

The Foundations of Risk Regulation for Banks: A Review of the Literature

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Introduction

Since the Great Depression, the stability of the international banking industry has been periodic. In the 1950s and 1960s, for example, the industry was stable in North America, but the 1980s witnessed the greatest frequency of failures ever recorded during the period from the Great Depression to the 1980s (Diamond and Dybvig 1986). In a recent World Bank publication, Caprio and Klingebiel (2003) document 117 systemic banking crises observed in 93 countries since the late 1970s. Over the same period, 51 non-systemic crises were observed in 45 countries. The causes vary from runs on banks to runs on national currencies, but these runs represent a subset of all the cases documented. Of course, many of the crises come from low-income countries or from transitional economies.

It is important, however, to mention that during the 1983–86 period, 15 members of the Canadian Deposit Insurance Corporation (CDIC) failed. Two of these failures were from banks. In the United Kingdom, three major banks failed in the 1984–95 period, while 1,400 savings and loans and 1,300 banks failed during the 1984–91 period in the United States. A large part of these failures is explained by the unique structure of this country's banking industry, which is composed of a large number of small and vulnerable

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banks with efficiency and diversification problems (Berlin, Saunders, and Udell 1991). Savings and loans failures alone accounted for more than \$180 billion or 3 per cent of GDP. These events motivated the Bank for International Settlements (BIS) Accord in 1998 and the United States of America's new Federal Deposit Insurance Corporation Improvement Act of 1991. The Canadian Deposit Insurance Corporation Act was amended as well. Since 1999, the CDIC has been applying a structure of differential premiums modelled on the individual risk principle. A final noteworthy fact is that the level of losses from bank failures in the 1980s matched those recorded for the 1865–1930 period.

Financial markets have changed dramatically over the past 25 years, introducing more competition for and from banks: new trading technologies have emerged; many types of derivatives contracts are currently traded by banks and their competitors; international banking has grown; and various regulatory changes have been implemented. To be specific, the 1988 Basel (or BIS) Accord introduced international capital regulation for credit risk in the G-10 group of countries; and, in 1996, the Accord was extended to market risk, including positions in foreign exchange, traded debt securities, traded equities, commodities, and derivatives (Crouhy, Galai, and Mark 2001). More than one hundred countries apply these rules in 2003. The year 2004 is expected to usher in significant changes modifying capital requirement rules for credit risk, and the year 2006 should witness operational risk regulation. Effects of the new regulation on bank risk are far from obvious, but it seems to have induced banks to maintain higher capital ratios (Jackson et al. 1999). It is not clear, however, that these higher ratios represent lower risks, because the Accord has also been criticized for having introduced distortions in bank behaviour.

Securitization of bank credit portfolios has become widespread in industrialized countries. Banks used to sell their mortgage loans, for such loans represented accurately evaluated risks. But since the advent of e-finance, it is possible to expand this activity to other types of loans, including those made to small businesses. This type of activity also allows banks to have a much more liquid credit-risk portfolio and, in theory, to adjust their capital ratio to an optimal economic level rather than adhering to the ratio decreed by the Basel Committee. One important regulatory issue is to know how this activity has affected the risk of banks (Dionne and Harchaoui 2003).

Bancassurance is another financial innovation that is now authorized in many industrial countries. It is at the core of future concerns in the banking milieu and removes the barrier between traditional activities providing insurance products and those offering financial services. The common target becomes individual or household financial portfolios and the integrated

management of the assets they generate. Bancassurance is highly developed in several countries, including France, where 61 per cent of life insurance collection takes place at bank windows. In non-life insurance, the penetration of bancassurance is more modest, representing only 8 per cent of turnover (Benoist 2002; Dorval 2002; Joly 2002). How this new integration of activities may affect the bank's role as a creator of liquidity is another issue that the regulator must consider when setting rules for the banking industry.

The corporate governance of banks is under as much scrutiny as that of many enterprises (Macey and O'Hara 2003). According to these authors, the special nature of banks as concerns deposit insurance may generate more moral hazard than in other markets. The structure of banks' balance sheets, with their high leverage conditions and their variation in liquidity for assets and liabilities, seems to support the argument that bank directors should assume fiduciary obligations to fixed claimants as well as to equity claimants. They also believe that bank creditors should be able to sue directors for violations of their fiduciary responsibility for prudence and loyalty. More concerned with risk management, Blanchard and Dionne (2003) proposed that members of the board's risk-management committee must be competent and independent, meaning that they should not be allowed to hold options to purchase the bank's shares. We must also not forget that many North American banks were involved in Enron transactions that may be considered problematic in terms of ethics and governance.

According to Diamond and Diba (1986), the macroeconomics of banking has limited banks to a money-supply role. However, banking regulations cannot limit the role of banks to macroeconomic considerations, because this approach may destroy the nature of banks by preventing them from offering other services, such as liquidity, that are also important for the economy. This criticism of the macroeconomic approach to banking regulation is fundamental and has been supported by many authors over the past 15 years. In fact, the microeconomics of banking is now at the heart of developments in the discussion of banking regulations, although macroeconomic considerations, such as the transmission of monetary policy, must remain central in the design of an optimal system (Van den Heuvel 2003).

We shall focus our attention on banking regulation by reviewing the microeconomic foundations of banking. Many authors find that the regulation of bank risk is not at its optimal level (Rochet 2004; Freixas and Santomero 2002; Santos 2000). Some of the measures proposed are *ex ante* (preventive), others are *ex post* (compensation). Our emphasis will be on banking regulation and its relationship to the new banking theories,

especially those concerning the bank's role as a financial intermediary and the links between bank runs and deposit insurance. We shall take a close look at the role that asymmetric information plays in the design of deposit insurance contracts. The risk-based pricing of deposit insurance will also be analyzed. The evolution of international banking's regulation of capital requirements will be reviewed, along with the introduction of other market disciplines such as subordinated debt. Finally, the management of banking regulation and the governance of banks will be discussed.

Market imperfections must also be considered in any discussion of banking regulation. We shall not, however, cover this part of the literature, which has been widely examined elsewhere (see, for example, Freixas and Rochet 1997; Ottawa 1998; Roy 1997, 2001).

Various forms of risk regulation have been suggested. One possibility is to regulate the freedom to withdraw deposits. Another is to let depositors withdraw their money and have the central bank or deposit insurance reimburse the depositors for their losses. When such public regulation is properly understood by all participants, bank runs related to panics will be prevented. This scenario is feasible only if the decisions of depositors are independent of economic conditions and limited to one or very few banks. A depositor's decision to withdraw may also occur when overall economic factors are sound, or even when there is confidence in the system.

For example, bank runs may be explained by the failure of many small firms or by borrowers facing negative economic conditions. The borrowers fail to reimburse their banks, and depositors may become nervous about the solvability of the banks. If this behaviour is not just local but affects many depositors from many banks, we may see an economic panic where many depositors will lose confidence in the banking system, withdraw their money, and thus create systemic risk or bank panic that may prove very costly for the entire economy. Other forms of protection against systemic risk must be considered for these events; simply offering deposit insurance may not be sufficient. In other words, deposit insurance alone may not maintain the confidence necessary to prevent the system from collapsing. At this stage, however, there is no satisfactory model for systemic risk. (See Rochet and Tirole 1996, for a first attempt; also see Allen and Gale 2000.)

Other forms of regulation, such as those dealing with capital adequacy, are more closely associated with prevention than with compensation. Since the implementation of the 1988 Basel Accord, many countries have been applying risk-based capital ratios to monitor bank risk. This practice has been questioned because of distortions it may have introduced in bank behaviour. One possible problem is that traditional capital ratios may not measure the true risk that banks face. Recent reports on modifications of the

current regulation indicate that there is no consensus on how to regulate bank capital (Santos 2000).

Before discussing regulation in the banking sector, we must introduce the key concept of bank runs, because this is the basic event justifying such regulation. Bank runs are caused by depositors trying to withdraw their assets from the bank to avoid a loss of capital. Runs may be set off by a threatened drop in the value of bank assets or of loans made through the monetary system, and they may result in a loss of confidence in banks. Yet recent empirical studies show that the runs occurring in the Great Depression did not necessarily conform to that definition. Bank runs do not require a drop in the value of underlying assets (Bernanke 1983). Variation in the costs of intermediation services may also affect the economy, and such variation has been shown to be a factor in the depth and duration of the Great Depression. Withdrawals may be explained by other reasons: a run on a particular bank may also affect the mood of depositors in other banks and spell danger for the entire system. Speculative runs do occur, but bank runs can also be motivated by rational behaviour and may occur in healthy banks. In other words, even banks known to be safe and efficient have gone bankrupt.

Bank runs usually generate systemic risk and do real damage, because they interrupt the flow of profitable investments and real consumption (externalities, because the financial markets are not complete). A number of public interventions are available to limit the externalities related to bank failures brought on by bank runs, and we plan to cover them in this survey.

The rest of the paper is organized as follows. Section 1 outlines a brief history of banking regulation. The nature of banks is then discussed in detail in section 2. Sections 3 and 4 describe the different forms of regulation and deposit insurance. In the second part of the paper, we cover subjects such as capital-adequacy regulation (section 5), precommitment to reduce audit costs (section 6), and the management of banking regulation (section 7). The concluding section summarizes the ideas and discusses various open issues related to banking regulation.

1 History of Banking Regulation

John Kareken (1986) has documented the history of U.S. regulations governing commercial banks from 1863 to 1986. He has also proposed an analysis on how banks should be regulated.

Before 1863, only state governments had the power to regulate banks, and this consisted merely in issuing bank charters. In 1863, however, the federal government began to take an interest in bank regulation. The National Bank

Act of 1864 provided that a federal agency, the Office of the Comptroller of the Currency (OCC), would have the power to charter banks. The federal government's bank chartering powers expanded rapidly. In 1864, the federal government passed the National Bank Act, which stipulated that newly chartered banks had to buy federal debt and issue notes provided by the treasury. This was done partly to meet the federal government's need for money to face the fiscal crisis arising in the aftermath of the Civil War. In 1913, the Federal Reserve Board (Board of Governors) was created along with 12 regional Federal Reserve Banks.

At the beginning of the new regulatory period, the federal government was concerned mostly with the quality of assets. During the early years, federal banks were not able to have branches, and this limited their geographical expansion. In 1933, federal banks attained parity with state-chartered banks in their ability to open branches. However, they were still prohibited from creating interstate branches and hence from national banking. The same restriction was imposed on bank holding companies. The federal government became the dominant figure in the management of banking regulation when it implemented federal deposit insurance in 1934.

The 1950s brought significant changes. The Bank Holding Company Act was passed in 1956, and important acquisitions and mergers—particularly in New York City—took place. In 1960, the Bank Merger Act establishing how and from whom permission must be obtained for mergers became part of the regulation. Before 1963, the Department of Justice was not involved in bank mergers, because it was believed that the antitrust statutes did not apply to banks. In 1966, however, a new act gave the Department of Justice the right to challenge any bank acquisition or merger approved by the OCC, the FDIC (Federal Deposit Insurance Corporation), or the FRB (Federal Reserve Board).

Regulating risks and monitoring safe banking became important issues in the earlier years of federal government interventions. One of the goals was to make the supervision of banks more effective. Another was to create a lender-of-last-resort mechanism, particularly designed for banks in the federal system with liquidity problems—a kind of deposit insurance system. However, the board allowed many banks to fail in the early 1930s. The federal government's role as insurer began in earnest in 1934, with its creation of the FDIC, which was allowed to offer coverage to banks outside the federal system. In this, the federal government achieved one of its long-standing objectives: to have all banks subject to its regulation. In Canada, the CDIC was created only in 1967, possibly because the banking industry is very different from that in the United States.

Another important historical fact, as concerns the topic under discussion, was the decision to design federal deposit insurance programs with identical premiums for all banks. It is well known that this type of insurance pricing is a potential source of adverse selection, since it reduces the insurance costs of bad risks and, thus, facilitates their entry into the industry. The federal deposit insurance systems were also designed to provide full coverage up to a maximum high enough to guarantee full coverage to the great majority of depositors. This second characteristic may generate a moral-hazard problem, since depositors' incentive to monitor bank risk is likely to disappear entirely under full insurance. Insurance pricing based on individual risk is used in many insurance markets to reduce this form of moral hazard (Winter 2000). Is this type of pricing sufficient for banks? The answer would appear to be no, and we will see why in the following sections.

After 1988, new regulations were introduced around the world; they included the following:

- The U.S. FDIC act was improved in 1991, as was the CDIC in 1999.
- England integrated the supervisory control over the activities of banks, insurance brokers, and securities dealers.
- The G-10 countries harmonized their regulations in 1988 with the Basel Accord. They are currently revising the Accord to increase market discipline.
- The European Central Bank was created.

In fact, current regulation takes many forms. Generally speaking, public intervention is concerned with:

- providing emergency liquidity assistance;
- designing optimal deposit insurance schemes;
- setting minimum solvency requirements for banks;
- supervising the banking industry by monitoring banks and closing those that do not comply with regulations.

2 The Nature of Banks

By definition, a bank's daily operations consist in granting loans and receiving deposits. A bank differs from a mutual fund, which invests deposits in traded securities, and from a finance company, which finances loans by issuing debt or equity (credit institutions) (Freixas and Rochet 1997). The four main functions of a bank are:

- To offer access to a payment system that reduces transactions costs to a minimum in the economy.
- To transform non-liquid assets into liquid assets. This function introduces a liquidity risk (arising from the difference in duration between loans (assets) and deposits (liability)), because banks hold only a fraction of the deposits.
- To manage risks, including that of liquidity. This has been an important new function since the early 1980s. It has modified significantly the basic role of banks in the economy as well as the regulation of that role. This new activity was developed mainly to meet competition from other financial institutions. Many transactions, such as swaps on interest rates, are not related to the bank's liabilities or assets but rather to random cash flows. They are therefore classified as off-balance-sheet operations. Moreover, some of these risk-management positions may actually flirt with risk to increase profits.
- To process information and monitor borrowers to develop a long-term relationship with borrowers and to limit the effects of information problems.

Before considering the connection between off-balance-sheet operations and risk-management activities, let us review the connection between the role of banks in creating liquidity and their role in processing information and monitoring borrowers, since these two roles are closely linked.

The balance sheet corresponding to the basic role of a bank is represented in Table 1.

Table 1
Bank balance sheet

Reserves	Deposits
Loans	Equity capital

According to Diamond and Dybvig (1983, 1986), the main services provided by banks are related to the following accounts:

- Deposits are banks' principal liability. The other important entry is owners' equity;
- Loans are the principal asset.

The basic roles of a bank are to receive liquid deposits and lend money in both short- and long-term illiquid forms. In that sense, banks create liquidity, a function to which other financial institutions do not have access. This is true, because, as Table 1 indicates, banks are obliged to keep only a fraction of deposits in liquid reserve. The loan loss reserves represent the expected credit loss. Banks are, however, obliged to meet all the demands for liquid withdrawals made by depositors. This role poses the major risk for banks. As long as the reserves are sufficient to cover all withdrawals, the banking system will work efficiently. If, for whatever the reason, depositors' demands for liquidity at a particular bank exceed that bank's reserves, it will be obliged to liquidate its illiquid assets (or loans) and may go into bankruptcy if it cannot respond quickly enough.

In that sense, banks are financial intermediaries that provide services to both sides of the balance sheet. Liability services, such as holding deposits, are offered to the depositors. In this way, banks offer depositors the possibility of returns they could not obtain by trading their assets directly with borrowers (Bryant 1980). This transformation of illiquid loans into liquid deposits is the definition of creation of liquidity proposed by Diamond and Dibvig (1983, 1986). The clearing of transactions and holding of currency inventories are the two most important liability services offered by banks. These services now have many substitutes in the economy, and these transformations have weakened the traditional links between the money supply and bank deposits. Consequently, banks may become less important for monetary policy. (See, however, recent papers on monetary policy transmission and, particularly, Van den Heuvel 2003.) Banks also offer a form of portfolio diversification or insurance to depositors by diversifying their deposits across many lending contracts instead of leaving them as a fraction of a single contract. In other words, the failure risk of a particular investment project is shared by all depositors. This risk sharing is usually seen to be efficient when compared with alternatives in the financial markets.

This type of service differs from the federal funds that create liquidity within the banking industry. For example, small deposit-rich banks may lend their extra deposits to large deposit-poor banks that, in turn, lend the money they borrow. In this case, the large banks provide the transformation service (from illiquid loans to liquid deposits), while the small banks do not (from liquid deposits to liquid deposits). So there is no double counting.

On the liability side, banks also play a protective role for ex ante, risk-averse depositors who are uncertain about the timing of their future consumption needs. Indeed, Bhattacharya, Boot, and Thakor (1998) show that banks are efficient in providing short-run consumption possibilities to depositors,

which is an important supplementary role on the liability side. In other words, banks improve risk sharing and enhance ex ante welfare by promising higher payoffs for early consumption and lower payoffs for late or delayed consumption in comparison with a world where such intermediaries would be absent. Consequently, this intermediation improves liquidity and risk sharing for many economic agents. (Also see Diamond and Dybvig 1986.)

Financial intermediary services on the asset side are motivated by information problems in the lending market: ex ante monitoring costs (adverse selection) and contract monitoring costs (ex ante and ex post moral hazard). This bank activity increases welfare when monitoring costs in the economy are high, because banks can often count on economies of scale in their management of monitoring costs (Diamond 1984). Without such intermediation, monitoring costs would be duplicated by investors or depositors. Competitive sellers of such services are still viewed, in the literature, as imperfect substitutes for banks: problems of credibility and less efficiency in capturing the full returns of monitoring. Moreover, institutions capable of monitoring many possibly interrelated projects provide depositors or investors a certain degree of diversification.

Converting illiquid assets into liquid assets is the main bank service associated with both sides of the balance sheet. This transformation service is crucial when considering different forms of regulation. The conversion of illiquid claims into liquid claims is like averaging out the large numbers of individual depositors and allowing a transfer of ownership without transferring the loan-monitoring task of the banks (this feature keeps other institutions and depositors from imitating banks). As pointed out by Diamond and Dybvig (1983) and later by Diamond and Rajan (2001), this dual role makes banks fragile.

As a complement to this argument, Bhattacharya, Boot, and Thakor (1998) present a standard banking model with either ex post moral hazard or ex ante adverse selection in the loans market. They confirm the usual results (Gale and Hellwig 1985): debt contracts are optimal in the presence of these information problems, and efficiency can increase with the size of banks, because banks can use the law of large numbers to obtain, on average, non-negative profits when investment projects are independent. Dionne and Viala (1992, 1994) have shown that debt contracts can also be optimal when both forms of moral hazard are present simultaneously and when audit costs are high when compared with incentive costs (Innes 1990). One can therefore conclude that, in the presence of asymmetrical information problems, debt contracts should be optimal (particularly in long-term relationships) and large banks should be efficient. Consequently, regulation should not limit

banks in their use of debt contracts (when audit costs are sufficiently high) and should not introduce restrictions on the size of banks, as long as there is competition.

The difficulties for a bank begin when many individuals start to withdraw their money earlier than expected. In such a scenario, consumption and profits may become unfeasible if liquid deposits are not sufficient. Because banks may not be able to satisfy the demands for withdrawals, other individuals may be induced to withdraw their money and a bank run is possible. Such bank runs are socially counterproductive, since they force premature liquidation of entrepreneurs' projects and reduce consumption possibilities.

This type of externality is often used to justify banking regulations, but some authors have argued that, when shocks to individuals are identically and independently distributed (i.i.d.), it is possible for a bank to anticipate them, and, under full commitment, regulation is not necessary. However, full commitment is never observed (even full commitment by governments). Moreover, decisions are often correlated, and, in that situation, matters are more complicated and liquidity protection cannot be achieved without some form of regulation.

3 Regulation

The main argument for regulation is that banks are special. When they fail, there may be third-party effects, because bank liabilities come in the form of money or very liquid assets.

The goal of banking regulation is to provide a safe and sound banking industry that will protect depositors and promote good investment policies among banks. Since banks constitute a special industry, the instruments of banking regulation must then be specific to that economic sector (Freixas and Rochet 1997). Banking regulation may not always, in the strictest sense, manage to improve welfare. From the viewpoint of prudential regulation (Dewatripont and Tirole 1994), banking rules may create at least two types of distortions: excessive risk taking by managers and implicit taxes that exhaust the entire surplus (Bhattacharya and Thakor 1993). Consequently, the basic form of bank regulation may explain the need for more sophisticated forms of regulation than those used to protect liquidity risk, and such forms must be sophisticated enough to supervise the way banks manage their risks.

The current regulation of bank risk management has three pillars:

- Adequate instruments to compute capital requirements and assess risks on private markets.
- Appropriate supervision of banks. It is important to have clear statements as to when and how supervisors will intervene.
- Practice of market discipline. There is also a need for clear statements regarding how market discipline can be generated.

Let us begin with the protection of liquidity risk. According to the discussion on basic banking activities, economic regulation is explained by the fact that society wants a guarantee of transaction balances that can prevent the economic externalities of liquidity contraction and also wants a public service that protects the average unsophisticated depositor against monetary losses. Some have also argued that, to have a stable monetary system, the balances in demand deposit or transaction accounts must be free from default risk. In other words, when banks fail, there may be third-party effects, because banks' liabilities are in the form of money (Kareken 1986).

Because banks practice payment on demand and on short notice, lack of liquidity is much more critical for banks than for other businesses. Therefore, if depositors believe that the liquidity of an institution is suspect, they will withdraw their funds, since many safe alternatives exist.

Banks are therefore particularly vulnerable to runs. Runs can easily spread to other institutions, which can also be put in danger. This may result in financial stringency and contraction. Clearly, it is not simply losses from isolated failures that concern authorities but also the domino effect of such events on other financial institutions, government securities, and safe havens. In panics, banks might have to suspend their conversion of deposits into currency, call back loans, and thus threaten the entire economy with illiquidity.

Many solutions for reducing the social costs of bank runs have been discussed in the literature. In the 1980s, when risk-management problems and off-balance-sheet transactions were not yet significant factors in banking activities, three such solutions were already popular: deposit insurance, government loans, and suspension of the convertibility of deposits into currency.

Suspension of convertibility does not solve the liquidity demand problem, except in situations where the bank run is motivated by fears based on false information. But it does provide temporary relief. According to Bhattacharya, Boot, and Thakor (1998), and as a general rule, restricting

withdrawals to the liquid funds available is not fair to depositors. Deposit insurance is better, in the sense that it limits withdrawals to the strictly necessary and forestalls the possibility of panic by maintaining confidence in the banking system.

For many years, deposit insurance has been the most effective device for preventing runs, because a single bank is not risky for clients. In that sense, deposit insurance improves welfare by protecting the creation of liquidity, which, up to now in this survey, has been the major role of banks. This is the standard welfare-improving argument associated with the presence of insurance in the absence of information problems. But here the welfare argument for the use of deposit insurance has two dimensions: (i) in case of bankruptcy, it covers depositors; and (ii) its availability reduces the threats of bank runs and systemic risks. Matters are not, however, quite so simple when information problems associated with deposit insurance arise, because problems of this sort may destroy the insurance value. Before analyzing the nature of deposit insurance in the presence of information problems, let us first discuss another solution to the bank-run problem: a 100 per cent bank reserve.

This solution limits banks to their liability side and ends their transformation of illiquid assets into liquid ones. The 100 per cent bank reserve has been categorized as a dangerous alternative to deposit insurance (Diamond and Dybvig 1986), because it will introduce substantial economic damage by reducing the level of liquidity. According to the authors, the same problem of liquidity risk will reappear in the long run, when society will be faced with controlling the other institutions, which will have rushed into the vacuum left by the banks in the financing of investment projects.

According to Goodhart (1987), even narrow banks would require the assistance of central banks, because of the composition of their asset portfolio. So, to eliminate banking regulation by means of a 100 per cent bank reserve, bank portfolios would have to be limited to very special assets, such as non-risky bonds or investments in riskless securities.

One way to reduce the insurer's and regulator's monitoring costs is to consider the possibility of exposing banks to subordinated debt. If banks had to rely on short-term subordinated debt open to frequent renegotiation, private lenders would be able to discipline the banks, but the banks would be more fragile. Other regulatory instruments considered for the security of the banking industry are: setting ceilings on deposit-interest rates; limiting entry, branching, and networking; and restricting mergers to safe and strong banks.

4 Deposit Insurance

In the United States, deposit insurance covers a maximum of US\$100,000 for an individual account. In Canada, the maximum is Can\$60,000, and in England, it is £31,700. It has often been argued that more failures are observed in countries where the insurance coverage is generous, because bankers, less closely monitored by their depositors, take excessive risks. In New Zealand, since 1994, there has been no deposit insurance. Banks are not supervised by the regulator but are required to disclose information on their accounts, and bank directors are personally liable in case of false disclosure statements.

It would be interesting to investigate the causes of bank failures before the creation of deposit insurance. And what were the economic consequences of such bankruptcies? Bhattacharya, Boot, and Thakor (1998) summarize some empirical evidence and compare the United States with Canada.

It has been argued that deposit insurance has a social cost, because the insurer must tax all individuals to finance potential withdrawals from a particular bank. This is not a valid argument, because, *ex ante*, all depositors would have agreed, in a free-choice insurance market, to pay that cost to have access to the insurance coverage. This is like saying that liability insurers introduce a social cost when they collect premiums to finance accident claims. On the contrary, it is easy to show, under perfect information, that risk-averse individuals are always willing to pay a fair premium to reduce the risk of accident. A fair premium means a premium equal to the insured's expected claim. Under these conditions, full coverage is obtained or the risk eliminated for the insured, in this case for the depositors. The further advantage of full deposit insurance is that it can reduce runs. In other words, with full deposit insurance, other safety regulations would not be necessary, because an appropriate pricing system for deposit insurance can be used without costs.

When there is imperfect information, either between insurers and bank managers or between depositors and bank managers, full coverage with an average premium corresponding to average risk in the banking sector or industry cannot be optimal and may prove to be a less efficient regulatory mechanism than other market discipline mechanisms.

There are two broad information problems in the insurance literature: adverse selection and moral hazard. Adverse selection is due to the fact that exogenous factors affecting individual risk are observable by the insured (here the banks) but not by the insurer. *Ex ante* moral hazard is explained by the fact that the policy-holder's prevention activities are private information and costly to monitor by the insurer, whereas *ex post* moral hazard is

explained by the insurer's difficulty in observing the true nature of the accident (bankruptcy) when it occurs.

For deposit insurance, adverse selection may be particularly important when a new bank enters the market or when merger and acquisition activities change the nature of a bank. They may also become important when banks change their business activities. Chan, Greenbaum, and Thakor (1992) have concluded that setting an optimal pricing for banks is practically impossible in a pure adverse-selection model with self-selection of the insurance contracts among different risk types. Freixas and Rochet (1998) show that optimal pricing is feasible in a world where banks manage deposits, but involves cross-subsidies between banks: efficient banks would be called upon to subsidize inefficient ones. Consequently, this might affect the industry's entry and exit decisions. But this conclusion comes from a particular model (with self-selection) that is not necessarily appropriate for our purposes. How is it that insurance companies are able to insure large corporations and reinsurers are able to insure insurance firms—both types of institutions that are almost as complicated as banks?

For ex ante moral hazard, the main prevention activities that are not observable by the insurer are related to the selection of investment projects or to any other risky activity that affects the probability of bank failure. As concerns ex post moral hazard (often related to fraud), the insurer's ability to observe the exact nature of the residual loss is important. Auditing losses is the more appropriate mechanism for obtaining ex post information. Interim audits may also be convenient when the insurer agrees to cover partial losses instead of waiting for bankruptcy.

Let us discuss in more detail the ex ante moral-hazard problem, since, according to the literature, it seems to be the more significant problem. However, we must say that we have not yet found any empirical studies on the significance of information problems in the deposit insurance business. (On empirical methodologies for measuring the significance of information problems in insurer portfolio, see Chiappori (2000) and Dionne (2000). It is noteworthy that empirical results in the automobile insurance sector show ex ante optimal risk classification to be efficient in eliminating residual asymmetrical information problems in insurer portfolios; see Chiappori and Salanie (2000) and Dionne et al. (2001).)

Without ex ante moral hazard, the cash-flow distribution of investment projects is perfectly observable by the insurer. It is clear that banks can affect this distribution by choosing their investment projects with managers' actions that are not observable. One implication of an insurer's passive role regarding this form of moral hazard is that deposit insurance may end up reducing market discipline by increasing the ratio of high-risk loans for the

same deposits and liquid reserves, because a greater number of riskier projects will be chosen than in a situation of full information. So, in the absence of any insurance-contracting mechanism designed to reduce the extra risk taking explained by moral hazard, additional regulations limiting risk taking by banks may be required to keep the total risk constant.

Some authors have argued that market discipline generated by depositors would reduce this form of moral hazard and that partial insurance coverage can be an appropriate mechanism in the long run. In the extreme case without any insurance coverage, the theory is the following, if we use a two-period model: suppose that banks have received their deposits in fixed payments and that there is no deposit insurance. The banks may then be tempted to choose risky projects (in the second-order stochastic sense), because this would increase expected benefits for the shareholders. In the long run, however, market discipline will counterbalance this type of behaviour, because depositors can always withdraw their money from a risky bank if they observe at the end of the first period that the bank has more risky projects than those anticipated at the beginning of the contracting period. Of course, this information has to be available at low cost to depositors. Moreover, depositors must have incentives to pay for this information. Without deposit insurance, the incentives would be present. They would probably also be present with partial insurance. However, it is not clear that small depositors would have the information and the competence required to be efficient auditors. Usually, creditors (depositors) are small and not well informed. They may also not be in a position to monitor bank managers. The role of the regulator is therefore to represent the interests of these depositors and to act on their behalf.

Moreover, this type of partial-insurance argument is appropriate only for the individual coverage that deposit insurance offers against isolated events or bankruptcies. We must not forget that full deposit insurance has another social value related to panics or contagious bank runs, in that depositors will rest assured or confident when they are fully covered. It is interesting to observe that, while full insurance has been available in North America, many bankruptcies have been observed, but no significant panics or contagious runs have been documented.

How then can we reduce the social cost of moral hazard and keep the nearly full coverage option? One frequently used instrument in insurance markets is pricing insurance in terms of the risk level of potential clients with continuous auditing of the managers' actions. Various difficulties can be associated with this mechanism, but, in the long run, it can prove to be just as efficient as partial insurance, particularly when the insurer is a monopoly, because the insured (the bank) cannot leave. In the banking industry, the

supplementary advantage would be keeping the risk of bank runs at a minimum. Of course, a public insurer must find financial incentive to invest money in monitoring banks. We shall come back to incentives designed to encourage public insurers to spend money on monitoring and to protect their independence from political influences. Moreover, because of the very nature of bank-run problems, ratings cannot be based on past claims accumulated over time but must rely on ex ante risk evaluation. This introduces difficulties associated with auditing the assets and liabilities of banks (Bond and Crocker 1993).

One means of encouraging the monitoring of bank risk is to introduce a private, regulated monopoly or even many private insurers into the system. The market could then fix the appropriate level of risk for banks. But the government might still have to back the coverage of large losses in order to minimize the risk of panics. Transition to the private sector may, however, be difficult to achieve because of lack of confidence on the side of depositors. One way would be to go about it progressively. This could reduce moral hazard if private insurers were capable of offering contracts tailored to individual risks.

Another way is to separate bank lending and depository roles and to reduce moral hazard by introducing a 100 per cent reserve on deposits. This is a complete solution for the moral-hazard problem in deposit insurance, because the need for such insurance would then disappear. But it would mean a radical change in the nature of banks. Loans would be made by funds instead of by banks, and (very) short-term loans would disappear. Moreover, as discussed in a previous section, this would mean a significant reduction of bank involvement in resource allocation, since it would eliminate the ability of banks to create liquidity by converting illiquid assets into liquid liabilities. Are there other ways of providing liquidity to depositors?

Bhattacharya, Boot, and Thakor (1998) discuss regulatory measures presented in the literature to reduce moral hazard:

- Cash asset reserve requirements. This measure is difficult to implement, however, because wide fluctuations associated with deposits and consequently with cash reserves are often observed for reasons not related to moral hazard.
- Another measure is to relate the bank's shareholder capital infusion to the bank's risk level. This measure imposes the choice of high-risk investment policies on shareholders. As for the pricing of insurance based on individual risk, the key element for implementing this measure is the regulator's or insurer's ability to observe the bank's risk.

- Market discipline. Two other risk-sensitive measures available as substitutes are partial insurance coverage and the emission of (uninsured) subordinated debt. In both cases, there would be increased monitoring by depositors or lenders of liquidity. The authors even mention a study showing that depositors may be more effective auditors than public agencies, because the latter will not always have the appropriate incentives.
- Bank closure policy. This measure can reduce monitoring costs and lower bankruptcy costs, but it is not clear that this would outperform the preceding measures. More research is needed.
- The role of bank charter value. Banks are not necessarily identical and may earn a higher charter value matching their higher yields. For example, some banks may be more efficient in monitoring the loans they offer. There should be a link between the way banks are regulated and their potential charter values. But the authors do not clearly identify this link, except for the claim that banks with a higher charter value should be less risky. Consequently, a high charter value might make it possible to design a better incentive-compatible, risk-sensitive capital requirement and a lower deposit-risk premium.

But are there alternatives to deposit insurance? Interbank loans can provide liquidity, but they have proved to be inefficient. Recently, the United States modified the FDIC system to allow the insurer to intervene before it is too late. A full set of indicators or ratings is used. This instrument, however, is complementary to deposit insurance and not a substitute for it.

The central bank could also provide such insurance for liquidity and increase the efficiency of interbank loans. In that sense, the central bank could replace deposit insurance as a lender of last resort when liquidity is needed. But it has been said that this might introduce conflicts of interest between monetary policy and risk regulation. For example, in a situation where the central bank wants to push the money supply via the banking system, it might, in the short run, be less willing to close a bank or to let it go into bankruptcy because of the possible impact on the first objective. It is better to have an independent agency. In an important liquidity crisis, the central bank can always make a loan to the deposit insurer that will be reimbursed in the long run as for any other catastrophic risk.

Market discipline using the liabilities of stockholders and managers can also be a substitute for bank regulations. For example, some authors have proposed that subordinated debt should be used to increase market discipline along with this form of liability (Evanoff and Wall 2000). This can be an instrument for extracting information from the market and increasing discipline only if stockholders and top managers are truly expropriated in

case of failure. Again, there is a commitment problem associated with the implementation of the instrument.

But market discipline can be a dangerous game, particularly when market prices become erratic. Market discipline is based on private ratings, but are they really good risk indicators? Conflicts of interest between ratings agencies and banks are possible, but more importantly, the informational value of ratings agencies is often considered to be weak.

The above discussion raised the need for precise information on individual bank risk in order to set appropriate incentives for risk management. Acquisition of this information might be very costly. Mechanisms other than audits might be more efficient. Kobayakawa (1998) proposes a model that will enable regulators to ensure that riskier banks will maintain higher capital holdings. The goal of this type of research is to reduce the burden of control and audit costs by using the theory of incentives in relationship to regulation (Laffont and Tirole 1993). We shall return to this model.

One last point on deposit insurance—one that is not often mentioned—concerns its effect on bank profits. Deposit insurance reduces the risk to depositors, so banks can offer interest payments at rates that are close to risk-free and invest the money in high-risk investments (Berlin et al. 1991). But this difference may also be used for paying insurance premiums with appropriate monitoring.

5 Capital Adequacy and Bank Regulation

The banking industry has undergone important modifications since the beginning of the 1980s. To be specific, competition from other financial institutions and between banks has increased. Banks now offer new products and participate in new markets (Crouhy, Galai, and Mark 2001). This increased scope opens a greater variety of deposit-generating activities to banks and other institutions. Recent regulation related to universal banking is concerned with the increased scope of banking and its links with capital requirement.

One important change is that banks are much more active in risk-shifting activities. They are involved in the design and trading of cash instruments and derivatives. According to the Federal Reserve Bank, U.S. banks had more than \$37 trillion in off-balance-sheet assets and liabilities in 1996, whereas they possessed only about \$1 trillion dollars of such assets and liabilities in 1986 (Crouhy, Galai, and Mark 2001, 3).

This exposure to new activities has increased the risk exposure of banks, which explains the need to impose new capital requirements on the G-10

group in the 1980s. Moreover, deposit insurance was not then priced according to individual risk, and the potential for moral hazard was significant. Optimal capital requirements should force shareholders to put more of their participation at risk and should strengthen their resolve to take fewer high-risk positions or to reduce moral hazard.

The current regulation is based on three pillars (Descamps, Rochet, and Roger 2002):

- Adequate instruments to compute capital requirements and assess risks on private markets.
- Appropriate supervision of banks. It is important to have clear statements as to when and how supervisors will intervene.
- Practice of market discipline. There is also a need for clear statements on how market discipline can be generated.

Hence, since 1988, we observe the use of more capital regulation to reduce the possibility of failure. This change also increases stockholder incentive to monitor managers more carefully, because the former have more to lose in case of failure, since part of the capital is their own. Stockholders have more to lose when banks have more capital, but recent modifications in the way market risk is handled have made it possible to use short-term subordinated debt to meet daily market risk (Tier 3), under certain conditions. For credit risk, Tier 1 and Tier 2 are used. Tier 1 includes stockholder equity, non-cumulative preferred stock, and interest in consolidated subsidiaries. Tier 2 includes cumulative perpetual preferred shares and 99-year debentures (Crouhy, Galai, and Mark 2001). However, current regulations have been criticized for allowing banks to substitute government securities for private loans in their asset portfolios. (For a study on this issue, see Furfine (2000).)

The recent research on capital requirements shows that, whereas they may indeed improve the solvency of the high-risk bank, increased capital requirements may also create distortions in the behaviour of banks, because the standards are the same for all banks. Current risk regulation provides no benefits for credit-risk diversification, though it does make room for adjustments for market risk through the use of internal models to compute the corresponding capital. So, under the current regulation of credit risk, the safer banks have no incentives to improve their risky position, and the risky banks have received an implicit advantage. It is not clear that the overall risk is lower than before in the market. In fact, there is no empirical study showing any link between capital requirement and bank risk.

Banks also operate in a much more competitive environment because of globalization and the deregulation of financial markets. They have more competition from non-banking institutions. Banking is also more complex

because of financial innovations and sophisticated management practices. Big banks have developed internal systems for computing economic capital, and they want these models to be used for the regulation of capital related to credit risk. This will increase the cost of monitoring for capital regulation and for deposit insurance based on individual risk to the level already existing for capital related to market risks. Consequently, some authors have proposed that subordinated debt should be used to increase market discipline and reduce auditing costs (Evanoff and Wall 2000).

Many authors have discussed the effects of capital adequacy on bank behaviour (Koehn and Santomero 1980; Kim and Santomero 1988; Rochet 1992; Furlong and Keeley 1989; Keeley 1990), but few have formally considered the *ex ante* moral-hazard problem discussed in the previous sections of this review. Santos (1999) proposes a model with moral hazard between borrowers and banks in the presence of deposit insurance and capital regulation. He shows that optimal contracts introduce an incentive scheme leading borrowers to lower their risks, which also reduces the bank's risks. Other partial-equilibrium contributions have also been proposed by Besanko and Kanatas (1996) as concerns conflicts between banks' managers and shareholders, and by Bensaid, Pagès, and Rochet (1995) as concerns the effects of adverse selection on the quality of bank assets and the effects of moral hazard on the performance of bank managers. The authors find that optimal regulation of solvency must allow adjustments for risks and provide for monitoring by independent agencies. But these contributions do not really consider off-balance-sheet operations and their monitoring.

Two obvious questions arise: Must banks have capital reserves for all types of off-balance-sheet transactions? The answer is yes. How do these new activities affect the bank's role in converting illiquid assets into liquid assets? The answer here is less direct, but some risk-management instruments have increased banks' liquid assets. In other words, some instruments decrease the liquidity risk by permitting banks to have rapid access to liquid assets. In that sense, risk management should have reduced the need for deposit insurance. If the closure rules related to capital adequacy are enforced, deposit insurance should only have a residual role to play in the optimal regulation of capital adequacy. But the converse may also be true: Do we need strong capital-adequacy rules when deposit insurance pricing is optimal? Are these two instruments substitutes or complements? There are very few contributions to these questions in the literature.

If banks act as portfolio managers when they choose the composition of their portfolios of assets and liabilities, it is advisable to use risk-related weights for the computation of the capital-to-asset ratio, because switching

assets is a delicate operation. Markets are not complete, however. Like Crouhy and Galai (1986), Kareken and Wallace (1978) propose a complete market framework and show that, in this context, capital regulation is dominated by the use of risk-related insurance premiums as instruments for solving the moral-hazard problem. But complete markets do not exist in real life.

To what extent should the optimal design of deposit insurance and capital requirement be made jointly? Giammarino, Lewis, and Sappington (1993) do not answer this difficult question directly but instead consider a model with potential moral hazard when the objective of the regulator is to provide optimal deposit insurance. They show that the insurance premium must be a function of the risk contained in the bank's loans portfolio and that low-risk banks should face lower capital requirements. Bond and Crocker (1993) obtain a similar result on the value of offering capital requirements and optimal deposit insurance jointly, in a model where banks have private information and risk classification is used to reduce the information asymmetry. Capital requirement remains necessary as long as the insurer risk-classification scheme cannot eliminate the residual information problem in the risk classes. It can also be shown, in a model where the self-selection of risks is used to reduce adverse selection, that capital requirements may generate a positive value by reducing the cost of obtaining private information on bank risk (Freixas and Gabillon 1998).

But for the moment, in what concerns credit risk, the BIS Accord treats all banks alike, so this type of regulation is not of any obvious use in complementing the optimal pricing of deposit insurance. Neither is it clear that the current capital ratios are good measures of bank risk. A new regulation based on banks' internal models may increase the incentive for banks to reduce their risk and disclose its value, but it will also increase the cost of auditing deposit insurance unless appropriate market instruments are used to reflect the market evaluation of these asset risks. The current internal models proposed in the literature for computing the optimal economic capital for credit risk are indeed very sophisticated (Gordy 2000; Crouhy, Galai, and Mark 2000), and many issues are still open.

Consequently, under the current capital regulation of banks, it is clear that deposit insurance must be set with premiums related to the individual risk of the banks. In other words, one cannot use the current Basel regulation as a substitute for this pricing scheme.

Descamps, Rochet, and Roger (2002) propose a model that sets conditions under which market discipline can reduce the capital requirements needed to prevent moral hazard. They reach two conclusions that are of importance in designing the optimal regulatory environment. Effective direct market

discipline by the regulator is possible only if banking supervisors are free from political interference. Indirect market discipline cannot be efficient in crises, because market prices become erratic. Consequently, a public provision for deposit coverage is necessary.

6 Regulation and Precommitment

Precommitment, an alternative to the internal models for risk management, is used to reduce audit costs and maintain the same incentives.

A first precommitment model was proposed by Kupiec and O'Brien (1995, 1997) to reduce the regulatory burden of internal models. This model incorporates an assessment of bank effectiveness in managing risks (here market risks) and puts greater emphasis on incentives for a bank to avoid losses exceeding the predetermined limit. The authors suggest the use of the value at risk (VaR) to fix the amount of capital. Of course, this type of model can be applied to any type of risk-taking activity, such as lending to private firms.

Under the precommitment approach, a bank announces the appropriate level of capital needed to cover the maximum value of expected loss. If the amount exceeds the value announced, the bank is penalized. In this model, the penalty rate is uniform and is not a function of the bank's declared risk. This mechanism encourages monitoring, and the bank's objective is to minimize the total cost of the expected penalty as well as the cost of raising capital.

In the Kupiec and O'Brien model, it is not clear, however, that the riskier banks will reveal their true level of risk, because the mechanism supposes that the revelation is made only *ex post*. Kobayakawa (1998) proposes an alternative, where the incentive-compatible contract fixes both the level of capital and the penalty rate, where both are chosen by the banks, *ex ante*, from a menu of contracts. The menu of contracts is predetermined by the regulator or the deposit insurer.

At equilibrium, the author maintains that different banks choose different contracts and different levels of capital. The current model does not really document the type of information the regulator would need to implement contracts. Another issue is to fix the limit of pressure a regulator can impose on a bank to obtain true information. One possibility for the regulator is to use public disclosure and let the market impose the penalties. Finally, Kobayakawa does not take into account the legal aspects of such an approach.

7 Management of Banking Regulation

One major difficulty with regulation is ensuring that governments are committed to applying the rules. Recent papers argue that banking supervisors should not be involved in monetary policy. According to Rochet (2004), we too often see political pressures exerted on bank supervisors to bail out insolvent banks. Greater market discipline cannot be a remedy for this problem, since market discipline can be efficient only when political intervention is not anticipated.

Even the definition of a safe banking system is subject to interpretation. For some regulators, safe means that, for small banks, a given failure should not degenerate into an epidemic of failures and that, for large banks, they should never fail at all (the too-large-to-go-bankrupt argument). When this interpretation is well understood by managers of large banks, public discipline becomes difficult to implement, and taxpayers may have to pay for the safety of large banks, even when there is no systemic risk. Rochet (2003) reports the case of *Crédit Lyonnais* in France, but other cases have also been documented in the United States, particularly the *Continental Illinois* crisis in 1984.

It is clear, however, that the regulatory authorities must use their judgment and must not apply the rules too strictly and without discernment. One mechanism used during recent years has been to have the central bank become a lender of last resort when the liquidity problem arises from a particular situation. This was the type of intervention the Federal Reserve Bank of New York (NY FED) used to save the Bank of New York when it had a big computer problem and the other banks were not able to find the money quickly enough. The Bank of England did not intervene in the *Barrings* case in 1995 for well-known reasons, and it was estimated that taxpayers should not have to pay for this type of failure. But at the same time, the Bank of England made a public announcement of its willingness to provide liquidity to the banking system if a big market disturbance should occur, and this was enough to prevent a panic. In both cases, taxpayers had nothing to pay: The Bank of England did not pay for *Barrings*, and the NY FED asked for collateral from the Bank of New York (Goodhart 2000).

Marc Quintyn and Michael W. Taylor (2002) analyze the independence of regulatory authorities. They discuss in detail the issue of the financial sector's regulatory and supervisory independence (RSI). This is an important issue, because improper supervisory arrangements have contributed significantly to the deepening of several recent systemic banking crises around the world. They argue that RSI is important for financial stability for the same reasons that central banking independence (CBI) is

important for monetary policy. For real independence, agency dependence and accountability needs must go hand in hand. The study also discusses a number of accountability arrangements.

These issues have not really been discussed in previous articles in the literature and in subsequent literature reviews. It is documented, however, that almost all the worldwide systemic financial sector crises occurring in the 1990s were due to the lack of independence between supervisory and political authorities (De Krivoy (2000) on the Venezuelan Supervision, and Lindgren et al. (1999) on the East Asian crisis of 1997–98).

In Korea, prior to the 1997 crisis, commercial banks were under the direct authority of the monetary board. Specialized banks and non-bank financial institutions were under the direct authority of the ministry of finance and economy. Monitoring by the ministry was regarded as weak, and this shortcoming was responsible in part for the 1997 crisis (Lindgren et al. 1999).

In Japan, lack of independence for the financial supervision function within the ministry of finance is also interpreted as having contributed to weaknesses in the financial sector (Hartcher 1998). More recently, the Japanese Financial Services Agency has been made accountable to the prime minister's office rather than to the ministry of finance. The results of this transfer are disappointing as regards the objectives of transparency and decisive authority. In fact, the lack of independence in this country is often interpreted as a potential source of systemic risk.

In Indonesia, political interference was even stronger with regard to the use of government funds for recapitalization. Political interference has also been suggested as a factor in that country's crisis.

Another aspect of the importance of RSI concerns the most appropriate regulation and supervision of financial market structures, including the regulation of banking supervision both within and outside of the central bank. The tendency to move to unified financial sector supervision often involves removing the banking supervision function from the central bank, where it had previously enjoyed a relatively high degree of independence derived from that of the central bank with respect to its monetary policy function.

Quintyn and Taylor (2002) stress that the key to effective regulation and supervision implies establishing proper accountability arrangements for the independent agency. Independence and accountability should be regarded as complementary instead of as a process that involves trade-offs between the two objectives.

We now know that the major motivation for regulating financial markets is to promote systemic or financial stability (the public-good argument): provide liquidity, minimize the cost of systemic risks related to bank runs, and sign deposit insurance contracts with appropriate incentives under adverse selection and moral hazard (Goodhart 1998).

We saw that regulation is necessary to achieve these goals. But delegation of regulatory power is also very important. Delegation is often seen to be exercised through a government agency or a specific minister. A second type of delegation involves handing regulatory powers to an independent agency. Independence has two dimensions: independence from political interference and freedom of dominance from industry interests. The public interest should not be reduced to industrial or professional interests (Stigler 1971).

To achieve financial stability, it is important to have a credible and stable set of regulations that include rule-based exit policies for weak or insolvent financial institutions. Politicians may be interested in stalling actions in the short run, and, in the long run, supervisors may be pressured to bail out rather than liquidate. If this type of behaviour is anticipated, some bank managers will be tempted to increase their risk, knowing that their complete independence will not be observed by the politicians.

Four dimensions of independence must be achieved: regulatory, supervisory, institutional, and budgetary.

7.1 Regulatory independence

The agency must have an appropriate degree of autonomy in setting rules. Calomiris and Litan (2000) strongly emphasize the need for supervisors and regulators to respond quickly to changing international conditions and trends.

To set the adequate level of autonomy, it is useful to separate the financial sector into three main categories: economic regulation (profits, pricing, entry, and exit); prudential regulation (level of risk)—the concern of this survey; and information regulation for the public and supervisors. Prudential regulation is related directly to the stability of the financial sector. It is also related to international rules and serves to maintain a certain autonomy in setting prudential guidelines for the adoption of international best standards and practices.

7.2 Supervisory independence

This is the most difficult dimension of independence. Governments often fail to punish enterprises that breach regulations and refuse to enforce

sanctions. They may also prolong the life of insolvent institutions and increase the costs to taxpayers at a later stage.

To increase independence, it might well be important to establish the following elements: legal protection for supervisors when performing their job; a rule-based system of sanctions and supervision favouring prompt corrective actions; appropriate salary levels for supervisors; and clear rules governing the layers of decisions and appeals in institutions. The process of licensing institutions and withdrawing their licences should be left to the supervisory agency.

7.3 Institutional independence

The institution must be independent of both the executive and legislative branches of government. An agency that is part of the executive branch, such as the ministry of finance, typically lacks independence.

7.4 Budgetary independence

This refers to the roles of the executive and legislative government branches in determining the agency's budget. Supervisors who can independently decide on the sources, size, and use of their budget are better equipped to be more independent.

Banks are the instruments for the transmission of monetary policy, so the central bank should be concerned about the soundness of their monetary policy. The central bank may have to act as the lender of last resort, so it must have access to information on banks experiencing liquidity problems.

However, there may be a conflict of interest between the two objectives. A central bank may adjust its monetary policy when it is concerned with the financial conditions of the banks and hence avoid the failure of some banks and this may affect its inflation control policy. Moreover, the central bank can be blamed for some bankruptcies that may affect its monetary policy. In general, successful organizations tend to have a clear and singular mandate.

Very few countries have managed to integrate monetary policy with prudential regulation. It is generally recognized that conflicts of interest and the possibility of damage to reputations are arguments against having supervisors in the central bank. Moreover, putting the RSI in the central bank would leave too much power to the latter and generate two conflicting objectives within the same institution.

The recent literature on political economy and incentive stresses that regulatory independence does not come free of cost. It may, in fact, create

collusive behaviour between regulators and interest groups (Laffont 2000; Faure-Grimaud and Martimort 2003). There are still open questions in the literature on the various trade-offs, and more research is needed on the foundations of the dynamics of regulation and on its applicability to the banking industry.

Conclusions

Banks are responsible for providing liquidity to the economy. This responsibility, however, is the main cause of their fragility. Banks' risks are regulated to protect liquidity in financial markets. The government is responsible for limiting the social costs related to the liquidation of investment projects and the reduction of consumption possibilities bank runs or systemic risk may cause.

Deposit insurance is the most efficient instrument for protecting depositors and for preventing bank runs. However, it may introduce distortions in banks' risk-management activities, because such activities are not perfectly observable by the insurer without cost. Many incentive schemes have been developed to reduce this form of moral hazard. Pricing deposit insurance according to an individual bank's risk seems to be the most appropriate strategy, but it does not appear to be sufficient in the sense that it seems to result in residual information problems in the market, although there is no appropriate statistical analysis on this issue. For the contract to be incentive-compatible, the behaviour of the bank must be monitored throughout the course of the contract, and premiums must be adjusted to changes in behaviour. Other direct forms of intervention by the regulator or the insurer may be necessary to complete the optimal pricing scheme in order to prevent opportunistic behaviour and panics (commitment problems from the banks when this pricing scheme is not sufficient).

Since the beginning of the 1980s, the banking industry has undergone important modifications. Banks must face much more international competition because of market globalization but also much more national competition owing to the deregulation of financial markets. The banking business is more complex and more involved in risk-shifting activities such as the design and trading of cash instruments and derivatives. Many of these transactions involve off-balance-sheet operations, which complicate the monitoring of banks, as well as the individual pricing of deposit insurance.

In 1988, the G-10 modified banking regulation significantly by setting capital standards for international banks. These standards have now been adopted by more than one hundred countries as part of their national risk regulation of banks. One major motivation for such regulation has been the

development of international banking. Another motivation has been the moral hazard related to the fact that risk-shifting activities were not really monitored by deposit insurers in the 1980s, because, at that time, deposit insurance premiums were the same for all banks. Now, however, risk-based pricing of deposit insurance with some form of monitoring is the rule in many countries.

Current regulation of bank capital adequacy has its critics, because it imposes the same rules on all banks. This seems particularly unsuitable when applied to credit risk, which is the major source of bank risk (about 70 per cent). Moreover, diversification of a bank's credit-risk portfolio is not taken into account in the computation of capital ratios. These shortcomings appear to have distorted the behaviour of banks, and this makes it much more complicated to monitor them (Allen and Gale 2003; Dionne and Harchaoui 2003). In fact, it is not even clear that the higher capital ratios observed since the introduction of this new form of capital regulation necessarily lower risks.

More fundamentally, it is not evident that current capital ratios have any economic meaning in terms of the true economic capital needed to protect against credit risk, particularly for loans risk. One explanation is the following: The regulator imposes capital ratios that do not correspond to the bank's optimal capital ratios. The bank then makes market adjustments by choosing other parameters that allow it to maximize shareholders' value while taking into account the level of regulated capital as a constraint. Many instruments for doing this are available to banks, such as substituting assets with different risk levels in a given class of capital.

Additional reform is expected in 2004, but there is as yet no consensus on the form it will take or on whether it will suitably regulate banks in individual countries. Consequently, it might be appropriate to continue developing national regulation based on optimal deposit insurance (with individual insurance pricing and continuous auditing on individual risk) and to keep searching for other optimal complementary instruments for use against systemic risk, instruments designed to fit the structure of the banking industry. Other market discipline and governance instruments may be more efficient than the current capital requirement scheme for banks' commitment problems associated with deposit insurance.

Further research is needed on a number of fronts: the empirical significance of information problems in the deposit insurer and bank relationship; the optimal pricing of deposit insurance when capital is regulated properly; and the optimal structure of the regulatory scheme involving the central bank, the regulator, and the deposit insurer. Who should be the lender of last resort? Who should decide that a particular bank must go into bankruptcy?

Do we need the same capital regulation rules in each country? Other subjects of research interest are banks' governance in relation to risk regulation and duplication of monitoring activities by deposit insurer and capital requirement regulator. And to what extent can market discipline or precommitment mechanisms be used to reduce some of these audit costs associated with capital requirement and deposit insurance?

From the outside, it seems there are too many non-coordinated participants on the regulation of banks' risk and that the regulatory rules appear more oriented to international rather than national needs.

The starting point to fix an optimal regulatory scheme would be clear definitions of systemic risk and what role banks should play in the transmission of monetary policy in this regulatory environment.

The central bank should be responsible for aggregate liquidity and, consequently, for shoring up systemic stability related to aggregate economic fluctuations such as business cycles. In particular, the central bank should monitor how current microeconomic regulation can affect macroeconomic stability.

Confidence in the financial sector is a public good that must be ensured by the government. Who should be in charge: the central bank or the regulatory agency? The revised literature appears to say that this role should be taken by a regulatory agency independent from the central bank and independent from the political power.

There is still no clear consensus in the literature on the optimal design for regulating banks. As things stand, there seems to be too much regulation: the current capital-ratio regulatory system—though onerous for banks to implement and manage and very costly for the regulator to monitor—does not provide the desired results.

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