Banks, Markets, and the Allocation of Risks in an Economy

by

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This paper discusses the role of banks and markets in the allocation of risks in an economy. Starting from a discussion of risk allocation in the Arrow-Debreu model, it criticizes the view that banks and markets are substitutes. Instead it is argued that markets are made by intermediaries and intermediaries in turn rely on – interbank – markets for risk management. The analysis raises the question why traditional contractual arrangements in banking leave banks subject to risks associated with macro shocks, which are in principle contractable in an incentive-compatible way. Several explanations for this phenomenon are discussed. (JEL: D 50, D 80, G 20)

1. Introduction

The present paper discusses the role of banks in the allocation of risks in an economy. Concern about this issue arises from the following three observations: *(1)* For some time, financial systems all over the world have been undergoing substantial changes. Some of the changes involve quite drastic reallocations of certain risks. For instance, the reorganization of the system of housing finance in the US has removed the interest rate risks associated with housing finance from depository institutions and homeowners, and shifted them to whoever buys mortgage-backed securities in the open market. *(2)* The 1980s and early 1990s have seen a recurrence of banking crises in several countries, raising the spectre that banks may be a substantial source of risks for the rest of the economy. This had been a familiar concern in a previous era, but had almost been forgotten in the decades between the 1930s and the 1970s. *(3)* Economic theory has as yet little to say about these matters. Theories of risk allocation are typically presented in a context of "perfect" markets in which there is no room for financial intermediaries. Theories of financial intermediation are typically presented in a setting in which most risks are diversified away by the law of large numbers so the problem of risk allocation is trivial. Finally,

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theories of risk-taking by financial intermediaries are typically presented in a setting in which the role of intermediation is not accounted for and the financial intermediary might just as well be any ordinary firm.

Given these observations, I see a need for a systematic theoretical assessment of the role of financial intermediation in allocating risks in the economy including the role of risk-taking by financial intermediaries themselves. The present paper makes a start towards such an assessment. I will try to develop a systematic account of the theoretical notions that we have and try to indicate their merits and their shortcomings with respect to the analysis of recent and ongoing developments in the financial sector. I will *not* say much about these developments themselves because I have done so elsewhere (HELLWIG [1994b], [1995a]).

The major empirical phenomenon that needs to be accounted for is the poor risk match between the assets side and the liabilities side of a traditional depository institution. A bank that takes in demand deposits or savings deposits and uses them to finance industry loans or real-estate loans exposes itself to many risks: the risk that depositors withdraw their funds, the risk that depositors ask for higher interest rates, the risk that the borrowers default and that the assets that are used as collaterals may be worthless. Some of these risks may "disappear" through diversification. Many of them however will not do so. Indeed it is important to see that many of the risks in banking are correlated with each other as they are driven by underlying common factors such as interest rates, exchange rates, the macroeconomy, etc. For example, an increase in market rates of interest induced by the central bank's monetary policy will at the same time (i) induce depositors to ask for higher deposit rates, (ii) depress the values of the properties that serve as loan collaterals, and (iii) reduce the level of overall economic activity, making it harder for firms to service their debts. Effects of this sort were responsible for the sorry shape of the American S & L institutions even before deregulation in the early 1980s. They also played a major role in the various banking crises of the early 1990s, in particular the Scandinavian crises of 1992/93. The question is, why depository institutions have traditionally exposed themselves to these non-diversifiable risks, and indeed why depository institutions in some countries are still doing so?

Many economists will point their fingers at statutory regulation as the main culprit. Discussions of the American S & L crisis tend to go in this direction, the question being only which is more to blame, deposit insurance in the 1980s or Regulation Q in the 1970s. Without denying the importance of statutory regulation in banking or the detrimental effects of certain regulatory devices, I am not convinced that this is the entire story. Explanations based on this regulation or that regulation are sometimes a bit provincial (in terms of time as well as place), overlooking the fact that the lack of risk-matching in the accounts of depository institutions is a fairly ubiquitous phenomenon, and, moreover, much of it goes back to – at least – the early decades of this century when statutory regulation was far less important than it became after the Great

Depression. To understand the phenomenon, we need to account for the enthusiasm of German banks about "cheap deposits" around 1910 as well as the misdeeds of American S & Ls around 1985.

2. Markets, Intermediaries, and the Allocation of Risks in a World Without Information Asymmetries

From the perspective of abstract allocation theory, the problem of risk allocation in an economy involves (i) the question of what is the economy's risk exposure altogether, and (ii) the question of how the given risks are distributed among the agents in the economy. The first question involves choices concerning investment, production, accident prevention, etc., that determine the economy's susceptibility to exogenous shocks, its flexibility in reacting to such shocks, and perhaps even its ability to profit from shocks, treating them as opportunities rather than hazards. The second question concerns the extent and effectiveness of risk-sharing between the different agents in the economy.

The two questions are not entirely independent of each other. The effectiveness of risk-sharing agreements has significant effects on the risks that are undertaken. If moral hazard is involved, the risk-sharing agreement itself affects the probability of an adverse outcome. Even so, it is useful to keep the two questions apart if only as a way to organize one's thinking about the assessment of institutions that determine the risk allocation in the economy.

Concerning the second question, abstract allocation theory provides the general principle that efficient risk-sharing requires a subdivision of all risks among the agents in the economy according to their respective degrees of risk tolerance. If there are many agents, this subdivision serves to make "diversifiable" risks "disappear" through the law of large numbers. The distinction between diversifiable and non-diversifiable risks is important for the discussion here. Since many of the most prominent risks affecting banks are non-diversifiable, the relevant question concerning the exposure of banks to these risks is *not* why anybody should bear them, but why the banks are bearing them rather than somebody else.

According to the central theorems of welfare economics, in the absence of moral hazard, adverse selection and other information problems, efficient risk allocations are achieved if the economy has a complete (Arrow-Debreu) system of contingent-claims markets in which all agents behave as price takers. In such a system there is no need and indeed no role for banks, insurance companies, or other intermediary institutions. Markets provide agents with an opportunity to share the return risks of firms at the same time as they insure each other against the consequences of uncertainty about the incidence of accidents, illness, death, or merely the timing of consumption desires.

The Arrow-Debreu model of contingent-claims markets forces us to rethink the traditional notion that financial intermediaries take securities such as shares

and bonds that are issued by firms and transform them into securities such as demand deposits and life insurance policies that are held by households (see, e.g., GURLEY and SHAW [1960]). In a complete system of contingent-claims markets, there is no need for such a repackaging of securities by intermediaries. A car manufacturer like Daimler-Benz can finance itself by issuing, e.g., life insurance policies directly, making use of the law of large numbers by issuing many such policies. Returns on these policies will of course depend on the returns of Daimler-Benz, but households can protect themselves against the risks inherent in these returns by holding diversified portfolios of life insurance policies with many firms. To the extent that return risks are non-diversifiable, a suitable reallocation of these risks is achieved by direct trading among households.

From this perspective, the notion of financial intermediation as a transformation of securities issued by firms into securities desired by households is one involving transaction costs savings rather than any inherent features of risk management. Whereas the notion of Daimler-Benz financing itself by issuing life insurance policies is not entirely absurd (at least in the absence of regulation to the contrary), the notion of the local greengrocer doing the same is a bit ludicrous. To be sure, he could finance, e.g., a capital investment of DM 100,000 by issuing a diversified set of life insurance policies to each of a million households, but then the mere costs of writing all the requisite contracts would eat up a significant portion of the funds that the households provide. If there are, say, a thousand shopkeepers to be financed, the intervention of an intermediary issuing significantly larger life insurance policies to each of the one million households and using the proceeds to finance each of the one thousand shopkeepers would *reduce the number of requisite contracts* from one billion (one thousand times one million for each shopkeeper-household pair) to one million and one thousand (one for each household and one for each shopkeeper). Even if the costs of writing a single contract are no more than a few pennies, such a reduction in the number of requisite contracts would reduce transaction costs significantly, not only in absolute terms, but also in relation to the funds that households provide.

The Arrow-Debreu model of a complete system of contingent-securities markets is based on the notion that transaction costs are negligible. The preceding example of contracting between a thousand shopkeepers and a million households show that the appropriateness of this notion may depend on the microstructure of the organization of transactions in the markets. In the example, transaction costs of a few pennies per contract are significant, perhaps even prohibitive, if every shopkeeper has to contract with every household to obtain the benefits of diversification, but they are negligible if an intermediary intervenes to collect the households' funds and finance the shopkeepers.

With direct contracting being very expensive, the intermediary in the example can be thought of a *market maker*. Whereas the Arrow-Debreu theory of perfect markets neglects the microstructure of who contracts with whom (as-

suming perhaps that everybody contracts with "the market" personified by that mythical figure, the Walrasian auctioneer), in practice contracting does rely on the intervention of institutions that serve to make "markets." Economists performing the repertory play "Banks Versus Markets" should therefore be aware that the title is a bit of a misnomer. Since the organization of markets relies on intermediary institutions, the issue of "Banks Versus Markets" concerns the comparison of different systems of intermediation rather than systems with and without intermediation. (Indeed in countries with universal banking, the operation of organized markets itself tends to lies in the hands of banks!)

The point goes beyond the semantics of the word "market." If we think of intermediaries as institutions providing savings of transaction costs, we conclude that the scope for intermediation depends on the potential for such savings. But then what is the proper point of reference? If the point of reference is given by the Arrow-Debreu model of perfect markets with negligible transaction costs, the scope for intermediation, including the ability of intermediaries to earn rents, would seem to be limited (see, e.g., HELLWIG [1994b]). But this line of argument is problematic if the neglect of transaction costs in the Arrow-Debreu analysis itself must be justified by referring to some intermediary providing market organization services at low costs. The conclusion of the argument may still be valid, but if it is, this is so because of competition among intermediaries rather than any competition from Arrow-Debreu markets. To give a concrete example, the "disintermediation" that has hit American depository institutions since the mid-1970s was driven by money market funds as a new set of intermediaries rather than any direct access of households to "markets."

So far, I have discussed the transaction costs saving role of financial intermediaries solely in terms of the number of contracts that have to be written without paying attention to their contents. In principle, the network of contracts resulting from the intervention of an intermediary could be equivalent to the contracts concluded in a complete system of contingent-claims markets. However, a further significant reduction in contracting costs should be available if contingency clauses in contracts are simplified. For the above example with a thousand shopkeepers and a million households, contingency clauses in a complete system of contingent-claims markets would have to refer to the entire set of contingencies depending on each shopkeeper's return and each household's mortality. If instead an intermediary concludes a contract with a household that depends only on the household's own mortality incidence and on the aggregate performance of the intermediary, this reduces the dimension of the space of contingencies that have to be provided for from one billion to two. The same reduction in the dimension of contingency clauses occurs if the contract between the intermediary and one of the shopkeepers depends only on the shopkeeper's own return and on the aggregate performance of the intermediary.

Indeed, on either side of the system, contingency clauses concerning the aggregate performance of the intermediary are unnecessary if the return risks of shopkeepers and the mortality risks of households are so well diversified that the intermediary's own net position is practically riskless. As discussed by MALINVAUD [1972], this is a situation in which a set of competing intermediaries offering contracts with contingency clauses depending *only* on their partners' specific risks will achieve a first-best allocation with full insurance of all (diversifiable) risks, just like a complete system of contingent-claims markets.

The well known DIAMOND and DYBVIG [1983] model of liquidity provision as insurance against uncertainty about the timing of consumption needs may be seen as an application of this idea. In the Diamond-Dybvig model, households are initially uncertain as to when they need (or want) to consume. In return for initial deposits, intermediaries provide them with well specified contingent promises to pay whenever they need to consume, relying on the law of large numbers to even out the aggregate claims of the different households. In the absence of complications due to information asymmetries, the resulting allocation is the same as would be achieved in a complete system of contingent-claims markets, but the requisite contractual arrangements are much simpler: Any household is contracting with just one intermediary rather than with all other households (on this point see also HELLWIG [1994a]), and moreover any contract specifies contingency clauses referring only to the household concluding it.

The notion of full diversification is of course an idealization, which strictly speaking requires an "infinite" number of contracting partners of the intermediary.[1] If the number of contracting partners is large but finite, full diversification cannot actually be achieved, but presumably the savings in transaction costs that are obtained from using simple contracts à la MALINVAUD [1972] or DIAMOND and DYBVIG [1983] outweigh the adverse consequences of having the intermediary bear a small return risk or even having the intermediary impose a small default risk on his contracting partners. This consideration provides a first explanation for a lack of perfect risk-matching in intermediaries' balance sheets that was mentioned in the introduction. However, given the numbers of contracting partners of typical intermediaries in reality, this explanation does not come up to the order of magnitude of the lack of risk-matching in reality. In particular it fails to deal with the lack of risk-matching in those instances where the contracting partners' risks are not independent, but are in fact driven by a common factor, and moreover this factor itself is easily contracted upon.

[1] Even with an infinite number of contracting partners, one may wonder about the fact that the intermediary is probably adding risks without subdividing them. For the discussion of this problem see DIAMOND [1984]. The discussion here is implicitly based on the assumption that the intermediary's risk preferences involve absolute risk aversion going to zero as wealth and consumption go out of bounds (for details see HELLWIG [1995b]).

3. Imperfect Information, Moral Hazard, and the Use of Deposit Finance

The discussion so far has neglected any considerations of imperfect information or moral hazard affecting relations between different market participants. In the present context, such considerations are however relevant because (i) they provide additional scope for financial intermediation, and (ii) they affect the nature of the contracts that can be concluded.

Concerning the scope for financial intermediation, DIAMOND's [1984] notion of *financial intermediation as delegated monitoring* rests on the view that agency problems in financial contracting may be reduced by monitoring and moreover such monitoring involves natural scale economies in the sense that no more than one monitor is required to do the job. Delegation of monitoring to one agent (or one institution) may give rise to new agency problems, but under certain circumstances, these are relatively minor. In particular, the agency problems created by delegation of monitoring may be negligible if monitoring concerns a large set of diverse borrowers whose aggregate returns are evened out by the law of large numbers.

As discussed by MAYER [1988], FISCHER [1990], and SHARPE [1990], financial intermediation as delegation arises not only from technical scale economies in monitoring as such, but possibly also from "strategic scale economies" involving the effect of the number of financiers on their relations with borrowers, in particular on their bargaining power in potential renegotiations of contracts as these relations unfold. As noted by VON THADDEN [1990], HELLWIG [1991], and RAJAN [1992], such strategic effects of having borrowers have to rely for their funds on a small number of financial intermediaries may not all be positive (for an empirical assessment see WEINSTEIN and YAFEH [1995]). Even so, the notion that exclusivity in the financing relation provides a *mechanism of commitment* by which borrowers are tied to their financiers and cannot easily renege on their promises, is one of the important ideas in the theory of financial intermediation.

Concerning the implications of imperfect information and moral hazard for the contracts concluded by financial intermediaries, the literature concentrates on the predominance of *debt* and the use of *"on demand"* clauses in the financing of traditional depository institutions. Debt contracts involve payment obligations of the borrower that are independent of his income or wealth. Outside of bankruptcy, all income risks of the borrower are therefore borne by himself; in addition there may be a certain risk of bankruptcy. This risk exposure of depository institutions is yet enhanced by "on demand" clauses in deposit contracts. These clauses leave the institutions uncertain as to when the depositors will present their claims.

For both phenomena, the literature presents several different explanations. The use of debt contracts is rationalized by both, an incentive argument and an argument concerning the costliness of return verification by lenders.

The *incentive argument* points to the problem of moral hazard concerning the effort that intermediaries put into monitoring. In models of moral hazard

involving only effort choices, debt finance has the advantage that the marginal benefits of an increase in effort accrue all to the borrower, in this case the intermediary who has issued a debt instrument. In contrast, under, e.g., share finance some of the marginal benefits of additional effort accrue to outside shareholders; if effort is non-verifiable this gives rise to agency costs (JENSEN and MECKLING [1976], HELLWIG [1994c]).

The *argument concerning costly state verification* points to the fact that a borrower's stipulated payment must be the same in all states in which state verification by lenders does not take place – otherwise he would have an incentive to misreport the state. Moreover minimization of verification costs requires state verification to be avoided whenever the stipulated payment corresponding to non-verification states is feasible, and to take place whenever this stipulated payment is not feasible. Optimal contracts thus have a natural interpretation as debt contracts involving a state-independent debt service obligation with costly state verification ("bankruptcy"!?) occurring if and only if this obligation is not met. State independence of the stipulated debt service obligation is a natural consequence of the lenders' inability to distinguish between states in which state verification does not take place (TOWNSEND [1979], GALE and HELLWIG [1985]).

DIAMOND's [1984] model of financial intermediation as delegated monitoring can be seen to combine the two arguments. He uses a variant of the state verification argument to derive the optimality of the use of debt finance in relations of firms or intermediaries to households as the final source of funds. In expected-value terms the agency costs associated with the provision of finance to intermediaries under these contracts are negligible because the intermediaries' loan portfolios are so well diversified that their own returns are (approximately) riskless. (Here we link up with the contracting costs argument of the preceding section.) Given the combination of fully diversified loan portfolios and debt finance of an intermediary, the positive incentive effects on monitoring effort come at no extra cost. Diamond does not actually discuss these effects at any length, but they are needed if one wants to explain why his model is one of financial intermediation rather than simply auditing.

As a practical matter, these arguments for the use of debt finance would seem to suggest that the recently developed American system of real-estate finance based on mortgage-backed securities will be vulnerable to the hazard of undermonitoring of property by the institution that provides the initial mortgage, and to the hazard of manipulated reporting of returns. The latter is presumably eliminated by a suitable system of (costly) auditing, but the former could be a real problem. The traditional system of having depository institutions financed by debt without any securitization of positions on the assets risks of their balance sheets exposed these institutions to more risk, but at the same time it did provide for monitoring incentives.

However, the given arguments for the use of debt finance have an important gap: They do not allow for moral hazard concerning the riskiness of the

intermediaries' lending strategies. Whereas debt contracts have positive incentive effects on effort choices, they also have negative incentive effects on risk choices. Given the outcome independence of payments to lenders in non-bankruptcy states, a borrower faced with the choice between a safe investment and a risky investment involving excess returns in good states at the expense of failure in bad states may find that the risky investment is advantageous because the excess returns in good states accrue entirely to him whereas the effects of an increased default probability are at least partly borne by the lenders (JENSEN and MECKLING [1976], STIGLITZ and WEISS [1981], BESTER and HELLWIG [1987]). The "gambling for resurrection" of many American S & Ls in the 1980s is usually interpreted in these terms (see, e.g., DEWATRIPONT and TIROLE [1994]), as is the behavior of some of the Scandinavian banks following their deregulation in the first half of the 1980s (BERGLÖF and SJÖGREN [1995]).

In DIAMOND's [1984] model of financial intermediation as delegated monitoring, excessive risk-taking does not occur because intermediaries have no risk choices to take. Given that the investment scale of each firm is fixed, with funds K, an intermediary finances K firms, with no scope for affecting the distribution of returns on his funds. If the firms's technologies allowed for variable investment scales, perhaps with increasing returns, excessive risk-taking would be a problem. In this case, the intermediary with given funds K would have to choose whether to make many small loans to obtain the benefits of diversification or to make a few large loans to save on monitoring costs and, possibly, to exploit economies of scale in investment. In the context of Diamond's model, with endogenous bankruptcy penalties, this choice would in fact be biased towards a concentration of funds in a few, possibly one, large project, as the intermediary would consider the effects of his choice on *expected* returns net of monitoring costs, but *not* on failure risk.[2] As usual in agency relations, this bias plays no role if the intermediary can effectively commit himself to an investment strategy as he obtains his funds. However, in the absence of such effective prior commitment, there will be fewer loans and a higher failure risk of the intermediary than would be Pareto-efficient. This discussion matches up with TILLY's [1986] historical account of German banks in the late 19th century providing "Development Assistance to the Strong," i.e. concentrating their lending on relatively few large firms with sizeable scale effects and incurring significant risks in the process. Lack of diversification as a result of

[2] In Diamond's model, the intermediary is obligated to pay a return-independent amount R – in money if this is available, in non-pecuniary penalities if money is not available. His net expected payoff is equal to the difference between the expected cash flow from his financing operations and R. Once R is given, he just maximizes expected cash flow, neglecting the externality that arises as his choice affects his failure risk and hence the probability that R is paid in non-pecuniary penalties as opposed to money, the point being that his own – non-sadistic – financiers benefit from the latter, but not the former.

excessive risk-taking by the intermediary moots Diamond's argument about the negligibility of delegation costs. If the tendency towards a concentration of lending on a few large clients is sufficiently strong, Diamond's own analysis suggests that this effect may actually undermine the viability of intermediation altogether.

Taking stock of these considerations, one may want to conclude that the observed risk exposure of traditional depository institutions is due to incentive and state verification problems mandating the use of debt instruments, either because the positive incentive effects of debt finance on monitoring effort outweigh the negative incentive effects on risk-taking, or because the state verification costs associated with other forms of finance are too large. While accepting that this is part of the explanation, I am not convinced that it is the entire story. *The arguments given fail to explain why deposit contracts and other debt instruments used by traditional depository institutions typically do not contain contingency clauses involving easily observed "macro" variables that are not subject to manipulation by the individual intermediary.*

For example, an intermediary using a seven-year term deposit to finance a fixed-interest twenty-year mortgage is subject to the risk that when the deposit comes due market rates of interest may have risen so that refinancing rates exceed the fixed mortgage rate or, equivalently, the present value of claims outstanding on the mortgage falls short of the intermediary's obligation to the depositor. If the intermediary's obligation to the depositor was made to depend on an index of market rates of interest prevailing at the time the deposit comes due, the risks associated with the initial uncertainty about future interest rates would altogether be shifted to depositors. Since market rates of interest are easily observed and are hardly manipulable by an individual intermediary, the lack of such contingency clauses in traditional deposit contracts cannot be explained by the incentive and state verification problems that I have discussed above.

Similar arguments apply to risks that are driven by other "macro" factors such as exchange rates or the macroeconomy. To be sure, a proper index for the evolution of the macroeconomy may not be easy to find. Even so, there should be surrogates such as stock price indices that would contain at least some relevant information. From standard incentive theory we know that the use of such information through contingency clauses would improve performance under incentive-contracting and at the same time reduce risk exposure. As yet however we have no good explanation as to why until very recently there has been hardly any such use of contingent contracts by depository institutions. The introduction of mortgage-backed securities in the US in the 1980s seems to have been the first major step in this direction, flawed as it is by the fact that the securitization concerns not only the risk induced by "macro" shocks such as movements in market rates of interest, but also mortgage-specific risks where outcomes presumably do depend on monitoring effort.

The risk exposure of depository institutions is further enhanced by the use of "on demand" clauses in contracts concerning demand deposits and savings

deposits. The literature contains two types of explanations for the use of such clauses.

In the context of *liquidity provision models* à la DIAMOND and DYBVIG [1983], the use of "on demand" clauses is rationalized by the assumption that consumer's type realizations are not observable from the outside. In particular, intermediaries cannot observe consumers's actual preferences with respect to the timing of consumption. The demand deposit contract obligating the intermediary to repay the depositor "on demand" then replaces a contract under which the intermediary repays the depositor when he needs it. The depositor's "demand" to have his money back serves as a signal of his "need" to have his money back, which is unproblematic if the arrangement is incentive-compatible, but may cause problems otherwise. Depending on the stringency of incentive compatibility considerations, the role of the intermediary as a market maker for a system of mutual insurance about the timing of consumption needs is somewhat impaired by the unobservability of these needs, but with the use of "on demand" clauses, it is not totally voided.

A *second class of models* sees the "on demand" clause in deposit finance as a device by which depositors can intervene to force liquidation of the intermediary's assets in circumstances where this is desirable either to provide for an efficient use of assets or to discipline and correct adverse behavior of the intermediary (JACKLIN and BHATTACHARYA [1988], CALOMIRIS and KAHN [1991]). In combination with a condition of sequential service of claims that are presented, the "on demand" clause is said to provide depositors with suitable incentives to collect the information needed to determine when asset liquidation is efficient as well as the power to impose such liquidation.

I am not convinced that either story captures the essence of the development of deposit finance. The idea of "on demand" clauses as mechanisms providing for efficient asset liquidation rests on the assumption that at the time when depositors intervene they can actually improve on the intermediary's use of assets. If we think about excessive risk-taking by the American S & Ls in the 1980s, this amounts to an assumption that risk choices are reversible in the sense that depositors observing risk-taking can intervene by demanding their funds back, thereby forcing liquidation and undoing the intermediary's risk choices without much of a loss. I find this highly implausible.[3]

I am also not convinced that we should think of liquidity provision by demand deposits solely in terms of insurance. In the early history of depository institutions, say in the case of the Hamburg Bank in the 17th century, these institutions provided a combination of safe-keeping and payments services for networks of merchants. "On demand" clauses would seem to have been a natural aspect of safekeeping contracts just as in contracts involving the safe-

[3] Interestingly, the formal model of CALOMIRIS and KAHN [1991] does not involve a problem of risk-taking, but rather one of fraud and theft which are prevented by early depositor intervention.

keeping of luggage at train stations. In a sense these clauses seem to be rather older than the recognition that deposits can be used as a source of finance and that depository constitutions have a natural role as financial intermediaries. Unfortunately though we have as yet no precise theoretical account of the economics of availability of safekeeping institutions (or indeed of the economics of availability of anybody, beginning with the local greengrocer).

Be that as it may, *none of the theoretical explanations of the use of "on demand" clauses in deposit finances can explain why the contents of demand-contingent payment promises by depository institutions take the form of debt with hardly any contingency clauses allowed for.* In particular they do not explain why for a long time traditional thrift institutions have used ordinary savings deposits to finance forty-year mortgages thereby exposing themselves to all the risks associated with movements in market rates of interest. As I have shown elsewhere (HELLWIG [1994a]), securitization of risks associated with interest rate movements would not be incompatible with liquidity provision à la Diamond-Dybvig; all that needs to be done is to have a clause whereby the depositor who withdraws his funds early receives the current value of long-term investments as well as the actual returns on short-term investments corresponding to his deposit. From the *ex ante* perspective, when people do not yet know at what time they want to use their funds, this may well be Pareto-efficient as it forces consumption at a date of early withdrawal to react to the information that reinvestment rates of return at this date are high.

As a practical matter, these considerations are important because practically all the major banking crises that we have had since the 1920s have been associated with interest rate shocks or business cycle shocks. This applies to the banking crises of the Great Depression as well as the crises associated with the worldwide highs of interest rates around 1975, 1981 and 1990. It seems as if the problem of recurrent banking crises could be defused if the exposure of depository institutions to these macro risks was greatly reduced. Available theory though fails to explain why this exposure is there in the first place.

As I have mentioned in the introduction, one possible explanation concerns statutory regulation. Such an explanation is supported, e.g., by the finding of BENSTON, CARHILL and OLASOV [1991] that average mortgage maturities in a sample of savings institutions went from 11 years to 20 years in the period from 1925 to 1940, i.e. the years when the New Deal regulation of depository institutions was instated. In the same context, one might also point to the implicit subsidy of deposits as instruments of financing thrift institutions that is provided by statutory deposit insurance with rates that are actuarily favorable to the depositor.

The problem with this explanation is that is does not account for the ubiquity of the phenomenon at issue. If I ask myself why German banks around 1910 began to move from a financing structure involving significant equity and significant (fixed-interest) bond finance to one involving "cheap deposits,"

I cannot point to regulatory effects as in the case of American institutions since the 1930s.

The key question is why deposits were considered to be "cheap." More precisely, why did banks consider it advantageous to assume the extra risks associated with deposit finance as opposed to bond finance in return for the decrease in the rates that they were promising? One explanation would point to the fact that at the time, intermediation margins were large and interest rate risks were small, so that the interest rate risks associated with deposit finance did not actually endanger the solvency of depository institutions. Certainly one can say that in the first half of the century fluctuations in interest rates never came near the levels which we have seen since the mid-1970s. However, if interest rate risks were small, why were households willing to accept deposit rates much below interest rates on bonds? If deposit finance was considered "cheap," why were households willing to provide it on these terms?

At this point I see three possible explanations: *(1)* A cartelized or at least oligopolistic banking industry found that elasticities in deposit markets were more favorable than elasticities in bond markets. The provision of payments services in combination with deposits may have played a role in this. *(2)* The promotion of "cheap deposit finance" is itself an instance of excessive risk-taking as I have discussed it above. To see the argument, suppose that an intermediary has concluded a debt contract of some sort involving whatever explicit contingency clauses seemed relevant at the time of contracting. Suppose that a new client comes along and a new contract has to be concluded with him. If the risks associated with the new contract are not all borne by the new client, some of them will in fact be borne by the previous client in the form of a bankruptcy risk of the intermediary. If the previous client cannot defend himself against this externality, the intermediary *and* the new client will consider it advantageous to impose on him in this way. "Cheapness" of deposit finance then is a consequence of the fact that at least some of the risks assumed by the intermediary under the deposit contract are in fact borne by a third party, namely previous creditors, bondholders and depositors. *(3)* To the extent that depositors are subject to "over-confidence" effects known from psychology, they might be willing to accept more of a reduction in contractual rates than is actually warranted. The "on demand" clause of the deposit contract may foster an illusion of being "in control," i.e. an illusion that, even though the intermediary's reliance on deposit finance involves significant risks, the control that one has through the "on demand" clause provides enough scope to get off before the risks may come home.

Which of these explanations, if any, is appropriate, and what weight should be given to any one of them (or to statutory regulation), is at this point an open question. I do believe that this is the key question to be resolved if we want to understand the economics of depository institutions.

4. Interbank Markets and the Allocation of Risks

Whatever awareness of interest rate risks and the like there may have been in the first half of the century, the developments since the mid-1970s have made financial institutions all over the world aware that risk exposure is a problem.[4] This is partly due to increased competition eroding margins that used to provide safety cushions and partly due to the mere extent of fluctuations in interest rates, exchange rates, real-estate prices, etc., over the past two decades.

As awareness of risk exposure has increased, risk management techniques have been improved and overall policies of financial institutions towards risk-taking have been adapted (or are currently being adapted). An interesting feature of this process is that hardly any of these activities concern the relations of depository institutions to households as the final source of funds. Reductions in risk exposure have first been sought through the introduction of contingency clauses into contracts with borrowers, e.g. variable-rate mortgages, and then at a later stage through risk-shifting contracts with third parties, e.g. interest rate swaps in derivative markets.

This observation is remarkable because contingency clauses in contracts with an intermediary's own financiers would seem to be a rather more foolproof way to eliminate risk from the intermediary's accounts. If the intermediary's debt to his financiers involves a contingency clause reducing this obligation when market rates of interest are higher, or the macroeconomy is doing badly, this is a clear-cut reduction of his bankruptcy risk. If instead the payment obligation to the depositor is fixed and the intermediary uses a third-party contract to compensate for the effects of any adverse contingencies, he becomes dependent on the third party's ability to fulfill the contract, i.e. he is exposed to the counterparty risk of the risk-shifting contract.

The problem is particularly serious because the counterparty risk is likely to be correlated with the underlying risk against which the intermediary seeks insurance. Moreover the counterparty risk is endogenous – and probably changing over time – as it depends on the evolution of the entire network of contracts concluded by the counterparty, the counterparty's counterparties in further contracts, etc. Counterparty risks and their correlations with the underlying macro shocks are intrinsically difficult – if not impossible – to assess. The question then is why risk management concentrates on third-party contracting rather than contracting with households as the final source of funds.

At this point, three possible answers came to mind. The first one refers simply to a lack of awareness of the problem. Such a lack of awareness would seem to be evidenced by the history of contracting starting from non-contingent contracts in the 1960s, moving to "LIBOR plus" and other variable-rate contracts

[4] The exception are those German banks that still see interest rate risk as the risk that loan rates may be too low.

with borrowers in the mid-1970s, and replacing or complementing these with third-party contracting since the mid-1980s as banks came to realize that risks "shifted" to borrowers through variable-rate clauses sometimes came right back in the form of credit risks.

A second answer would again point to moral hazard. If banks see the problem of correlated counterparty credit risks in derivatives markets as a systemic problem which central banks will have to take care of (see WUFFLI [1995] for an example of this attitude), they have no incentive to worry about these risks or their correlations with macro shocks.

A third answer points to transaction costs and the market role of financial intermediaries, providing a link between the first part of this paper and the present discussion. The following two points are worth considering: *(1)* To the extent that different financial institutions have different clienteles, contracting between financial institutions, e.g. in derivatives markets, may actually provide for advantageous reallocations of risks across households without engendering counterparty risks and the like. This is the case when exchange rate risks are traded between institutions located in different countries, enabling, e.g., a German institution to sell US-dollar claims which it regards as risky for German marks to an American institution which regards the D-Mark position as risky. Similarly a pension fund with a long investment horizon may be unconcerned about the interest-induced valuation risks of fixed-interest mortgages, in which case a sale of mortgage-backed securities to this fund provides a beneficial reallocation of the interest rate risk. *(2)* The other point concerns the day-to-day handling of risks. Adjustments of contracts with households as the final source of funds may be too clumsy as a tool to reduce risk exposure from assets even if the risks in question are easily contractable. Suppose that a bank starts the day with interest-induced risks in assets and liabilities fully matched. When in the course of the day it makes a five-year, fixed-interest loan, how exactly is it to shift the interest rate risk inherent in this loan off its accounts? The notion of a simultaneous, perfectly matching bond issue makes sense in a simple three-period model of the sort studied by DIAMOND and DYBVIG [1983] or HELLWIG [1994a], but *not* in the real world where bond issues to households tend to be lumpy – highly regulated, costly and therefore spaced out in time. The interbank market is much more flexible, providing readily available facilities for shifting interest rate risk on a day-to-day, or even hour-to-hour, basis through suitable swap transactions.

The word *availability* is perhaps the key word in this discussion. Part of the services that a bank provides to loan and deposit customers alike is its availability. The depositor can come and go, make deposits and withdrawals as he pleases – provided he does not exceed his credit limit. Similarly the borrower can make his loan application whenever he pleases. This availability of the bank as a potential transactions partner is an essential part of the market making function discussed in section 2. In the absence of direct coordination of borrowers and depositors, this role of the bank almost automatically induces a lack of

risk-matching between the bank's assets and liabilities. To the extent that this is seen as a problem, the bank itself must rely on a set of potential partners that are available for risk-shifting purposes whenever the need arises. Such availability for risk-shifting purposes is not usually provided by households to banks. It is however a service that different financial intermediaries creating an interbank market can provide to each other.

The discussion here departs from the standard approach of looking at intermediaries and markets as alternatives, with markets providing a bound on the scope for intermediation (see, e.g., JACKLIN [1987], HELLWIG [1994 a]). Intermediaries and markets actually complement each other in that intermediaries are needed to "make markets." Intermediaries in turn need markets in order to reallocate the risks that they absorb from households and firms. In line with the notion that markets are made by intermediaries, operations in these markets will typically involve intermediaries dealing with intermediaries.

Even so, two critical questions remain: *(1)* How do the market making activities of intermediaries – providing their availability to households and firms, and participating in a readily available system of inter-intermediary dealings – interact with the incentive problems that are endemic to financial contracting? In more concrete terms, if an intermediary can choose a net level of desired interest rate risk exposure and adapt its dealings on derivatives markets to its other transactions so as to obtain this desired position, what scope is there for moral hazard in this choice, in particular, for excessive risk-taking of the sort discussed in section 3? *(2)* To what extent is the correlation between counterparty risks and macro shocks a source of *systemic risk*, with a potential for domino effects and the like? Could it be that the seeming safety provided by a system, in which all intermediaries have almost perfectly hedged positions, is merely an illusion in that the overall exposure of the system to macro shocks is hidden in the correlation of counterparty risks with these shocks? Elsewhere (HELLWIG [1994 b], [1995 a]), I have given examples showing that this is not altogether impossible. The examples are extreme and therefore not to be taken too seriously. They do show however that if we are concerned about the safety of the financial system, we have to worry about these correlations and have to complement the traditional institution-by-institution approach to the assessment of system stability by a more comprehensive approach that is concerned with the exposure of the consolidated system to macro shocks.

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