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**BANK CAPITAL REGULATION IN
CONTEMPORARY BANKING THEORY:
A REVIEW OF THE LITERATURE**

by

João A C Santos

**BANK FOR INTERNATIONAL SETTLEMENTS
Monetary and Economic Department
Basel, Switzerland**

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Abstract

This paper reviews the theoretical literature on bank capital regulation and analyses some of the approaches to redesigning the 1988 Basle Accord on capital standards. The paper starts with a review of the literature on the design of the financial system and the existence of banks. It proceeds with a presentation of the market failures that justify banking regulation and an analysis of the mechanisms that have been suggested to deal with these failures. The paper then reviews the theoretical literature on bank capital regulation. This is followed by a brief history of capital regulation since the 1988 Basle Capital Accord and a presentation of both the alternative approaches that have been put forward on setting capital standards and the Basel Committee's proposal for a new capital adequacy framework.

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1. Introduction

Banking is undoubtedly one of the most regulated industries in the world, and the rules on bank capital are one of the most prominent aspects of such regulation. This prominence results from the central role that banks play in financial intermediation, the importance of bank capital for bank soundness and the efforts of the international community to adopt common bank capital standards.

Banks have always been the most important financial intermediaries in virtually all economies. This results from their role as providers of liquidity insurance and monitoring services and as producers of information. With respect to the regulation of bank capital, its importance derives, among other things, from the role it plays in banks' soundness and risk-taking incentives, and from its role in the corporate governance of banks. It also has to do with the influence of capital on the competitiveness of banks. This influence was in fact one of the key factors behind the international efforts to harmonise capital standards in the 1980s.

The international convergence of bank capital regulation started with the 1988 Basle Accord on capital standards. The G10 countries signed the Accord, which was intended to apply only to internationally active banks. Its focus was the measurement of capital and the definition of capital standards for credit risk. Since then the Accord has been endorsed by many other countries, been applied to many other banks and been subject to some amendments. It was amended in 1996 to cover market risks arising from banks' open positions in foreign exchange, traded debt securities, traded equities, commodities and options. In 1999, the Basel Committee on Banking Supervision released for comment a proposal to amend the Accord's original framework for setting capital charges for credit risk. In it, the Committee also proposed to develop capital charges for risks not taken into account by the present Accord, such as interest rate risk in the banking book and operational risk.

Since its introduction, the Capital Accord has been acknowledged for its contribution to the widespread use of risk-based capital ratios both as measures of the strength of banks and as trigger devices for supervisors' intervention, as in the prompt corrective action schemes in place. The Accord has also been praised for the international convergence of capital standards and for the improvement of these standards in many countries. Its design, however, has been blamed for several distortions to the business of banking. Growing evidence both on these distortions and on a reduction in the Accord's effectiveness, together with a better understanding of its conceptual shortcomings, has led to proposals to redesign it.

Despite the debate that such proposals have generated and the recent progress in the research on banking, there is still no consensus on how best to design the regulation of bank capital. This partly reflects differences in opinion as to the objectives of that regulation and the diverging results that

researchers have unveiled regarding the optimal design of capital standards. It is also a reflection of our limited understanding of the implications of that regulation in general equilibrium frameworks. Notwithstanding these shortcomings, the research already undertaken has produced some important guidelines for the design of capital standards. This paper contributes to the ongoing debate on bank capital regulation by reviewing both the contemporary banking literature that is most relevant to that debate and the theoretical literature on bank capital regulation. The paper also presents a brief analysis of the proposals that have been put forward to replace the Accord's original framework for capital standards for credit risk. The paper does not review the empirical literature on bank capital standards. For a review of this literature see, for example, Jackson et al (1999) and the references contained therein.

The remainder of the paper is organised as follows. The next section reviews the literature on the design of the financial system and the existence of banks. Section 3 discusses the market failures that justify banking regulation and presents the various mechanisms that have been suggested to address these failures. Section 4 reviews the literature on bank capital regulation and on the relationship between this regulation and the design of the deposit insurance scheme. Section 5 presents the 1988 Capital Accord and its main amendments. This is followed by a presentation of the alternative approaches to the Accord's original framework for credit risk that have been put forward and a brief description of the new capital adequacy framework that the Basel Committee has proposed to replace the 1988 Accord. Section 6 concludes.

2. The banking sector

Only recently have researchers started to address the general questions of the optimal design of the financial system and the optimal scope of financial intermediaries. The predominant role that banks have long played in financial intermediation led researchers to focus for many years on the development of theories explaining the existence of these intermediaries. This in turn has shaped the research both on the motives for regulating banks and on the role of capital regulation.

2.1 Design of the financial system

Economic theory has traditionally focused on the real sector of the economy and disregarded the role of financial intermediation, viewing it as a veil. Effectively, in a world à la Arrow–Debreu, where markets are complete, information is symmetric and other frictions are not present, there is no room for financial intermediaries. However, the world we live in is quite different from that envisioned by Arrow and Debreu, which explains the increasing evidence of financial intermediaries' influence in the economy. This evidence has manifested itself in various different ways, ranging from a strong

correlation between the size of the financial system and the level of the country's economic development (King and Levine (1993)) to differences in the way firms finance investment in bank-based systems (systems where banks predominate) and market-based systems (those where financial markets predominate) (Mayer (1988)).¹

Despite the interest in the configuration of the financial system that such evidence has generated, our understanding of the interlinkages between the various parts of that system remains limited because research on the optimal design of the financial system is still in its early stages and has been hampered by the complexity of the problems involved.² Nevertheless, researchers have already made significant progress explaining, for example, the parallel existence of financial intermediaries and markets, the differences between bank-based systems and market-based systems and the role of various financial intermediaries.³

As for the research on financial intermediaries, it focused initially on the development of theories to explain commercial banks but has more recently been extended its goals to a study of the implications of broadening the scope of these intermediaries to include activities such as investment banking, insurance and commerce.⁴ Notwithstanding all this progress, the research on bank capital regulation continues to focus on intermediaries that combine lending with deposit taking.

2.2 The existence of banks

In a world à la Arrow–Debreu with complete and frictionless markets, there would be no need for financial intermediaries because investors and borrowers would be able to achieve efficient risk allocation on their own. It is necessary to modify the assumptions underlying this framework and assume the presence of some frictions in order to justify the existence of financial intermediaries. In the earlier theories of banks, these frictions result from transaction costs. In the contemporary theories, they arise instead from informational asymmetries.

In earlier theories of financial intermediation, such as Gurley and Shaw's (1960), the main activity of intermediaries would be the transformation of securities issued by firms (shares and bonds) into securities demanded by investors (deposits). Financial intermediaries are valuable because they

¹ See Levine (1997) for a review of the empirical literature on the relationship between financial development and economic growth, and Allen and Gale (1995) for an analysis of the two prototypes of the bank-based and market-based systems, the German and the American system, respectively.

² For an extensive discussion of financial system design, see Thakor (1996a) and Allen and Gale (1998).

³ For an analysis of the differences between bank- and market-based systems, see Dewatripont and Maskin (1995), Sabani (1993) and Allen and Gale (1997). For theories explaining the simultaneous existence of securities markets and banks see Gorton and Haubrich (1987), Seward (1990), Bolton and Freixas (1997) and Boot and Thakor (1997).

⁴ For a review of the literature on the implications of mixing commercial banking with investment banking, insurance and commerce, see Rajan (1996) and Santos (1998a); Kane (1996) and Eisenbeis (1996); and Saunders (1994) and Santos (1998b), respectively.

provide services of divisibility and risk transformation, which borrowers cannot obtain on their own under identical conditions due to transaction costs. For example, if there are fixed costs associated with any financial transaction, borrowers will form coalitions to sell together in order to save on these costs. If there are indivisibilities in the transaction technology, a coalition of investors will be able to build a more diversified portfolio, that is, one with lower risk than the portfolio each member is able to build on its own.⁵

In modern theories of financial intermediation, the two most prominent explanations for the existence of intermediaries like depository institutions are the provision of liquidity and the provision of monitoring services.⁶ Banks are valuable as providers of liquidity services because they provide depositors with liquidity insurance (Bryant (1980) and Diamond and Dybvig (1983)). By issuing demand deposits, banks can improve on a competitive market because these deposits allow for better risk-sharing among households that face idiosyncratic shocks to their consumption needs over time.⁷ The importance of banks in this framework arises from an information asymmetry: the shock that affects a household's consumption needs is not publicly observable.

Banks are valuable as providers of monitoring services because they act as delegated monitors to investors and thus avoid the duplication of monitoring costs, (Diamond (1984)). As with the liquidity insurance explanation, the key to the existence of banks in this setup is also an informational problem. Firms are assumed to have more information about their investment projects than investors do. Investors can learn this information but only after incurring a monitoring cost. They may choose, however, to delegate monitoring to a bank, through which they all provide funding to the firm. By acting as delegated monitors of investors, banks save on monitoring costs and make funding available to firms at a lower cost than direct lending.

The provision of liquidity insurance explains the liability side of the bank's balance sheet and the provision of monitoring services explains the asset side of the balance sheet. None of these approaches, however, puts forward an explanation as to why it is advantageous for an intermediary to offer both of these services, as happens with the existing depository institutions. Diamond and Rajan (1998) address this issue in a model where both investors and borrowers care about liquidity. The former are concerned with liquidity because they are uncertain about the time at which they may want to reduce their holdings of a financial asset, while the latter are concerned with liquidity because they

⁵ For a review of earlier banking literature, see Santomero (1984). For a review of modern banking theory, see Bhattacharya and Thakor (1993) and Freixas and Rochet (1997).

⁶ Ramakrishnan and Thakor (1984) and Millon and Thakor (1985) provide explanations for the existence of financial intermediaries like brokers whose role is to produce information for resale.

⁷ Gorton and Pennacchi (1990) also derive a theory of financial intermediation based on the provision of liquidity services. In their model, intermediaries provide liquidity not by designing securities that insure investors against a random shock to their preferences for the timing of consumption, but instead by designing securities that protect uninformed investors from the costs they would incur when trading with investors that possess superior information.

are uncertain about their ability to raise added funding in the future. An intermediary that accepts deposits and extends loans is valuable in that setting because it enables depositors to have better access to their funds than they would if they invested directly in firms, and it insures borrowers against the risk that funding will be cut off prematurely, which they would face had they borrowed from an investor.⁸

In conclusion, the research on the design of the financial system reviewed in this section shows that financial institutions and markets are not perfect substitutes, thus confirming that the configuration of the financial system matters. Therefore, any change to one of these institutions, for example through regulations, is bound to have implications far beyond the institution itself. Despite this, researchers continue to focus on financial intermediation through banks. This is motivated partly by the role of banks, which are still perceived to be the most important intermediaries, and partly for simplifying reasons because models rich enough to encompass various forms of intermediation become highly complicated very quickly.

3. Do banks need to be regulated?

The justification for any regulation usually stems from a market failure such as externalities, market power or asymmetry of information between buyers and sellers. In the case of banking, there is still no consensus on whether banks need to be regulated and, if so, how they should be regulated. This partly reflects the lack of consensus on the nature of the market failure that makes free banking not optimal.⁹ Nonetheless, there are two justifications that are often presented for regulating banks: the risk of a systemic crisis and the inability of depositors to monitor banks.¹⁰

3.1 The systemic risk argument

Banks' provision of liquidity services leaves them exposed to runs (Diamond and Dybvig (1983)). The reason is that a bank needs to operate with a balance sheet where the liquidation value of its assets is less than the value of liquid deposits in order to provide liquidity services. Under these circumstances, given that depositors' expectations about the value of their deposits depend on their place in line at the time of withdrawal because of the first come, first served rule, a run can occur without the release of adverse information about the bank's assets and even when there is perfect information about the

⁸ Other papers that explain the existence of intermediaries that simultaneously offer deposit-taking and lending services include Calomiris and Kahn (1991), Flannery (1994) and Qi (1998).

⁹ See Dowd (1996) and Benston and Kaufman (1996), who dispute of the arguments often presented in defence of bank regulation.

¹⁰ See Goodhart et al (1998), Chapter 1, for other rationales for banking regulation.

bank's assets. For example, if depositors panic, they may try to withdraw their funds out of fear that other depositors will do so first, thus forcing an otherwise sound bank into bankruptcy.

If there were no aggregate uncertainty and if each bank's investment in the short-term asset were publicly observable then depositors could be fully insured against the liquidity risk faced by their bank if banks could lend to each other (Bhattacharya and Gale (1987)).¹¹ However, when there is asymmetry of information about the banks' assets, as happens when banks provide monitoring services because this requires them to hold a large portion of their assets in the form of illiquid loans, the interbank market will not generally be able to provide depositors with full liquidity insurance. A possible reason is that under these conditions, banks are afraid of a "winner's curse" (that is, of lending only to other banks that have already been rejected loans because of their poor quality) and consequently lend less than they would under homogeneous information (Flannery (1996)).

Asymmetry of information about banks' assets makes them susceptible to an additional source of runs, the release of information on the value of those assets, (Jacklin and Bhattacharya (1988)).¹² A bank run that is triggered by the release of information indicating poor performance by the bank may be beneficial because it is a source of discipline. In contrast, a run triggered by depositors' panic or by the release of information when there is asymmetry of information among depositors about bank returns will not be beneficial.¹³ In this case, the run is costly because it forces the premature liquidation of assets, thus disrupting the production process. Furthermore, it may trigger contagion runs, which may culminate in a system failure.¹⁴ It is this risk of a system failure that forms the basis of the classical argument proposing mechanisms to insure banks against liquidity shocks despite their interference in the free functioning of markets.

3.1.1 *Proposals to insulate banks from runs*

One of these proposals suggests the development of narrow banks, that is, banks that invest only in riskless securities, such as short-term government securities.¹⁵ Narrow banks are run-proof but this comes at a cost in that they do not perform one of banks' key functions, the creation of liquidity.

¹¹ For an analysis of the case where there is aggregate uncertainty, see Chari (1989) and Hellwig (1994).

¹² Chari and Jagannathan (1988) develop a model where both types of runs can arise. They modify the Diamond-Dybvig model by assuming that the bank's investment produces a random return that is observable by a portion of the depositors that wish to consume later. When the remainder of the depositors observe a large withdrawal in the first period they do not know if it is driven by the depositors that wish to consume early or by the informed depositors that learned of poor performance by the bank. In equilibrium, both "poor performance" runs and "panic" runs can occur, with the latter being triggered by the fear of poor performance anticipated by the informed depositors.

¹³ See Calomiris and Gorton (1991) for a review of the literature on bank panics.

¹⁴ Aghion, Bolton and Dewatripont (1999) show how the failure of one bank may trigger a contagious run on other banks in a model with multiple competing banks and an interbank market.

¹⁵ For a discussion on narrow banks, see Kareken (1986), Litan (1987), Bryan (1988), Pierce (1991) and Gorton and Pennacchi (1992).

Another drawback associated with narrow banking results from the inability of intermediaries to exploit the gains that result from combining deposit-taking with lending extended through commitments or credit lines (Kashyap, Rajan and Stein (1999)). Moreover, it is possible that the new firms that would move in to fill the vacuum left by banks would inherit the problem of runs (Diamond and Dybvig (1986) and Wallace (1996)).

Another proposal suggests funding banks with equity rather than demand deposits. This would make banks immune to runs but would be costly, as under certain conditions demand deposits dominate equity contracts in insuring consumers against random shocks to their intertemporal preferences for consumption (Jacklin (1987)).¹⁶ This proposal, therefore, yields a trade-off between stability and efficiency.

A third proposal builds on the suspension of convertibility. If banks could precommit not to liquidate more than the portion of their assets that is necessary to meet the liquidity demands of those consumers that wish to consume early then they would eliminate the other consumers' incentive to run on the bank. Suspension of convertibility, though, provides complete insurance only if liquidity shocks are perfectly diversifiable and if the portion of consumers that wish to consume early is known.

A fourth proposal, probably the oldest one, is associated with Bagehot (1873), who is usually credited with the first analysis of a central bank's role as lender of last resort (LLR) in preventing a bank run from turning into a panic. To that end, he argues that the central bank should make clear in advance its readiness to lend any amount to a bank that is having liquidity problems provided the bank is solvent. Lending should be done at a penalty rate (to reduce banks' incentives to use these loans to fund normal business) and only against good collateral (valued at pre-panic prices).

It appears, however, that the conditions set out by Bagehot for operating the LLR function impede the LLR from attaining its key objective. A bank with good collateral will be able to borrow from the market. It is when there is some uncertainty about the bank's financial condition that the bank may not be able to meet its liquidity needs in the interbank market and therefore an LLR becomes valuable (Flannery (1996)).¹⁷ In Bagehot's own words: "Every Banker knows that if he has to prove that he is worthy of credit, however may be his argument, in fact his credit is gone" (p. 68). The LLR could avoid this problem by committing to extend liquidity support to all the banks seeking it, but this would come at a cost, as it would lead to moral hazard.

¹⁶ Calomiris and Khan (1991) focus instead on the importance of banks being funded with demandable debt because of depositors' monitoring role. Depositors can monitor the bank because they can withdraw their funds when they observe unacceptable policies. In this case, in contrast to Diamond and Dybvig (1983), a bank run is beneficial and deposit insurance is unwarranted. However, if depositors' monitoring is noisy, then deposit insurance may be valuable. See Carletti (1999) for the problems with depositors' monitoring when they do not have perfect information about the bank's future prospects.

¹⁷ See Freixas, Soussa and Hoggarth (1999) for a review of the literature on the lender of last resort function.

A final proposal to protect banks from runs is for the government to offer deposit insurance (Diamond and Dybvig (1983)).¹⁸ A government scheme of full insurance guarantees banks complete protection from runs.¹⁹ However, such a scheme is not socially costless because the government will have to tax other sectors of the economy, and therefore leads to a possible deadweight loss, when it is asked to provide liquidity as a result of a bank's low return or of large early withdrawals. Deposit insurance, in addition, may lead to moral hazard.

3.1.2 Deposit insurance and moral hazard

Government deposit insurance has proven very successful in protecting banks from runs, but at a cost because it leads to moral hazard.²⁰ By offering a guarantee that depositors are not subject to loss, the provider of deposit insurance bears the risk that they would otherwise have borne. As a result, it diminishes depositors' incentive to monitor banks and to demand an interest payment commensurate with the risk of the bank. Furthermore, when the insurance scheme charges the bank a flat rate premium, the bank does not internalise the full cost of risk and therefore it has an incentive to take on more risk.²¹

Merton (1977) pioneered the use of the arbitrage pricing method, originally developed for pricing options on common stock, to analyse the deposit insurance distortion on banks' risk-taking incentives. He shows that deposit insurance can be viewed as a put option on the value of the bank's assets with a striking price equal to the promised maturity value of its debt. If the insurance premium is risk-insensitive, the bank can increase the value of the put option by increasing the risk of its assets and/or decreasing its capital-to-assets ratio.²² A bank's appetite for risk is further increased with an increase in competition in the banking sector and a reduction in the value of the bank's charter (Marcus (1984) and Keeley (1990), Hellmann, Murdock and Stiglitz (1997), and Matutes and Vives (1998)).

¹⁸ See Kyei (1995), Barth, Nolle and Rice (1997) and Garcia (1999) for the insurance schemes in various countries.

¹⁹ Note that, contrary to the suspension of convertibility, a government insurance scheme protects banks from runs even when the portion of consumers that wish to consume early is random, as the government can levy a tax based on the realisation of that variable.

²⁰ Kareken and Wallace (1978) and Dothan and Williams (1980) study the moral hazard associated with deposit insurance using state preference models, while Merton (1977, 1978) does so using an option pricing model.

²¹ Boot and Greenbaum (1993) note another problem of a risk-insensitive insurance premium: it eliminates the funding-related benefits of reputation because it fixes the bank's future funding costs. This problem is particularly acute when there is high competition among banks as this eliminates monopolistic rents, which would otherwise encourage banks to choose the optimal monitoring effort. John, John and Senbet (1991) note that even if deposit insurance were fairly priced, banks would still have risk-shifting incentives if regulators could not write contracts on their asset risk choices. The reason is that the limited liability condition that protects bank shareholders makes their payoff stream convex.

²² Empirical research on US banks in the 1980s, however, fails to show that banks in general maximise the value of the put option. Keeley (1988), for example, finds that banks hold more capital than required by regulation. Marcus and Shaked (1984), Ronn and Verma (1986) and Pennacchi (1987a) estimate the fair rate of deposit insurance under certain conditions. They find that the fair rate varies considerably across banks and that it is, for many of the large banks, lower than the premium charged by the FDIC.

The trade-off introduced by deposit insurance – ruling out bank runs at the expense of moral hazard – has motivated proposals to change the design of the deposit insurance scheme or introduce complementary regulations aimed at reducing the moral hazard while maintaining the protection to depositors.²³ The most frequent proposals to deal with the moral hazard caused by deposit insurance are to charge banks risk-related insurance premiums and to regulate their capital structure.²⁴

3.1.3 Is fairly priced deposit insurance possible?

To eliminate the risk-shifting incentive it gives banks, deposit insurance needs to be fairly priced. However, as we are about to see, asymmetry of information may make the computation of fair premiums impossible or undesirable from a welfare point of view.

Starting with Merton (1977), a vast literature has used the arbitrage pricing method to determine the fair insurance premium.²⁵ The arbitrage pricing method assumes that, among other things, the financial markets are complete, the provider of deposit insurance has perfect information about the risk of banks' assets, it can value accurately banks' assets, and moral hazard is explicitly or implicitly ruled out. Under these conditions, however, deposit insurance is not necessary because there is no risk of bank panics.

For that reason researchers began to study the feasibility of fairly priced deposit insurance where there is asymmetry of information. Chan, Greenbaum and Thakor (1992), for example, consider a setting where there is asymmetry of information and the insurance provider offers a menu of contracts, each requiring the bank to hold a certain capital-to-assets ratio and charging it a given insurance premium per unit of deposits it holds. The authors find that it is generally impossible to implement incentive-compatible, fairly priced deposit insurance in that setting. When there is only adverse selection, the impossibility arises because banks are indifferent vis-à-vis their capital structure when insurance is fairly priced. Therefore, they prefer a lower insurance premium for any positive level of deposits. Because of this, the high-risk institution always prefers the menu of contracts chosen by the low-risk institution as long as this one chooses some positive level of deposits.

²³ Buser, Chen and Kane (1981) suggest that the provider of deposit insurance deliberately charge a subsidised risk-insensitive insurance premium to entice banks to submit themselves voluntarily to the regulatory dominion it controls.

²⁴ Other suggestions for dealing with the moral hazard problem include requiring banks to issue subordinated debt (Wall (1989)), extending the liability of bank shareholders (Esty (1998)), and changing the insurance coverage to a system that provides coinsurance. Nagarajan and Sealey (1997) question the effectiveness of subordinated debt, and of a system where banks acquire private coinsurance on at least a portion of their deposits, in reducing banks' risk-taking incentives due to deposit insurance. See Board of Governors (1999) for a review of the literature on subordinated debt and Merton and Bodie (1992) for a discussion on the effectiveness of these mechanisms in limiting banks' risk-taking incentives.

²⁵ For example, Merton (1978) considers audit costs, Pennacchi (1987b), Acharya and Dreyfus (1989) and Fries, Mellabarral and Perraudin (1997) study various bank failure resolution methods, Mullins and Pyle (1994) study liquidation costs and Kerfriden and Rochet (1993) consider interest rate risk.

Freixas and Rochet (1995) consider the issue of incentive-compatible fair pricing of deposit insurance in a more general framework, where banks are valuable because they manage deposits. They show that fair pricing is feasible but is not desirable from a welfare point of view. The reason is that it entails a subsidisation of the less efficient banks by the more efficient ones. This cross-subsidisation prevents the less efficient banks from mimicking the more efficient ones, thus improving the allocation of deposits, but it is distortionary because it leads to inefficient entry and exit decisions.

3.2 The depositors' representative argument

The systemic risk argument builds on the instability that arises with banks' provision of monitoring and liquidity services, which leaves them with a balance sheet that combines a large portion of liabilities in the form of demand deposits with a large portion of assets in the form of illiquid loans. Dewatripont and Tirole (1993a, 1993b) propose a rationale for banking regulation – the representation hypothesis – that builds instead on the corporate governance problems created by the separation of ownership from management and on the inability of depositors to monitor banks.

The departing point of their argument is that banks, like most businesses, are subject to moral hazard and adverse selection problems. Therefore, it is important that investors monitor them. Monitoring, however, is expensive and requires, among other things, access to information. Furthermore, it is wasteful when duplicated by several parties. In the case of banking, this is complicated by the fact that bank debt is mainly held by unsophisticated depositors without the necessary information to perform efficient monitoring. In addition, because most of them hold only a small deposit they have little incentive to perform any of the functions that monitoring a bank would require. This free-riding problem creates a need for a private or public representative of depositors. That need can be met by a regulation that mimics the control and monitoring that depositors would exert if they had the appropriate information, were sophisticated and fully coordinated.

In sum, the research reviewed in this section shows that banks provide superior intertemporal risk-sharing when they fund themselves with demand deposits. Under these conditions, however, bank runs and panics may develop as an equilibrium phenomenon. Because these are costly, several mechanisms have been proposed to rule them out. These mechanisms, however, are themselves costly. For example, government deposit insurance can provide depositors full insurance but is a source of moral hazard. These problems are usually presented as one of the reasons for regulating banks. Another common rationale for banking regulation builds on the problems that the separation of ownership from management raises for corporate governance. In the case of banks, these problems are compounded by the fact that depositors are not in a position to monitor management, as they are small and uninformed. Therefore, they need to be represented by a regulator.

4. The regulation of bank capital

Since Modigliani and Miller's seminal contribution in 1958 showing that in a frictionless world with full information and complete markets the value of a firm is independent from its capital structure, researchers have studied the implications of deviations from that world for a firm's optimal capital structure. Taxes, costs of financial distress, imperfections in the product markets, transactions costs and asymmetry of information problems are just some examples of the frictions that researchers have considered to explain a firm's capital structure. In the case of banks, they have also considered two other factors: banks' access to the safety net, in particular to deposit insurance, and the fact that small, generally uninformed investors hold most of the bank debt.

4.1 Capital regulation and the systemic risk argument

As we have seen, deposit insurance, when not fairly priced, gives banks an incentive to increase risk, which they can accomplish, for example, by increasing the risk of their assets or their leverage. This risk-shifting incentive, together with the potential externalities resulting from bank failures, has been one of the main justifications for regulating bank capital.²⁶

The earlier literature on bank capital regulation, such as Kahane (1977), Kareken and Wallace (1978) and Sharpe (1978), studies the effectiveness of capital standards in controlling banks' solvency in complete market, state preference models. This literature creates a role for capital regulation by introducing deposit insurance. Depositors are fully insured and, therefore, have no incentive to adjust the demanded returns for the risk undertaken by the bank. Because the insurance provider charges banks a flat insurance premium it gives them an incentive to increase risk. A problem with this rationale for capital regulation is that when markets are complete and there is no information asymmetry the need for deposit insurance is unclear and when it exists it can be appropriately priced, which eliminates the risk-shifting incentive.

This led researchers to start studying capital regulation in incomplete market settings. Some researchers adopted the portfolio approach of Pyle (1971) and Hart and Jaffee (1974), which models the bank as a portfolio of securities. Bankers choose the composition of their portfolios in order to maximise the expected profit for a given level of risk, taking the yields of all securities as given. Koehn and Santomero (1980) and Kim and Santomero (1988) adopt this approach and assume, as a proxy for the incompleteness of markets, that bankers are risk-averse and therefore maximise a utility function of the bank's financial net wealth. A possible justification for this proxy is that the bank is owned and managed by the same agent, which cannot completely diversify the risk. The introduction

²⁶ See Berger, Herring and Szegö (1995) for a discussion of the various roles of capital in banking firms.

of a flat capital requirement restricts the risk–return frontier of the bank, forcing it to reduce leverage and to reconfigure the composition of its portfolio of risky assets. This may lead to an increase in the bank’s probability of failure because the banker may choose to compensate the loss in utility from the reduction in leverage with the choice of a riskier portfolio.²⁷ Regulators can eliminate this adverse effect by requiring banks to meet a risk–based capital requirement instead.

The conclusion by this literature that more stringent capital standards could lead to an increase in the bank’s risk of failure drew a great deal of attention, but it was subsequently questioned on several grounds. Rochet (1992) questions two features of the Pyle–Hart–Jaffee model adopted in this literature. Bank capital is treated in the same way as any other security, implying that banks can buy and sell their own stock at a given price, regardless of their investment policy, and banks choose their policies as if they were fully liable. Rochet shows that when limited liability is taken into account and bank capital is exogenously set at a certain level, the convexity of preferences due to limited liability may dominate risk aversion, and the bank, if undercapitalised, will behave as a risk lover. In this case, even a risk–based capital regulation that makes use of “market–based” risk weights (that is, weights proportional to the systematic risks of the assets as measured by their market betas) may not be enough to restrain the bank’s appetite for risk.²⁸ It may be necessary to impose an additional regulation, for example, to require banks to operate with a minimum capital level.

Furlong and Keeley (1989) and Keeley and Furlong (1990) also question the adverse effect of more stringent capital standards, arguing that this result does not hold when the possibility of bank failure and the effects of changes in the value of the deposit insurance put option are appropriately considered. The authors use a value–maximising model where a bank with publicly traded stock maximises the value of its stock. They show that the bank never increases portfolio risk as a result of increased capital standards when it pays a flat rate deposit insurance premium. The reason is that the marginal value of the deposit insurance option with respect to asset risk declines as leverage declines. Therefore, an increase in capital standards reduces the bank’s incentive to take risk.

A key aspect of modern banking theory not considered in this literature is the existence of information asymmetries. These are important because they are directly related to the existence of banks. As we saw previously, an important function of banks is to screen and monitor loans. The returns of these loans then become private information to bank managers, giving them discretion in the choice of the screening and monitoring intensities of loans. This discretion can lead to various forms of moral hazard when a bank management’s incentives are distorted, as happens when there is deposit

²⁷ Blum (1999) also shows that capital regulation may lead to an increase in bank’s riskiness but in a dynamic framework. This allows for the consideration of capital standards’ intertemporal effects. If it is too costly for the bank to raise equity to meet higher capital standards tomorrow, an alternative is to increase risk today.

²⁸ This assumes that it is possible to compute the risk weights for all the assets in the bank’s portfolio, which may not be feasible because of the non-marketable assets.

insurance. Gennette and Pyle (1991) consider the role of asymmetry of information by assuming that it prevents some firms from accessing the capital markets. Banks, however, can monitor these firms and thus make positive NPV loans. This contrasts with the previous literature, where banks invest in zero NPV assets (because these are traded on perfect capital markets). Banks finance themselves with insured deposits and thus have their incentives distorted towards risk-taking. An increase in capital standards now has an ambiguous effect on the probability of failure. The induced increase in the portfolio risk may be outweighed, depending on the relationship between the NPV of loans and bank's investment in loans, by the effect of the reduction in the bank size.

Santos (1999) also considers the role of information asymmetry, but in a model where there is a principal-agent problem between the bank and the borrowing firm. The optimal contract the bank uses to fund that firm involves a combination of a loan and an equity stake in the firm. This contract is distorted by the fact that the bank funds itself with insured deposits. An increase in capital standards leads the bank to adjust this contract to account for the higher costs it will incur in case of bankruptcy (as it is forced to operate with lower leverage) and the higher cost of funding (as capital is more expensive than deposits). This adjustment in the financing contract induces the firm to lower its risk, which in turn reduces the bank's risk of insolvency.

The previous papers assume that banks are owned and managed by the same agent or that there are no conflicts of interest between management and shareholders. Besanko and Kanatas (1996) study the implications of this assumption.²⁹ In their model, bank insiders own only a fraction of the bank equity and take unobservable actions that maximise their own welfare. In that setting, higher capital standards have the usual asset substitution effect, leading, for a given asset base, to a reduction in the risk of the bank's assets. They also have the additional effect of reducing the bank insiders' effort as their equity stake decreases with the bank's issuance of equity to meet the new standards.³⁰ This dilution effect has a negative impact on the bank's solvency, which in some cases outweighs the asset substitution effect.

Information frictions can also give rise to adverse selection problems. Bensaid, Pagès and Rochet (1995) consider both the presence of an adverse selection problem, as the quality of the bank's assets is private information of the bank's owner, and a moral hazard problem, as the bank's profits depend on the unobservable effort chosen by the banker. In contrast with most of the previous literature that focuses on the solvency effects of capital regulation, their main goal is to find the efficient solvency regulation that minimises the dead-weight losses of running deposit insurance. They find that optimal

²⁹ As we saw before, Dewatripont and Tirole (1993a) also study the problems created by the separation of ownership from management to explain bank regulation, but they focus on the importance of capital regulation in the allocation of control rights between different groups of claimholders and the induced impact on bank managers' incentives. See Section 4.3 for the role of capital regulation in their framework.

³⁰ For an extensive analysis of the implications for the design of bank regulation that arise from the cost of issuing new equity, see Kupiec and O'Brien (1998).

regulation can be decentralised by offering banks a menu of solvency and quality requirements. Solvency requirements need to be risk-adjusted and quality requirements are defined in terms of (soft) *interim* information, measured, for instance, by ratings performed by independent agencies.

The literature reviewed above uses a partial equilibrium analysis and therefore does not capture the costs to the other sectors of the economy of an increase in the demand for capital due to capital standards. Gorton and Winton (1995) show that these costs may lead the regulator to set a capital standard lower than that called for by stability considerations alone.³¹ Banks in their model provide liquidity by offering demand deposits and produce information about borrowers which is lost if they fail or leave the industry. In choosing the capital standards, the regulator faces two problems: one deriving from banks' participation incentives (negative externalities from bank failures make their social charter value higher than the private value, giving shareholders less incentive to raise capital than the regulator) and the other from the imperfect substitutability between capital and deposits. Increasing capital standards reduces the risk of failure (this is both privately and socially desirable because the bank's charter value is lost less often), but it reduces deposits (this is costly because these securities are less informationally sensitive than bank capital and therefore they economise on the "lemons cost" that agents incur when trading in the latter).

4.2 Deposit insurance premium and capital standards: are they related?

In the absence of moral hazard, if the insurance provider has perfect information about the risk of banks' assets it can attain actuarial soundness equally well with either a risk-based insurance premium or risk-related capital standards (Sharpe (1978)). However, when the insurance provider is able to observe bank risks only with error, these alternative pricing mechanisms are no longer equivalent (Flannery (1991)). This suggests that when there are information frictions it is advantageous to consider jointly the design of deposit insurance and capital requirements.³²

Giammarino, Lewis and Sappington (1993) consider this issue in a model where the banker knows the quality of the portfolio of loans but the regulator does not, and the banker can influence that quality through an unobservable effort choice. The objective of the regulator is to provide deposit insurance while maximising social welfare. In this case, it is valuable to determine jointly the insurance premium

³¹ Diamond and Rajan (1999) point out another side effect of capital standards in a setup where financial fragility is essential for banks to create liquidity. Higher capital standards are costly because they reduce banks' fragility and, consequently, their ability to create liquidity.

³² Researchers have also considered the interplay between deposit insurance and other regulatory instruments. Kanatas (1986) finds the incentive-compatible policy that should be adopted by a regulator that jointly manages deposit insurance and the discount window facilities when banks have private information about their financial condition. See also Sleet and Smith (1999) for the interplay between deposit insurance and the lender of last resort function. Craine (1995) focuses instead on the relationship between fairly priced deposit insurance and bank charter policy and Hellmann, Murdock and Stiglitz (1997) consider the interplay between capital requirements and deposit rate controls.

and capital standards. Under the socially optimal deposit insurance system, the insurance premium needs to be adjusted for the quality of the bank's portfolio of loans, and higher-quality banks are allowed a relatively larger asset base and face lower capital requirements. Freixas and Gabilon (1998) study the interplay between capital standards and deposit insurance when there is adverse selection and show that under the optimal regulation "low-quality" banks receive an implicit subsidy. They pay a high insurance premium but are not required to meet capital standards. "High-quality" banks, in contrast, have to meet minimum capital standards but pay a lower insurance premium. The importance of having the insurance premium tied to capital standards in this setting stems from the fact that, because of the imperfect information, it pays to offer a regulation with a trade-off between the capital standards and the insurance premium in order to extract information and minimise the cost of inducing the low-quality banks to mimic the high-quality ones.³³

4.3 Bank capital regulation and the depositors' representative argument

As explained above, Dewatripont and Tirole (1993a) justify the need to regulate banks because of the corporate governance problems arising from the separation of ownership from management. When frictions prevent the writing of complete contracts between shareholders and managers, the financial structure of a firm is important because it determines the allocation of control rights among the firm's claimholders. In the case of banks, an efficient allocation of control rights needs to take account of the fact that bank debtholders (depositors) are not in a position to monitor managers because they are small and uninformed. They need a representative.³⁴

In Dewatripont and Tirole's model, monitoring by the controlling party influences the manager's choice of effort, which is assumed to be unobservable. Effort is costly, but it improves the bank's performance. Bank managers do not care about monetary incentives, but they enjoy private benefits from running the bank in the absence of interference. The controlling party decides whether to interfere based on information it receives about the manager's effort.

Within this setup, the authors show that the optimal monitoring scheme threatens the manager with interference in the event of poor performance and guarantees him no interference as a reward for good performance. This can be implemented by leaving control with relatively passive claimholders (shareholders) when the bank performs well and transferring it to the more interventionist claimholders (the depositors' representative) in the event of poor performance.³⁵ Key to this result is

³³ See also Bond and Crocker (1993) for an analysis showing the value of jointly considering capital requirements and deposit insurance when banks possess private information.

³⁴ For other analyses of the interplay between capital regulation and monitoring of the bank by a regulator, see Campbell, Chan and Marino (1992) and Milne and Whalley (1998).

³⁵ See Dewatripont and Tirole (1993a), Chapter 8, for specific ways to implement the optimal scheme using net worth adjustments or voluntary recapitalisation.

the fact that shareholders favour no interference (because their payoff is a convex function of profits), while depositors are more conservative (because their payoff is a concave function of profits). Moreover, the lower the bank's solvency, the stronger the shareholders' bias towards risk and the weaker the depositors' bias against risk (depositors become almost like equityholders when the bank is very undercapitalised). Efficient regulation in this setup requires an increase in interference when bank performance deteriorates and includes a credible mechanism to transfer control to the regulator when the bank's solvency is low. The minimum solvency requirement could be part of such regulation if it defines the threshold for the transfer of control to the regulator.

To sum up this section, deposit insurance is efficient in protecting banks from runs, but it distorts their incentives towards risk. This problem is one of the justifications for bank capital regulation. Earlier literature on capital standards models banks as portfolio managers that invest in zero NPV securities and focuses on the question of whether these reduce banks' risk of insolvency. It finds mixed results, which have been questioned on the grounds that this literature neglects the special features of banks and assumes no asymmetry of information between banks and regulators.

The research that models banks as firms that perform valuable services shows that increasing capital standards generally leads to an asset substitution effect that improves banks' solvency. Meeting the higher standards, however, is costly, for example because of a dilution effect, in which case the improvement may be reversed. Research in more general equilibrium settings shows that even though an increase in capital standards may improve banks' stability, it may not be desirable as it reduces deposits. This is costly because these are less informationally sensitive and therefore save on the "lemons cost" that agents incur when they trade in bank capital.

The literature on the optimal design of regulation finds results that are somewhat dependent on the regulator's social welfare objective and the information frictions. Some of its important insights are that because of the asymmetry of information the isomorphism between a risk-based insurance premium and risk-based capital standards no longer holds, and therefore exclusive reliance on either mechanism alone is sub-optimal. In general, the optimal regulation encompasses a menu of the regulatory instruments, designed to extract information from banks and minimise the cost of "bribing" the lower quality banks to mimic the higher quality ones.

Finally, there is a strand of literature which explains the role of capital standards based on the corporate governance problems in banks arising from the separation of ownership from management. Because depositors are not in a position to monitor bank managers, they need to be represented by the regulator. Capital standards may be an important instrument to implement the optimal governance of banks because they can be used to define the threshold for the transfer of control from shareholders to the regulator.

5. From the 1988 Accord to the Basel Committee's 1999 proposal for a new framework

The 1988 Basel Capital Accord has made an important contribution to the prominence of bank capital regulation. The Accord has been praised, for example, for promoting the international convergence of capital standards and for improving these standards in many countries. Over time, however, its conceptual limitations together with financial innovation have created incentives and opportunities for regulatory capital arbitrage, and have consequently led to a reduction in its effectiveness. This has prompted a debate on the design of capital standards and put pressure on the regulatory authorities to revise the Accord. This debate focused initially on the alternative approaches to setting capital standards put forward in the literature, but since the mid-1999 it has centred on the Basel Committee's proposal for a new capital adequacy framework.

5.1 The 1988 Capital Accord and its amendments

In the early 1980s, as concern about international banks' financial health mounted and complaints of unfair competition increased, the Basel Committee on Banking Supervision started considering proposals to set capital standards for these banks.³⁶ An agreement was reached in July 1988, which was phased in by January 1993.

The 1988 Accord explicitly considered only credit risk. It required international banks from the G10 countries to hold a minimum total capital equal to 8% of risk-adjusted assets, with at least half of this met by tier 1 capital (equity capital and disclosed reserves).³⁷ Tier 2 capital could include, among other instruments, hybrid debt capital instruments. Risk-adjusted assets were defined as the sum of the risk-adjusted assets on and off balance sheet. On-balance sheet assets were assigned to one of four risk buckets (0%, 20%, 50% and 100%) and then weighted by the bucket's weight. Off-balance sheet contingent contracts, such as letters of credit, loan commitments and derivative instruments, which are traded over the counter, needed to be first converted to a credit equivalent and then multiplied by the appropriate risk weight.³⁸

Over time, the Accord has been fine-tuned to account for financial innovation and some of the risks it did not consider initially. For example, it was amended in 1996 to require banks to set aside capital to

³⁶ Some have suggested other motives for the harmonisation of capital requirements. Wagster (1996), for example, argues that the ultimate objective was to eliminate the funding cost advantage of Japanese banks.

³⁷ See Cooke (1990) for the debate that led to the Accord and Basel Committee (1999a) for the Accord and its amendments. For a comparison of banks' and securities firms' capital standards, see Ball and Stoll (1998).

³⁸ The Accord does not set capital charges for contracts traded on organised exchanges because in the event of default the exchange adopts the counterparty's obligations.

cover the risk of losses arising from movements in market prices.³⁹ This amendment also defined a tier 3 capital to cover market risks, and allowed banks to count subordinated debt (with an original maturity of at least two years) in this tier.

The main novelty of this amendment relates to the fact that it allows banks to use, as an alternative to the standard approach, their internal models to determine the required capital charge for market risk.⁴⁰ The standard approach defines the risk charges associated with each position and specifies how these charges are to be aggregated into an overall market risk capital charge. The internal models approach, in contrast, allows a bank to use its model to estimate the value-at-risk (VaR) in its trading account, that is, the maximum loss that the portfolio is likely to experience over a given holding period with a certain probability.⁴¹ The market risk capital requirement is then set based on the VaR estimate.⁴²

5.2 Alternative approaches to set capital standards

When the Accord was introduced in 1988, its design was questioned because, among other things, the capital ratios appeared to lack economic foundation, the risk weights did not reflect accurately the risk of the obligor and it did not account for any benefits from diversification. Over time, new concerns emerged about the Accord because financial innovation made it increasingly easier for banks to find “cosmetic” adjustments to boost their reported capital ratios without enhancing their soundness (Jones (2000)).

Growing evidence on these shortcomings, together with the experience accumulated since the Accord was introduced and the research undertaken in the meantime, prompted the development of various alternative approaches to the Accord’s “buckets” framework for setting capital standards, (Mingo (2000)). Under one of these approaches, the internal ratings-based approach (IRBA), banks would assign a rating to each borrower based on their rating models and estimate the probability of default

³⁹ The market risks considered in the amendment are (a) those pertaining to interest rate-related instruments and equities in the trading book and (b) foreign exchange risk and commodities risk throughout the bank.

⁴⁰ See Hendricks and Hirtle (1997) for a brief description of the internal models approach.

⁴¹ A 10-day, 99th percentile VaR estimate equal to \$100 means the bank would expect to lose more than \$100 on only one out of 100 10-day periods.

⁴² The capital charge for general market risk is based on the VaR estimates calibrated to a 10-day, 99th percentile standard. To be precise, the capital charge is equal to the larger of the previous day's VaR estimate or the 60-day average VaR estimates times a scaling factor, which is usually equal to three. The scaling factor, which may be increased to four when too many VaR violations are detected in the back testing procedure, has been one of the most debated elements of the market risk amendment. See Stahl (1997) and Danielsson, Hartmann and de Vries (1998) for different views on this subject.

(PD) for each of the ratings they define. Regulators would then define a function to convert this vector of PDs into the minimum required capital.⁴³

Another approach, the full models approach (FMA), would extend to credit risk (and possibly other risks) the Accord's approach for market risks. Banks would need to develop a system to estimate (either independently or jointly) the probability density functions for losses in all of the bank's business (housed in the banking and trading book) stemming from each of the risk categories. The regulator would then set the capital requirement so that a given soundness objective, for example a minimum solvency standard, is met.

Finally, some have suggested using the "pre-commitment" approach (PCA).⁴⁴ This approach was initially designed as an alternative to the internal models approach for market risks (Kupiec and O'Brien (1995)).⁴⁵ Under the PCA, a bank would pre-commit to a maximum loss exposure over a period of time and the capital charge would be defined as a function of that loss exposure. Should the bank incur a larger loss, it would be subject to a penalty, which could take the form of monetary fines, punitive capital charges or other restrictions on future trading activities.

How do these approaches compare with the 1988 Basle Accord? As we saw above, that Accord adopted a "buckets" approach, treating all banks alike, and thus not giving safer banks the incentive to distinguish themselves from riskier ones in order to save on capital. Moreover, the definition of buckets based on the asset category that it adopted, a criterion only loosely related to risk, further heightened banks' incentive to develop regulatory capital arbitrage practices. The IRBA represents an improvement over that approach because it defines the buckets based on a risk measure rather than on the asset's category. As a result, it would bring regulatory capital requirements for each exposure into closer alignment with the risk of the underlying asset and would give banks better incentives to improve on their risk management practices, as this would be reflected in capital savings. However, the extent of this advantage depends partly on the way regulators map the information produced by banks' internal models into the regulatory capital. For example, if they were to set capital requirements only for a reduced number of rating buckets, this would reduce, but not eliminate, incentives for regulatory capital arbitrage.⁴⁶ An additional shortcoming of the IRBA is, as with the framework in the

⁴³ Under a more developed variant of the approach, banks would also estimate the expected loss given default (LGD) for each credit claim. In this case, regulators would have to link the matrix of EDFs and LGDs to the minimum required capital.

⁴⁴ Other approaches include the supervisory approach and the base-plus approach put forward by Estrella (1998) and Sheppard-Walwyn and Litterman (1998), respectively.

⁴⁵ See Bliss (1995), Stephanou (1996) and Kupiec and O'Brien (1997a) for a comparative analysis between the PCA and the internal models approach to set capital charges for market risk.

⁴⁶ The fact that different banks already use different internal rating models compounds this problem and it will require the regulator to "translate" each bank's rating system into a common system for regulatory capital allocation purposes. See Mingo (2000) for a further discussion of this and other practical problems with the IRBA and Tracey and Carey (2000) for a discussion of the rating models used by US banks.

1988 Accord, its inability to account for differences across institutions in such things as the portfolio's diversification.

The FMA and the PCA do not suffer from these problems, but they have their own drawbacks. Though conceptually different, the two approaches are related (Rochet (1999)). In the FMA, the back testing validation procedure (including the penalties in case the bank fails the test) needs to give the bank the incentive to reveal truthfully the probability density function of its portfolio's losses, which the regulator would then use to set the capital requirement. In the PCA, the penalty function needs to give the bank the incentive to choose the capital requirement that the regulator would have imposed had it known the density function of the bank's portfolio of losses. A challenge to both approaches is that to be incentive-compatible the back testing procedure and the penalty function have to be bank-specific, which raises questions of feasibility.⁴⁷ The FMA is more intrusive in management and requires banks to release more information. The PCA in contrast, because it applies penalties *ex post*, is more prone to a time consistency problem. Regulators, for example, would be pressured to waive the penalty in case it were to lead to bankruptcy.⁴⁸ In addition, because of limited liability the approach does not protect against go-for-broke strategies.

In sum, the new approaches to setting capital standards move away from the “one-size-fits-all” approach of the original Basel's Capital Accord. They all attempt to take account of the fact that banks are better informed about their risks than regulators. Some of them go even further and aim at designing incentive-compatible standards. These approaches, however, in contrast with the literature on optimal regulation, do not consider other regulatory instruments. That literature suggests that the inclusion in the regulatory menu of instruments, such as deposit insurance, access to the lender of last resort, (soft) information (measured for instance by agencies' ratings) and possibly the set of services banks want to offer, would facilitate the design of a regulation giving banks the incentive to truthfully reveal their risk. Besides the conceptual differences between the various approaches, their implementation also raises different challenges regarding the modelling and measurement of credit risk as well as the data necessary to validate them.⁴⁹ Despite giving consideration to the full models approach, these feasibility issues led the Basel Committee to opt for an approach based on banks' internal rating models in its proposal to revise the Accord.⁵⁰

⁴⁷ See Prescott (1997) for a discussion of the importance of the penalty scheme, Kupiec and O'Brien (1997b) for a discussion of the feasibility of bank-specific penalty schemes and Daripa and Varotto (1997) for an analysis of the reputational implications of disclosing a breach of the committed loss.

⁴⁸ See Marshall and Venkataraman (1999) for an analysis of limiting the penalty as not to lead banks into default and Mailath and Mester (1994) for a study of the regulator's incentives to close a failing bank.

⁴⁹ See Altman and Saunders (1998) for a discussion on the progress in credit risk measurement and Gordy (2000) and Crouhy, Galai and Mark (2000) for a comparison of some credit risk models.

⁵⁰ See Basel Committee (1999b) for a review of current banking industry practices on credit risk modelling.

5.3 The Basel Committee's proposal to revise the 1988 Accord

In June 1999, the Basle Committee released for comment its proposal for a new capital adequacy framework. The proposal consists of three pillars: minimum capital standards, a supervisory review process and effective use of market discipline (Basel Committee (1999c)). The last pillar is intended to encourage banks to disclose information in order to enhance the role of market participants in monitoring banks. To that end, the Committee is proposing that banks disclose information on, among other things, their components of regulatory capital, risk exposures and risk-based capital ratios computed in accordance with the Accord's methodology.

The second pillar, the supervisory review process, is intended to ensure that a bank's capital position is consistent with its overall risk profile and to enable early intervention. According to the Committee, the review process should rest on a set principles, including the principle that supervisors expect banks to operate with capital above the regulatory minimum and should be able to require them to hold capital in excess of that minimum, and the principle that supervisors should seek to intervene at an early stage to prevent capital from falling below prudent levels.

The first pillar, the new capital requirements, aims at making capital charges more correlated with the credit risk of the bank's assets. The Committee also propose to develop capital charges for risks not considered in the current Accord, such as interest rate risk in the banking book and operational risk. Regarding credit risk, the Committee propose a new standardised approach and it has announced that it will propose an alternative approach based on banks' internal ratings frameworks. The new standardised approach retains some parts of the 1988 Accord, such as the definitions of regulatory capital. Its major novelty is the replacement of the existing risk weighting scheme by a system where the risk weights are determined by the rating of the borrower, as defined for example by a rating agency. According to the proposed system, for each given class of borrowers, those with high ratings have a risk weight smaller than 100% but those with the lowest rating have a risk weight larger than 100%.⁵¹

With respect to the Committee's proposal to set capital standards based on banks' internal ratings frameworks, its release is expected only in early 2001. However, the Committee has already announced that banks will have to meet a set of conditions in order to be considered for this approach and that the proposal will encompass at least two variants, a foundation and an advanced approach, with the latter relying on more parameters estimated by the banks' models.⁵²

⁵¹ The Committee proposes that, based for example on the Standard & Poor's methodology, corporates with an AA rating or better have a 20% risk weight, those with a rating below B- a 150% risk weight and all the others, including unrated companies, a 100% risk weight. See Basel Committee (1999b) for the proposed risk weights for claims on banks and sovereigns.

⁵² See Nouy (2000) for the information already made public on what will be the Basel Committee's proposal to set capital standards based on internal ratings models.

It is outside the scope of this paper to provide a detailed analysis of the Committee's proposal, as this would require a full presentation of it. Moreover, some parts of it, particularly the standardised approach, have already been the subject of extensive analysis elsewhere.⁵³ However, a comparison with the literature reviewed above shows that some of its insights seem to have been incorporated in the proposal, but others not. For example, the literature on the optimal regulation in settings where there is asymmetry of information shows that incentive compatibility calls for a menu approach instead of a "one-size-fits-all" rule. The Committee's proposal appears to indicate a move in that direction. In addition to the standardised approach, it also includes the information that there will be an IRBA, which is a way of recognising that banks are better informed about their risks than regulators and of making use of that informational advantage. Furthermore, its decision to offer multiple variants of the IRBA meets one of the necessary conditions for offering banks a menu of regulations and the opportunity for them to distinguish themselves from their peers depending on their preferences.

Whether that menu will give banks the right incentives to reveal their true preferences rather than mimic other banks will depend, among other things, on the authorities' objective for offering multiple variants, their design, and the access and exit conditions.⁵⁴ In this respect, the Committee's proposal, because it considers only capital adequacy, appears not to have taken into account the insight of the literature that in general it is advantageous to consider instruments other than capital standards in the menu. The inclusion of some of the instruments suggested in the literature, such as deposit insurance and access to the lender of last resort, however, goes beyond what supervisors themselves can do and would require the involvement of other authorities.

There are areas where the Committee's proposal could be in agreement with the literature, but some of the details that are still missing make this evaluation difficult. A case in point is the second pillar, the supervisory review process. One of its stated goals is "to enable early supervisory intervention if capital does not provide a sufficient buffer against risk". This idea of early intervention seems to resemble the insight of the literature on the role that capital standards can play in the optimal governance of banks. They can be used to define the trigger point for interference in management and transfer of control from shareholders to the depositors' representative, the supervisory authority.⁵⁵ According to the literature, however, both the trigger point and the forms of interference need to be specified *ex ante*. The Committee's proposal does not include similar definitions. In addition, the

⁵³ See, for example, Hall (1999), ISDA (2000), Reisen (2000), Monfort and Mulder (2000) and US Shadow Financial Regulatory Committee (2000).

⁵⁴ Though still commonly associated with the insurance business, where they are designed to separate customers by their risk preferences, menus of contracts, however, are increasingly been used by many other industries such as phone companies and electrical utilities where they are designed to separate customers by their needs.

⁵⁵ An application of this insight is the prompt corrective action scheme in effect in the United States since the passage in 1991 of the Federal Deposit Insurance Improvement Act. The scheme defines a series of trigger points based on a bank's capitalisation and a set of mandatory actions for supervisors to implement at each point.

associated discretion can also be a source of problems in the principal-agent relationship between banks and supervisors.⁵⁶

Finally, there are those areas where it is still not possible to evaluate the new capital standards because the proposal is silent about them. That is the case of the minimum capital requirement. While the proposal states that the definition of capital will not be subject to changes, it does not state the criteria that will determine the minimum capital requirement and the corresponding objective.

6. Final remarks

Despite the progress in the research on banking since 1988, the year of the Basel Capital Accord, there is still no consensus on the optimal design of bank capital regulation. There are differences in opinion regarding the market failure that justify banking regulation. There are differences in the conclusions of the research on the optimal design of capital regulation, albeit explained by different modelling assumptions. In addition, there are still many relevant questions that remain unanswered. For example, we still lack a full understanding of the relative efficiencies of the various financial intermediaries in processing and aggregating information, and we also lack a complete understanding of the optimal risk-sharing among the various claimholders in a general equilibrium framework.⁵⁷

Notwithstanding these shortcomings, the research already undertaken, particularly that which builds on contemporary banking theory, has produced some useful insights for the design of capital standards.⁵⁸ For example, it shows that raising the minimum required capital standards may improve banks' stability but it is a potential source of costs, some of which are rather subtle. Increasing the costs of operating in the banking business may lead to inefficiencies, as intermediation through other financial intermediaries is not a perfect substitute for that through banks. In addition, raising the share of bank capital in the economy may be costly, as securities are not perfect substitutes. The research also shows that there is value in considering banks' informational advantage. In this case, incentive compatibility calls for a regulation that encompasses a menu of different regulatory instruments. Accordingly, in general, it will be advantageous to include in the menu instruments other than capital standards. Finally, a strand of that research points to the importance of capital standards in the implementation of the optimal governance of banks, as they can define the threshold for interference

⁵⁶ See Kane (1990) and Goodhart et al (1998), Chapter 3, for a discussion of the principal-agent problems that can arise between regulators and regulated.

⁵⁷ Theoretical research on the macroeconomic implications of bank capital regulation, for example, is still very scarce. See Blum and Hellwig (1995), Thakor (1996b) and Krainer (1999).

⁵⁸ This research has also produced conclusions about other regulations; see Bhattacharya, Boot and Thakor (1998).

in management and for transfer of control from shareholders to the depositors' representative, the supervisory authority.

An analysis of the Basel Committee's proposal for a new capital adequacy framework reveals that some of these insights have made their way into the proposal, at least in a simplified form. This is evidenced in the replacement of the "one-size-fits-all" approach of the 1988 Accord with a more menu-like approach, offering banks different variants of the regulation. In contrast with the literature, however, the proposal's "menu" does not consider regulatory instruments other than capital standards. However, it is worth noting that in the case of some of the instruments suggested in the literature, such as those related to deposit insurance and the lender of last resort facility, their inclusion in the menu is beyond what supervisors can do on their own. Further evidence in the proposal of an insight of the literature is pillar two, the supervisory review process, which was introduced to enable early supervisory intervention. Here too, though, the proposal does not completely follow the literature, as it does not pre-specify both the trigger points and the corresponding forms of supervisory interference. Finally, in a few areas, such as the minimum capital requirement, it is still not possible to evaluate the new regulation because the Committee's proposal is silent about them.

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