

# Systemic Aspects of Risk Management in Banking and Finance

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## 1. INTRODUCTION

Problems of risk management are very much on the agenda in banking and finance. There is a clear sense that risk exposure of the financial system has been increased by the changes that have taken place over the past two decades. Twenty years ago, the failure of Herstatt was largely seen as an isolated event, the consequence of a trader gone wild with nobody to control him. This year, the failure of Baring Brothers is not only seen as the consequence of a trader gone wild; it is also seen as a sign of possible danger for the entire financial system.

The sense of unease is at least partly a reaction to the proliferation of financial innovation. The outsider finds it difficult to see through the new financial instruments or the new risk management techniques that have been developed. Lack of familiarity breeds suspicion. Given such suspicion, cases like Metallgesellschaft or Baring Brothers receive special attention – and in turn breed further suspicion. The suspicions may be reinforced by the observation that banking regulators have for some time been concerned about the risk implications of new financial instruments, but have as yet been unable to design and enact a definitive scheme of prudential supervision of these activities.

In fact though, the most substantial problems in banking have involved traditional banking activities rather than new instruments. The S&L crisis in the United States started with a standard problem of maturity mismatch between home mortgages and savings deposits inducing effective insolvency at a time of high interest rates in the early eighties. The recent Scandinavian banking crisis was due to excessive real-estate finance making banks vulnerable to interest rate increases. Bad loans to business firms are a recurrent theme of the eighties and early nineties from Continental Illinois to the recent problems of Crédit Lyonnais, which, incidentally, exceed the Baring Brothers debacle by an order of magnitude. Increased risk exposure in banking and finance is a problem of traditional banking operations just as much as it is a problem of new financial instruments.

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If indeed the risk exposure of financial institutions has increased, what factors were responsible for this development? What scope is there today for risk management? What scope for banking regulation? The present paper addresses these issues from a systemic point of view, i.e., by looking at developments in banking and finance with a view to the overall allocation of risk in the economy. Thereby, I hope to avoid the worst pitfalls of the piecemeal approaches that have dominated public and regulatory discussion from the deregulation of the early eighties to the reregulation and international harmonization since the late eighties. Public discussion has tended to deal with problems as they surfaced without considering (i) whether the problems that surfaced were not merely the symptoms of more serious diseases and (ii) what would be the side effects of the remedial measures taken. The most infamous instance of this was the deregulation of the American S&L's in the early eighties.<sup>1</sup> More recently the 1988 Basle Agreement or the 1991 Federal Deposit Insurance Corporation Improvement Act do not seem to have been based on a comprehensive view of banking and banking regulation either.

In the following, I will briefly assess the developments that have led to the current situation. In the process I will try to identify the factors that have increased the risk exposure of financial institutions. Thereafter I will discuss the implications of my assessment for the role of risk management, considering first the problem of risk perception, secondly the role of incentives for risk taking, and, finally, the scope for prudential regulation and supervision.

## 2. WHY HAS RISK IN BANKING INCREASED?

Any discussion of risk in banking must start from the observation that a bank's obligations to its depositors are mostly independent of the returns which the bank earns. Low realizations of returns do not reduce the bank's obligations towards its depositors. Risks are born by shareholders; to the extent that equity is insufficient, bank failure is a possibility.

Certain risks in the bank's operations may be negligible because they are subject to the law of large numbers. This may, e.g., be the case for borrower-specific default risks in small loans or for depositor-specific withdrawal risks in demand and savings deposits. It is *not* the case for correlated risks such as interest-induced valuation risks on long-term assets, interest-induced refinancing risks on short-term liabilities or the business cycle component of default risks on loans. In any given period these risks are *not* subject to the law of large numbers and there is no smoothing across customers. In the absence of contractual arrangements shifting them to another party, these risks have to be born by the bank.

Given the lack of risk matching between obligations and assets, one should not be so surprised at the bank failures of the past fifteen years. Instead one should be surprised at

1. As early as 1983 KAREKEN wrote that deregulation was «putting the cart before the horse».

the low rate of bank failures between the thirties and the seventies. After all, if a bank is less than ten percent equity-financed, it doesn't take much of an adjustment in asset values to wipe out the equity; if fixed-interest loans and securities were valued at discounted present values using market rates of interest for discounting, it wouldn't take much of an interest rate movement to induce a notional insolvency.

As far as I can tell, the low rate of bank failures between the midthirties and the midseventies is explained by the following considerations:

- Prior to the midseventies, market rates of interest did not fluctuate very much.
- Under the Bretton Woods System, exchange rate risks also did not play much of a role.
- Price competition between banks was restricted by cartel practices or deposit rate regulation.
- Disintermediation was not a serious threat. Depositors were not much concerned about bank failures, and there was not much competition from nonbank intermediaries.

In a nutshell, bank failures did not play much of a role because intermediation margins were high relative to undiversifiable risks. Therefore depository institutions could cope with the bad times they encountered. Moreover once the bad times were over, the high intermediation margins provided a natural source of funds for rebuilding equity without much ado. In the absence of «mark-to-market» accounting for loans and mortgages, some of the fluctuations in effective equity positions did not even appear in the books.

The factors that made for bank safety in the period 1935-75 are no longer there today. They have been eroded by various developments since the midseventies:<sup>2</sup>

- Fluctuations in nominal interest rates have become much more pronounced. At their peaks in the midseventies, the early eighties and the late eighties/early nineties, interest rates attained levels that had been unheard of in previous decades.
- With the abolition of the Bretton Woods System, exchange rate risk began to play a major role.
- Competition in banking and finance has become more intense. In part this development was set off by nonbank intermediaries such as money market funds entering the fray in periods of high interest rates. In part it involved cross-border competition opening after removals of capital controls and other impediments to international finance.

Again in a nutshell, intermediation margins in banking were eroded just as interest rate risks and exchange rate risks increased. The lack of risk matching in bank balance sheets was thereby brought to the fore – most dramatically in the case of the American S&L's that had financed fixed-interest, long-term mortgages with short-term deposits and were technically insolvent as of 1981.

In this process deregulation played a dual role. On the one hand, the abolition of deposit rate regulation as well as various asset allocation rules was a response to the

2. For a more detailed discussion of these developments, see HELLWIG (1994b).

observation that these regulations harmed the position of depository institutions faced with competition from institutions outside the domain of regulation, non bank intermediaries or foreign institutions. On the other hand, the deregulation itself contributed to the intensification of competition. In any case it must be kept in mind that the deregulation of the early eighties occurred because a system based on barriers to competition was no longer viable.

The account so far explains the apparent increase in risk in banking since the seventies by (i) extraneous increases in interest and exchange rate risks and (ii) the erosion of intermediation margins due to increased competition. In addition, there also seems to have been an increase in risk taking by banks. Many accounts of bank failures and crises refer to reckless lending and investment strategies. Well known examples are the American S&L's after deregulation (see, e.g., KAREKEN [1983], KANE [1989], WHITE [1991]), large American commercial banks in the late eighties (BOYD and GERTLER [1994]), or the Swedish banks after deregulation (BERGLÖF and SJÖGREN [1995]).

From a theoretical perspective, an increase in risk taking by banks was to be expected. It is well known that debt finance – of which deposit finance is an example – involves moral hazard in the form of «excessive risk taking» (STIGLITZ and WEISS [1981], BESTER and HELLWIG [1987]): Under debt finance, the downside risks are partly born by lenders, but the windfalls of good return realizations accrue to the borrower. Given this asymmetry, the borrower has an incentive to choose a strategy involving high return realizations if it succeeds, but a low probability of success. This moral hazard problem is the more serious the more pronounced is the asymmetry in the incidence of good and bad return realizations; the asymmetry in turn is the more pronounced the lower the borrower's equity and the closer he is to default. The extreme example was provided by those S&L's that were effectively insolvent at the time of deregulation and then proceeded to «gamble for resurrection» (DEWATRIPONT and TIROLE [1994]).

In this context the disappearance of oligopoly rents may also play a role (GEHRIG [1995]). The higher potential future rents are, the more one has to lose from bankruptcy. The prospect of future rents from the banking franchise thus reduces risk taking incentives just like an equity buffer. The reduction of oligopoly rents due to the intensification of competition since the seventies has reduced effective bankruptcy penalties and increased incentives for risk taking. Financial institutions were tempted to replace oligopoly rents by premia on risk taking. This may explain, e.g., the behaviour of large American commercial banks in the late eighties (BOYD and GERTLER [1994]). It may also explain the extent to which banks all over the world played the yield curve from 1991 to 1993, exposing themselves to interest rate risk, which in fact came home to hit many of them in 1994.

In summary, the intensification of competition in banking since the midseventies has enhanced risk not only because it has reduced or eliminated the buffers provided by intermediation margins; it also has increased outright incentives for risk taking by banks.

### 3. RISK MANAGEMENT AND RISK PERCEPTION

Given the changes in banking and finance that have occurred since the seventies, what are the implications for risk management? Specifically, (i) what are the implications for the risk management strategies that are available, and (ii) what incentive problems have to be dealt with? Both questions concern banking regulators as well as individual banks. I begin with a discussion of different risk management strategies.

The discussion is based on the assumption that competitive pressures on intermediation margins are not likely to disappear, i.e., that the mechanisms which made for bank safety in the fifties and sixties are unlikely to be reinstated in the foreseeable future. Financial innovation, international financial integration, improvements in communication – all these forces, which have made for more competition since the seventies, are still at work. If anything, I should expect the intensification of competition to continue, eventually attaining also the sectors and countries that have so far remained immune.<sup>3</sup>

With continued pressure on intermediation margins, bank failures and banking crises will not become any less frequent unless banks change their strategies so as to improve the risk match between their gross returns and their obligations. When intermediation margins are low, it is simply not feasible for banks to assume undiversifiable risks, in particular interest rate risk, at the levels at which they have assumed them in the past.

The problem is not just that the reduction of the margin between lending rates and borrowing rates makes a bank more vulnerable to fluctuations in borrowing rates. The more important problem is that the reduction of margins makes it more difficult to rebuild equity after a period of «bad luck», i.e., after a bad risk realization. Given the greater difficulty of rebuilding equity between incidences of «bad luck», banks are more vulnerable to the risk of having repeated incidences of «bad luck». This is important because no institution – *no matter what its initial reserves may be* – is able to withstand an arbitrarily long run of unlucky risk realizations.

The full extent of the problem is not always appreciated. This is mainly because traditional concepts of risk in banking stand in the way of a proper risk perception. Specifically, the traditional distinction between credit risks and market risks tends to induce an underestimate of the risks assumed when a bank holds nonfungible loans and mortgages. Since interest rate risks are subsumed under market risks, the distinction between credit risks and market risks frequently leads to the view that nonfungible loans and mortgages are not subject to interest rate risk. As the American S&L's found out to their chagrin, this view is mistaken. To be sure, nonfungible loans and mortgages are not subject to interest-induced fluctuations in «market values». However, like market values, the present values of returns on these securities vary with the rates used for discounting

3. For example, German banks, which so far have not known much competition at the retail level, are likely to experience significant pressure on their deposit base once (i) political pressure from the European Union and from the United States forces the German system to be more open to international competition, and (ii) improvements in communication technologies reduce the role of branch networks in the competition for household savings.

like any market value; equivalently, the institutions holding these securities are subject to interest-induced refinancing risks. In the absence of intense competition for funds, these refinancing risks may be negligible and the traditional view of credit and market risks harmless. In a competitive system though, in which deposit rates move with market rates, interest-induced refinancing risks are nonnegligible, and the view that nonfungible securities are not subject to interest rate risk is harmful to a proper perception of a bank's risk exposure.<sup>4</sup>

What can be done to improve the risk match between returns and obligations and to reduce the risk of bank failures and banking crises? In principle, three types of strategies can be distinguished:<sup>5</sup>

- Banks can try to shift undiversifiable risks to their borrowers, e.g., by making variable-rate loans and mortgages.
- Banks can try to shift undiversifiable risks to their lenders, e.g., by financing fixed-interest loans with fixed-interest obligations of similar maturities.
- Banks can try to shift undiversifiable risks to third parties, e.g., through interest rate swaps or other derivative instruments.

These strategies can of course be used in combination as well as separately. For the purpose of the analysis though it is easier to look at each of them in isolation.

In considering these different strategies, it is useful to remember that the returns on *real* assets and the risks in their returns are by and large independent of the underlying financial arrangements. (I am neglecting the real resource costs associated with bankruptcy.) A building provides accommodation services over a time span of some fifty years or more. The value of the building, say, after five years is subject to interest-induced valuation risk. Financial packaging can redistribute this risk between parties, the owner of the building, a third party, the bank's shareholders, the bank's depositors – in Switzerland the risk can even be shifted to tenants. However, financial packaging cannot eliminate the risk altogether. From a general-equilibrium perspective, it is clear that *the risks inherent in the economy's real assets have to be borne by somebody; the question is who will have to bear them.*

Under the first of the strategies mentioned above, risks are in principle borne by the borrowers. If the market rate of interest goes up, the variable-rate clause of the loan contract makes the borrower's interest obligation go up. If he is actually able and willing to pay the higher rate, the bank as lender is thereby able to withstand the tougher competition for deposits.

4. Given these considerations – and given the experience of the American S&L's –, the extent to which the distinction of credit risk and market risk pervades regulatory thinking about risks in banking is somewhat disconcerting, see, e.g., the recent proposals of the Basle Committee on Banking Supervision (1995).
5. In drafting this passage, I have wondered whether I shouldn't list a fourth strategy, namely, to have more equity so as to have a larger buffer against risks. However, for reasons discussed in the following section, I have come to the conclusion that this is not a well specified strategy at all.

However, the accommodation services provided by a building do not change when interest rates go up. As the increase in the market rate of interest raises the borrower's debt service obligation his tenant may be unable or unwilling to pay more rent, so he may be unable – or unwilling – to pay more interest. If he defaults on his obligation, the bank as lender may repossess the property only to find that its value in the market is depressed because interest rates are so high. The attempt to shift interest rate risk to the borrower by means of a variable-rate contract is then only partly successful. To some extent the variable-rate clause has merely replaced interest rate risk by interest-induced credit risk.

This consideration reinforces the criticism of the traditional distinction between credit risk and market risk. Contrary to what the distinction between credit risk and market risk would seem to suggest, *the two sets of risks may be correlated, and moreover, credit risk may be endogenous*, depending, e.g., on whether the underlying loan contract involves a fixed or a variable rate. For instance, it seems that in the United States, in the early eighties the level of credit risk in the mortgage market went up significantly as fixed-rate mortgages were replaced by variable-rate mortgages on a large scale. Overall it is still likely that the move to variable-rate instruments has reduced the exposure of depository institutions to interest-induced risks, but because of the increase in interest-induced default risks, the reduction was smaller than anticipated.

No such problem arises if a bank tries to shift risks to its depositors rather than its borrowers. In this case, the bank's very obligation is tied to its return, so the possibility of bank bankruptcy is *automatically* reduced or eliminated. To be sure, the depositor will require a risk premium for the risks he assumes. However, given the real assets that are financed and given the risks inherent in these assets, these risks have to be borne anyway, and whoever bears them will require a risk premium. There is no prior presumption that the risk premium required by depositors is any larger than the risk premium required by anybody else, in particular, a shareholder.

In this context, it is worth noting that there is no necessary link between the allocation of return risks and the provision of liquidity to depositors. Liquidity provision requires some assurance that the depositor can liquidate his position whenever he wants to. However, the price at which he does so need not be fixed. To see this, consider the case of a bank making five-year, fixed-interest, nonfungible loans and financing itself by a five-year, fixed-interest, *fungible* bond. If the bond market works well, it provides bondholders with liquidity in the sense that they can always sell at the going market price. At the same time, they bear all interest-induced valuation risks, leaving the bank immune against the interest-induced risks in its loan position.<sup>6</sup>

In contrast, the attempt to shift risks to third parties generates new credit risks – just like the attempt to shift risks to borrowers. Consider the financing of a real-estate investment through a fixed-rate mortgage with interest rate risk hedged by a fixed-

6. Under certain assumptions about household preferences, the overall risk allocation induced by such an arrangement may actually be constrained-Pareto-efficient, see HELLWIG (1994a).

rate/variable-rate swap. If the counterparty in the swap is always able and willing to pay, the arrangement is fully successful. However, when market rates of interest are high, the counterparty's obligations under the swap are high, and it may be unable or unwilling to pay. Here again, an interest-induced default risk may replace the underlying interest rate risk that the bank is trying to hedge. The net effect is still likely to be a reduction in the bank's exposure to interest-induced risks, but, as in the attempt to shift the risks to the borrowers, a full insulation of the bank from these risks cannot be achieved.

Counterparty credit risk in a derivative contract is difficult to assess. Like credit risk in a variable-rate contract, counterparty credit risk in a derivative contract is correlated with the underlying risk which is to be hedged, and moreover the nature of the correlation is endogenous to prevailing contractual arrangements. For quantitative assessments data on the past incidence of these risks are of little help if prevailing contractual arrangements change. Worse yet, in the absence of full transparency about prevailing contractual arrangements, these risks may change without any institution being aware of it.

To see the issue, consider the problem of maturity transformation and interest rate risk exposure. For the sake of the argument, consider an institution that finances itself by issuing fixed-interest securities with a maturity of  $n$  months and that invests in fixed-interest securities with a maturity of  $n+1$  months. On the face of it, maturity transformation is small, and interest rate risk exposure is minimal. Suppose however that we have 479 such institutions, one each for  $n=1,2,\dots,479$ . These institutions may be transforming a one-month deposit into a forty-year fixed-interest mortgage, with significant interest rate risk exposure for the system as a whole. *The interest rate risk exposure of the system as a whole is not visible to the individual institution unless it knows that it is but an element of a cascade and that credit risks in the cascade are correlated.*

However, financial institutions typically do not know their trading partners' overall positions, let alone their trading partners' trading partners' positions, ... . Therefore they cannot tell whether they are elements of a cascade or not. Nobody can tell how much undiversifiable risk is hidden in counterparty credit risks. More generally, when there is a significant amount of interbank borrowing and lending under various clauses, the risk assessment of each institution's position individually may not provide enough information to assess the risk exposure of the system as a whole.

Given these considerations, it is somewhat disconcerting to observe that in practice risk management strategies involve attempts to shift risks to borrowers or to third parties, usually other financial institutions, rather than to depositors.<sup>7</sup> Leaving aside the possibility that deposit finance may be artificially subsidized, e.g., by government-backed deposit insurance schemes, I suspect that this observation reflects the century-old notion that deposit finance is cheap because depositors are willing to pay a high premium for the safety of their claims. Prior to 1970, this notion was probably justified. Today, in a

7. Even the securitization of mortgages in the United States usually involves a shifting of risks to other financial institutions rather than final households.

world of greater risks and more intense competition for deposits, the matter is less clear. Could it be the case that prevailing strategies are based on misperceptions of the systemic element in counterparty credit risks?

Turning from the risk management strategies of individual banks to banking supervision and regulation, I note that the preceding considerations have a few straightforward implications:

- First, prudential supervision needs to abandon the idea that credit risks are independent of other risks. The «driving-factors approach» which underlies the Basle Committee's recent espousal of models of market risks used by the banks themselves ought to be extended to credit risks, with due recognition of the relevant correlations.
- Secondly, prudential supervision ought to think in terms of system risk as well as institution risk. Traditionally, banking supervisors assess the situation of banking institutions by looking at each institution individually. As shown by the cascade example above, this approach may miss important aspects of system risk exposure.

Concerning the latter point, it would be desirable to have at least some transparency about the scope of inter-institution transactions and positions, so that at the very least one might *assess the net position of the financial system vis-à-vis the rest of the world*, households and firms. Under current reporting practices, this is not possible, partly because risk-bearing aspects of, e.g., interbank contracts are typically not reported, and partly because the fragmentation of financial subsystems reporting to different supervisory authorities prevents a comprehensive assessment. The problem of fragmentation is not only one of fragmentation by national boundaries; at least in the United States it is also one of fragmentation by sectoral or other regulatory boundaries.

#### 4. BANK EQUITY, RISK TAKING INCENTIVES AND PRUDENTIAL SUPERVISION

The preceding discussion of risk management strategies has neglected the possibility that a bank might simply have more equity so as to have a larger buffer against the risks that it faces. This is of course the strategy that underlies the Basle Committee's thinking about capital adequacy regulation. The problem is that as given it is not a well defined strategy at all.

If we think of a bank faced with repeated risks *in a dynamic context, the question is how equity can be adjusted over time*. As I mentioned above, in the pre-1970 period after a bad spell, equity could always be rebuilt from oligopoly rents. In 1991-1993, recapitalization was helped by monetary policy allowing banks to play the yield curve (and expose themselves to interest rate risk).<sup>8</sup> What is to be done if neither of these sources of new equity is available? A recapitalization through the open market is likely to be difficult as prospective stockholders may be wondering how many more skeletons there

8. Presumably, the exchange rate turbulences of 1992 and 1993 also provided banks with a nice transfer from taxpayers.

are in the closet.<sup>9</sup> A «recapitalization» through a takeover by another bank may be the most realistic possibility, but, as the Scandinavian experience shows, the scope for this may be limited, especially when all banks are having difficulties at the same time.

Given the difficulties of recapitalization after a spell of bad luck – and given the possibility of repeated bad spells – it is not clear what one means in asking a bank to follow a strategy of having more equity as a buffer. More equity in the beginning – certainly! But thereafter?

In this context, it is worth noting that there is a significant difference between the securitization of risks through the specification of obligations to depositors or other lenders and the shifting of risks through the issue of outside equity. To be sure both operations shift risk to outside financiers. However, equity involves a nonspecific shifting of risks including risks that may already have materialized, the skeletons in the closet. In contrast, contingency clauses in debt contracts involve a shifting of particular risks that are clearly specified in the contract. The securitization of particular risks, e.g., interest rate risks in debt contracts therefore involves fewer problems of moral hazard and asymmetric information and is less likely to be subject to rationing in the market than an all-purpose quasi-securitization of risks in a new outside equity issue.

Why should there be any prudential regulation of bank equity at all? The standard argument is that depositors need to be protected against the possibility of bank failure. From a welfare theoretic perspective, the merit of this argument is unclear. First, it is not clear why statutory regulation is needed to protect depositors. If depositors are concerned about bank safety, won't banks have an incentive to have high equity and advertise this fact? From a public-choice perspective, I can understand that well capitalized banks may want to call for statutory regulation to eliminate the competition from undercapitalized banks. From a welfare theoretic perspective though, we should need an additional argument to establish that unregulated quality competition on the basis of bank safety provided by bank equity would involve a market failure that needs to be corrected.

Secondly, if we accept the need for statutory regulation of bank equity to protect depositors, it is not clear why we should stop short of a 100% equity requirement. This would provide perfect protection to depositors. However, there would be no depositors left. Shall we suppose that the 8% fixed in the Basle Agreement is a compromise between the notion that 100% would provide perfect protection and the notion that perfect protection is useless if there is nobody left to be protected? If so, why 8%, rather than 4% or indeed 50%? The preceding discussion of the changing nature of undiversifiable risk in banking should make us suspicious of any rigid quantification. At the very least we should have an argument as to the guiding principles underlying the choice of numbers.

A more subtle argument points to moral hazard in banking as a source of market failure. As mentioned above, any institution that is financed by debt, i.e., by securities

9. See MYERS and MAJLUF (1984) or GREENWALD and STIGLITZ (1990) for extensive discussions of the difficulties of external equity finance.

whose claims are independent of the institution's returns, has an incentive to choose «too risky» a strategy as the downside risks are borne by the financiers and the upside windfalls accrue to the institution. This «excessive risk taking» problem is the smaller the higher is the bank's equity. Indeed the «overissue» of deposits relative to equity itself may be regarded as an instance of the problem. Statutory regulation of bank equity may then be seen as an attempt to correct for this «market failure» (ROCHET [1992], DEWATRIPONT and TIROLE [1994], GEHRIG [1995]). To provide a sense of drama, we may add another reference to «zombie» S&L's gambling for resurrection in the eighties.

Of course, the abstract incentive argument applies to a debt-financed nonfinancial firm just as much as it applies to a bank. There are however three major differences:

- The debt-equity ratios of banks tend to be substantially higher than those of ordinary firms (DEWATRIPONT and TIROLE [1994]).
- Bank debt tends to be held by many small depositors; firm debt in contrast tends to be more concentrated (DEWATRIPONT and TIROLE [1994]).
- Assets held by banks tend to be more fungible than assets held by firms. While outright theft à la Vesco/IOS may be the exception, asset substitution is more of a danger in banks than in nonfinancial firms.<sup>10</sup>

All three observations imply that «excessive risk taking» may be a more serious problem for banks than for nonfinancial firms. Bank equity is relatively lower, debt-holders have less of an incentive to engage in monitoring activities, and asset fungibility provides more scope for running risks at the creditors' expense.

The interplay of incentives, lack of monitoring, and asset fungibility was illustrated rather drastically in the Baring Brothers episode. In this episode, a single trader was able to build a huge uncovered position in just a few days with no interference from the head office. Indeed when margin calls should have alerted the head office that they had a problem, they preferred to look the other way. The trader was motivated by an incentive scheme with a large bonus component. The head office was motivated by the notion that this was a competent trader. After all he had been making large profits in previous years. The notion that large profits may be a sign of excessive risk rather than competence or high effort does not seem to have entered their considerations.

In the context of our more general discussion, the following observations seem relevant:

- The development of large, relatively liquid markets for complicated financial products has increased the scope for undetected risk taking through large speculative positions.
- The complexity of trading strategies underlying the development and pricing of derivative products has required delegation to highly specialized individuals or teams, with less scope for competent monitoring.<sup>11</sup>

10. For a theoretical analysis of the role of asset fungibility, see MYERS and RAJAN (1995).

11. In the Baring Brothers case, apparently monitoring would not have been so difficult. Note however that in the Metallgesellschaft case at least some authors put the blame on incompetent monitoring and

- Incentive schemes which are heavily profit-oriented without allowing for risk expose the institution to excessive risk taking by its derivative trading teams. The problem is exacerbated when professionalization induces the illusion that one has all risk under control whereas in fact one sees only those risks that one knows from the Black-Scholes formula.<sup>12</sup>
- Whereas the preceding points concern the internal organization of the bank rather than the relation of the bank to its creditors, from the perspective of the creditors, the bank's internal organization, namely the extent of delegation to specially skilled traders, the choice of incentive schemes for these traders, and the choice of monitoring strategies may involve an element of excessive risk taking. Whatever the head office of Baring Brothers actually thought when they preferred to look the other way, their behavior was indistinguishable from that of somebody who thought «Heads – we win, tails – the creditors loose».

These considerations support the view that excessive risk taking is more of a problem in the financial sector than in the nonfinancial sector. They also suggest that the problem may be particularly relevant today, as many financial institutions are still trying to find appropriate patterns of organization for risk management in a changing environment. If one adds the observation, which I made above, that the decline of anticipated oligopoly rents is itself likely to exacerbate the problem, one can understand why this should be a matter of concern for statutory regulation.

Is it clear though that capital requirements are the appropriate regulatory response? I have three major reservations. First, positive incentive effects of capital requirements on risk taking have *only* been demonstrated in a one-shot investment-return framework. They have *not* been demonstrated in any dynamic framework involving sequences of investment choices and return streams. In a dynamic framework one has to worry about incentive effects of *ongoing* capital requirements determining the scope for investment as one goes along. These incentive effects are not limited to capital requirements constraining risky investment as they are made. There will also be incentive effects of *anticipated future* capital requirements on current investment choices. Some effects will be risk-reducing: I may prefer to reduce risky investments in order to hold a buffer of «surplus capital» enabling me to avail myself of future chances when they come up. Some effects will also be risk-enhancing: If I have little «surplus capital», I may prefer to gamble, i.e., to choose a risky strategy which provides me «surplus capital» if it succeeds and leaves the regulators with a mess if it fails. An overall account of the incentive effects of capital requirements is as yet not available.

Secondly, from a system perspective, I am bothered by the macroeconomic implications of capital requirements that are independent of macroeconomic conditions. Sup-

interference from the head office rather than the speculative activities that were undertaken (CULP and MILLER [1995a,b]).

12. Note the difficulties that the literature on the Metallgesellschaft case has in coming to terms with the role of counterparty credit risks and their correlation with spot market prices, see CULP and MILLER (1995a,b), EDWARDS and CANTER (1995), MELLO and PARSONS (1995).

pose that the economy is hit by a negative shock to aggregate demand. If the fall in aggregate demand reduces the debt service of nonfinancial firms, this in turn reduces bank profits and – in the absence of fully compensating issues of outside equity or declines in dividends – bank equity. Under a capital adequacy requirement, the decline on bank equity reduces bank lending. This in turn reduces business investment and further exacerbates the negative shock to aggregate demand (BLUM and HELLOWIG [1995]). Because of stock-flow interactions, this effect is likely to be even more drastic, if we think of the initial shock as a monetary shock raising interest rates and if we have «mark to market» accounting.

Thirdly and most importantly, capital requirements seem like a crude and indirect way of addressing the problem of excessive risk taking. The Dewatripont-Tirole argument as to why excessive risk taking is more serious for banks than for nonfinancial firms starts from the contrast between the monitoring of nonfinancial companies by their creditors – few in number and each of them large – and the absence of monitoring of banks by their depositors – many in number and each of them small. Given this contrast, prudential supervision is seen as a substitute for monitoring by creditors. However, a kind of statutory «monitoring» that is limited to the enforcement of capital adequacy requirements seems all too simplistic. With exogenously given, very crude risk weights, such «monitoring» does not get to the core of the asset substitution problem as evidenced, e.g., in the Baring Brothers episode. Indeed as markets are becoming ever more complex and the scope for asset substitution is becoming ever larger, I expect that capital requirements will become ever less effective as an incentive device.

If one looks at prudential supervision of banks as a substitute for monitoring by creditors, one ought to think about monitoring strategies that go more directly to the heart of the matter. This would require supervisory authorities to take a more active part in banks' strategy choices, perhaps along the lines taken by banks in their relations with industrial companies. As presently constituted, supervisory authorities are not in a position to do so. They have neither the resources nor the incentives to do more than implement a few simple bureaucratic rules. As for the resources, I wonder whether the issue isn't important enough to warrant investing rather more. If we think of excessive risk taking as a serious problem and if we think of the scope and incentives for excessive risk taking as becoming ever larger, we cannot expect to control this problem for free.

The problem of incentives for bank supervisors is more difficult. On the one hand, one wants them to actively represent the interests of depositors in strategic decision making. After all, if things go wrong, the choices taken concern the depositors – or a deposit insurance agency – fairly directly. On the other hand, one does not want them to approach this task with a bureaucratic inflexibility which interferes with all innovation in the financial sector. Can one design institutions that provide a reasonable compromise between these two considerations? This is perhaps the most important challenge for the prudential supervision of banks in the future.

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#### ZUSAMMENFASSUNG

Nach einem kritischen Résumé der Entwicklung des Finanzsektors in den letzten zwanzig Jahren werden Strategien des Risikomanagements für Banken und Bankenaufsicht diskutiert. Besondere Aufmerksamkeit gilt den systemischen Risiken, die sich daraus ergeben, dass in einem komplexen Geflecht von Interbankbeziehungen die Gegenpartierisiken der einzelnen Verträge und ihre Korrelation mit den zugrundeliegenden wirtschaftlichen Risiken weder für die Vertragspartner noch für die Aufsichtsbehörden zu übersehen sind. Ein weiterer Abschnitt behandelt das Problem des «Excessive Risk Taking» von Banken und nimmt kritisch zu dem Versuch Stellung, dies durch Eigenkapitalregulierung zu kontrollieren.

#### RESUME

Après un bref résumé de l'évolution du système bancaire et financier lors des vingt années passées, l'article discute les stratégies de maniement des risques pour les banques et les autorités de supervision bancaire. Il met en focus les risques systémiques qui ressortent de la complexité du système de contrats interbancaires avec des risques de contrepartie et leurs corrélations avec les risques sous-jacents tout à faits intransparents. La dernière partie de l'article discute le problème de prise excessive de risques par les banques et critique la notion qu'on puisse contrôler ce problème par la régulation de solvabilité des banques.

#### SUMMARY

The paper provides a critical summary of recent developments in banking and finance and discusses risk management strategies for banks and for banking supervision. Special attention is paid to systemic risks which arise because the nexus of interbank contracts is so complex that counterparty credit risks and their correlations with underlying risks are transparent neither to banks nor to bank supervisors. Another section discusses «excessive risk taking» by banks and provides a critical analysis of the attempt to control banks by capital adequacy regulation.