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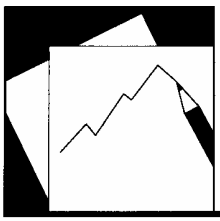

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MODIS: A Market-Oriented Deposit Insurance Scheme

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Abstract

This paper argues that an optimal deposit insurance scheme would allow the level of insurance coverage to be determined by the market. Based on this principle, the paper proposes an insurance scheme that minimizes distortions and embodies fairness and credibility, two essential characteristics of a viable and effective deposit insurance scheme. Using a simple model for the determination of the optimal level of insurance coverage, it is shown that the optimal coverage is higher for developing compared to developed countries; a condition that is broadly satisfied by prevailing deposit insurance practices around the world.

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I. INTRODUCTION

In recent years, and especially in the aftermath of the Asian financial crisis, an increasing number of countries have been introducing some form of explicit deposit guarantees, and such arrangements are now widespread around the world. The G-22 Working Party on strengthening Financial Systems has recommended introduction of explicit deposit insurance, and the Financial Stability Forum has formed a working group to develop international guidelines for deposit insurance. More recently, Hong Kong SAR has begun deliberations on the design of a guarantee scheme, and the Federal Deposit Insurance Corporation (FDIC) is planning a revision of the deposit insurance scheme in the United States. Moreover, deposit protection arrangements have been harmonized across the European Union (EU).

The wide acceptance of the need for a deposit guarantee scheme does not, however, reflect a belief that the moral hazard implications of such schemes are negligible and can be ignored. Rather, it more likely represents a view that moral hazard is a smaller price to pay—at least in the short run—than the costs arising from the systemic risk implications of bank runs or bank failures in the absence of deposit guarantees.[2] In other words, although essentially an empirical question, the net effect of deposit insurance is perceived to be an increase in banking system stability.

The ways in which moral hazard resulting from a deposit guarantee scheme manifests itself are well known. First, deposit insurance provides an incentive for banks to select more risky (and potentially more profitable) portfolio strategies, without having to pay higher interest rates to compensate depositors for the additional risk. Thus the guarantee scheme may encourage excessive risk taking by banks. Second, depositors, confident in the protection provided by the insurance scheme, have less incentive to monitor bank managers' behavior, or to engage in flight to quality. Third, supervisory forbearance may rise as bank supervisors, assuming that liquidity crises are unlikely in the face of deposit insurance, may become reluctant to require prompt corrective actions by weak institutions (Garcia, 1999). Indeed, irrespective of the net effects of a deposit insurance scheme on financial system stability, there is a rather unambiguous theoretical finding that such schemes could encourage risk taking by banks (Merton, 1977; Kareken and Wallace, 1978; Gennotte and Pyle, 1991; Boot and Greenbaum, 1993; Matutes and Vives, 1996, 2000).

Against the background of these theoretical findings, much work has focused on specific features of a deposit insurance scheme that could help reduce the moral hazard implications of the safety net. However, the available proposal falls short of alleviating the main concerns mentioned

[2] More generally, it is sometimes argued that the adverse side effects of regulation in general often dominate its beneficial effects (Schwartz 1995, Black 1995, Kaufman 1998). Despite all the regulations, or perhaps, some might say, because of them, 118 of IMF member countries (out of 184) have encountered systemic banking crises.

above. The design of a deposit guarantee scheme that reduces systemic risk and contagion but does not lead to excessive risk taking by banks remains a challenge.

The previous work in this area indicates that improving the market-oriented features of the scheme enhances its effectiveness in the above sense. The proposal for a market-oriented deposit insurance scheme (MODIS) outlined in this paper is a step in that direction. The proposal seeks to minimize banks' risk-taking, while avoiding some of the main pitfalls of the alternatives proposed.

The rest of this paper is organized as follows. Section II reviews the literature on the moral hazard consequences of deposit guarantees to distill the lessons of the previous studies on reducing incentives for risk-taking by banks associated with deposit insurance schemes. Section III describes the features of the MODIS proposal and presents a model for determination of the optimal deposit insurance coverage ratio. A comparison of the MODIS proposal with its precursors and the prevailing practice in the United States is provided in Section IV, and some concluding remarks are presented in Section V.

II. The Moral Hazard Implications of Deposit Insurance

A. Theory and Empirical Evidence

The theoretical justification for deposit insurance is presented in a seminal paper by Diamond and Dybvig (1983). They demonstrate that the existence of demand deposits can lead to multiple equilibria, including one with bank runs. As the latter may cause the failure of sound banks and real economic damage, a deposit insurance system that can rule out massive withdrawals produces a superior outcome. According to Bryant (1980), deposit liabilities backed by risky assets, together with asymmetric information on these assets, may lead to bank runs. Under the assumption of illiquidity costs, a government deposit insurance system can redistribute risk in a way that is not available to the private economy, although it cannot necessarily keep a bank run from occurring. Bryant (1981), modeling bank runs as the collapse of a fiat money system, shows that such collapses, which reduces production and employment, can be avoided with the introduction of deposit guarantees. In Matutes and Vives (1996), self-fulfilling depositor expectations in the presence of economies of scale yield multiple equilibria, some of which involve individual or systemic bank failures. Against this background, deposit insurance, by preventing systemic confidence crises, and causing an expansion of the deposit base, can be welfare improving.

The conclusions of these papers regarding the superiority of the steady state in the presence of deposit insurance depend crucially on the assumptions that bank runs will lead to large-scale bank failures and therefore major disruptions in output. These papers do not consider the possibility that the moral hazard implications of deposit insurance could also lead to bank failures (although not through deposit runs). Once this possibility is recognized, a case for deposit insurance could be made only if the probability of bank failures resulting from deposit insurance is lower compared to the probability of experiencing contagious bank runs. Given that

the measurement of these probabilities is an almost impossible task, prudence dictates that the deposit insurance scheme be designed to minimize the cost of moral hazard.

Another strand of the literature, which is more relevant to the objective of this paper, has focused on the repercussions of deposit guarantee schemes in general, or certain specific features of the scheme, on banks' risk-taking. Matutes and Vives (1996) argue that depositor protection schemes may encourage fiercer competition for deposits, thereby increasing banks' failure probabilities, and producing a larger deadweight loss for the economy. Gennotte and Pyle (1991) show that deposit insurance, by allowing banks to borrow at a subsidized rate, encourages both risk-taking and inefficient investment.

Foremost among the features of deposit insurance schemes considered by the theoretical literature is the flat-premium feature whereby all banks pay the same contribution rate irrespective of the riskiness of their portfolios. Kareken and Wallace (1978) show that, under a flat-premium deposit insurance arrangement, banks hold a portfolio which is at least as risky as regulations allow. Matutes and Vives (2000) illustrate how deposit insurance with flat premia tends to make banks more aggressive competitors in setting rates to attract depositors, and induces them to take maximal asset risk positions.[3] Boot and Greenbaum (1993) also show that banks' credit monitoring is lower in a system of fixed-premia deposit insurance, than in the absence of a deposit guarantee. Merton (1977) shows that deposit insurance is equivalent to a put option, and uses option pricing to derive the cost of flat-premium insurance to the guarantor. He then proves that this cost increases with the volatility of the value of banks' assets during the term of the deposits.[4] Chami, Fullenkamp, and Sharma (2002) argue that banks, holding a call option that comes from the standard deposit contract and a put option granted through deposit insurance, are effectively holding a straddle and therefore can profit from volatility (risk taking), making the insurance scheme funded by flat premium unviable.

1. Risk-adjusted insurance premia

On the other hand, there is some evidence in the literature that risk-based insurance pricing alleviates moral hazard. Matutes and Vives (2000) show that risk-adjusted premia, paid after banks' decisions on asset risk have been taken, reduce incentives for hazardous portfolio strategies and generate lower failure rates.[5] Cordella and Levy Yeyati (1998) demonstrate that risk-based contributions enhance banks' incentive to monitor their own risk position, provided that the risk information is fully disclosed to the insurance agency.

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[3] Similar results are obtained in Cordella and Levy Yeyati (1998).

[4] This result has been extended to take into account audit costs (Merton, 1978), liquidation costs (Mullins and Pyle, 1991), and interest risk (McCullough, 1981; Kerfriden and Rochet, 1993).

[5] Nevertheless, even with risk-adjusted premiums, deposit rates may be too high, and welfare may be improved by introducing deposit limits or rate regulation.

There is evidence to the contrary as well, suggesting that risk-sensitive premia may generate detrimental effects on banks' portfolio decisions. Pennacchi (1987) shows that with risk-adjusted contributions, the degree of risk-taking depends on the resolution strategy in the event of bank failure. Specifically, if the insuring agency followed a policy of resolving failures by extending direct payments to depositors, monopoly rents (charter values) would induce banks to take less risk and increase their capital. On the other hand, if the insuring agency pursued a resolution strategy involving purchase and assumption or merger, banks charged with risk-sensitive premia would still tend to take excessive risks. Also, Dewatripont and Tirole (1993b) point out that risk-based pricing may induce perverse effects on banks' risk-taking, if the higher cost of deposit insurance further reduces bank solvency.

The theoretical literature unambiguously shows that explicit deposit insurance generates incentives for excessive risk-taking by banks, but the empirical evidence on the subject is mixed.[6] For example**,** Thies and Gerlowski (1989) and Wheelock (1992) find a positive relationship between deposit insurance and increased risk taking of U.S. banks in the 1920s. Similarly, Demirgüç-Kunt and Detragiache (1997, 2000) find that deposit insurance raised the probability of bank failures in a panel of more than 60 countries during the 1980s and 1990s. However, Wheelock and Wilson (1994) and Alston, Grove, and Wheelock (1994) do not find a significant relationship between the rate of U.S. bank failures and deposit insurance, and Karels and McClatchy (1999) show that the adoption of deposit insurance is not associated with higher risk-taking by the U.S. credit unions during 1971–90. Also, analyzing the U.S. thrift industry in the 1930s, Grossman (1992) shows that newly insured thrifts undertook less risk than their uninsured counterparts, although the difference in risk-taking diminished as the length of time an institution was insured increased.

One limitation of these studies, which could possibly explain the inconclusiveness of their results, is that most of them overlook a number of factors that can alter the moral hazard implications of deposit insurance, as suggested by the theoretical literature. As a result, the estimates may suffer from the omitted variable bias.[7] First, the risk-taking effects of deposit insurance may be mitigated by the amount of uninsured (subordinated) debt on banks' balance sheets that fosters effective monitoring by debt holders (Dewatripoint and Tirole, 1993a, b; Calomiris, 1999). Second, risk-taking behavior is influenced by bank franchise value.[8] A depository institution with high charter value has no incentive to risk failure, because its owners could not sell the charter if the bank were declared insolvent (Keeley, 1990; Demsetz, Saidenberg, and Strahan, 1996). Banks' franchise value depends on market power (Keeley,

[6] For a review of empirical studies prior to 1990, see Gilbert (1990).

[7] An exception is represented by the recent paper by Gropp and Vesala (2001).

[8] Franchise value (or charter value) is the present value of the stream of profits that a company or a bank is expected to earn (Demsetz, Saidenberg, and Strahan, 1996).

1990), reputation (Boot and Greenbaum, 1993), and relationship with the client (Besanko and Thakor, 1993). All these factors may lessen the moral hazard consequences of deposit insurance.

Another weakness of the above empirical studies is that they focus exclusively on explicit deposit insurance, without taking into account the consequences of implicit guarantees. Clearly, whenever an implicit system of deposit protection is already in place, the expected impact of the introduction of explicit insurance on risk-taking is likely to be ambiguous. For example, the risk-taking decisions of banks that are viewed as 'too big to fail' may not be sensitive to deposit insurance, if such banks consider themselves to be the beneficiaries of an implicit comprehensive safety net. In such cases, explicit but limited, deposit insurance may be a useful way to reduce the safety net, and hence moral hazard (Gropp and Vesala, 2001). Again, as the empirical evidence on the moral hazard of deposit protection is mixed, it would be prudent for any supervisory agency to try to design a deposit insurance scheme that would not raise the specter of moral hazard.

B. Reducing the Moral Hazard Implications of Deposit Insurance

Several proposals have been put forward to help reduce the risk-taking consequences of deposit protection. These include, in addition to risk-adjusted insurance premia discussed above, tightening the capital requirements for banks that make banks internalize the cost of increased risk; "narrow banking," according to which the maturity structure of bank assets should be perfectly matched with that of their liabilities; and enforcing stronger market discipline, whereby depositors or other creditors are induced to monitor banks' portfolio decisions. These proposals, while helpful, suffer from various drawbacks that limit their effectiveness in reducing moral hazard, as explained below.[9]

1. More stringent capital requirements

In principle, banks that are better capitalized can be expected to be less prone to risky strategies, as they have more to lose in the event of failure (Furlong and Keeley, 1987; 1989). This observation could mean that more stringent capital regulations reduce risk-taking incentives (and hence the expected liability of the deposit insurance system). However, a distinction has to be made between banks that maintain a high level of capital voluntarily and those that hold higher levels of capital only if required by regulators. Risk aversion may not be much affected by increased capital requirements on the latter group. Indeed, some models indicate that a tightening of the capital constraint may reduce the total volume of risky portfolio, while, at the same time, raising the fraction of portfolio invested in risky assets (Kim and Santomero, 1988; Gennotte and Pyle; 1991, Rochet, 1992). Therefore, the theoretical implications of more stringent capital regulations remain ambiguous.

[9] Additional proposals, including creating a private deposit insurance, or relying on independent rating agencies to induce managerial discipline, are discussed in Dewatripont and Tirole (1993b).

2. Narrow banking

Under this proposal, banks should be required to back insured deposits with marketable, low-risk assets, and allowed to do what they want with the uninsured portion of their liabilities. In practice, narrow banking eliminates the safety net, as government insurance would have to be provided only in the unlikely event of bank losses on very low-risk, marketable securities (Calomiris, 1999). One problem with this approach is that the part of the bank that carries out the essential lending activities, on which enterprises and other borrowers depend, is not protected. Therefore, bank runs on uninsured deposits, and subsequent credit crunches, would still be possible.

3. Market discipline

Another method to minimize the potential moral hazard cost of deposit insurance is the so-called "market-discipline approach." This proposal combines government deposit insurance with market-driven enforcement of prudent bank behavior. It assumes that market participants (depositors and bank creditors) are able to process information, and have the incentive to monitor, as well as punish, excessive risk-taking. In practice, effective depositor monitoring of banking activity can be achieved only under certain conditions (Barajas and Steiner, 2000; Birchler and Maechler, 2002; Calomiris and Powell, 2000; Mantripragada, 1992). First, there must be a group of depositors for whom risk is a major concern in choosing a bank. Second, banks must be allowed to fail, with consequent losses for depositors. Third, banks must disclose, and depositors must have access to relevant information on the banks' activities and balance sheets. The depositors must be able to analyze and derive conclusions from the data, or there must be analysts who advise them on the condition of the banks. Fourth, the discipline imposed by depositors has to be severe enough to affect banks' decisions, but not so drastic as to lead to disruptive runs, involving the whole financial system**.** Finally, the banking system has to be fundamentally sound. These conditions are usually difficult to achieve, although not impossible as indicated by the case of New Zealand.

Prominent among the proposals to enhance market discipline in deposit insurance systems are (a) providing insurance *only* to small depositors and (b) requiring banks to hold a minimum amount of subordinated debt (sub-debt). These proposals are discussed below.

a. Covering only small depositors

Clearly, the smaller the ratio of deposits covered by deposit insurance, the less resulting moral hazard and the higher the incentive for the larger depositors to monitor the activities of the bank (Garcia, 1999). The problem, however, is that this approach to deposit insurance leaves out the all-too-important issue of determining the coverage ratio that allows market discipline and serves as a deterrence to bank runs. Moreover, insurance limits are effective only if depositors cannot circumvent them by spreading deposits across various institutions or different types of deposits. An alternative of this approach, the coinsurance systems (whereby the insurance agency and depositor share losses in a specified proportion), may be too complex for an average depositor to

understand. Another variant of this approach is to require a deductible on the amount of deposits covered. However, such deductibles are regressive as small depositors are placed at a relative disadvantage. It is unlikely that such schemes can discourage bank runs (Mantripragada, 1992).

b. Mandatory subordinated debt

This proposal involves requiring banks to maintain a minimum amount of subordinated debt, thereby providing a cushion to absorb losses and reducing the expected costs of bank failure for the deposit insurance agency. The proponents of sub-debt argue that it could alleviate the moral hazard implications of deposit insurance for several reasons.[10] First, since sub-debt is uninsured, its price is sensitive to the risk of the issuing bank. This should force depository institutions to take into account the impact of their risk-taking decisions on funding costs (Federal Deposit Insurance Corporation, 1983; Horvitz, 1986). Second, institutions that take on excessive risk, or that manage their portfolio poorly, would find it difficult to sell their sub-debt, and would have to shrink their risky assets or issue new capital. Calomiris (1999) suggests imposing monthly rollovers on sub-debt. Banks that are unable to issue sub-debt at rates below a certain cap would be required to reduce their risky assets. Third, banks' ability to place sub-debt, and the issue prices, would be important signals for market participants and supervisors thereby reducing forbearance (Cooper and Fraser, 1988; Evanoff, 1993).[11] Fourth, as sub-debt holders are exposed to losses, but do not benefit from the upside gains resulting from risky strategies, they would have a strong incentive to monitor banks and demand full information disclosure. Fifth, subordinated debt holders, unlike small depositors, are supposed to be sophisticated enough to exercise careful oversight of banks.[12]

There is some empirical evidence on some of these purported benefits of sub-debt proposals. A number of studies have found that subordinated debt holders demand higher returns from riskier banks indicating that there is some evidence of a link between asset risk and banks' funding costs. However, there is also some evidence that lack of information can jeopardize the market's

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[10] The proposals on the use of sub-debt as a device to encourage market discipline have found an echo in the proposal for reforming bank capital regulations presented by the U.S. Shadow Regulatory Committee (2000), and in the Report by the Board of Governors of the Federal Reserve System and the Treasury Department to the Congress on the "Feasibility and Desirability of Mandatory Subordinated Debt" (2000). Both these reports conclude that mandatory subordinated debt issuance may enhance market discipline and bank soundness.

[11] This effect is referred to as *derived discipline*, while the impact of sub-debt issues on banks' cost of funding is regarded as *direct discipline*.

[12] Surveys of the different sub-debt proposals, and of the empirical studies on the effectiveness of subordinated debt to enhance market discipline, are presented in Board of Governors of the Federal Reserve System (1999), Evanoff and Wall (2000), and Lang and Robertson (2000). For a theoretical discussion, see also Dewatripont and Tirole (1993b).

attempts to price risk accurately. Can market participants make more accurate assessments of a bank's conditions than institutional supervisors? Some of the information available to regulators becomes known to the market with a substantial lag, thus casting doubt on whether the market can be a better bank watchdog than institutional supervisors. Also, the sub-debt requirement turns the straddle position the banks hold (when there is deposit insurance) to a *strangle*,[13] which means that sub-debt may not necessarily reduce banks' incentive to take excessive risk (Chami, Fullenkamp and Sharma 2002).

III. Proposal For A Market-Oriented Deposit Insurance Scheme

The proposals discussed in the previous section do not fully address the objective of minimizing the incentive for risk-taking inherent in deposit insurance programs. Most of these proposals either have ambiguous theoretical implications, or suffer from practical implementation problems. Against this background, this section proposes a market-oriented deposit insurance scheme (MODIS) that builds on the previous proposals to reduce the moral hazard implications of such safety nets. Similar to some of the other proposals, MODIS is based on the belief that the market discipline approach provides the most likely scenario for minimizing the potential moral hazard costs of deposit insurance.[14] As explained below (and Box 1), the distinctive feature of MODIS is that it relies almost completely on market forces to deter excessive risk taking by banks. The basic objective of MODIS is not to prevent all bank failures, but to contribute to the soundness of the financial system, by making it less likely that a nonsystemic problem in the banking system becomes systemic. MODIS would do so by providing a measure of protection to depositors, while making them also responsible for their own financial actions.

A. The Main Features of MODIS

1. An uninsured deposit portion

The purpose of the two-tier deposit structure is to ensure that banks are subject to market discipline. Both the theoretical literature and several empirical studies show that uncovered depositors, who could suffer from losses in the event of bank failure, would impose discipline on banks, demanding higher deposit rates from riskier institutions and shifting their funds to safer banks, thereby penalizing risk-taking. Matutes and Vives (2000) show that, in the presence of depositors sophisticated enough to realize how deposit rates and investments affect the probability of bank failures, banks with more risky portfolios set a higher deposit rate than their competitors. The empirical studies of the U.S. banking system find evidence that riskier

[13] In the terminology of option theory, s*trangle* means a long position in both a call and a put, with different strike prices. In the above context, the difference between the strike prices results from the existence of sub-debt.

[14] A comparison between MODIS and other market based discipline approaches is presented in Section IV.

institutions pay a higher premium on uninsured large denomination CDs (Baer and Brewer, 1986; Rolnick, 1987; Hannan and Hanweck, 1988; James, 1988, 1990; Cargill, 1989, and Keeley, 1990), and attract smaller amounts of these deposits, compared to more sound banks (Park, 1995; Goldberg and Hudgins, 1996; Park and Peristiani, 1998; Marino and Bennett, 1999).

Box 1. Summary of the Main Features of MODIS

1. Banks can issue two types of deposits: tier 1 and tier 2. Tier 1 deposits are fully guaranteed by a government-run deposit insurance system. Tier 2 deposits are explicitly denied such protection. Tier 2 deposits can be redeemed before maturity only at a penalty.

2. Depositors can choose how to allocate their deposits between the two tiers. There is no upper limit on either tier 1 or tier 2 deposits. Banks can compete for either type of deposits by raising interest rates.

3. Banks are required to publicly display the size of their tier 1 deposits as a percentage of total deposits (henceforth, tier 1 ratio), and their ratings awarded by the banking supervisory agency (henceforth, safety stars).

4. Each bank pays a deposit insurance premium, which depends positively on both the volume of its tier 1 deposits and the spread between its tier 2 and tier 1 deposit interest rates.

5. Banks will be required to hold additional capital over and above the usual (BIS-related) standards, the size of which will depend on their interest rate spreads, safety stars, and tier 1 ratio.

6. A bank may be subject to intensified supervision depending on the size of its tier 1 ratio, safety stars, and interest rate spreads.

There is, however, a potential problem with such a two-tier system of insured and uninsured deposits. If depositors could easily switch funds from one tier to the other, they would do so on the first signs or impression of trouble in a bank (or the banking system, for that matter). If this were the case, however, the benefits of market discipline would be lost. The distinction between insured and uninsured deposits would become meaningless and uninsured depositors would assume that their deposits too are implicitly guaranteed. To minimize this possibility, under MODIS, tier 2 deposits can be redeemed before maturity only at a penalty.[15] The size of the penalty should be established to be a clear deterrence against early withdrawals.

[15] Since penalty on early withdrawal cannot be applied to demand deposits, these deposits should be included in tier 1.

The existence of uninsured deposits in the system brings about the risk of bank runs. There are two aspects to this issue. The runs may reflect a flight to quality, which is the cornerstone of market discipline to impose prudent behavior on banks. The runs can also reflect flight to cash or other currencies. However, this possibility is likely only if the deposit insurance scheme is not credible or the confidence in the whole banking system has eroded. If the deposit insurance scheme is credible, any depositor willing to pay the penalty of early withdrawal of its uninsured deposits will shift to insured deposits at the same bank or elsewhere. Thus, such runs will most likely reflect a flight to insured deposits and no major credit crunch will result. If the deposit insurance scheme is not credible, however, the runs will also affect insured deposits. Thus the existence of uninsured deposits will not result in a banking panic, and if a panic does take place the insured deposits will not be immune either.

Nevertheless, to minimize this risk, MODIS includes a system of endogenous supervision and capital regulations to strengthen the banking sector. As discussed below, under this mechanism, oversight and capital requirements would be intensified, depending on a bank's interest rate spread, safety starts, and tier 1 ratio. These requirements improve the credibility of deposit insurance and reduce the risk of a flight to quality. Also, under MODIS, the rapidity of bank runs would be limited by the fact that, as just mentioned, only time deposits would be uninsured. This would give banks some more time to address the liquidity problem. Finally, it has to be recognized that the possibility of runs and credit crunches to a certain extent might be an inevitable consequence of restoring market discipline (Calomiris, 1999).

2. No upper limit on the volume of tier 1 and tier 2 deposits

The traditional argument for an upper bound on insured deposits per depositor is that the deposit insurance system should protect only the small and less-informed depositors, leaving large depositors to monitor banks and exercise market discipline. Under MODIS, insurance is not denied to large deposits. MODIS allows depositors, irrespective of their size of deposits, a choice as to whether or not to shoulder the burden of monitoring the banks they deal with. A sophisticated client may be able to monitor the banks, but under MODIS, that client has a choice to be involved in monitoring, take some risk, and receive a higher return, or take no risk and receive a lower return. In MODIS, then, the distinction is not between the level of deposits as to whether the marginal deposit receives protection. The level at which the deposit insurance kicks in is endogenous. It depends on the interest rate and the depositors' behavior toward risk. This also marks the difference between the uninsured deposits in our proposal and the large-value CDs available in the United States that have a minimum denomination and have no protection above $100,000.

3. No ceiling on interest rates

Given that under MODIS there are no restrictions on the supply of either type of deposit by banks, there is a risk that competition for deposits could become destabilizing, inducing institutions (especially the undercapitalized or failing ones) to aggressively bid interest rates up to attract more deposits and finance risky projects. With regard to tier 2 deposits, it can be reasonably expected that banks would have limited incentive to engage in cut-throat competition.

As mentioned above, the higher the spread between tier 2 and tier 1 deposit rates, the higher deposit insurance premia, capital requirements, and the intensity of supervision. Thus banks would not want to bid up their tier 2 interest rates and widen the margin with tier 1 deposit rates. Competition can, however, be aggressive for insured deposits, as the guarantee makes the supply of funds more elastic to rates of return (Matutes and Vives, 1996). Besides, banks' appetite for risk can be particularly high if deposits are insured, as undercapitalized banks, which do not have much to lose, would be willing to attract insured deposits using high interest rates, and then invest the funds in high risk projects.[16]

In light of this possibility, it could be argued that a ceiling on the interest rate paid on insured deposits would be desirable. Apart from eliminating cut-throat competition among banks, a deposit interest rate ceiling would improve the profitability of banks and hence raise their franchise value. The increase in the franchise value would then lead to more prudent behavior (Hellmann, Murdock, and Stiglitz, 1998, 2000).[17] Ceilings on deposit rates do exist in some countries and they did exist in the United States, under Regulation Q.

However, MODIS does not include such a ceiling because of the well-known distortionary effects of interest rate caps and because they are usually circumvented in different ways. Moreover, if the ceilings are decided by the association of banks, there will be collusion on the cap. If the ceilings are set by the government, this would lead to distortionary behavior: banks would try to circumvent the limits, or to compete on nonpecuniary services to depositors.

Rather than an interest rate cap, MODIS requires banks with a larger volume of tier 1 deposits to pay a higher insurance premium. This premium should be set in such a way as to reduce the incentives for destabilizing competition. To further reduce the possibility of destabilizing excessive competition, MODIS relates the intensity of supervision and capital adequacy requirement positively to the tier 1 ratio.

4. Disclosure requirement

The disclosure and public display of some financial statistics are essential since the degree of moral hazard is directly related to the extent of transparency of the riskiness of banks' portfolios (Dewatripoint and Tirole, 1993a; Matutes and Vives, 2000). If banks' performance and asset risk are not observable, banks will take the highest risk possible even in the absence of deposit insurance (Dewatripoint and Tirole, 1993a; Matutes and Vives, 2000). As a minimum, MODIS requires the banks to inform the public about their overall health and conformity with the

[16] Some evidence for the behavior in the case of Argentina is provided in Schumacher (2000).

[17] Hellmann, Murdock, and Stiglitz show that in the presence of excessive bank risk-taking behavior, it is impossible to implement any Pareto efficient outcome using just capital requirements as the tool of prudential regulation. Instead, any Pareto efficient outcome can be implemented by a combination of capital requirements and deposit rate controls.

prudential standards (safety stars), their behavior toward risk and vulnerability to bank runs. The first is gauged by the bank's safety stars and the last by its tier 1 ratio. Transparency with regard to these statistics would allow depositors both to choose the banks that conform to their level of risk aversion, and to determine the distribution of their funds between tier 1 and tier 2 deposits.[18] A bank with a low tier 1 ratio would be vulnerable to bank runs, therefore, depositors would exercise caution when a low tier 1 ratio is observed. Some would decide to choose tier 1, rather than tier 2 deposits, or switch to another bank. In this way, the market would determine the equilibrium tier 1 ratio for each bank.

5. The insurance premium

To be fair, and avoid good banks cross subsidizing unsound institutions, insurance contributions have to be risk-adjusted. Also, as discussed in Section II, risk-based pricing of insurance could further alleviate moral hazard. A critical issue related to the introduction of risk-adjusted premia, though, is how to price banks' contributions. This issue has received attention in the literature (Merton 1977, 1978; Acharya and Dreyfus,1989; Kerfriden and Rochet, 1993). Acharya and Dreyfus (1989), in particular, show that the optimal deposit insurance premium is a non-decreasing function of the deposit to asset ratio, and a monotonically increasing function of the risk of bank investment. Consistent with this theoretical result, under MODIS, a bank's contribution to the insurance fund would be increasing in the amount of insured deposits, and in bank risk.

What is, however, an adequate measure of bank risk? Banks' assets generally embody private information, so that, in practice, it is difficult to link deposit insurance premia directly to banks' risk profile. Therefore, under MODIS the spread between interest rates on tier 2 and tier 1 deposits is considered as an indicator of risk. This indicator is easily observable and cannot be manipulated by banks.

Also, to reduce the detrimental effect of banks increasing their asset risk after the deposit insurance terms have been established, revisions of the contributions should be undertaken regularly, and more recent data should be given higher weight in determining the premium. As data on deposits and interest spreads are readily available, these periodic revisions could be carried out easily.

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[18] The publication of financial statements that use fair value accounting would significantly enhance the disclosure requirements and the monitoring of banks by depositors. Even though the extension of fair value accounting to loans in banks' balance sheet is still subject to debate among standard setters, bankers, and policymakers, the British Bankers Association has advocated the disclosure of an estimate of their fair value when banks publish their financial statements. See Chisnall.

Specifically, we propose the following formula for calculating the premium:

$$P = \alpha \left[\frac{\max(r_1, r_2)}{1 - \max(r_1, r_2)} \right] I$$

or when $s = r_2 - r_1 \geq 0$,

$$P = \alpha \left[\frac{r_1 + s}{1 - r_1 - s} \right] I,$$

where,

P is the deposit insurance premium, which would be calculated and paid once a year;
I is tier 1 deposits (calculated on the basis of the weighted average of the monthly values of insured deposits during the previous year);
r_1 is the weighted average interest rate on tier 1 deposits;
r_2 is the weighted interest rate on tier 2 deposits, and
s is the spread between weighted average interest rates on tier 2 and tier 1 deposits.
$\alpha > 0$ should be determined by simulation exercises, incorporating the default risk, to ensure adequate funding.

The above formulation for the premium charge has a number of implications. First, if the spread is less than or equal to zero, then

$$P = \alpha \left[\frac{r_1}{1 - r_1} \right] I$$

This possibility is highly unlikely, however. Clearly, a bank that wishes to attract tier 2 deposits will have to quote a positive spread. Moreover, if the interest rate offered on tier 1 deposits is equal to or higher than that on tier 2 deposits, there will be simply no incentive for depositors to place their funds in tier 2 (noninsured) accounts. By offering a zero or negative spread, the bank reveals its preference for having only insured deposits. However, the higher cost of the premium required if all deposits are insured, the additional capital requirement, and the heightened supervision it necessitates under MODIS will most likely rule out such a preference.

Second, this formula allows a nonlinear positive relationship between the insurance premium and the bank's quotes of tier 1 interest rate and the spread. Such a formula would help reduce the risk of destabilizing competition for tier 1 deposits (discussed above) because higher interest rates on tier 1 (everything else being equal) would lead to a higher premium. Also, given that premium contributions would increase with the spread(s) between tier 1 and tier 2 deposits, a bank's incentive to use a high spread to attract tier 2 deposits would also be curtailed.

Third, a bank that has no insured deposits will not pay a premium, but even small amounts of insured deposits entails insurance cost. It could be argued that banks with a large ratio of tier 2 deposits are most likely also those perceived to be more safe and sound. Requiring such banks to pay a premium would amount to cross-subsidization. However, there is little doubt that all banks benefit when the financial system is sound, which would allow the payment, clearing, and settlement system to function efficiently. Payment system efficiency is a public good for which all banks, including those perceived to be safe and sound should be required to pay.

6. Supplementary capital requirements

As interest rate spreads, safety stars, and the share of tier 1 deposits are all indicators of a bank's risk, more stringent capital regulations should be set for depository institutions that exhibit high spreads, unfavorable supervisory ratings, and a low tier 1 ratio. The additional capital requirements would strengthen riskier banks by providing them with more capital cushion in the event of losses. But this requirement means that even a bank that is adequately capitalized and in good financial health would have to increase its capital simply as a result of a change in interest rate spread in order to remain in compliance with MODIS. The required capital increase for this purpose should be well defined in terms of the change in the interest rate spread, tier 1 ratio, and safety stars. In order for this requirement to serve as an effective tool for deterring excessive risk-taking by banks, there should be no doubts about the binding nature of the obligation. Therefore, the required increase in the capital base should be mandatory and not at the discretion of the supervisory authority.

7. Intensive supervision

Dealing with supervision is costly for banks. The regulations should make it clear that the intensity of supervision is explicitly linked to the tier 1 ratio, the safety stars, and interest rate spreads. The stars would be awarded based on off-site monitoring and on-site examinations by the supervisory agency. The purpose of this MODIS requirement is again to reduce banks incentives for risk-taking, and for bidding up tier 2 deposit rates to attract depositors. Banks could then set their targeted tier 1 ratio and improve on their safety to minimize supervision.

The idea of introducing a form of endogenous supervision is not new. For example, the U.S. Federal Deposit Improvement Act of 1991 imposed the requirement that supervisors take a series of mandatory and optional actions as a bank's capital adequacy declines (Prompt Corrective Action (PCA) requirement). However, a weakness of this approach is that, in determining capital ratios, it relies on book values, which might differ from the market values (Evanoff and Wall, 2000, 2001), and be subject to manipulation by banks. In contrast, a system of endogenous supervision based on interest rate spreads and the tier 1 ratio has the advantage that these variables are objective, market-based measures of risk, which do not rely on questionable accounting rules and cannot be manipulated.[19]

[19] In the same vein, in the context of mandatory subordinated debt proposals to enhance market discipline, some economists have recommended using sub-debt yield spreads as triggers for

(continued…)

To further enhance supervision, under MODIS, and following the FDIC model, the deposit insurance agency would have responsibility for banking supervision as well. This institutional setup could prevent the agency problem that would arise if monitoring of banks' risk-taking is delegated to a separate agency (Cordella and Levy Yeyati, 1998).

8. Should joining MODIS be compulsory?

Joining MODIS amounts to supplying insured deposits. The choice of what products to offer should be left entirely to the bank. A bank can decide on the basis of its own cost structure, risk aversion profile, and market conditions whether it would like to supply insured deposits. However, under MODIS, banks are required to quote interest rates on both types of deposits. Therefore, a bank that does not wish to participate in MODIS will offer a below-market interest rate on tier 1 deposits. The decision not to offer insured deposits could have important financial implications for the bank. Offering only uninsured deposits raises the additional capital requirement for the bank as discussed earlier, since the effective spread between tier 2 and tier 1 deposit rates becomes larger. Moreover, it will become more and more costly for a bank to fund its operations entirely on the basis of the higher-cost tier 2 deposits. Also, a bank offering only uninsured deposits will have to behave much more prudently, which means its income from loans may be reduced (since it has to lend to good customers who pay less interest). These conditions militate against opting out of MODIS.

B. The Optimal Level of Coverage Under MODIS

1. A simple model of bank run and moral hazard

The central message of MODIS is that the deposit insurance scheme should be market-oriented. The insurance coverage (the tier 1 ratio) is determined by the market and hence could be time varying and bank specific. This is in contrast with the current schemes worldwide in which the insurance limits are set by the governments. Are these limits appropriate? What determines how high they should be? The following model sheds light on this aspect.

We assume that there is a representative bank. Let z be the bank's ratio of insured deposits to total deposits. We make the following assumptions.

(A1) The probability of a bank run, π, is a decreasing function of z: $\pi'(z) < 0$.

(A2) Banks would make loans with returns $r \sim (\mu(z), \sigma(z))$ that depends on z:

$$\mu(z) = \begin{cases} r_f + \beta_1 \sigma(z) & \text{with probability } \pi(z) \text{ (when bank run)} \\ r_f + \beta_2 \sigma(z) & \text{with probablity } 1 - \pi(z) \text{ (when no bank run)} \end{cases}$$

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supervisory discipline under PCA. Such a proposal has been endorsed by the U.S. Shadow Financial Regulatory Committee (Evanoff and Wall, 2001).

with $0 \le \beta_1 < \beta_2$ and $\sigma'(z) > 0$.

(A3) Social welfare is increasing in the bank's mean return, μ, and decreasing in the standard deviation, σ, of the bank's returns:

$$U(\mu, \sigma), \text{ and } U_1 > 0, U_2 < 0.$$

These assumptions are all intuitive. (A1) states that as z increases, that is, as more deposits are insured, there will be less chance of a bank run. (A2) states that as more deposits are insured, there is less market discipline and hence the bank would take more risk aiming at a higher mean return. The mean return depends on the risk banks take and on whether there is a bank run. In the rest of the paper, we set, without loss of generality, $\beta_1 = 0$ and $\beta_2 = \beta > 0$. (A3) is standard and used frequently in the literature.

We need to characterize the condition that determines the socially optimal ratio of insured deposits to total deposits, z^*. There could be two formulations of social optimal problems. The first is to maximize

$$\pi(z)U(r_f, \sigma(z)) + (1-\pi(z))U(r_f + \beta\sigma(z), \sigma(z)).$$

The second is to maximize

$$U\left(\pi(z)r_f + (1-\pi(z))(r_f + \beta\sigma(z)), \sigma(z)\right).$$

The two formulations will give similar results in general and will give the same results if $U(\mu, \sigma)$ is separable and is linear in μ. In the following, we will use the second formulation for simplicity.

We now find out how U changes with z:

$$\frac{dU}{dz} = U_1 \times \left((1-\pi(z))\beta\sigma'(z) - \pi'(z)\beta\sigma(z)\right) + U_2 \times \sigma'(z) \qquad (1)$$

Assumptions (A1) and (A2) imply that the first term is positive and the second is negative. This captures mathematically the trade-off of deposit insurance. The benefit is two fold: it reduces the chance of a bank run, $-U_1 \times \pi'(z)\beta\sigma(z)$ and it raises the expected return when there is no bank run, $U_1 \times (1-\pi(z))\beta\sigma'(z)$. The cost is represented by more risk taking by the banks, $U_2 \times \sigma'(z)$.

We could proceed with a general statement that,

$$z^* = \begin{cases} 0 & \text{if } \dfrac{dU}{dz} \le 0 \text{ for any } z \in [0,1] \\ z^* & \text{if there exists a } z^* \in (0,1) \text{ such that } \left.\dfrac{dU}{dz}\right|_{z^*} = 0 \\ 1 & \text{if } \dfrac{dU}{dz} \ge 0 \text{ for any } z \in [0,1] \end{cases}$$

or we could use the following simple set of functional forms to derive more intuitive conditions for optimality:

$$U(\mu,\sigma) = \mu - \frac{1}{2}\theta\sigma^2$$
$$\pi(z) = \pi_0(1-z)^2$$
$$\sigma(z) = \sigma_0(1+\eta z)$$

where θ_0 and σ_0 are positive, $0 \le \pi_0 \le 1$ and $0 \le \eta \le 0.5$. The last parameter restriction, $0 \le \eta \le 0.5$, is a sufficient condition to guarantee that the social welfare function is concave in reduced form in $z \in [0,1]$.

Note that z is not a random but a choice variable. It is selected by the market. Once z is given, the probability of the event of a bank run is given by $\pi(z)$, and the probability of no bank runs, by $1-\pi(z)$. The above specification of $\pi(z)$ implies that as z increases, namely more insurance coverage, the probability of bank run decreases.

With these functional forms, equation (1) becomes,

$$\frac{dU}{dz} = \beta\sigma_0\left[\eta(1-\pi_0)+2\pi_0\right] - \theta\eta\sigma_0^2 + \left[\beta\sigma_0(4\eta-2)\pi_0 - \theta\eta^2\sigma_0^2\right]z - 3\beta\sigma_0\eta\pi_0 z^2 \qquad (2)$$

Evaluated at $z=0$ and $z=1$, we have,

$$\left.\frac{dU}{dz}\right|_{z=0} = \sigma_0\left\{\beta\left[\eta(1-\pi_0)+2\pi_0\right] - \theta\eta\sigma_0\right\}$$
$$\left.\frac{dU}{dz}\right|_{z=1} = \sigma_0\eta\left[\beta - \theta(1+\eta)\sigma_0\right]$$

The quadratic nature of dU/dz means that in order to have an interior solution $0 < z^* < 1$, we must have,

$$\beta\left[\eta(1-\pi_0)+2\pi_0\right]-\theta\eta\sigma_0 > 0 \tag{3}$$

$$\beta-\theta(1+\eta)\sigma_0 < 0 \tag{4}$$

We have the following proposition.

Proposition: *If* $\beta\left[\eta(1-\pi_0)+2\pi_0\right]-\theta\eta\sigma_0 \le 0$*, there should be no deposit insurance. If* $\beta-\theta(1+\eta)\sigma_0 \ge 0$*, there should be full insurance(no uninsured deposits). Otherwise, there should be partial insurance.*

Among the actual deposit insurance schemes, there is, at one extreme, New Zealand, with an explicit denial of deposit insurance. At the other extreme, there are a number of crisis countries offering blanket insurance coverage. Are these choices consistent with what the above model suggests?

According to the model, an explicit denial of deposit insurance is optimal if $\beta\left[\eta(1-\pi_0)+2\pi_0\right]-\theta\eta\sigma_0 \le 0$. This condition holds when the benefit of a reduction in bank runs as a result of introducing an infinitesimal deposit insurance coverage, $\beta\left[\eta(1-\pi_0)+2\pi_0\right]$, is smaller than the cost due to moral hazard of the coverage, $\theta\eta\sigma_0$. As we can see, this requires σ_0 and θ to be large. In other words banks should be taking "large" risks and the society should be highly averse toward risk-taking by banks. In this case, it is optimal to have no deposit insurance, because the society wants to make sure that banks take minimum risk even though this means that the chance of a bank run could be substantial. The applicability of these conditions to New Zealand is an empirical question, but it would be reasonable to suggest that in developed countries neither σ_0 and θ is likely to be very large.

On the other hand, according to the above model, full insurance is optimal if $\beta-\theta(1+\eta)\sigma_0 \ge 0$. This holds if there is low risk aversion, or if the marginal expected return of banks' risk-taking, β, is high. It also holds if $\sigma_0(1+\eta)$ is small. Note that $\sigma_0(1+\eta)$ is the standard deviation of returns to bank loans under full insurance. Small $\sigma_0(1+\eta)$ means that little moral hazard is associated with full insurance. Neither of these cases is likely to be true for crisis countries. Hence, the model suggests that full insurance for crisis countries is unlikely to be optimal. One may argue that during a crisis, the probability of bank runs is very high. This could be captured in our model by an increase in parameter π_0. Wouldn't this call for full insurance? The answer is no. The increase in π_0 will indeed raise the level of protection, since $dz^*/d\pi_0 > 0$ as proved

below, but not all the way to full insurance, because the condition for full insurance, $\beta - \theta(1+\eta)\sigma_0 \geq 0$, is independent of π_0.

We now assume that in most countries, conditions (3) and (4) hold so that the optimal insurance coverage is $0 < z^* < 1$. We are interested in how the parameters θ, σ_0, π_0 and η influence z^*.

From equation (2), it is easy to see that the more risk averse the society (the higher θ) or the more risk-taking are the banks (the higher σ_0), the more market discipline the society desires, and hence the smaller the insurance coverage, z^*. As for $dz^*/d\pi_0$ and $dz^*/d\eta$, our intuition says that $dz^*/d\pi_0 > 0$ (that is, a higher probability of bank runs raises the society's need for more deposit protection), and $dz^*/d\eta < 0$ (a higher η means a higher marginal effectiveness of market discipline exercised by uninsured depositors, hence the optimal level of insurance coverage should be lower). This intuition is borne out as we have:

$$\frac{dz^*}{d\pi_0} = \left[\frac{\sigma_0 \eta z^*}{\pi_0}\right] \frac{\theta\sigma_0(1+\eta) - \beta}{3\beta\sigma_0\eta\pi_0 z^{*2} + \beta\sigma_0\left[\eta(1-\pi_0) + 2\pi_0\right] - \theta\eta\sigma_0^2} > 0$$

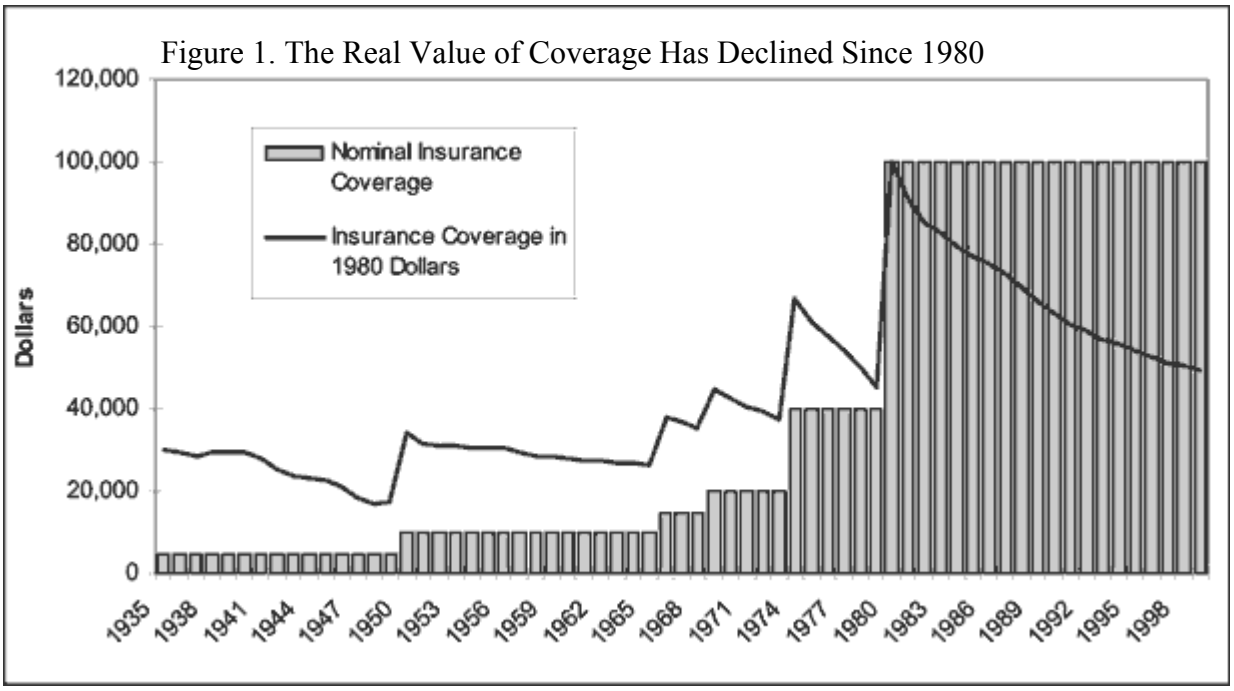
$$\frac{dz^*}{d\eta} = -\left[\frac{z^*}{\eta}\right] \frac{2\pi_0\beta\sigma_0(1-z^*) + \theta\eta^2\sigma_0^2 z^*}{3\beta\sigma_0\eta\pi_0 z^{*2} + \beta\sigma_0\left[\eta(1-\pi_0) + 2\pi_0\right] - \theta\eta\sigma_0^2} < 0,$$

2. The experiences of the United States and other countries in light of the above model

Beginning in the early 1980s, with the deregulation of the banking sector in the United States under way, banks competed more intensively for deposits and hence had to take more risk, which meant a higher σ_0. According to the above model, the optimal rate of insurance coverage should be lower in response to this higher σ_0. In contrast, the FDIC insurance coverage limit was actually *raised* in 1980 from $40,000 to $100,000. Part of the increase was due to the fact that high inflation up to 1980 had eroded the real value of the insurance coverage. But even in real terms, there was a substantial jump in coverage (Figure 1). According to the above model, this jump in insurance coverage was a wrong policy, unless we assume that the pre-1980 level of coverage was substantially below the optimal level. However, it is difficult to determine whether or not this was the case, because the government, rather than the market, set the coverage ratio and there is no indication that the government had optimality in mind when setting the pre-1980 ratio. It is therefore difficult to know in which period policy erred. [20] Under MODIS, the market determines the optimal level of insurance coverage.

[20] In retrospect, the jump of the insurance limit from $40,000 to $100,000 may have arguably contributed to the severity of the subsequent Savings and Loans crisis.

Figure 1. The Real Value of Coverage Has Declined Since 1980



Source: FDIC (2000).

The U.S. experience may be an example of too much deposit protection, but what can we say about insurance limits worldwide? According to Garcia (2000), deposit insurance coverage is 1.4 times GDP on average in Europe, 3.0 times in Asia, 3.4 times in the Western Hemisphere, 3.5 times in the Middle East, and 5.5 times in Africa. Since financial markets and market participants' approach to investment is less sophisticated in developing countries compared to the developed countries, it may be safe to assume that: (a) market discipline is weaker (a smaller η), and (b), in the absence of deposit insurance, bank runs are more likely (a higher value of π_0) in the developing countries than in the developed countries. The above model suggests that as a result of the smaller η and the higher π_0, the optimal insurance coverage is higher. In other words, since the uninsured depositors cannot effectively monitor risk-taking by banks, it makes more sense to raise insurance protection so as to reduce the likelihood of bank runs. Thus, the generally higher level of deposit insurance coverage in the African countries compared to the European countries is justifiable. However, again, with the governments setting the insurance limits, it is not possible to establish the optimality of the absolute levels of the insurance coverage in the countries of either region.

3. Possible extensions of the model

The model presented above abstracts from likely contagion effect of bank runs. To bring back the contagion effect, we could assume that the probability of a bank run for bank *i* is $\pi(z_i, z)$, where z_i is bank *i*'s ratio of insured deposits to total deposits and *z* is the average of that ratio over all banks, and,

$$\pi_1 < 0 \text{ and } \pi_2 < 0$$

These conditions state that (a) the higher the fraction of insured deposits in bank *i*, the lower will be its bank run probability and (b) the higher is the average fraction of insured deposits over all the banks, the more stable will be the banking system and hence the lower will be the bank-run probability for any individual bank *i*.

We could then solve a pseudo social optimization problem to derive the first-order conditions and then substitute $z_i = z$. This solution is different from that of a true social planner who would take $z_i = z$ into account when deriving the first-order conditions. The true social planner would recognize that an increase in one bank's insurance coverage would generate the additional benefit of lowering the bank-run probability for all other banks. As a result, the social planner would prefer a higher insurance coverage than the pseudo planner. Therefore, the possibility of contagion could create a case for a government subsidy on insured deposit accounts in order to raise the insurance coverage to socially optimal level.

Another dimension along which the model can be extended is to introduce the interaction between banks' risk-taking and the supervision by the deposit insurance agency. A suitable framework for this analysis would be a Stackelberg game in which the deposit insurance agency is the leader and the banks are the followers. The extended model could then be used to discuss the optimal threshold of tier 1 ratio that triggers supervisory actions.

IV. Comparison with the Subordinated Debt Proposal and the FDIC Model

A. Comparing MODIS and Subordinated Debt Proposals

MODIS shares some features with the mandatory subordinated debt proposals discussed in Section III. Both MODIS and sub-debt proposals rely on uninsured claims to enhance market discipline and consider the spread between the interest rates on the uninsured and insured claims as an accurate measure of a bank's risk. This spread is a factor in the determination of the deposit insurance premium, and can serve to trigger supervisory actions.[21]

[21] For example, Calomiris (1999) recommends that banks should pay an insurance premium which varies month-to-month with the actual interest rate spread they pay above the treasury bill rate on subordinated debt.

The main difference between MODIS and the subordinated debt proposals is that the former relies almost entirely on market forces in determining the amount of insured deposits. Whereas under MODIS, the uninsured share of deposits and the interest rate spread would be endogenously determined by the market, sub-debt proposals envisage the introduction of various restrictions on banking activities. These restrictions include: ratio of sub-debt to total assets,[22] sub-debt issues of two years maturity, 1/24 of which would mature each month Calomiris (1999), and the requirement that, at the time it is placed, the interest rate on this sub-debt should be within a predetermined limit.

The MODIS proposal also eliminates an important disadvantage of the sub-debt proposals. Under the latter, when a bank is poorly capitalized, subordinated debt becomes de facto equity. In that event, sub-debt holders have no incentives to impose discipline on banks (Dewatripont and Tirole, 1993b). This would not be the case in MODIS, because uninsured depositors would still be senior to other creditors.

Another factor that suggests that MODIS would work better than subordinated debt proposals is that there are indications that the uninsured deposit market develops faster and deeper than the sub-debt market. In the United States, for example, the uninsured deposit market is much larger than the sub-debt market (Lang and Robertson, 2000). Also, there are doubts on whether compulsory sub-debt issues would be feasible for small banks. Given the relative lack of complexity of small banks, and the sizable financial burden of issuing sub-debt securities, it is likely that only large banks would be able to issue subordinate debt in amounts sufficient to ensure a liquid market for the debt.[23] Therefore, most proposals for mandatory sub-debt advocate the requirement only for large banks.[24] On the contrary, uninsured deposits can easily be issued by large and small banks alike. In fact, in the United States, uninsured deposits are already an important source of funds for small banks: while only a few small banks have issued sub-debt, as of mid-1999, uninsured deposits accounted for more than 13 percent of total deposits at banking institutions with less than $100 million in assets (Lang and Robertson, 2000). Furthermore, the MODIS proposal is likely to be more suitable for developing countries than the sub-debt proposals, because offering uninsured deposits requires a lower level of market sophistication, and it is less expensive for banks, than issuing subordinated debt.

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[22] The Shadow Financial Regulatory Committee recommends 2 percent as the minimum ratio of subordinated debt to assets.

[23] For instance, in the United States, while almost 90 percent of bank holding companies with assets of $10 billion or more had issued subordinated debt in 1998, only 6 percent of bank holding companies with assets between $50 million and $500 million had done so (Lang and Robertson, 2000).

[24] For instance, the Shadow Financial Regulatory Committee (2000) suggests exempting banks with assets under $10 billion.

B. Comparing MODIS and the U.S. Deposit Insurance System

As recognized by the FDIC, the current U.S. deposit insurance system has a number of problems (FDIC, 2000), including fairness, business cycle considerations, and effectiveness of the cap on insured deposits. These shortcomings have prompted a review of the system by the FDIC. This section highlights how MODIS overcomes some of the weaknesses of the current U.S. deposit insurance system.

1. Fairness

The FDIC rules can be characterized as unfair for several reasons. During the first 50 years of the FDIC, every insured institution was assessed the same insurance premium, which was 3.3 to 8.3 basis points, depending on the economic condition (FDIC, 2000). This method of assessment appeared unfair because the good banks were effectively subsidizing bad ones. Therefore, after the mid-1990s, the FDIC switched to risk-adjusted insurance contributions. In the new system, institutions that are best rated are not required to pay deposit insurance premiums at all. As a consequence, only a small share of depository institutions pay contributions to the insurance fund. For example, only 7 percent of all banks and thrifts paid a premium at the end of 1999. Thus for highly-rated banks, which can raise their insured deposits without paying a premium, the marginal cost of deposit insurance is zero. Moreover, the assessment of banks' portfolios is based on the CAMELS rating system, which provides useful qualitative information on the banks, but is a poor leading indicator of bank failure. If only CAMELS 4- and 5- rated banks were considered, bank regulators would have only identified 46 percent of the banks that failed in the late 1980s and early 1990s (Gup, 1998). In fact, the FDIC's most costly bank failures in recent years have occurred rather abruptly among institutions that had consistently reported strong earnings and capital (FDIC, 2000, p. 17).

Under MODIS, the insurance premium is set according to the following formula, as discussed above, $P = \alpha \left[\frac{r_1 + s}{1 - r_1 - s} \right] I$, $\alpha > 0$. This implies that a strong bank, able to attract deposits while maintaining a lower spread than a weak bank, would pay a lower premium. MODIS is therefore fairer for the strong banks compared to the FDIC practice in its first 50 years. Compared to the FDIC's recent practice, MODIS helps reduce the disadvantage of having a small percentage of depository institutions bearing the entire burden of funding the FDIC.

2. Business cycle considerations

The MODIS formula for calculating insurance contributions gives the premium the role of an automatic stabilizer. During a boom, banks compete more intensely in raising the spread to attract deposits and fund more adventurous projects. Thus the premium would increase. During a recession, the opposite is true. In this way the deposit insurance fund would accumulate insurance premium receipts during good times when banks can afford it, while in bad times it would put a lower burden on banks' resources. This is in contrast to the current FDIC practice,

whereby banks are charged with a high insurance premium to fund insurance losses when they can least afford it (FDIC, 2000, p. 5).

3. Effectiveness of a cap on insured deposits

Under the current FDIC regulations, the coverage limit is $100,000 per person, per institution, but complexities of the laws can make the limit greater in practice. The statutory limit can be circumvented by spreading deposits across various institutions or different types of accounts. Therefore, the FDIC emphasis in protecting small depositors turns out to be socially wasteful, as large depositors spend time and energy to overcome the insurance cap by opening multiple accounts using names of relatives.

MODIS would allow savers with different degrees of risk-aversion to obtain a different degree of coverage. In this sense, it is a proper insurance mechanism. At the same time, by offering alternative combinations of risk and returns on deposits, it would give depositors different investment options. Depositors would weigh the benefit of a higher rate on tier 2, against the safety in tier 1. They would compare a profile of interests quoted by banks, and their tier 1 ratio, plus the safety stars awarded by the banking regulator. Then, they would decide in which bank to put their money, and whether to opt for tier 1 or tier 2 deposits. In contrast, in a limited deposit insurance system, with a uniform cap on insurance coverage, savers cannot choose their desired degree of coverage, nor can they decide among alternative combinations of risk and returns on deposits.

Moreover, under MODIS, the coverage limit would be determined by the market, as the market would set the equilibrium tier 1 ratio for each bank, which would vary over time. Instead, in a limited deposit insurance scheme, like the current U.S. system, the statutory coverage cap is completely arbitrary. Also, as the limit is set in nominal terms, its real value diminishes continuously. Finally, under MODIS, agents are responsible for their own actions. Depositors would be aware that when they choose an uninsured deposit to enjoy higher interest returns, they would be taking a risk. They will have no one to blame, but themselves, if the banks that took their deposits failed.

V. CONCLUDING REMARKS

An ideal deposit insurance system strikes a delicate balance between the benefit of a safety net and the cost of moral hazard. The deposit guarantee schemes in effect in the IMF member countries do not seem to achieve this balance. Most countries have adopted some form of partial deposit insurance system, with little or no market-related features, that suffers from the shortcomings explained in this paper. There are also a few extreme cases of explicit blanket guarantees (adopted mainly by countries during crises and by Japan), implicit (blanket?) guarantees (China), and explicit denial (New Zealand). The problems associated with blanket guarantees are well recognized by the countries adopting them, and in any case, these types of guarantees are explicitly announced to be temporary. The effectiveness of the explicit denial approach still remains to be seen. The banking system in New Zealand, which is largely foreign

owned, is doing well now, but it remains to be seen whether the explicit denial of deposit insurance can handle a crisis situation in the future.

This paper has argued that within the wide spectrum of the possible safety nets, the optimal system should be determined by the market. Based on this principle, the paper proposes a system of deposit insurance that minimizes distortions and embodies fairness and credibility, two characteristics that are essential for a viable and effective deposit insurance system.

MODIS, as proposed in this paper, is designed such that the bank that takes more risk pays a higher insurance premium. There is no direct subsidization across banks. MODIS is also designed to allow a choice of risk and return combinations to bank clients. A person who puts funds in a bank's uninsured account in search of higher returns would have to monitor the bank closely and has no one to blame if the bank fails. In this sense, MODIS is fair.

MODIS is credible and market friendly. The power of the market lies in its role to aggregate individual pieces of information. Asymmetric and incomplete information may hinder the market at times but no regulation or supervision can effectively replace its function. MODIS relies on individuals to decide how to allocate their funds, among banks, and between insured and uninsured accounts. MODIS also relies on the bankers themselves to decide how competitive they want to be.[25] The fact that MODIS only covers the insured account and that the intensity of supervision responds to risk evaluation means that the insurance payout burden under MODIS is likely to be manageable and hence the system is credible.

[25] A different, and less market-friendly, two-tier deposit insurance proposal is outlined in Walker and Hoontrakul (2001). The proposal's main weakness is that it makes deposit insurance compulsory for small deposits but voluntary for large deposits.

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