regulations.

If capital markets are underdeveloped compared to the banking system, standard loan contract such as unconditional standby from sound banks is probably the best possible option. It is also consistent with the view that banks would probably ask for larger involvement in the decision making about deposit insurance. In such a set up, pricing of standby may emerge as an open issue. Overly rigid starting positions for negotiations about pricing may endanger an agreement. Public sector representatives would probably claim that they are giving up a part of control over the system and introducing sound principles of lending against safe recovery which, if pursued correctly, will diminish present value of the cost of premium. Hence they will require minimum pricing in order to grow equity part as fast as possible. On the other side, industry representatives will tend to stay closer to market pricing, because they may be less convinced that they will have no losses associated with this credit exposure, especially in the initial years of operations. At the same time, they probably will not be convinced that banking supervision and analytical skills are developed up to the standards of developed markets. It is of critical importance that the spirit of public-private dialogue and cooperation prevails here, so that all arguments will be valued properly and reflected in fair pricing. Otherwise, lack of negotiation skills and commitments can undermine design of an optimum institutional solution.

More importantly, if principles of financial policy as set out here are strictly followed, and if DIF's creditors are members of the scheme, the problem of standby fee and interest rate becomes largely irrelevant. Let D denote standby amount, f is standby cost, G are deposits that serve as a base for premium calculation where $\rho$ is rate of premium and $g_i=G_i/G$ is a share of individual member of the scheme. Assuming that each member of the scheme participates in a standby arrangement in proportion to its market share in insured deposits, net premium paid is equal to gross premium minus earnings on the stand-by arrangement:

$$\rho - fg_i\left(\frac{D}{G}\right) \qquad (5)$$

Since (gross) premium is set in order to hit target equity coverage ratio, standby cost is neutral. The higher the stand-by cost is, the higher the target gross premium and vice versa. This theoretical construct will be more relevant for actual behavior in standby negotiations if parties believe that they can estimate safe recovery accurately.

For the same reason it is important to note that, in the case of standby, DIF has to follow debt-equity disbursement logic in the case of each individual failure. If DIF has enough equity at disposal, it should not restrain itself from drawing on standby because using

too much equity will weaken its loss absorption potential for eventual future bank failures. Any departure from this rule would undermine the logic of the whole financing structure and most probably represent an obstacle in future standby re-negotiations.

Alternatively, local banks may fail to coordinate and/or capital markets may be more developed and/or it may be easy to tap international capital markets. These possibilities pave the way for a number of alternative considerations.

Bond issues are one option, but such an issue would probably confuse the market. Clearly there is no way for bond holders to monitor local banks and influence their behavior. However, if there is bond holder's fiduciary, perhaps holding a significant part of bond issue (fiduciary may be arranger of the bond issue and/or, eventually, holder of the riskiest class of bonds), informational asymmetry may be overcome if fiduciary has analytical and business capacity to monitor banks. Large IFIs, but also large private international banks, might play this role in the smallest economies in SEE.

Securitization is also an interesting possibility. Stable future cash flow is a necessary condition for securitization. Since instrument would be covered by DIF's estimated claims on recoverable part of assets in bankruptcy, low risk profile makes it suitable for securitization. A number of cash flow problems that may arise (administrator may reimburse claimants too late, etc.) can be mitigated by using available premium inflow and/or through additional liquidity support to the transaction. A sophisticated credit enhancer who would understand the financial structure behind the debt issue (perhaps IFI again) may get involved. Credit risk can also be reduced substantially by DIF's commitment to use new premium inflows to cover for possible cash shortfalls if recovery under bankruptcy was projected too optimistically. Again, arranger can act as securitized bond holders' fiduciary by monitoring banking system and DIF performance, henceforth overcoming information asymmetry problems. It is not clear how would rating agencies view such an issue, but it is clear that there are many innovative ways to improve financial safety net by aligning incentives within deposit insurance framework, keeping in mind complex relationships between financial management, financial analysis and choice of financial instruments.[25]

[25] Synthetic securitization based on an instrument like a credit default swap may also be considered.

*Debt equivalents*

In order to expand the set of potential innovative financial solutions, authorities may consider alternative instruments which would serve just as well as debt from the incentives point of view. Two options are discussed below to provoke thinking, but not to present many technical details.

Instead of paying a premium coupled by debt extension, banks' payments to deposit insurance scheme can be treated as investments. This would transform DIF into an investment fund sponsored by investing banks and monitored jointly by the industry and the government. Such solution calls for joint public-private management of the insurance scheme. Stakeholders would have to assess risks jointly and transparently in order to determine amount of required investment per period. The same risk assessment can be used as a guideline for risk provisioning, since one part of banks' investment would always be at risk in proportion to expected loss and risky recovery. Furthermore, stakeholders would jointly determine asset allocation policy of DIF, ensuring proper balance between risk and return under professional portfolio management. One problem related to this model in comparison to the standby line of credit is that banks have continuous cash outflows for the purpose of investing to the Fund, while in the line of credit model cash flows out only at distress in proportion to pay-out exposure. However, this problem should not be a big obstacle if DIF's assets would be properly managed. Moreover, liquidity shock at distress - which is present under the line of credit model, may be smoothed in time under this model. In addition, if a country has a high rate of reserve requirement, transition to a new financial model can begin by one-off reduction in the rate of required reserve followed by obligatory reinvestment of these funds to DIF, which would manage the assets conservatively for a limited period of time in order to alleviate monetary consequences of the transitory operation. For example, for some time DIF can invest only in government securities and the government can be a party to this solution by promising to set proceeds aside with the central bank for sterilization purposes.

Alternative variation of this model is a shift to a quasi-ex post system where assets "reserved" for deposit insurance would be invested directly by banks under guidance and monitoring of deposit insurance authority. Such a technical solution is applied in Slovenia where authorities determine coverage ratio and require banks to invest a determined portion of insured deposits (2.5 percent) into government securities. Nevertheless, it is not enough to introduce a technical solution only. The key to the solution is that (i) there is some flexibility

in determination of the coverage ratio, so that each year a new decision based on expected loss, safe and risky recovery calculation can be introduced, (ii) there is provisioning against risks,[26] (iii) there is public-private partnership in managing the deposit insurance scheme.

## VI Conclusions

Discussions about the role of deposit insurance within financial stability architecture neglected an impact that the choice of deposit insurance fund's (DIF's) financial instruments may have on banks' incentives to take risks. If DIF borrows against a portion of its exposure which can be expected to be recovered under reasonable assumptions in institutions at distress, than DIF should accumulate own funds (equity) only in proportion to the expected loss. DIF can borrow the remaining part of funds that are needed for pay out of insured deposits in failed institutions. Creating credit exposure of sound banks and/or other creditors towards deposit insurance institution will increase monitoring incentives and probably lead to demands to participate in a decision making process in a mixed deposit insurance system. This will help to align public and private incentives, increasing the likelihood of optimum pricing of deposit insurance, possibly creating additional avenue to perform lender of the last resort function and producing an incentive to consider broadening of DIF's authorities to turn it into a risk minimizing vehicle. Application of this principle of financial management requires continuous risk assessment and stress testing on a bank by bank basis. Short time series and analytical difficulties should not discourage deposit insurers in SEE in applying these methods. Methods can be adjusted in order to be useful at a given level of development of their statistical and analytical systems. Deposit insurers have to make a strategic decision to invest heavily in analytical teams and systems.

[26] Although funds are invested in risk-less securities, risk provisioning makes economic sense because underlying risk is not that of government papers, but of individual banks' failure.

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