Review

On the Management of Financial Guarantees

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Guarantees of financial performance on loans and other debt-related contracts are widely used throughout the U.S. and international financial systems. Parent corporations routinely guarantee the debt obligations of their subsidiaries. Commercial banks, insurance companies, and, on occasion, sovereigns offer guarantees in return for fees on a broad spectrum of financial instruments ranging from traditional letters of credit to interest rate and currency swaps and even put warrants on stock indices. More specialized firms sell guarantees of interest and principal payments on mortgages and tax-exempt municipal bonds. Every state in the United States has an insurance guaranty fund that guarantees policyholders against losses from insurance company insolvencies. The federal and provincial governments of Canada have, in the past, made extensive use of loan guarantees to subsidize local corporations.\(^1\)

The largest provider of financial guarantees is almost surely the U.S. government, either directly or through its agencies. The most important of its liability guarantees, both economically and politically, is deposit insurance. However, guarantees are also used extensively elsewhere. In the corporate sector, the government has guaranteed the debt of small businesses and, on occasion, as with Lockheed Aircraft and the Chrysler Corporation, it has done so for very large businesses. Established in 1980, the United States Synthetic Fuels Corporation was empowered to grant loan guarantees to assist the financing of commercial projects that involve the development of alternative fuel technologies. The Pension Benefit Guaranty Corporation (PBGC) provides limited insurance of corpo-

\(^1\)See Baldwin, Lessard, and Mason [4].
rate pension-plan benefits. Residential mortgages and farm and student loans are examples of noncorporate obligations that the government has guaranteed. The U.S. government has also given guarantees of other sovereigns' debt as a form of foreign aid.

But guarantees are even more pervasive than this list of explicit guarantees would suggest. Any time a loan is made, an implicit guarantee of that loan is involved. To see this, consider the fundamental identity, which holds in both a functional and a valuation sense:

\[
\text{Risky Loan + Loan Guarantee} = \text{Default-Free Loan.}
\]

\[
\text{Risky Loan} = \text{Default-Free Loan} - \text{Loan Guarantee.}
\]

Thus, whenever lenders make dollar-denominated loans to anyone other than the United States government, they are implicitly also selling loan guarantees. The lending activity therefore consists of two functionally distinct activities: pure default-free lending and the bearing of default risk by the lender.

To see this point more clearly, it will perhaps be helpful to think of the lending activity taking place in two steps: (i) the purchase of a guarantee and (ii) the taking of a loan. Suppose that the guarantor and the lender are two distinct entities. In the first step, the borrower buys a guarantee from the guarantor for $10. In the second step, the borrower takes this guarantee to the lender and borrows $100 at a default-free interest rate of ten percent per year. The borrower winds up receiving a net amount of ($100 - $10 = $90 in return for a promise to pay back $110 in a year. Of course, often the lender and the guarantor are the same entity — for example, a commercial bank — and the borrower simply receives the net $90 from the bank in return for a promise to repay $110 in a year. The interest rate on the loan is then stated as 22.22%, i.e., ($110 - $90)/$90. This promised rate reflects both the risk-free interest rate and the charge for the guarantee. To see that the two are separable activities, note that the holder of the risky debt could buy a third-party guarantee for $10. The holder would then be making a total investment of $90 + $10 = $100 and would receive a sure payment of $110.

The purchase of any real-world loan is thus functionally equivalent to the purchase of a pure default-free loan and the simultaneous issue of a guarantee of that loan. In effect, the creditor simultaneously pays for the default-free loan and receives a "rebate" for the guarantee of that loan. The magnitude of the value of the guarantee relative to the value of the default-free loan component varies considerably. A high-grade bond (rated AAA) is almost all default-free loan with a very small guarantee component. A below-investment-grade or "junk" bond, on the other hand, typically has a large guarantee component.

Guarantees are also involved in other financial contracts besides loans. In swap contracts, for example, guarantees of performance by both parties to the swap agreement are often provided by a third-party financial intermediary. If such a guarantee is not purchased, then each of the parties is providing de facto a guarantee of its counterparty's performance. As nonfinancial firms make increasing use of such contracts, their managers need to better understand how to efficiently manage the explicit and implicit guarantees associated with them.

The analysis of guarantees in the sections that follow has relevance to the evaluation of virtually all financial contracts, whether or not the guarantees are explicit. Lenders and counterparties to swap agreements face the same set of risk and control issues as any explicit guarantor. Therefore, the analysis of the methods used by guarantors to control the cost of providing contract guarantees is relevant more generally to corporate managers.

I. The Role of Guarantees

To properly understand the role played by guarantees of financial contracts, it is helpful to focus first on financial intermediaries, whose primary business is to deal in such contracts. We draw a distinction between the "customers" and the "investors" of a financial intermediary. Calling attention to the distinction between customers and investors of nonfinancial firms is rarely necessary, because it is generally obvious. Few would confuse the customer who buys a car from an automobile firm with the shareholder, lender, or other investor who buys its securities. Similarly, no one would confuse a customer who changes money at a bank or takes out a loan from it with an investor who owns shares in the bank.

But the customers of many types of financial intermediaries receive a promise of services in the future in return for payments to the firm now. Those financial services usually involve future payments to the customer of specified amounts of money, contingent on events and

\[2\text{This identity strictly applies only if the guarantee itself is default-free, and it covers the whole loan. That is, the guarantor will not default on its obligation, and its obligation is to fully make up any loss on promised payments. Some guarantees have deductibles or require coinsurance with the debtholder. Tax treatments and other regulatory factors could also affect the value identity. While such variations are important in analyzing individual situations, they are not essential in understanding the fundamental functional activities of lending as discussed in the text.}

\[3\text{See Merton \cite{41}, \cite{46}, and \cite{47} for a formal development and an extensive bibliography on this approach to analyzing risky debt.}
passage of time. Those promised payments are liabilities of the firm, both economically and in the accounting sense. Since investors in the firm also hold its liabilities, the distinction between customers and investors is not always so clear for such intermediaries.

The distinction between the two can, however, be made. Customers who hold the intermediary’s liabilities are identified by their strict preference to have the payoffs on their contracts as insensitive as possible to the fortunes of the firm itself. For example, the function served by a life insurance policy is to provide its beneficiaries with a specified cash payment in the event of the insured party’s death. That function is less efficiently performed if the contract instead calls for the death benefit to be paid in the joint event that the insured party dies and the insurance company is solvent. Even if the insurance company offers an actuarially fair reduction in the price of the insurance to reflect the risk of insolvency, a risk-averse customer would prefer the policy with the least default risk. Indeed, we doubt that many real-world customers would consciously agree to accept nontrivial default risk on a $200,000 life insurance policy, even in return for a large reduction in the annual premium from $400 to $300. Similar results obtain in theoretical models in which the customer has all of the relevant information necessary to assess the default risk of the insurer. In most real-world cases, the customers do not have the relevant information, and this fact makes the potential welfare loss from default even larger.

By contrast, investors in the liabilities issued by the insurance company (e.g., stocks or bonds) expect their returns to be affected by the profits and losses of the firm. Indeed, their function is to allow the company to better serve its customers by shifting the burden of the risk and resource commitment from customers to investors. The investors are, of course, compensated for this service by an appropriate expected return. The resulting increase in efficiency of customer contracts from this shift in risk-bearing makes customers better off. Note that while the roles of “customers” and “investors” are distinct, the same individual can be both a customer of and an investor in a particular firm. Thus, I can both buy an insurance policy from a particular insurance company and also hold shares of its common stock as part of my investment portfolio.

The distinction between an investor-held and a customer-held liability claim is not unique to financial intermediaries. For example, a customer who buys a warranty on a new car from an automobile manufacturer wants the repairs paid for in the event that the car is defective. In fact, the customer’s contract pays for repairs in the joint event that the car is defective and the automobile manufacturer is financially solvent. If given a choice, customers would prefer not to accept additional default risk in return for an actuarially fair reduction in the cost of the warranty. Much the same point can be made about the implicit contract with customers to ensure that spare parts are available in the future for repairs. Although it can become quite significant for a financially distressed firm, default risk is probably a secondary consideration for most customers of an automobile manufacturer. In contrast, because of the substantial size and long duration of many financial contracts such as annuities and life insurance, default risk is a first-order issue for customers of financial intermediaries. Thus, the success of a financial intermediary depends not only on charging adequate prices to cover its production costs, but also on providing adequate assurances to its customers that promised payments will be made.

By definition, a financial intermediary is a firm whose primary business is to buy financial assets and issue financial liabilities. Its economic raison d’être is to provide financial instruments and products to customers who cannot obtain them more efficiently by directly trading in security markets. Some intermediaries serve their princi-

4 As a formal example of this general point, consider an economy where there are pure Arrow-Debreu securities for every state of the world. It is well-known that a complete set of such securities permits Pareto-efficient allocations. If, however, the payoffs on such securities were also contingent on the solvency of the issuer of the securities, then they would lose their efficiency. See Merton [47, pp. 450-1, 463-7] for a more complete discussion of this point.

5 There is a counterargument for indifference that asserts that the customer may be able to eliminate the effect of this default risk either by hedge trading in the securities of the life insurance company or by entering into a large number of tiny insurance contracts with many different companies. Such a case can perhaps be made for frictionless, complete-market economies. However, the very role of the intermediary is to service those entities (its customers) who cannot trade efficiently and enter contracts costlessly. As discussed in Merton [46] and [47], a major rationale for the existence of intermediaries is to reduce the costs that households would otherwise incur to manage risks directly through transactions in the securities markets.

6 By definition, mutual companies are organized in such a way that all of their customers are also investors. However, for many products, such as term life insurance policies, the customers of mutual insurance companies are probably unaware that they are also investors. Indeed, if they believed that they were exposed to meaningful default risk by virtue of buying a policy from a mutual company, they would probably buy their insurance elsewhere.

7 Thus, we distinguish between market makers and financial intermediaries. One test of whether an instrument will be traded directly on a securities market or be handled by an intermediary is as follows: If the
pal function by buying assets of a certain type from customers. They issue liabilities to investors to facilitate the performance of that principal function. For example, consumer-finance companies in the United States serve the primary purpose of making loans to their customers, and they raise all of the money they lend by issuing securities that are held by investors. Other intermediaries serve their principal function by issuing liabilities of a certain type, and they manage their assets to facilitate this principal function. One such type is a property and casualty insurance company that issues more or less customized insurance contracts to its policyholders, and invests almost exclusively in securities traded in the capital markets. Other intermediaries service customers from both sides of their balance sheets. Commercial banks and thrift institutions in the United States are examples. In order to service their customers, those institutions must have either "buffer" assets (including third-party guarantees of their own liabilities), or "buffer" liabilities (such as investor capital), or both.

There are essentially three ways for an intermediary (whether one- or two-sided) to provide assurances against default risk to the customers who hold its liabilities:

(i) By having investors put in additional capital beyond that required for funding of the physical investments and working capital needed to run the business. This "assurance" capital can be in the form of equity or subordinated debt.\(^8\)

(ii) By purchasing guarantees of its customer liabilities from a private third party. This might be accomplished by a confederation of private parties as in the reinsurance market. This approach works best for covering customer liabilities where the risk is diversifiable, as in the case of mortality risk. It can also work where the risk, although not diversifiable, can be hedged in the capital markets, as in the case of stock market or interest rate risk.\(^9\)

(iii) By government guarantees of its customer liabilities. This approach may be best where the risk cannot be diversified or hedged through the capital markets. An example would be if the risk is due to a possible failure of part of the financial system, as in the case of a major breakdown in the payments system.

A more detailed discussion of the issues underlying whether private or government provision of guarantees may be more efficient is presented in Section V. But first, we discuss issues relating to the management of guarantees that apply regardless of whether the guarantor is a private or governmental body.

II. Managing the Guarantee Business

The offering of guarantees is a business activity. Functionally, guarantees are insurance policies that oblige the guarantor to make the promised payment on a financial contract if the issuer fails to do so.\(^10\) The economic loss to

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\(^8\) There is an agency cost associated with the provision of large amounts of equity capital. Because equity securities place few restrictions on managers of the firm, shareholders bear the risk that managers will use the firm's resources in ways that are not in the best interests of the shareholders. (See Jensen and Meckling [23] and Jensen [22]) Another incremental cost of equity capital is its tax disadvantage for a corporation, especially in the United States. By prescribing a required payout schedule, subordinated debt has a lower agency cost for capital-raising than equity. Because interest payments are deductible, it does not have the tax disadvantage of equity. To be effective as assurance capital, however, subordinated debt must be truly subordinated to customer claims. This is by no means a trivial provision. Asymmetric information — where customers are relatively less informed — may permit subordinated debt investors to pull out before the losses for which the assurance capital is needed are realized. Moreover, subordination of debt may seem clear in principle, but be reversed by rulings of courts. In the United States, bankruptcy judges have considerable leeway in deciding the seniority of various debt claims, including customer claims. In some important decisions, bankruptcy judges have even ruled that the claims of government guarantee agencies are to be treated as no more senior than the claims of other creditors. Both subordinated debtholders and guarantors have the moral-hazard problem that the firm may change the risk composition of its assets so as to cause a transfer of value from creditors to shareholders. If the assets of the firm are liquid, then such asset changes can be made quickly and at low cost. Hence, Baldwin [3] argues that increasing the liquidity of the firm's assets can cause this moral-hazard problem to become more severe. We discuss the issue of the appropriate form of assurance capital in greater detail in Section II.C.

\(^9\) Recently, futures markets have been created to provide traded contracts with payoffs contingent on catastrophic events such as hurricanes. Such futures contracts provide an alternative to insurance companies as an institutional mechanism to hedge those types of risk.

\(^10\) Some use the term "bonding contracts" rather than "insurance contracts" to describe guarantees.
the guarantor is equal to the difference between the promised payment on the guaranteed contract and the price received from the sale of the assets that are available from the issuer as collateral for this obligation. This difference is called the "shortfall." It is generally assumed that the issuer will only default if the shortfall is nonnegative. All assets of the liability issuer that the guarantor has recourse to seize will be called "collateral" assets, even if they are not formally pledged and segregated. For the business to be viable, premiums charged for the guarantees must be large enough to cover both actuarial loss experience and operating costs.

Profitability is achieved by a mixture of adequate premiums, control of operating costs, and control of the frequency and the severity of shortfall losses. For example, consider the profit from the sale of a single guarantee. For simplicity, assume that there are no operating costs. If the value of collateral assets, \( V \), exceeds the promised payments, \( E \), the guarantor keeps the premium and pays nothing. But if the value of assets is less than the promised payments, the guarantor must pay the difference, \( E - V \). The guarantor’s maximum profit is equal to the premium plus interest earned from investing the premium prior to payment of losses or expiration of the guarantee. This maximum profit is diminished by the shortfall or loss experience from issuer defaults. The minimum profit (or, more accurately, the maximum loss exposure) is the promised payment. The guarantor’s profit function is thus given by \( P(1 + r) - \max[0, E - V] \), where \( P \) is the premium and \( r \) is the interest rate.

The guarantor firm bears the full downside risk as if it were the owner of the collateral assets.\(^{11}\) It does not, however, participate in the upside gains that an owner of those assets would receive. Because of this asymmetry, the guarantor’s expected profit is a decreasing function of the variability of the shortfall. If the promised payment \( E \) is fixed, then the variability of the shortfall is the same as the volatility of the asset value.

To illustrate, suppose that the guarantor charges a certain premium at the beginning of the term of the guarantee and invests it at the risk-free interest rate. The premium charged by the guarantor plus interest earned on it is $10. The guaranteed payment is $100, and the underlying asset can take a value of either $120 or $80, each with a probability of 0.5. The asset’s expected value is therefore equal to the promised payment of $100, but there is a possible shortfall of $20. The guarantor’s expected profit is equal to the premium plus interest less the expected shortfall:

\[
\text{Guarantor's expected profit} = 10 - 0.5 \times 20 = 0.
\]

Now suppose that there is no change in the asset’s expected value, but its variability increases. Suppose that its value can be either $150 or $50, each with a probability of 0.5. The asset’s expected value remains equal to the $100 promised payment, but there is now a 0.5 probability of a $50 shortfall. Since the premium charged by the guarantor plus interest earned is still $10, the expected profit has declined:\(^{12}\)

\[
\text{Guarantor's expected profit} = 10 - 0.5 \times 50 = -15.
\]

There are three interrelated methods available to a guarantor to manage its business: (i) monitoring the value of the collateral assets; (ii) restricting the kinds of assets acceptable as collateral; and (iii) setting a premium schedule for the guarantee that is related to its loss exposure. In general, all three of these methods for managing the guarantee business are used in combination, but the relative importance of each varies.\(^{13}\) We now examine each method in greater detail.

A. Monitoring

If the guarantor has a covenant right to surveil continuously and seize assets, shortfall losses can be minimized either by auditing the value of the assets and seizing them before their value dips below the promised payment, or by making sure that the assets accepted as collateral always have a value at least equal to the promised payment. This policy permits the guarantor to function with minimal restrictions on the type of collateral assets and with minimal premium charges. In some guarantees, the covenants provide that the assets cannot be seized prior to a specified future date. When there is such a provision (called a "term" guarantee), monitoring alone cannot limit the shortfall losses. That is, monitoring only works as a means of controlling shortfall losses if the guarantor has the right to seize assets when some predetermined minimum or maintenance value for the collateral assets is violated.

\(^{11}\)We are assuming that the guarantee is complete, i.e., that it fully covers the default risk. As noted in footnote 2, many real-world guarantees have provisions that limit coverage.

\(^{12}\)That an increase in shortfall volatility causes the guarantor's liability to increase — and hence its expected profit to decrease — is shown more generally in Merton [42], [46].

\(^{13}\)As we will show, the best combination of methods depends upon such factors as surveillance costs, the feasibility of restricting assets, and the ability of the guarantor to estimate risk-based premiums. Government regulation will also influence the feasibility of certain combinations of methods.
Perhaps the best example to illustrate how monitoring with continuous surveillance can work effectively to protect the provider of a guarantee is the case of broker margin loans. It is instructive, because the system functions with only a minimal fee for the guarantee provided and relatively weak asset restrictions. When an investor opens a margin account with a broker and borrows money to buy stocks or bonds, the broker effectively is in the position of loan guarantor. For example, consider an investor who invests $100,000 in stocks, borrowing half of the funds from the broker. In practice, brokers typically borrow the funds that they lend to investors from a bank and guarantee the bank payment in full even if the investor defaults. The loan from the bank to the broker is collateralized by all of the broker's assets. These loans — both the loan from the broker to the investor and from the bank to the broker — are due on demand. The broker's fee for providing its guarantee (that is, for absorbing the default risk of the investor's collateralized loan) and for servicing the account is embodied in the spread between the interest rate it charges the margin investor and the interest rate it pays to the bank.

As guarantors, brokers set two types of capital requirements: initial margin and maintenance margin. The initial margin requirement is the required net worth of the investor's account at the time the margin loan is made and the securities purchased. All the securities purchased by the margin investor remain in the possession of the broker as collateral for the loan, and the broker calculates the market value of these securities daily (and sometimes more often on days when there is unusual volatility in price movements). The net worth of the investor's account is calculated as the market value of the collateral less the debt to the broker. If the net worth of the account falls below a prespecified fraction of the value of the collateral, called the "maintenance margin ratio," the broker notifies the investor that he must add additional equity capital to his account immediately. If the investor does not respond to this margin call, the broker exercises its right to sell the securities serving as collateral and pays off the loan out of the proceeds. The investor receives the remainder, if any.

Brokers find that this system offers them substantial protection despite the fact that the prices of the securities held by investors are often quite volatile. Indeed, the restrictions placed by brokers on securities that may be held in margin accounts are minimal, and brokers typically undertake only a minimal check of the borrower's total net worth. Nominally, the broker has recourse for any shortfall beyond the securities in the investor's account. However, brokers do not appear to rely on recourse to the investor's net worth to any significant extent. Despite the price volatility of the securities held in margin accounts, the implicit fees charged by brokers for their guarantees are quite low. Indeed, we found a local discount broker who charged 50 basis points below the call-money-rate-to-brokers rate quoted daily in the Wall Street Journal.

To summarize, the key elements of this system of monitoring margin loans are: (i) the guarantor has possession of the collateral; (ii) the value of the collateral is reconstituted frequently at readily ascertainable market prices; and (iii) the guarantor has the right to automatically liquidate the collateral to pay off the guaranteed liability if the ongoing capital requirement is violated. Each of these elements is essential for the system to function properly. In particular, frequent monitoring of the market value of the collateral would be pointless if the broker does not have the right to seize and liquidate the collateral as soon as the required maintenance margin ratio is violated.

Generalizing from this example of broker loans, we can make some observations about the requirements for an effective system of monitoring. First, the relevant market price to be used in valuing the assets is the price at which they can be sold — the bid price. Any asset is therefore eligible to be held in a margin account as long as it has a bona fide bid price for the quantity to be sold. As long as assets are marked to market at the bid price, the illiquidity of an asset serving as collateral is not a problem for the guarantor. However, illiquid assets (which by definition have a large bid-ask spread) are not suitable for guarantee systems relying on monitoring because the borrower is vulnerable to having the asset seized and liquidated when the bid price falls, even if the average of the bid and ask

14 Even if the broker lends its own funds to margin investors, it is effectively a guarantor, since, as discussed in our introduction, its loan consists of a default-free loan less a guarantee of that loan.
15 In the United States, the terms are set by individual brokers, but the Federal Reserve sets regulatory minimum levels of initial margin requirements.

16 Note that volatile assets, such as common stocks, can have small bid-ask spreads and therefore be quite liquid. While illiquidity may be a barrier to the effective use of a monitoring system, volatility by itself is not a problem.
17 Typically the background checks of margin investors performed by brokers are not primarily designed to determine the investor's creditworthiness. Rather, the intent appears to be either to avoid future lawsuits for unsuitable investments involving leverage or to ascertain that the account is not being used for "laundring" stolen securities.
prices falls by a relatively small amount. The spread cost from this “bid-ask bounce” is a deadweight loss to the collectivity of the debtor and the creditor. Thus, if it is large and the chances of a violation are not negligible, this form of handling guarantee risk is inefficient for illiquid assets. Therefore, when the underlying assets are illiquid, a guarantee system that relies heavily on monitoring is not efficient.

The issue of the liquidity of the assets held as collateral is frequently associated with the question of the size of the required capital cushion. These are, however, logically distinct issues. The problem of liquidity is addressed by marking assets to the bid price. If the bid price fluctuates smoothly over time without any big, discontinuous “jumps,” then the guarantor does not require a large capital cushion. The purpose of the cushion (i.e., the capital requirement) is to protect the guarantor against the possibility that the asset price will fall below the trigger point before the guarantor can seize and liquidate it. The issue of liquidity of the collateral is sometimes treated interchangeably with the possibility of large jumps in price because the two are likely to be positively correlated. But, as in the case of common stocks, it is possible for the assets to be very liquid and yet be subject to large discrete jumps in price.

The measure of “account net worth” or capital to be used as a trigger for seizure of assets should include only the value of assets that can be realized in a liquidation, net of any liquidation costs. To the extent that “going-concern” value or other intangibles can be preserved in a liquidation, then they should be included in capital. Otherwise, they should be excluded.

Note that the monitoring-audit activity described here is distinct from standard auditing activities such as verifying that the insured entity holds the assets it claims to possess. Auditing of this sort is designed to prevent fraud and to ensure compliance with asset restrictions and other nonvaluation covenants. Market valuation of assets and liabilities is not typically a part of it.

In many real-world situations, there is a nontrivial cost to valuing the assets held as collateral that rules out continuous surveillance of asset values as a feasible policy. This cost, together with the costs of seizure and liquidation, creates a tradeoff between the guarantor’s operating costs on the one hand and limiting loss experience on the other. One would thus not expect surveillance to be effective if these operating costs are high. In order to lower the costs of surveillance, valuations to determine the solvency of insured intermediaries are often performed at discrete time intervals — either randomly determined or scheduled in advance. The guarantor may use readily available market information to help determine when to perform an audit of the solvency of an insured intermediary. If, for example, the insured intermediary’s investor-held liabilities are traded in the capital markets, then their market value can provide useful information to the guarantor. Thus, an unusual decline in the market value of a particular bank’s stocks or bonds, should increase the likelihood that the guarantor of the deposit liabilities of that bank undertakes an audit.

Surveillance is often performed by third parties who are not at risk of their own capital. The real-world reference here is to rating agencies (such as Standard & Poor’s, Moody’s, and A. M. Best) who provide outside surveillance services for a fee, but do not themselves guarantee loans. There are, however, limits on how much guarantors can prudently rely on those rating agencies as a substitute for their own surveillance. Even with the so-called “reputation” effect, the incentives of the rating agencies can be such that it may be more important to them to produce essentially the same forecasts (ratings) as their competitors than to be accurate in their forecasts. Under conditions where customers can only observe “noisy” signals of raters’ forecasting skills, a rating agency that produces a correct prediction when its competitors are wrong may stand to gain less than it stands to lose by producing an incorrect prediction when its competitors are right.

The surveillance and seizure system employed by brokers in protecting themselves against default risk on the

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18For example, suppose that an investor buys an illiquid asset at an ask price of $100 when the bid price is $50. Suppose that the price subsequently drops to $75 ask and $25 bid. If a margin call occurs and the asset is liquidated, the total loss in value is $100 - $25 = $75, even though the average of the bid and ask price has declined by only $25.

19As we will discuss in Section II.C, higher capital requirements can also substitute for frequent surveillance.

20For a formal analysis of a random surveillance process of this sort, see Merton [43].

21The argument is that in a less-than-full-information world, if all providers of the service are wrong, customers are more likely to assume that the event was not forecastable and hence, not penalize any of the firms for their error. On the other hand, if the rater makes a correct prediction when all others are wrong, the rater will gain fewer new customers because, with noisy signals, the rater's success may be seen as just a matter of luck. Much the same issue arises for professional investment managers, whose fees are not significantly dependent on the realized returns on their clients' portfolios. A formal model demonstrating this "herding" behavior among such agents could be developed along the lines of the models in Holstrom and Ricart i Costa [20] and Scharfstein and Stein [61].
part of their customers is not the only such system. The futures and options exchanges in the United States and throughout the world employ similar methods. Miller [53, section 2.1.2], for example, describes how futures exchanges insure the parties to a futures contract against contract default risk by employing perfected collateral that is marked to market on a daily basis. There is an additional layer of protection against contract default risk built into the system in the form of a clearinghouse with both assurance capital and guarantees of its own performance from third parties. All contracts are formally between the buyer or seller and the exchange clearinghouse and thus carry that institution’s guarantee. The same is true for exchange-traded options.

The swap market offers another example. The vast majority of swap contracts are between two parties through the intermediation of a bank or other financial-services firm. The role of the intermediary has been both to bring parties together and to provide performance guarantees (for a fee). Recently, however, swap contracts are being written to include perfected collateral that is marked to market frequently, thus making the provision of third-party guarantees less important and less expensive.

B. Marking to Market

A system of monitoring to control the risks faced by guarantors can only work if there are mutually acceptable rules and valuation procedures to determine when the intermediary’s assets can be seized and liquidated by the guarantor. As already discussed, the valuation of assets for the purpose of implementing this system should be at the bid side of their current prices (including any impact on these prices caused by the size of the proposed transactions). Such periodic revising of values is called marking to market.22

Although the concept of marking to market is straightforward, its implementation can be complex. If the collateral assets are traded in well-functioning, organized markets such as national stock exchanges and government-securities markets, then reliable market values are readily observable, and marking to market is a relatively easy process. However, for assets that trade either infrequently or in significantly smaller lot sizes than the holdings of the intermediary, estimates of market prices are subject to significant errors, and reaching agreement on the proper mark-to-market procedure is more difficult.

In the context of a surveillance and seizure system, these estimation errors impose risks on both the guarantor and the insured intermediary. If the errors overstate values, the guarantor will not seize as quickly as it should, and the proceeds realized from seizure will be less than expected. If the errors understate the values, the intermediary will be seized and liquidated when it is actually solvent. Thus, a “conservative” valuation method from the perspective of one party to the system will be an “aggressive” valuation method from the perspective of the other party. Hence, the valuation method should be unbiased. Protections for the parties from measurement errors in the prices can be provided by other rules of the monitoring system — such as the minimum size of the intermediary’s net worth before seizure is permitted.

Because of the natural tension between the guarantor and the insured intermediary over asset valuation, a key element of a mark-to-market system is that it seeks to minimize the opportunities for manipulation. Especially if its assets are traded infrequently, the intermediary has information about their true values that is not costlessly available to other parties including the guarantor. As indicated, the intermediary’s incentives favor biased-high estimates of prices of its assets and biased-low estimates of the prices of its liabilities. Thus, while the intermediary may have information that could improve the accuracy of the valuation, it may be optimal to neglect its inclusion in the mark-to-market estimates, if inclusion of this information requires too much discretion on the part of the intermediary. That is, the accuracy of the valuation procedure is important, but just as important is that the procedure be known, agreed upon by both parties in advance, and difficult to manipulate.23 In sum, a proper mark-to-market model is one that, specified ex ante, gives the best estimate of market price, using verifiable data.

A word on book values in a monitoring system. It is sometimes suggested that circumstances in which estimates of market prices are “noisy” are ones that favor using book values — that is, amortized acquisition cost. This seems to us to be a non sequitur. We are not aware of scientific evidence that book values are the best estimates of market prices, especially for financial assets of the kind held by intermediaries. Indeed, since financial assets whose prices are observable fluctuate substantially over

22There is a considerable literature on the virtues and disadvantages of marking to market for various purposes, such as measuring accounting earnings for tax purposes or for performance measurement, etc. Here, we are concerned with marking to market only for purposes of triggering the seizure and liquidation of assets of an insured intermediary.

23Bernard, Merton, and Palepu [8] test for manipulation in the mark-to-market system used by the Danish government to monitor and seize insolvent banks.
time, it is highly unlikely that the best-fitting unbiased, nonmanipulatable model would produce values that remain virtually constant (around predictable amortized acquisition cost) over time. Standard accounting rules for marking down book values of assets, such as creating a reserve for bad loans, are usually subject to considerable management discretion. One would therefore expect that for monitoring purposes, the guarantor would be reluctant to let an insured intermediary use book values for illiquid assets. There is a certain irony that the assets with the most uncertainty about their values would be valued by a book system which produces almost no variation in price.

Just as it is important to mark the assets to market, so guaranteed liabilities must also be marked to market. Otherwise, the exposure or shortfall estimates of the difference between asset value and promised liability payment value are distorted, and the monitoring process can become dysfunctional. In the case of broker margin loans or demand deposits, the guaranteed liability is equal to the original principal plus accrued interest. More generally, as in the case of annuities and other insurance policies, the stream of promised payments can stretch far into the future. The question of how to compute the present value of the payments that are guaranteed is, therefore, an important issue.

For example, consider an intermediary selling life annuities to its customers, and investing in bonds that are marked to market. Suppose, however, that its annuity liabilities are evaluated using an interest rate assumption that does not reflect the current market rate. If market interest rates rise, the firm may appear to be inadequately capitalized, because the market value of the bonds in its portfolio falls while the present value of the annuities computed at the nonmarket rate remains unchanged. Symmetrically, a decline in interest rates will create the appearance that the firm is overcapitalized. Such a "mismatch" between asset and liability valuation methods can be so dysfunctional that it causes the intermediary to avoid hedging or matching assets with liabilities, where such hedging would actually reduce the economic exposure of the intermediary and hence, of the guarantor. 

C. Capital Requirements
Since the collateral held in broker margin accounts consists entirely of securities traded by the broker, the cost of surveillance is relatively low. Margin requirements are determined by the need for a capital cushion to protect the broker against the possibility that the security prices will change discontinuously and "jump" below the trigger point before the broker can sell the securities. By comparison, it may be much more costly for the guarantor of an insured intermediary to audit the value of the intermediary's assets frequently. In such cases, the capital cushion can serve an additional function as an alternative to frequent surveillance.

If capital is large relative to the value of insured customer claims, then premiums charged by the guarantor can be low, and surveillance can be done less frequently. Since this saves surveillance costs, perhaps a lower-cost solution for the guarantor would be to simply require insured intermediaries to have large amounts of capital in the form of either equity or subordinated debt. Unfortunately, as with the frequent-surveillance solution, this too has its costs.

First, consider the equity-capital choice. As an empirical matter, financial intermediaries, both insured and uninsured, do not typically have large amounts of equity capital relative to the size of customer liabilities. As discussed in footnote 8, one theoretical explanation for this behavior is the agency and tax costs associated with equity financing of any corporate enterprise. The very characteristic of the equity cushion that makes it attractive to the guarantor of the intermediary — that shareholders of the intermediary have no contractually specified claims to the firm's future cash flows — is the characteristic that creates a moral hazard for the shareholders who provide that equity cushion. The resulting agency and tax costs are thus the costs of using a large equity cushion as an alternative to more frequent surveillance.

The agency and tax costs associated with using equity for assurance capital can be significantly reduced by the use of debt, because debt instruments require the firm to make contractually specified payments in the future, and those payments are tax deductible for corporations. The use of subordinated debt to provide the assurance capital for insured intermediaries thus seems to offer a simulta-

24This actually happened with defined-benefit pension funds in the late 1970s and early 1980s. Under accounting rules in effect at the time, pension funds were required to mark their assets to market, but were allowed to value their accrued pension benefits using nonmarket interest rates. Financial Accounting Standards Board 87 and 88 have largely corrected this particular problem. See Bader and Leibowitz (2) for an analysis showing the enormous distortions in the reported under- and over-funding of pensions caused by the pre-FASB 87 rules.

25Similarly, some intermediaries may be deterred from hedging activities in the futures and forward markets by accounting rules that do not allow them to recognize in their financial statements the risk-reducing effects of such transactions.

26The only control shareholders have over the pattern of future payments of dividends is their right to elect management.
neous, lower-cost solution to the requirements of both the providers of capital and the guarantor.

But there are problems with subordinated debt too. Debt instruments, such as corporate bonds, often offer investor-creditors ways of getting their cash payments out of a troubled institution before the guarantor can — high-coupon payments, call provisions, sinking funds, and put-option provisions are examples.\textsuperscript{27} Furthermore, these investor-creditors may become aware of the financial difficulties of an insured intermediary before the guarantor, especially if the guarantor has reduced its surveillance activities to save costs. Perhaps even more serious, at least in the United States, is the uncertainty surrounding actual priority of creditor claims in the event of financial distress.

As we know from the work of Tufano [69], these problems are not new.\textsuperscript{28} In recent times, the courts have interpreted the bankruptcy laws in such a way that there is considerable ambiguity about the priority of the guarantor's claims in the event of bankruptcy. In two recent cases, the courts have decided that the claims of the federal agencies that have assumed the guaranteed deposit liabilities of failed thrifts and the guaranteed annuities of bankrupt pension plan sponsors are to be treated \textit{pari passu} with those of other creditors under Chapter 11 of the Federal Bankruptcy Code.\textsuperscript{29}

Thus, unless the bankruptcy laws are changed to remedy the problem of settling the priority of claims for firms in financial distress,\textsuperscript{30} high capital requirements in the form of subordinated debt may not be a good substitute for aggressive monitoring by the guarantor. It is essential for the guarantor to monitor the value of assets serving as collateral, and, in the event of a violation of the required capital ratio, to seize them before the other liability-holders of the firm cause the firm to seek Chapter 11 or other bankruptcy-law protections.\textsuperscript{31}

\textbf{D. Asset Restrictions}\textsuperscript{32}

As an alternative to monitoring, the second method a guarantor can use to control its potential losses is to require the insured firm to reduce the variability of the difference between the value of its assets and the value of its promised payments. An insured intermediary with long-term, money-fixed liabilities could, for example, be restricted to hold long-term, fixed-income securities; an insured intermediary with short-term deposit liabilities could be restricted to short-term assets. This type of restriction is known as "matching" (assets to liabilities) or "running a matched book" (of business). Asset restrictions are important to guarantor management even when full matching is not required, because the restrictions limit the amount of risk that the insured firm can take.

For example, consider a state guarantor fund that insures the payments on life annuities sold by life insurance companies doing business in the state. The guarantor could require each insurance company to hedge its fixed-income liabilities by investing in default-free, fixed-income securities with the same maturity as the benefits promised to policyholders.\textsuperscript{33} This eliminates the risk to the guarantor stemming from uncertainty about future interest rates and from uncertainty about the solvency of the issuers of the fixed-income securities. The only remaining risk to the insurance company and therefore to the guarantor is mortality risk. By imposing the matching of assets and liabil-

\textsuperscript{27}A perhaps subtle example of this problem is the right of employees to demand a lump-sum payment of pension benefits from the corporate sponsor of a defined-benefit pension plan. Employees with a claim to pension benefits exceeding the limits guaranteed by the government are in the position of subordinated debtholders. By demanding a lump-sum settlement instead of a life annuity, such employees can accelerate their claims at the expense of the guarantor.

\textsuperscript{28}Tufano [69] shows that over a hundred years ago, creditors of the railroads in the United States were grappling with this issue. Some of the major financial innovations of that period — preferred stock, income bonds, and voting trusts — were motivated primarily by the need to find efficient ways to resolve financial distress without incurring the deadweight losses associated with bankruptcy proceedings.

\textsuperscript{29}The first is the case of the Pension Benefit Guaranty Corporation against LTV, and the second is the case of the Resolution Trust Corporation against Oak Tree Savings Bank. The Federal Deposit Insurance Corporation apparently accepts a \textit{pari passu} position with other creditors. It has, however, repeatedly asked Congress to change that status and give it priority in liquidation.

\textsuperscript{30}For one approach that deals with this problem by creating a system of "no-fault default," see Merton [46, section 2.7].

\textsuperscript{31}But of course, a guarantor cannot always anticipate a firm's filing for Chapter 11 protections. However, even in those cases where, as a result of such a filing, the guarantor is prevented from immediately realizing the collateral value, empirical evidence indicates that claims of secured creditors are almost uniformly upheld. See Weiss [70].

\textsuperscript{32}This section is entitled "asset restrictions" rather than the more general "net worth" restrictions (which implies either restrictions on assets or on liabilities or a combined restriction on both) because our analysis focuses on situations where guarantees of customer-held liabilities (such as deposits or annuities) are the main concern. In its usage here, the term "asset restrictions" applies not only to book assets, but to all business activities of the firm including "off-balance-sheet" ones such as letters of credit and other guarantees issued by the firm and matched-book market-making in swap contracts and other derivative securities.

\textsuperscript{33}The general version of this matching with respect to changes in interest rates is called "immunization." See Leibowitz [34, pp. 695-692].
ilities on its insurance companies, the guarantee fund can charge very low premiums and still be viable.

While simple in concept, the matching of assets and liabilities is not always as simple to implement in practice. Thus, one might believe that life insurance companies can hedge the interest rate risk of their annuity liabilities by simply investing in long-term, fixed-rate mortgages or bonds. However, at least in the United States, virtually all mortgages and bonds have prepayment or call provisions that allow the issuer to retire them early. Life insurance companies that attempt to match maturities must therefore deal with this prepayment risk. Thus, we see that, even in this seemingly straightforward case, the matching of assets and liabilities can be complex to implement.

As a second example of the use of asset restrictions, consider the situation of a guarantee fund designed to insure savings accounts at savings institutions. The guarantor could require the savings institutions to hedge their deposit liabilities by investing in default-free, fixed-income securities with the same maturity as the deposits. Note that the asset restrictions cover both the default-risk characteristics of the fixed-income securities held by the insured institution and their maturities. If a savings institution has deposit liabilities with a short maturity and is allowed to invest in long-term bonds, the guarantor of the deposits can be subject to considerable interest rate risk, even if the bonds are free of default risk.

Starting in the 1980s, the development of trading in derivative securities — financial futures, forward contracts, options, and swaps — greatly enhanced the ability of intermediaries to reduce (or increase) their exposure to risk without necessarily changing their sources or uses of funds. Thus, by entering into an interest rate swap contract, an intermediary can effectively convert a long-term, fixed-rate asset or liability into a floating-rate one, or vice versa. For example, consider a thrift with an established set of customers on both sides of its balance sheet: depositors on the liability side and mortgage borrowers on the asset side. The deposit liabilities are floating-rate, while the loans are mostly long-term, fixed-rate mortgages. By entering a floating-rate for fixed-rate swap, in which it pays a fixed rate and receives a floating rate, the thrift can effectively match its floating-rate deposit liabilities to its long-term, fixed-rate assets. Thus, by using interest rate swaps, the thrift can effectively match its assets and liabilities without either changing to new types of customers or asking any of its current customers (depositors or borrowers) to change their behavior.

The use of swaps by intermediaries to match their assets and liabilities is not limited to interest rate swaps. Swaps are remarkably flexible instruments with great potential as a risk management tool. For example, an intermediary that offers deposits linked to a stock market index to its customers and invests its funds in fixed-rate mortgages could enter an offsetting "equity-for-fixed-rate-debt-return" swap to create very low variability in its net worth. As in the previous example of the thrift, the swap allows the intermediary to offer its customers the products or services they demand while simultaneously controlling its risk exposure.

Just as an intermediary with unmatched assets and liabilities can quickly reduce the variability of its net worth (and thus the exposure of the guarantor of its liabilities) by entering into swaps or taking offsetting positions in futures contracts, so it can quickly reverse the process and become unhedged. Indeed, an intermediary can even increase rather than decrease its unhedged risk exposure by taking positions in those derivative securities that accentuate the imbalance between its asset and liability positions. Thus, the very efficiency of the derivative-securities markets in permitting rapid and low-cost hedging of positions, can also make it difficult for the guarantor to keep track of the intermediary's exposure to shortfall risk. In order for the guarantor to monitor asset restrictions effectively, it must be aware of and understand the implications of all posi-

34 Unlike mortality risk, prepayment risk is systematically related to the level of interest rates which affects all fixed-income security prices. Therefore, diversification across different kinds of fixed-income instruments with different issuers will not eliminate or even significantly reduce this risk exposure. Many of the innovations in the U.S. fixed-income securities markets in the 1980s (such as collateralized mortgage obligations or CMO's) have been driven by the desire of pension funds and other intermediaries with long-term annuity liabilities to hedge the prepayment risk of mortgages. See Bodie [9].
tions the intermediary holds in derivative securities at each point in time.

Another trend, developed during the 1980s, that has allowed intermediaries to reduce their risk exposure is securitization of mortgages and other assets such as credit-card receivables, car loans, and even some commercial loans. The growth of markets for securitized loans of various sorts has made it possible for intermediaries such as thrifts to continue to perform their traditional function of mortgage loan origination and servicing without bearing the full risk of the loans. From the perspective of the buyer of the securitized loans, the result of this process of securitization is a loan with perfected collateral. At the extreme, if an intermediary sells all of its customer-based assets, it becomes a service agency. To overcome the resultant agency problem, the intermediary that sells its loans often offers a partial guarantee of the loans' performance.

E. Risk-Based Premiums

When monitoring is costly or inappropriate, perhaps because of asset liquidity problems, and when complete asset-liability matching is undesirable, then an alternative way for the guarantor to operate is to charge risk-related premiums. The system of property and casualty insurance works in this way. A precondition for the success of a system of risk-based premiums for financial intermediaries is that the guarantor has some control over the volatility of the value of the collateral asset portfolio. For risk-based premiums to work, asset variability need not be reduced to zero, but it does have to be known (or at least bounded) and not subject to significant unilateral change by the insured intermediary after the premium has been set. If the insured intermediary can unilaterally change the variability of the asset portfolio ex post, then the guarantor faces a problem of moral hazard.

Estimation of the proper risk-based premiums for the kinds of guarantees discussed here is feasible. There is a substantial and sophisticated academic literature on estimating the value of loan guarantees and deposit insurance. However, we choose here a simpler route to provide a sense of the private-sector market prices for loan guarantees. As discussed at the outset, the price of non-guaranteed debt plus the price of a loan guarantee for the debt is equal to the price of default-free debt with the same terms. It follows as a matter of subtraction that the value of the loan guarantee is equal to the difference in the prices of the two bonds. Corporate bonds traded in actual markets are not guaranteed. Hence, by estimating the prices for those bonds if they were default-free and subtracting the actual market prices of the bonds, we derive implied market prices for the guarantees.

Merton [46, Table 8] presents such a tabulation for a sample of ten below-investment-grade bonds. We reproduce it here as Exhibit 1. The selection criteria were nothing more than picking lower-grade bonds issued by companies with names that are probably recognizable by most. None of the bonds were in default or trading "flat" at the time the selections were made. The estimates of their corresponding default-free prices are derived by discounting promised coupon and principal payments at nine percent, which was, at the time, approximately the current U.S. Treasury bond and note rate.

Since the purpose of Exhibit 1 is simply to provide an indicated range of implied market prices for guarantees, no adjustments were made for either cumulative interest or call provisions. Such detailed adjustments would not change the central point that the prices of loan guarantees can be quite large. Pan Am (even well before its recent bankruptcy filing) stands out as an extreme with an $89 price for the guarantee which is 150% of the bond's nonguaranteed price of $59. However, as indicated by the other entries in Exhibit 1, loan guarantee prices in excess of 50% of the bond price without the guarantee are not uncommon.

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37 However, securitization of the intermediary's assets may increase the exposure of its guarantor if the intermediary uses its "best" assets for this purpose and retains its "worst" assets within the firm. By so doing, the intermediary has in effect created a whole class of new creditors senior to the guarantor. Financially distressed, regulated firm is especially likely to sell those assets which have the highest market-to-book values so that those sales have the most favorable impact on its (book-value) capital-to-assets ratio. Thus, the assets remaining within the firm as collateral for the guarantor are likely to have relatively low market-to-book values. Baldwin [3] analyzes the problems for guarantors from this type of selective asset "stripping."

38 For a discussion and analysis of this moral-hazard problem for guarantors, see Merton [46, section 3.2]. Much of the academic literature on deposit insurance during the 1980s focused on this as perhaps the central problem for guarantors. By the analogy between loan guarantees and put options, it is generally believed that the management of the firm has an incentive to increase the riskiness of the firm's assets. However, this need not always be the case as demonstrated by the models in Keeley [31], Marcus [36], Merton [43], and Pennacchi [57].

39 See, for example, Acharya and Dreyfus [1], Crouhy and Galai [14], Cummins [15], Jones and Mason [24], Marcus and Shaked [37], Merton [42, 43, 46, 47], Osborne and Misra [56], Pennacchi [57, 58], Ronn and Verma [59], Selby, Franks, and Karki [60], Sharpe [62], Sosin [66], and Thomson [68]. See also the entire September 1991 Issue of the Journal of Banking and Finance.
### Exhibit 1. Estimates of Loan Guarantee Values Derived From Corporate Bond Prices

<table>
<thead>
<tr>
<th>Company</th>
<th>Years to Maturity</th>
<th>Corporate Bond Prices</th>
<th>Loan Guarantee Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>With Guarantee(^a)</td>
<td>No Guarantee(^b)</td>
</tr>
<tr>
<td>Continental Airlines</td>
<td>6</td>
<td>109.12</td>
<td>66.00</td>
</tr>
<tr>
<td>MGM/UA</td>
<td>6</td>
<td>118.24</td>
<td>63.38</td>
</tr>
<tr>
<td>Mesa Capital</td>
<td>9</td>
<td>127.36</td>
<td>95.50</td>
</tr>
<tr>
<td>Navistar</td>
<td>14</td>
<td>100.00</td>
<td>89.00</td>
</tr>
<tr>
<td>Pan Am</td>
<td>14</td>
<td>147.23</td>
<td>58.63</td>
</tr>
<tr>
<td>RJR</td>
<td>11</td>
<td>88.80</td>
<td>70.88</td>
</tr>
<tr>
<td>RJR Nabisco</td>
<td>11</td>
<td>141.35</td>
<td>76.88</td>
</tr>
<tr>
<td>Revlon</td>
<td>20</td>
<td>117.25</td>
<td>80.75</td>
</tr>
<tr>
<td>Union Carbide</td>
<td>9</td>
<td>102.49</td>
<td>92.25</td>
</tr>
<tr>
<td>Warner Communications</td>
<td>23</td>
<td>124.11</td>
<td>97.00</td>
</tr>
</tbody>
</table>

Notes:
\(^a\)Assumes a flat United States Treasury yield curve at nine percent and no adjustment for call provisions.
\(^b\)Closing market price, Wall Street Journal, May 11, 1990; no adjustment for cumulative interest.

Source: Reprinted from Merton [46].

In summary, the three basic methods that a guarantor of liabilities has to manage its function on a sound business basis are:

(i) **Monitoring.** This method requires the guarantor to frequently mark-to-market the assets and liabilities of the insured institution and be ready and able to seize the collateral as soon as the institution’s net worth falls below a predetermined maintenance target. It works best when the guarantor has perfected possession of the collateral and when the assets and liabilities have easily ascertainable market values.

(ii) **Asset Restrictions.** This method of controlling costs requires the insured institution to (at least partially) hedge its guaranteed liabilities, and limits the volatility of its net worth.

(iii) **Risk-Based Premiums.** Under this method, the guarantor charges a fee that is commensurate with the riskiness of the guarantee. It works best when the guarantor has access to the informational inputs needed to establish a fair price and when the risk characteristics of its assets and/or liabilities cannot be unilaterally changed by the insured intermediary after the premium has been paid.

In practice, guarantors (whether private or government) use mixes of all three methods. As we have seen, depending on the context, some mixes will be more efficient than others.

Note that no mention has been made of the investment and financing policies of the guarantor. There are three reasons. First, we have assumed for the analysis that the guarantor has sufficient capital so that the investment policy is not being relied upon to ensure that the guarantor can make good on the guarantee. If the quality of the guarantee is in question, then we are led to a potential problem of infinite regress — who guarantees the guarantor, who guarantees the guarantor of the guarantor, and so on?

Second, to the extent that the guarantor earns a higher expected return by investing in assets with higher risk, there is no “excess” value to support lower premium charges by the guarantor. Higher expected returns are simply compensation for greater risk-bearing. Furthermore, even if the guarantor has special investment expertise which makes possible the achievement of higher risk-adjusted expected returns, there is no reason to assume that these higher risk-adjusted returns will or should be used to subsidize the guarantee business in the form of lower premiums.

For example, suppose there are two identical guarantee firms that have priced their guarantees to compete with each other. Since, by assumption, the guarantees issued by both firms are free of default risk, the premiums charged customers will be the same. Suppose that the first guarantee firm invests the premiums collected so as to minimize the risk exposure of its shareholders — say, by investing in Treasury bills, while the second invests the premiums in a stock market index fund. The shareholders of the second guarantee firm are thus exposed to stock market risk in
addition to the risk of the firm’s guarantee liabilities. They are compensated for bearing the stock market risk by the expectation of earning a higher return on their investment in the equity of the guarantee firm. But this can only be achieved by “passing through” to the shareholders the higher expected returns on the firm’s stock market assets. Competition from other guarantors prohibits the firm from charging higher premiums to customers to “cover” its losses from stock investments. Hence, there is no reason to believe that the second firm will or should change the premiums it charges for its guarantees based on the outcome of its stock market investments. Similarly, if the second firm has skill in either stock market timing or in security selection, so that it can actively manage its investment portfolio to earn a noncompetitive higher risk-adjusted expected return, there is no reason to believe that this excess return will or should be used to subsidize its guarantee business, since realizing superior investment performance does not require that one be in the guarantee business.

III. Corporate Guarantees
Guarantees are ubiquitous in the world of corporate finance, although often they are implicit rather than explicit. Some common situations in which the analysis of guarantees is central to decision-making and control by corporate financial officers are:

- Parent company guarantees of the debt or other contractual obligations of a subsidiary. (The chief financial officer is likely to be the decision-maker.)
- Swap and other derivative-security contracts entered into by the corporation. (The treasurer would be most directly involved.)
- Pension obligations under defined-benefit pension plans. (The chief pension officer would be most directly involved.)

In general, the efficient mix of the three methods described in Section II for managing corporate guarantees will depend on the specific circumstances.

A. Parent Guarantees of a Subsidiary
A prime case of the use of guarantees is when a parent company guarantees the debt or other contractual obligations of a subsidiary. Such guarantees are often quite important to the subsidiary firm. In some cases, suppliers or customers might not even be willing to do business with the subsidiary if they doubt that the parent company would honor the subsidiary’s commitments. Sometimes a guarantee from the parent company constitutes the entire equity capital of the subsidiary. Such guarantees do not usually appear explicitly on the balance sheets of the parent or its subsidiary. Nonetheless, their economic value can be very large in relation to other corporate assets and liabilities. The management of those guarantees can therefore be an important part of the job of the parent company’s financial managers.

To help in analyzing such guarantees, we begin with the reasons for companies to establish subsidiaries:

- To better control risk exposure of either the parent to the subsidiary or the subsidiary to the parent. 40
- To enhance the company’s ability to evaluate individual performance and to create different compensation systems for a diverse set of its businesses.
- To conform with regulatory requirements specific to a particular business environment.

An example that illustrates all three reasons for establishing subsidiaries is a multinational corporation that organizes itself into separate national subsidiaries. By doing so, the parent company can limit its exposure to country-specific risks, tailor its incentive and compensation systems to fit different cultural and political environments, and conform to different (sometimes contradictory) regulatory regimes.

In managing guarantees of its subsidiaries, a parent company may find it efficient to use management methods that would not be feasible for an external guarantor. Unlike an external party, the parent’s management can have access to virtually all of the proprietary business information available to the subsidiary’s management without jeopardizing the competitive position of the subsidiary. Such access greatly reduces problems of asymmetric information between the guarantor and the guarantee. The parent’s management, for example, can decide to establish an internal mark-to-market accounting system to monitor its exposure from guarantees of its subsidiaries even though the resultant reports would not be available to outsiders. It is therefore likely that moral-hazard and other principal-agent problems are less severe here than they would be with an outside guarantor.

Subsidiaries often fall under different regulatory authorities from their parents, which may cause the efficient combination of methods for managing the guarantee to change. In an international context, for example, the different laws and regulations of the host countries may impose constraints on the combination of methods avail-

40 The typical case is that the parent is limiting its exposure to liabilities incurred by the subsidiary. However, with bank-holding companies and their banks or credit-enhancement subsidiaries of investment banks, such as Merrill Lynch Derivative Products Inc., the reverse is the case.
able to a multinational parent corporation to manage guarantees of its individual national subsidiaries.

B. Credit Risk of Swaps

Corporate treasurers have turned increasingly to the futures, options, and swap markets to manage their currency and interest-rate risks and to seek the lowest-cost financing globally available. Counterparty credit risk is often a major concern with these contracts, and corporate treasurers must decide the most appropriate mix of methods to manage those risks.  

A firm that enters a swap contract has essentially two ways to deal with counterparty credit risk:

- Require collateralization and manage the guarantee exposure itself.
- Require the purchase of a third-party performance guarantee (e.g., from a top-credit financial institution with an AAA credit rating).

If the first path is taken, the methods of management are the same as those described in Section II.

C. Corporate Pension Benefit Guarantees

Another economically significant example of guarantees in corporate finance arises in the context of defined-benefit pension plans sponsored by firms for their employees. According to U.S. law, the assets in the pension fund serve as collateral for the sponsor’s benefit obligations to its employees. Thus, the assets in the pension fund are encumbered corporate assets securing a particular form of the corporation’s nonequity liabilities. However, in some other countries, any pension fund surplus (i.e., the excess value of pension assets over contractual pension obligations, if any) must be used to increase pension benefits beyond the amount specified in the benefit formula. In such situations, the pension fund is effectively a subsidiary in which the employees have an equity stake. However, unlike the usual “symmetric” pattern of gain and loss for equity, should the assets in the pension fund “subsidiary” be insufficient to pay the benefits promised to employees under the plan’s benefit formula, then the firm must make up the difference. The firm sponsoring the defined-benefit pension plan for its employees is thus a guarantor of the “debt” of this pension “subsidiary.”

IV. A Hypothetical Example

To illustrate how our analytical framework can be used by a corporation’s managers, consider SubCo, a fictitious wholly owned subsidiary of PareCo, a $1 billion corporation which has an AAA credit rating. SubCo has assets worth $100 million and has issued zero-coupon bonds maturing in one year with a face value of $103 million. Without PareCo’s guarantee, SubCo’s bonds would be below-investment-grade and have a market value of $91 million. With the guarantee, SubCo’s bonds are high-grade and have a market value of $98 million. The $7 million difference in value is due to PareCo’s guarantee. However, the guarantee does not appear on the conventional balance sheet of either corporation. Without it, it appears as if SubCo’s capital structure is 98% debt and two percent equity; when, in fact, the guarantee provided by PareCo is an asset of SubCo which makes the “true” amount of equity capital correspondingly larger.

To see this, consider the “extended” balance sheets of PareCo and SubCo in Exhibit 3, Panels A and B, and contrast them with the conventional balance sheets in Exhibit 2, Panels A and B. Exhibit 3 shows the guarantee of SubCo’s bonds explicitly as an asset of SubCo and a liability of PareCo. Note that the consolidated balance sheet, shown in Panel C of Exhibit 2 and Panel C of Exhibit 3, is the same for both the conventional and the extended cases; it is unaffected by how we choose to record the guarantee.

While for external users (e.g., security analysts), PareCo’s consolidated balance sheet may be sufficient, PareCo’s managers can make use of the unconsolidated “extended” balance sheets to run the business more effectively. As discussed in Section III.A, there are three main arguments in favor of such an internal management accounting scheme. Let us consider each:

For a development of corporate pension policy along these lines, see Bodie [10] and [11].

The value of the guarantee in this example is calculated using the Merton (42) model with the variance rate of the logarithmic change in SubCo assets equal to 0.04 per year and a riskless interest rate of 0.05 per year.

Merton and Perold (52) use this “extended” balance-sheet approach to derive their measure of risk capital of a business. See Merton (44) for an early use of the extended balance sheet in the same context as here.

Since PareCo’s equity in SubCo is an asset which offsets its guarantee liability in Exhibit 3, Panel A, the current value of PareCo’s shareholders’ equity is unaffected by the explicit accounting for the guarantee.

---

41See Cooper and Mello [13], Litzenberger [35], Solnik [65], and Sundaresan [67] for formal analyses of the credit-risk exposure in swap contracts.

42This is the case in the Netherlands, for example.

43In the United States and several other countries, the defined-benefit pension obligations of private firms are also guaranteed up to certain limits by the government. See Bodie and Merton [12].
Exhibit 2. Conventional Balance Sheets of PareCo and SubCo

Panel A. PareCo Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td></td>
</tr>
<tr>
<td>Assets</td>
<td>$1,000 million</td>
</tr>
<tr>
<td>Equity in SubCo</td>
<td>$2 million</td>
</tr>
<tr>
<td>Shareholders</td>
<td></td>
</tr>
<tr>
<td>Equity</td>
<td>$1,002 million</td>
</tr>
</tbody>
</table>

Panel B. SubCo Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>$100 million</td>
</tr>
<tr>
<td>Bonds</td>
<td>$98 million</td>
</tr>
<tr>
<td>Equity</td>
<td>$2 million</td>
</tr>
</tbody>
</table>

Panel C. Consolidated Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>$1,100 million</td>
</tr>
<tr>
<td>Bonds</td>
<td>$98 million</td>
</tr>
<tr>
<td>Shareholders</td>
<td></td>
</tr>
<tr>
<td>Equity</td>
<td>$1,002 million</td>
</tr>
</tbody>
</table>

(i) To better reflect PareCo’s risk exposure through SubCo. The exposure of PareCo to SubCo risk is reflected in the difference between the extended balance sheet of PareCo in Exhibit 3, Panel A, and the conventional balance sheet in Exhibit 2, Panel A. In Exhibit 3, Panel A, the guarantee of SubCo’s bonds appears explicitly as a liability of PareCo.

(ii) To more accurately allocate capital in performance evaluation and compensation systems. To see the distortions in reported performance that can result from ignoring the value of the parent’s guarantee, suppose that PareCo uses ROE as a performance measure. Assume that during the year, SubCo’s net income turns out to be $2 million. If based on the $2 million of conventional balance-sheet equity in Panel B of Exhibit 2, its reported ROE will be 100%. But if the $7 million value of the guarantee from PareCo is taken into account as in Panel B of Exhibit 3, SubCo’s ROE is only 22.22%.48

(iii) To facilitate recognition by the authorities regulating SubCo of PareCo’s total equity investment. Suppose that SubCo is subject to price regulation, and is allowed only a “fair” rate of return on its invested capital. A “fair” rate of return of 15% on $2 million of conventional balance-sheet equity is $300,000, which is only a 3½% rate of return on the $9 million of actual economic equity capital. It thus makes an enormous difference how SubCo’s equity capital is computed.49

Exhibit 3. Extended Balance Sheets of PareCo and SubCo

Panel A. PareCo Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td></td>
</tr>
<tr>
<td>Assets</td>
<td>$1,000 million</td>
</tr>
<tr>
<td>Equity in SubCo</td>
<td>$9 million</td>
</tr>
<tr>
<td>Shareholders</td>
<td></td>
</tr>
<tr>
<td>Equity</td>
<td>$1,002 million</td>
</tr>
</tbody>
</table>

Panel B. SubCo Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>$100 million</td>
</tr>
<tr>
<td>Bonds</td>
<td>$98 million</td>
</tr>
<tr>
<td>Equity</td>
<td>$2 million</td>
</tr>
<tr>
<td>Guarantee from</td>
<td></td>
</tr>
<tr>
<td>PareCo</td>
<td>$7 million</td>
</tr>
</tbody>
</table>

Panel C. Consolidated Balance Sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>$1,100 million</td>
</tr>
<tr>
<td>Bonds</td>
<td>$98 million</td>
</tr>
<tr>
<td>Shareholders</td>
<td></td>
</tr>
<tr>
<td>Equity</td>
<td>$1,002 million</td>
</tr>
</tbody>
</table>

V. Government Guarantees

To this point, the analysis and discussion apply generically to the activities of guarantors, whether private or government. We now consider explicitly the special role of government as guarantor.

All over the world, governments provide guarantees either through specific programs such as deposit insurance or by providing credit. In the United States, for example, the federal government is the nation’s largest underwriter of default risk. The U.S. Office of Management and Budget (OMB) estimates that in 1992, three-fifths of all non-federal credit outstanding was assisted by federal credit programs, government-sponsored enterprises (such as the Federal National Mortgage Corporation), or deposit insurance. In terms of U.S. taxpayer exposure, however, the

48Note that it is even possible for a subsidiary to have a negative reported net worth when the value of the guarantee is omitted.

49See Merton (44) for a real-world application of this approach in the case of the ARCO Pipe Line Company.
largest part of the total of U.S. government guarantees outstanding is, by far, deposit and pension insurance.\footnote{OMB estimates the total present value of the costs of federal guarantees in force in 1992 at between $203 to $294 billion, of which $89 to $111 billion was deposit insurance and $30 to $60 billion was pension insurance. These figures are taken from Table 13-1 in the \textit{Budget of the U.S. Government for Fiscal Year 1993}, Part One, p. 267.}

To clarify government's role, one distinguishes three types of risk: (i) diversifiable risk, such as mortality risk, that can be eliminated through pooling and subdivision of nearly independent risks; (ii) nondiversifiable business cycle risk reflected in interest rates and the stock market, that can be borne efficiently by investors and, if desired, hedged in the capital markets; and (iii) systemic risk, such as the risk of a run on the payments system, that can neither be diversified away nor hedged through the capital markets.

The hallmark of the third type of risk is that it is the result of a "log jam" in the system that can be most efficiently dealt with by some form of government intervention. In the case of the payments system, for example, there seems to be a consensus that government intervention is justified in the event of a system-wide panic. The consensus, however, does not extend to a belief in the need for this intervention to take the form of government guarantees. Thus, government can impose regulations making it mandatory to purchase guarantees, but it need not be the entity that provides the guarantees.\footnote{It is a common practice in the United States for state governments to mandate insurance coverage and to let private-sector institutions provide it. For example, although virtually all 50 state governments require drivers to purchase automobile insurance, the state government is rarely the provider.}

A common objection to having government provide the guarantees is that once customers have them, the discipline of the competitive market is lost. There are limits, however, to relying on market discipline in the case of financial intermediaries offering financial products and services to customers who perceive those products as default-free. Perhaps the most important of those limits is imposed by the problem of \textit{time inconsistency}. The essence of time inconsistency is that despite a commitment that is optimal \textit{ex ante}, it is sometimes optimal \textit{ex post} to renege.\footnote{For a discussion of the time inconsistency problem in the context of macroeconomic policy, see Kydland and Prescott [33].} For market discipline to work effectively, everyone must believe that the government will allow institutions to fail. It is perhaps credible to believe that the government will allow an individual institution to fail, \textit{ceteris paribus}. It is not credible to believe that the government will permit an individual institution to fail if to do so could induce system-wide damage or outright failure. In the case of bank failures, this credibility issue is called the "too-big-to-fail" problem.

The time inconsistency problem arises with respect to guarantees because under certain circumstances, it is socially optimal for the government to renge on its threat to allow default. Whether or not time inconsistency is the principal explanation, we note that in the United States, ever since the Great Depression, regardless of the political party in office or its ideological slant, every administration has seen fit to intervene to insure all the depositors — both insured and uninsured — of large banks. Some analysts see in this the triumph of political expediency over sound economic policy — interest-group pressures on the federal bureaucracy work to soften the resoluteness required to simply let institutions "sink or swim." Perhaps. However, an alternative explanation is that all of those different administrations in Washington believed that in the case of a major bank failure, it was socially better to "violate" a commitment to let uninsured liability-holders lose than to suffer the adverse economic and social consequences of a possible breakdown in the payment system.

The government, therefore, is caught in a \textit{paradox of power}. For market discipline to work, the government must bind itself convincingly not to bail out institutions that get into trouble. But the government is too powerful to not intervene. Everyone knows that since government makes the rules, it can change them too.\footnote{In the context of the United States, the federal government has even acted in apparent violation of the Constitution, when it seemed warranted. See the episode documented in Galbraith [18, p. 83].} Indeed, only an incompetent government would not intervene to stop a panic. But if the government will bail out customers \textit{ex post}, then there is implicit insurance, even if there is no explicit insurance, \textit{ex ante}.\footnote{Thus, even before the thrift bailout, few, if any, people believed that the U.S. government's commitment to insured deposits was limited to the net worth of government deposit-insurance agencies such as the Federal Deposit Insurance Corporation (FDIC) or the now-defunct Federal Savings and Loan Insurance Corporation (FSLIC). Thus, there were no wholesale withdrawals of covered deposits as news of the depletion of these insurance funds became public.}

And so it seems that the government is \textit{de facto} guarantor of at least some financial intermediaries all of the time and of all financial intermediaries at least some of the time. It should manage those \textit{de facto} obligations in the same way as its explicit guarantee activities by using some combination of the three methods described in Section II.
If it does not, then the consequences will be some combination of unintended subsidies by taxpayers and distorted investment allocations caused by incentives for excessive risk-taking on the part of the insured institutions. In Section VI, we review some of the economic consequences of a poorly managed government guarantee system in the case of the savings and loan associations in the United States. In anticipation of that specific review, however, let us consider some general problems with having government serve as guarantor of financial intermediaries.

Even if it recognizes the cost of its guarantees, the government is not obliged to price them accordingly. Government, as we all know, is subject to constant pressures from various interest groups to subsidize their activities. There can be political pressure for the government to charge less than the fair market premium for its guarantees and/or to price them in such a way that risky institutions are charged too little and safe institutions are charged too much.55 The provision of "cheap" government guarantees is a particularly attractive form of subsidy because it is less "visible" than outright cash payments, price supports, or other forms that require either immediate cash outlays or budget allocations. In the past, some among both the general public and politicians have mistakenly believed that a loan guarantee costs the government nothing unless there eventually turns out to be a shortfall.56 However, perhaps due to the large losses in the deposit insurance funds, such arguments seem to appear less frequently now. Indeed, the United States government has, since 1990, taken steps in its budget process to account for the cost of the guarantees it issues.57

Analysis of Section II suggests, moreover, that even if faced with a political constraint limiting the size of the premiums it can charge, the government can still adopt procedures using the other tools of management to maintain the solvency of its guarantee activity, prevent excessive risk-taking, and avoid unintended subsidies. If it can, for instance, establish an effective system of monitoring, then premiums can be kept low with the system solvent. But, if it can neither charge adequate risk-based premiums nor monitor effectively, then the only route left open is asset restrictions. As already discussed, even in a guarantee system that relies on risk-based premiums, some asset restrictions are required to limit moral hazard and make the guarantee contract viable. But to rely primarily on asset restrictions (with little monitoring) to keep premiums low, the guarantor must require the insured intermediary to completely hedge its insured liabilities.58 If the imposition of strict asset restrictions by the government guarantor is also ruled out because it is perceived as too much government "regulation," then the guarantor is left with no feasible way to perform its guarantee function efficiently.

A potential problem in implementing a system of monitoring is fragmentation within the government. The authority for monitoring insured institutions may lie outside the agency which provides the insurance.59 As a result, the incentives for the government monitor may not be as aligned with the guarantor's need to control losses as they would be if that governmental unit also provides the insurance. As noted in Section II.A, this same problem arises for private-sector guarantees, if the auditor or credit rater has no direct economic stake in the size of a shortfall.

A second problem in implementation is the possibility that once an insured institution gets into trouble, government regulators, including those with direct responsibility for the guarantee fund, will not use the authority they have to quickly seize assets and limit the losses. Some informed analysts believe that such "forbearance" on the part of government regulators is an inherent feature of the political environment in the United States and cannot be avoided.60 Failure to seize the assets of an intermediary that has violated the terms of the guarantee will render a

55For example, whenever a uniform premium is charged for insurance to a group whose members are heterogeneous with respect to their risk exposure, the low-risk members will be subsidizing the high-risk members. But such arrangements may not be stable. If the low-risk members cannot opt out, they are likely to modify their behavior to pursue high-risk strategies. Hence, once again, we see that a non-risk-based premium structure can lead to greater risk exposure for the guarantor.

56Of course, as shown in Exhibit 1, the market value of a loan guarantee can be quite substantial. This same mistaken belief, if applied to the private sector, would imply that insurance companies do not incur a liability when they issue policies, but only when there are actual damage claims.


58Note that a prerequisite for this restriction is that there exist some traded assets that will, in fact, hedge the liability. In some cases, it may be efficient for the government to act as innovator and create a market for such instruments.

59In the case of the thrifts, before the reforms of 1989, the Federal Home Loan Board, through its regional banks, performed the monitoring function, while a legally separate Federal Savings and Loan Insurance Corporation (FSLIC) provided deposit insurance. Fulfilling their obligations as "lenders of last resort," the Federal Home Loan Banks made collateralized loans to troubled thrifts with a higher priority claim than FSLIC. According to Easby and Baldwin [16], none of the 12 Federal Home Loan Banks has ever experienced a single loss on such loans in their sixty-year existence. That is not, of course, the experience of FSLIC. In the case of pensions, the Department of Labor and the Internal Revenue Service monitor, and the PBGC insures.

60This hypothesis is explored at length by Kane [28].
guarantor actuarially insolvent unless an offsetting larger premium is charged in anticipation of this failure. In an analogy to broker margin loans analyzed in Section II.A, forbearance is like brokers letting investors continue to maintain control over their investment portfolios after they have failed to respond to a margin call. Clearly, if the investor is permitted to continue after his net worth has fallen to zero, the investor has every incentive to invest in riskier assets in an attempt to produce a positive net worth before the assets are seized. Moreover, once such violations are permitted, they become “anticipated,” and the entire control mechanism can collapse because there is no indicated point where it will be enforced.

There is also the reverse problem: perfectly safe and solvent financial institutions insured and regulated by the government may be unnecessarily constrained in their activities by government officials, whose incentives favor avoiding losses and provide no rewards for gains. Every guarantor has an incentive to try to discourage risk-taking by the insured party. Private guarantors, however, must also respond to the offsetting incentive of competition for guarantee business. The government does not, if such insurance is required as a matter of regulation.

VI. Application of the Analysis to the Thrifts

The foregoing analysis can be applied both retrospectively and prospectively. In this section, it is used to provide a better understanding of the problems faced by the Federal Savings and Loan Insurance Corporation (FSLIC), the U.S. government body that insured savings and loan associations in the 1970s and 1980s. It also points to some problems that could develop in the future with respect to the government’s programs to guarantee commercial bank deposits and defined-benefit pension plans, if current policies are continued. Although the context is a public-sector guarantee program, the analysis of alternative courses of action to avoid costly errors applies equally well to the management of guarantees in the corporate sector.

Before applying our analysis to the thrifts in the United States, we briefly sketch the relevant background facts. During the first half of this century, thrifts evolved as specialized institutions taking deposits from small savers and lending the money so deposited to residential mortgage borrowers. Thrifts came to have two basic economic functions: (i) to provide a riskless, liquid, short-term saving vehicle for large numbers of small savers, and (ii) to provide long-term financing for residential homeowners at fixed interest rates.

Thus, a mismatch was created between the long-term, fixed-rate mortgages held as assets by thrifts and their short-term deposit liabilities. The mortgages were subject to two kinds of risk: real estate risk and interest rate risk. The real estate risk stemmed from the possibility that mortgage borrowers might default on their obligations to the thrifts and that the value of the real estate that collateralized the mortgage loans might not suffice to pay the amounts promised to depositors. The interest rate risk stemmed from the possibility that interest rates would rise, causing the value of the fixed-rate mortgages held by thrifts to decline, and thereby forcing them into insolvency.

The thrifts first experienced serious difficulties in the 1960s and 1970s, when interest rates became both higher and more variable than they had been before. As interest rates rose in the 1970s, the market values of the fixed-rate mortgages held by the thrifts fell, while their deposit liabilities did not. As a result, the market value of the capital (defined as assets minus deposit liabilities) of many thrifts fell to very low levels.

As guarantor of the thrifts, FSLIC had ultimate responsibility for the risk of a shortfall. What mix of the three methods — asset restrictions, risk-based premiums, and monitoring — did it use to manage its guarantee business during the 1970s? Since the assets of thrifts were restricted to residential mortgages, the assets were certainly not matched to their demand and short-maturity deposit liabilities. Premiums were not risk-related. So, in principle, FSLIC relied primarily on a system of monitoring. It established capital requirements and had the right to seize and liquidate any insured thrift that violated them.

But the method used by FSLIC to value thrift assets did not accurately reflect the actual amount of money that it could realize from a seizure and sale, either as a going-concern or a liquidation. Thrifts were permitted to value their mortgages at their amortized acquisition cost. In principle, thrifts were required to recognize bad debts. They did not, however, have to recognize declines in market value caused by a rise in interest rates. Therefore, the valuation method overstated the liquidation value of a thrift’s assets when market interest rates rose.

Thus, in many cases, FSLIC did not have the right to seize the assets of thrifts that violated capital-ratio requirements in market value terms. But even abstracting from issues of liquidity, the earning power of these assets were insufficient to permanently support interest payments on

Footnote:
61Many articles and books have been written about the S&L crisis. See, for example, Benson, Carhill, and Olasov [6], Benson and Kaufman [7], Kane [29], [30], Kohl [32, chapter 17], Mayer [38], Mishkin [54, chapter 11], and White [71] for detailed descriptions.
deposits. Later, especially in the 1980s, when the shortfall problems became considerably more severe and it had the right to, FSLIC appears to have been reluctant to seize and liquidate thrifts. 62

In 1980, several measures were taken by the government that greatly aggravated the economic (but not the statutory) deficit of FSLIC. Deposit insurance limits were raised from $40,000 per account to $100,000. At about the same time, accounting standards were relaxed so that some of the economically insolvent thrifts were made statutorily solvent. Finally, insured thrifts were allowed to invest in a broader class of assets that were riskier investments than before. Removing asset restrictions was hailed by some as a step towards "deregulation" that would allow troubled thrifts to "diversify" and earn their way back to health. However, deregulation was a misnomer in this instance. What was actually occurring was a reduction in the intensity of monitoring of government-insured institutions with no offsetting protections for the guarantor.

All else the same, the greater the volatility of the returns on an insured thrift's asset portfolio, the higher the market value of its shareholders' equity. 63 Since the price of government deposit insurance was unrelated to the risk of their assets, thrifts in the 1980s had an incentive to invest in more risky assets. 64 Moreover, since the price of insurance was also unrelated to the total size of an insured institution's deposit liabilities, thrifts had an incentive to expand rapidly. Many thrift institutions therefore grew rapidly during the period from 1980 to 1989, especially in the Southwestern United States. Since the more insolvent thrifts were offering the highest interest rates to depositors during this period, they were often growing the fastest. 65

Much of the money raised by thrifts was invested in commercial and residential rental real estate ventures. While ex ante many of these were surely sound investments, given the enormous rise in the volume of activity, just as surely some had expected returns that would not have justified taking the risk in the absence of the distorting incentives of cheap deposit insurance. The growth stopped only when the Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) was passed in 1989. Kane [30, p. 11] estimates that closing down all the thrifts that were insolvent in 1983 would have cost FSLIC about $25 billion. By 1989, when FSLIC was closed down, Kane estimates the bailout cost to be $150 billion. 66

Much emphasis has been placed in the media and in the United States Congress on the role of fraud and incompetence in the thrift crisis. Fraud and incompetence surely played a role in escalating the cost to the taxpayers of covering the thrift bailout. 67 However, the major problem was clearly the nonviable structure of deposit insurance, including actuarially underfunded government insurance agencies. There were undoubtedly some thrift managers in the 1980s, who chose more volatile assets because they believed that higher promised yields implied higher expected returns and profits. Indeed, there were perhaps some government regulators with thoughts along the same lines and who further concluded that this increased expected profitability would lead to healthier thrifts and thereby reduce the burden on the deposit insurer. But higher promised yield is not a reliable indicator of higher expected return. Furthermore, even if those assets had higher expected returns, if these higher expected returns were only fair compensation for bearing greater risk, then the same result obtains from the shift to more volatile assets: the value of thrift equity increases only because the liability of the deposit insurer increases.

Prospectively, our analysis points to potential problems from other types of loan guarantees under the current system in the United States, especially FDIC insurance of commercial bank deposits and PBGC insurance of private

62 Kane [29] has described the problem thus:

"Acting promptly was not in the authorities' individual and collective interest, because the costs of whistle-blowing tend to be very high. When an official first calls attention to a severe public policy problem, the whistle-blower is likely to be blamed for causing the mess."

63 This follows because levered equity is structurally the same as a call option on the assets of the firm. See Merton [41], [42], [46], and [47].

64 The incentive applies in terms of maximizing equity value. It does not apply to non-equity-owning managers and mutual-type institutions, unless their position becomes one of de facto equityholders. During the 1980s, a considerable number of thrifts changed from mutual to stockholder-owned. Benson, Carhill, and Olasov [6] and Ely and Baldwin [16] provide empirical support for the prediction that stockholder-owned thrifts pursued more risky investment projects.

65 Mayer [38, pp. 4-9] provides a dramatic example in the case of American Diversified Savings Bank of Lodi, California. In June 1983, it reported total assets of $11.7 million. When the government finally closed it down in June 1988, it had assets of $1.1 billion. FSLIC's loss was $800 million. The process of deposit expansion was greatly accelerated by the brokering of deposits by other financial-service firms.

66 A large portion of this cost was an unintended transfer from taxpayers to depositors, mortgage borrowers, sellers of real estate, their agents, and stakeholders of the insured institutions. The economic costs of the bailout, net of such transfers, are the distortion of investments and various deadweight costs such as legal recovery fees.

67 According to the Wall Street Journal, July 20, 1990, Ben Ely of Ely & Company estimates fraud losses at $5 billion or only 3.4% of his $147 billion total estimated cost of the thrift bailout, excluding future interest payments on current borrowings.
definite-benefit pension plans. It also serves to illustrate the large losses that can occur from mismanagement of the guarantee business, whether private-sector or government operated.

VII. Summary and Conclusions

Financial guarantees, such as insurance against credit risk and contract default, serve an important function for virtually every player in the global economy — households, businesses, and governments. Without such guarantees — both implicit and explicit — many economic activities would be less efficiently performed. The principles for effective financial management of guarantees are the same, whether in the corporate, financial, or public sectors.

We have presented some common situations in which the analysis of guarantees is central to decision-making and management control by financial officers of nonfinancial firms:

- Parent company guarantees of the debt or other contractual obligations of a subsidiary.
- Swap and other derivative-security contracts entered into by the corporation.
- Pension obligations under defined-benefit pension plans.

For financial intermediaries, the efficient management of implicit and explicit guarantees is critical to business success. The customers of many types of financial intermediaries receive a promise of services in the future in return for payments to the firm now. Those promised future services are liabilities of the firm, both economically and in the accounting sense. There are essentially three ways for an intermediary to provide assurances against default risk to the customers who hold its liabilities:

- By having investors put in additional capital beyond that required for funding of the physical investments and working capital needed to run the business.
- By purchasing guarantees of its customer liabilities from a private third party. This might be accomplished by a confederation of private parties as in the reinsurance market. This approach works best for covering customer liabilities where the risk is diversifiable, as in the case of mortality risk, or where the risk can be hedged in the capital markets, as in the case of stock market or interest rate risk.
- By government guarantees of its customer liabilities. This approach may be best where the risk cannot be diversified or hedged through the capital markets.

The three basic methods that a guarantor of liabilities has to manage its business on a sound basis are:

- Monitoring. This method requires the guarantor to frequently mark-to-market the assets and liabilities of the insured party and be ready and able to seize the collateral as soon as the party's net worth falls below a predetermined maintenance target.
- Asset Restrictions. This method of controlling costs requires the insured party to (at least partially) hedge its guaranteed liabilities and limits the volatility of its net worth.
- Risk-Based Premiums. Under this method, the guarantor charges a fee that is commensurate with the riskiness of the guarantee.

In practice, guarantors (whether private-sector or government) use combinations of all three methods. As we have seen, depending on the context, some mixes will be more efficient than others.

When government serves as a guarantor, there are benefits but also often special problems. Governments are subject to constant pressures from various interest groups to subsidize their activities. The provision of "cheap" government guarantees is a less "visible" form of subsidy than outright cash payments, price supports, or other forms that require either immediate cash outlays or budget allocations.

If faced with a political constraint limiting the size of the premiums that it can charge, the government can still adopt procedures using the other tools of management to maintain the solvency of its guarantee activity, prevent excessive risk-taking, and avoid unintended subsidies. If it can, for instance, establish an effective system of monitoring, then premiums can be kept low with the system solvent. But, if it can neither charge adequate risk-based premiums nor monitor effectively, then the only route left open is asset restrictions. Reductions or increases in asset restrictions and monitoring of insured institutions should not be classified as acts of "deregulation" or "reregulation." As we have seen, all guarantors, whether govern-

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68For applications of the framework presented here, see Merton and Bodie [49] for an analysis of deposit insurance, and Bodie and Merton [12] for an analysis of pension guarantees.

69As touched on in Section V, government actions in the 1980s that allowed thrifts to invest in riskier assets were sometimes termed "deregulation." In fact, there was no reduction in government-mandated and government-provided deposit insurance, which would have been an act of deregulation.
ment or private-sector providers, must apply some feasible combination of such controls to remain viable.

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