Government Risk-Bearing

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edited by

Mark S. Sniderman

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Preface

The U.S. government bulks large in the nation's financial markets. The huge volume of government-issued and -sponsored debt affects the pricing and volume of private debt and, consequently, resource allocation between competing alternatives. What is often not fully appreciated is the substantial influence the federal government wields over resource allocation through its provision of credit and risk-bearing services to the private economy. Because people and firms generally seek to avoid risk, at some price they are willing to pay another party to assume the risk they would otherwise face. Insurance companies are a class of private-sector firms one commonly thinks of as providing these services.

As the federal government has expanded its presence in the U.S. economy during this century, it has increasingly developed programs aimed at bearing risks that the private sector either would not take on at any price, or would take on but at a price thought to be so great that most potential beneficiaries would not purchase the coverage. Today, roughly three-fifths of all nonfederal credit outstanding is assisted by some form of federal program.[1] The federal government provides insurance of many private pension plans through the Pension Benefit Guaranty Corporation, subsidizes and implicitly guarantees the liabilities of several agencies dominating secondary loan markets (for example, the Federal National Mortgage Association, Federal Home Loan Mortgage Corporation, and Student Loan Marketing Association), and either makes direct loans or guarantees privately generated loans through a variety of credit programs to farmers, exporters, home purchasers, and others.

In addition to the allocative effects these federal credit and risk-bearing programs impose on the economy, they also expose taxpayers to losses when program revenues do not cover costs. A recent and massive reminder of this fact can be found in the federal government's payments, beginning a few years ago, to protect

depositors at a large number of insolvent financial institutions. Depositors at these savings and loans and commercial banks were generally reimbursed at par on the value of their deposits via insurance provided by the Federal Savings and Loan Insurance Corporation or the Federal Deposit Insurance Corporation. Estimates of the combined taxpayer cost for rescuing depositors at these banks and thrifts are in the range of $250 billion.

This crisis prompted Congress to enact legislation in 1989 (the Financial Institutions Recovery, Reform, and Enforcement Act [FIRREA]) and again in 1991 (the Federal Deposit Insurance Corporation Improvement Act [FDICIA]) designed to strengthen the capital and regulation of depository institutions, as well as to provide a funding mechanism to take over the insolvent ones and dispose of their assets. The fundamental structure of the deposit insurance system itself — flat-rate pricing, no coinsurance, and de facto coverage of foreign deposits — was not altered. Moreover, the entire premise of federal deposit insurance — that it is essential to the stability of our financial system — appears to be taken for granted.

The Federal Reserve Bank of Cleveland sponsored a conference in May 1991 to discuss the concept and performance of the federal government as a risk-bearing enterprise. The authors of the papers in this volume, primarily experts on insurance products in which the federal government has some involvement, were asked to consider the rationale for a federal presence in these markets and to discuss the resulting effects on market performance and taxpayer exposure. Our hope is that a better understanding of the government as a risk manager will assist public discussion about the appropriate role for government in the provision and administration of deposit insurance.

Al Ringleb and Steven Wiggins are interested in large-scale, long-term hazards that occur with low frequency after a long gestation period. These phenomena are troublesome because they typically affect a large number of people, are inherently difficult to forecast, and pose substantial inference problems for people who wish to take precautions against them. In their paper, Ringleb and Wiggins draw parallels between the risk of bank failures and other risks they have previously studied, such as carcinogens and environmental disasters. With a particular concern toward mechanisms to manage these kinds of latent hazards, they evaluate tort liability, market forces, and direct regulation. They find, in studying the history of savings institutions, that direct regulation appeared to work better than it actually did because the regulations did not adapt with the evolution of the industry. Ringleb and Wiggins suggest that large-scale, long-term hazards are exceedingly difficult to manage ex ante, if one's social objective is to mitigate the behavior that produces the hazards.

The second paper in this volume, by Howard Kunreuther, also focuses on low-probability events. Kunreuther explicitly addresses the role of the federal

government in dealing with certain risks when private insurers are reluctant to provide coverage. Should the government provide any coverage, and should it force homeowners and businesses to take protective actions to minimize losses from these hazards? The author argues that the key to determining government involvement is whether or not the disasters are catastrophic. If they are, as in the case of earthquakes, the government could bear some of the risks because the insurance industry might not have the financial capacity to respond to a severe shock in a densely populated area. In return, the government would have the right to demand that loss-prevention measures be taken by potential earthquake victims. On the other hand, Kunreuther indicates that a government role is much less clear in the case of leaking underground storage tanks, since there is no scope for catastrophe and the insurance industry appears capable of bearing the risks.

Although Kunreuther does not directly discuss federal deposit insurance, there is an interesting analogy between his thoughts on earthquake protection and some proposals to reform the government's implicit policy of "too big to let fail" with regard to large banks and thrifts. The banking industry has proposed using an industry-supported insurance fund, similar to the current Bank Insurance Fund operated by the Federal Deposit Insurance Corporation, to reimburse covered deposits for most bank failures. However, in the event of a bank failure that would be deemed catastrophic (presumably a large bank failure that carries high risks of bank runs and payments system gridlock), the federal government would bear the risk. Of course, the industry could be asked to reimburse the government over a reasonable period of time, rather than have the taxpayers bear the full risk. Moreover, the government, following Kunreuther's earthquake analysis, should take steps to minimize the potential damage from large bank failures. Restrictions on interbank exposures, enacted in FDICIA, are an example of such an action.

The next three papers in the volume squarely address a fundamental question: What is the economic justification for public insurance in an economic system driven by private property and private risk-taking? Are there circumstances in which government risk-bearing is consistent with free-market capitalism? How does society prevent inappropriate use of government insurance?

Brian Wright examines the public involvement in agricultural risk-bearing and provides some thought-provoking lessons for the financial sector. Wright traces the evolution of U.S. agricultural policy since the 1930s, with emphasis on crop insurance and disaster relief programs because they contain elements that are pertinent to the study of the banking system. Wright documents how agricultural policies typically provide for large net transfers to farm owners and encourage wasteful and risky farming practices. He maintains that superficial economic analyses are often used as window dressing to support government insurance programs, but that economists have paid scant attention to the effects of these

programs on consumption smoothing. Wright thinks that private agents have powerful incentives and tools available to them, without government-sponsored insurance programs, to smooth their own consumption. He questions the wisdom of constantly pursuing risk-reduction programs through government policies without obtaining a better understanding of people's attitudes toward risk and analyzing the actual effects of government policies on consumption.

Mark Flannery evaluates the economic justification for government risk-bearing in the financial sector by providing a detailed assessment of potential market failures and possible government interventions. Flannery divides financial-sector products into three broad classifications: primary securities, "banking" services, and payments services. He then proceeds to determine the conditions under which the markets for these three products might not function appropriately, and whether government risk-bearing or direct regulation could be expected to improve real resource allocation or income distribution. Flannery finds that a persuasive case can be made for a government role in providing deposit insurance to small savers and ensuring payments system stability. He finds it much more difficult to justify government interventions in the financial system in order to promote macroeconomic stability or to prevent contagious bank runs. A real contribution of his paper to the public finance literature is a careful consideration of the potential strengths and weaknesses of the government relative to the private banking market. In general, Flannery concludes that government risk-bearing in financial markets is difficult to justify on microeconomic grounds, although government information production and monitoring might improve social welfare in a number of circumstances.

Joseph Stiglitz, like Flannery, takes on the question of when the government should bear risk within the financial economy. He argues that because government sets the legal framework for society, collects taxes, redistributes income, and attempts to provide macroeconomic stability, it will inevitably be involved in some form of risk-bearing . Stiglitz recognizes the many forms in which market failures might provide opportunities for the government to improve welfare, but he also notes that government activities, too, are subject to widespread failure. Governments find it particularly difficult to assess risks because of political pressures not to differentiate one person or firm from another in the way the private sector would. This difficulty leads to large and hidden subsidies. Governments are also susceptible to pressures not to enforce certain regulations.

Stiglitz then presents a specific plan for reforming the government's interventions in the financial system. His intention is to capitalize on the advantages the government has over the private market—namely, its greater ability to avoid adverse selection and moral hazard through compulsory membership and disclosure of information. He would allow banks to choose between government

deposit insurance or none at all, but if financial institutions chose to be insured, they would be required to pay premiums on all deposits. The government would regulate the interest rate paid on insured deposits, and the insured banks would have to satisfy high capital and net worth requirements. These provisions, Stiglitz argues, should be regarded as actions of a prudent insurer, not a government regulator. Interestingly, Flannery's analysis brings him to express sympathy for proponents of the "narrow" bank; Stiglitz does not call his proposal a narrow bank, but there are strong similarities to the concept.

Wright, Flannery, and Stiglitz each consider the conceptual difficulties government faces in living up to the possibilities that exist for improving dysfunctional markets. The next two papers discuss the authors' experiences with specific government programs related to insurance markets. Dennis Connolly contrasts the performance of both the government and private insurers in the market for nuclear power generation with their joint performance in the arena of environmental cleanup. Connolly maintains that the government's approach to risk-bearing for liability in nuclear power generation has been successful and is worth emulating in other situations; he holds the opposite opinion with regard to the nation's approach to risk-bearing in protecting the environment.

Having decided that clean, cheap electrical power was in the public interest, Congress created a special insurance and liability plan for utilities operating nuclear power plants (the Price–Anderson Act). Essentially, the plan calls for risk-sharing between the private insurance market and the government, with the latter assuming the liability for catastrophes that exceed the "capped" exposure of the former. Without that feature, it is doubtful that the private sector would have been willing to write any coverage for nuclear plants, and the federal government would have had to shoulder the entire burden of not only coverage, but also the design and implementation of loss-control practices in the plants.

Connolly describes the government's methods for dealing with environmental impairment as poorly conceived, and as threatening the solvency of many private insurers. The crux of his complaint is that Congress did not consider how private parties would respond to the insurance implications of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), better known as Superfund. Connolly argues that Superfund has already caused private insurers to withdraw from the markets for most environmental exposures, induces enormous sums to be spent on legal costs in a socially inefficient manner, and promotes costly delay in the cleanup of hazardous sites. Connolly concludes that the Superfund approach is a poor framework for future governmental responses to risk-bearing problems because it is based on a "...government-sponsored rifling through the 'deep pockets' of all supposedly wealthy parties...ever associated with a polluted site," rather than on a rational system of balancing public and private interests.

Kathleen Utgoff, a former executive director of the Pension Benefit Guaranty Corporation (PBGC), uses her experiences with that agency to illustrate the struggle that government faces when it seeks to compensate people for losses and still preserve incentives for welfare-enhancing corporate actions. The PBGC single-employer program was designed to protect employees covered by inadequately funded private pension plans, but during the 1980s some troubled firms realized that they could obtain large federal subsidies by terminating their pension plans. Moreover, in a striking similarity with the deposit insurance system, the value of the subsidy was greater for the least-profitable companies. Consequently, troubled firms had less incentive to put money into their pension funds than did healthy companies.

In the face of mounting deficits at the PBGC, and to the surprise of many, Congress implemented a number of reforms to the federal pension insurance programs in 1986 and 1987. The new legislation increased pension insurance premiums, restricted the use of PBGC funds to truly distressed firms, and strengthened the PBGC's claims in bankruptcy proceedings. Despite the overhaul, the financial viability of the agency is now threatened because healthy firms still have incentives to withdraw from the defined-benefit pension system (easily done by converting their existing plan to a defined-contribution plan), leaving only unhealthy firms to be insured by the PBGC. Utgoff concludes that the PBGC provides an excellent example of how federal insurance programs do not take the incentive effects of plan participants into account. Because these effects are usually ignored, insurance programs are not designed with enough features to blunt moral hazards. And, when deductibles or copayments are discussed, critics decry these measures as unduly harsh on people who are suffering losses. Until government officials who design insurance programs take into account the predictable responses of those who are indemnified against losses, Utgoff states, these programs will run the risk of financial collapse.

The final two papers draw attention to efforts by the government to recognize and manage its risk exposure. Marvin Phaup emphasizes that the President's budgets for 1991 and 1992 took major steps toward organizing information on the scope of government exposure and proposing program reforms. Phaup also explains how the Credit Reform Act of 1990 changed the budgetary accounting system for direct loans and guarantees from a cash basis to a "front-loaded accrual basis." Effective in fiscal year 1992, these programs will be recognized in terms of their long-run subsidy cost. Phaup also discusses efforts to control risk generated through the operations of government-sponsored enterprises and the deposit insurance system. A principal contribution of his paper is a set of tables detailing the estimated subsidy budget authority and outlays for various federal direct loan programs.

Justine Rodriguez outlines her experiences as an observer of government risk-bearing programs and calls for better information on the subsidy costs of

various federal programs and for a keener understanding of how incentives could be better structured in program design. She recounts how political incentives have led to the enormous growth in government risk-bearing programs during the past two decades. Policymakers favor these programs because they can be readily regarded as "free goods," and because constituents perceive the value of credit or insurance as being greater than an equal amount of money spent as a direct grant. Rodriguez laments the unchecked spread of these programs because she concludes that they have encouraged people to undertake riskier activities than are warranted and have exposed taxpayers to undue losses. She indicates what kind of research would benefit government officials who are seeking to implement reforms.

All of the authors at the conference benefited from the comments of their discussants, whose papers also appear in this volume. Together with all of those who attended the conference, the discussants helped to develop the authors' themes, bring out additional nuances, and offer critical commentary. Although the participants did not agree on a plan to reform the nation's deposit insurance system, it became clear as the conference progressed that the government's experiences in other forms of risk-bearing provide many useful lessons for such an endeavor.

Note

1. For a more complete description of these programs and their scope, see Chapter 13: "Identifying Long-Term Obligations and Reducing Underwriting Risks," in *The Budget for Fiscal Year 1993,* U.S. Government Printing Office, 1992.

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Government Risk-Bearing

1 Institutional Control and Large-scale, Long-term Hazards

Al H. Ringleb and Steven L. Wiggins

Large-scale and long-term hazards have become increasingly prevalent in our economic system. In the workplace, recent research has linked cancer to heavy metals, as well as to such basic materials as wood and petroleum. The consumer market also offers numerous potentially carcinogenic products, such as cigarettes, saccharin, and various food additives. The extent of large-scale hazards, however, is not limited to market exchanges between firms and either workers or consumers. Significant externalities are created by many of these risks, including environmental disasters such as the Exxon Valdez oil spill, potential nuclear-plant accidents such as Three Mile Island, and toxic waste dumps that threaten local communities and water supplies.

The authors gratefully acknowledge financial support for Professor Wiggins' research from the State of Texas Advanced Research Program, Grant No. 14995.

A striking parallel also exists between the large-scale hazard problem and the current thrift and banking crises. In both cases, there is a long temporal separation between the activities that lead to misfortune and the misfortune itself. With latent hazards, this separation arises both because injury occurs with low probability and because there is a long incubation period for injuries within the human body. With the current thrift and banking crises, a temporal separation results because severe crises are relatively unlikely. In both cases, however, normal activities can persist for many years before it becomes necessary to deal with a large misfortune. This potentially long incubation period creates unique problems as economic agents attempt to infer the likelihood of disaster, to provide incentives for safety, and to compensate potential victims. Much can be learned by comparing and contrasting recent experience with handling these problems.

A major social issue is how to govern large-scale hazards. Options include ordinary market forces, tort liability, direct regulation, and taxation. This paper discusses the use of the first three choices. The complex inference problem of agents complicates the implementation of any of these alternatives. We consequently conclude that all of the options considered are likely to suffer significant deficiencies, which may be severe when attempted solutions are naively implemented, as has commonly been the case in the past. Our analysis attempts to identify specific implementation problems and to assess some of the advantages and disadvantages of each institutional alternative.

The paper is organized as follows: Section 1 discusses the central distinguishing features of large-scale, long-term hazards. Section 2 compares markets with liability in the context of occupational carcinogens. Section 3 examines regulation and some of the implementation problems in the recent financial crisis, and section 4 concludes.

1. Large-scale Hazards and Alternative Institutions

1.1 The Unique Features of Large-scale, Long-term Risks

Two of the features that distinguish the risks examined in this paper are their large scale and comparative infrequency. Carcinogenic risks, risks of man-made disaster, and risks of severe financial crisis all encompass extraordinary damages. The life-threatening nature of carcinogenic hazards means that the cost of even a few injuries can run in the tens of millions of dollars. Man-made disasters generate large-scale damages because a single incident can influence the lives of several thousand victims. The scale of an accident is then considerable even if each person suffers only minor injuries. More commonly, large damages are incurred

individually, including deaths and debilitating injuries. Financial disasters create extraordinary losses because large numbers of depositors may lose their savings and because the associated disintermediation can undermine resource allocation throughout the economy.

A second unifying feature of these hazards is the commonly long temporal separation between risky activities and the realization of damages. In the case of carcinogens, this separation is rooted in a long incubation period. Most exposures to these substances result in cancer only after a latency period, ranging anywhere from 4 to 40 years and averaging about 20 years (Ringleb and Wiggins [1990]). For man-made disasters and financial crises, a long temporal separation arises because such disasters occur with small probability.

In each case, this separation strains the institutions used to govern firms' activities. An example is the evaluation of firm safeguards. In the case of carcinogens, production techniques and worker tasks vary over time, making it difficult to infer the effect of exposure or the impact of safety efforts on the likelihood of contracting cancer. This inference problem is further exacerbated by variation in firms' safety practices. Unless such variation can be readily quantified, it complicates efforts to analyze industrywide risk-exposure trade-offs.

Accurate forecasting of the probability of disaster is similarly difficult for financial institutions. Low frequency makes actuarial rating of alternative safeguards problematic. As financial institutions evolve, and as the linkage between them changes, past experience becomes an unreliable guide to potential future problems. Insufficient data thus hamper agents' ability both to develop reliable information regarding the likelihood of disaster and to evaluate the consequences of alternative firm safeguards.

Another major implication of the low frequency of occurrence/long latency period is that it complicates the inference problem of workers, consumers, and other agents in evaluating risks. For occupational carcinogens, man-made disasters, and financial crises, there is only a small probability that a given agent will experience significant losses. Tversky and Kahneman (1974, 1986) show that people use simple heuristics and "frames" in attempting to extrapolate probabilities from circumstances that they feel are similar to an event in question. Hence, the way in which individuals frame a particular situation (or the event they believe is most similar) significantly affects ex ante risk assessments. This problem is exacerbated when feedback is slow or when the number of trials is small. In such situations, inaccurate risk assessments can persist indefinitely.

These potential consumer and worker misperceptions do not mean that individuals will systematically underestimate risks. Rather, different people are likely to have widely varying perceptions of risk based on their own frames of reference. Variations in risk assessments, moreover, seem at least casually consistent

with the risks under consideration here. For example, some cigarette smokers seem relatively oblivious to potential cancer risks, while antismoking advocates express concern over the relatively milder hazards posed by passive smoking. Similar problems also seem present in assessing the risks of financial disaster. Before the advent of deposit insurance, small changes in financial condition often led to large variations in individual perceptions of risk. These relatively uncontrolled swings in perceptions then generated public panic and frequent bank runs. Thus, significant heterogeneities in risk perceptions are likely to exist in equilibrium.

Such variation in risk perceptions does not mean that agents will intrinsically underperceive risks. In a previous paper, however, we have shown that in the case of occupational carcinogens, an underperception of risk *is* likely. The reason can be seen by a simple analysis: Assume that individual agents will experience damages d if they contract an occupational cancer.[1] Further, let $r(Ms)$ be the probability the agent assigns to the likelihood that he will contract cancer, where Ms is the true probability. Finally, let the expected value of $r(Ms)$ equal Ms, so that the *population* of agents has fully rational risk perceptions.

Figure 1–1 illustrates these risk perceptions with a distribution centered around the true probability of injury. Figure 1–2 then provides the corresponding labor supply curve. The horizontal curve represents labor supply if all agents have accurate risk assessments, corresponding to Ms. Actual labor supply begins with a lower intercept than the perfect information curve, because the first workers attracted into the industry will be those with the most-optimistic risk assessments. As industry output expands, less-optimistic workers must also be attracted into the industry, so the wage must rise to compensate these workers for *their* perceived level of risk.

The two labor supply curves cross at the median worker, because the distribution of risk perceptions is assumed to be symmetric, and mean risk perceptions are assumed to be equal to actual risk. The implication is that if hazardous sectors employ fewer than half of the workers in their potential labor force, the marginal worker is likely to underperceive risks.

As a result, market wages will be inefficient because the marginal worker is likely to be overly optimistic and to demand an insufficient wage premium. This has two important implications: First, workers will be undercompensated for risk in equilibrium, and second, firms will have an insufficient incentive to supply safety in equilibrium. Hence, the market mechanism is likely to break down.

This result is also probable for potential financial disasters, but for slightly different reasons. In this case, agents are apt to have significant differences in risk perceptions, but a large fraction of the population is likely to hold demand deposits. This means that under normal circumstances, banks will attract these deposits, suggesting that marginal underperceptions of risk are unlikely.

Figure 1–1. Risk Perceptions

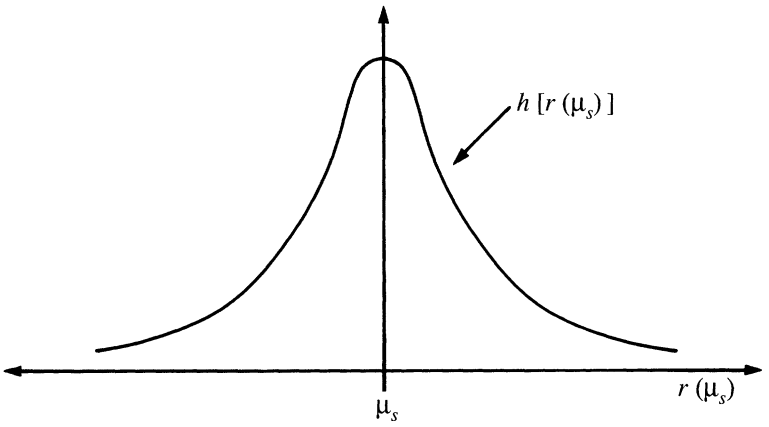
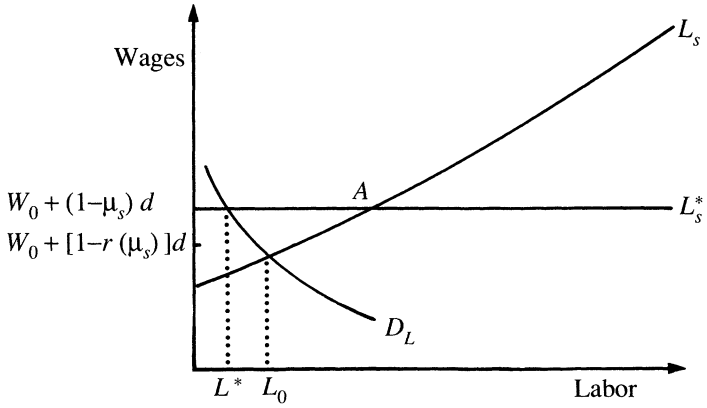


Figure 1–2. Labor Supply Curve



The more important problem with financial distress is that small amounts of news may lead to large changes in agents' perceptions of risk. The results of Tversky and Kahneman show that with low-probability events, agents use frames and incorporate new information using ad hoc methods. In particular, graphic events swing perceptions of probability more than is warranted by the information content of the event. For instance, when a single bank becomes troubled, there can be a large increase in the perceived risks of deposits in all banks, which can then

lead more-pessimistic depositors to withdraw their funds. Panic may then ensue as other depositors revise their evaluation of financial solvency using this highly imperfect information.

These arguments indicate that small probabilities of disaster can undermine the allocative efficiency of simple market mechanisms for occupational carcinogens, for man-made disasters, and for financial distress. The lack of efficiency for market mechanisms suggests the possible use of alternative allocation devices. The same factors that undermine market allocation, however, can also pose substantial problems for other institutions. The next section proposes various institutional alternatives. We then review recent experience showing how possible problems in risk assessment can undermine both liability and direct regulation.

2. Liability: Theory and Recent Evidence from Large-scale, Long-term Hazards

The discussion in the previous section shows how the problems associated with occupational carcinogens and with financial disasters share the potential for serious distortions of the simple pricing mechanisms. In both cases, these distortions are rooted in potential risk misperceptions.

Given these problems, it becomes important to consider institutional alternatives to market allocation. To enhance social welfare, such institutions must serve two purposes: They must provide appropriate incentives for firms to make efficient decisions regarding risk–return trade-offs, and they must ensure that consumers are appropriately compensated for the risk they bear.

A variety of potential social institutions can achieve these goals. Alternatives include 1) the court system, through both liability and contract law, 2) direct government regulation, 3) government insurance, and 4) taxes.[2] The difficulty with these approaches is that large-scale, long-term hazards pose unique enforcement problems. A long loop exists between actions and feedback, meaning that potential errors or miscalculations can remain undetected for many years, and then emerge to create severe damages. These problems can radically undermine the enforcement of regulation, taxes, and liability, rendering ineffective their intended incentive effects. The analysis below evaluates institutional alternatives, explicitly taking these problems into account.

Tort liability has emerged as a dominant institution for handling large-scale, long-term hazards both in the workplace and for products. The key advantage of a liability system is that it is injury-based, permitting compensation for injuries to be made after parties determine the extent of damages involving hazards associated with the workplace, products, and other activities.

Spence (1977) shows the major advantage of ex post compensation under liability, particularly in the way that liability can create efficient incentives for safety and implicit insurance to workers or consumers, even if the firm has superior information regarding the extent of a hazard. Liability works because it creates an implicit transfer to the injured and because it links the transfer to the *actual* level of observed damages. This linkage means, for example, that final payments are not made between a firm and its workers until all possible on-the-job injuries have been observed. If a firm knows more about hazards than its workers do, liability permits the court to surmount the firm's superior information through the ex post liability payment.

This ex post feature means that even when firms have better information than workers do, liability can provide both insurance and appropriate incentives for safety. Liability is like a traditional insurance system because it compensates workers or consumers for injuries received. The need to make such "insurance" payments, moreover, forces the firm to bear the expected costs of injury, which creates an incentive to adopt efficient levels of safety. With long-term hazards, liability appears particularly attractive because it permits injury-based compensation where dangers are (arguably) difficult to foresee.

2.1 The Incentive Problem of Liability Systems

Recent evidence, however, suggests that liability may provide problematic incentives in the context of large-scale, long-term hazards. Paradoxically, the factor limiting a liability system for such hazards is its injury-based nature, whereby payments for damages are made only after injury becomes manifest. With long-term hazards, this means that potential damage awards accrue over many years. Firms then have an incentive to avoid damage payments through bankruptcy, reinforced by the fact that hazardous activities can often be segregated into small, distinct corporations. These corporations operate hazardous production processes, and then sell the comparatively safe output to other firms or even to consumers. When suits are filed, these firms can then declare bankruptcy.

In our earlier papers, Ringleb and Wiggins (1990) and Wiggins and Ringleb (1992), we investigate the theoretical and empirical implications of the bankruptcy strategy. The empirical analysis focuses on exposure to occupational carcinogens as a determinant of small corporation entry rates into U.S. manufacturing industries from 1968 to 1980. That period was chosen in part because it spanned changes in liability rules, which in some cases allowed workers to circumvent the exclusionary rules of workmen's compensation statutes.[3] More important, strict liability lowered the burdens of proof faced by workers as they sought to sue other parties, such as suppliers and contractors.[4] Potential liability problems were further heightened because numerous

linkages were established regarding occupational sources of cancer. We find that expected liability damage payments rose substantially during this period.

If bankruptcy is likely to be an effective shield against liability, then this increase in liability damage awards should lead to greater entry by small firms into hazardous sectors. In Ringleb and Wiggins (1990), we investigate this issue empirically. In particular, we estimate a simple model of the determinants of small-firm entry, including a variable that measures employee exposure to workplace carcinogens. The results show that high levels of exposure were associated with increased rates of small-firm entry.

The striking feature of the results, however, is the magnitude and significance of the estimated effects of worker exposures on entry rates of small corporations (those with less than $250,000 in assets in 1980 dollars). Our statistical estimates indicate roughly a 20 percent increase in the total number of small corporations as a result of the incentive to avoid liability. The magnitude of these results suggests widespread efforts to avoid liability payments. Because these attempts are likely to be valuable only if firms expect to declare bankruptcy to avoid payments, the empirical results imply that bankruptcy is likely to be a substantial problem.

In Wiggins and Ringleb (1992), we use a two-period model to analyze the theoretical implications of high probabilities of bankruptcy for a liability system. In the first period, the firm invests, takes costly safety precautions, and produces. In the second period, possible injuries are realized and suits are filed. If revenues exceed damages, workers are paid their claims, but if revenues are insufficient, the firm is liquidated in bankruptcy proceedings. The analysis compares a simple wage with a liability system. The wage is biased downward because in equilibrium, adverse selection leads employed workers to underestimate the likelihood of injury, even if the population of workers has rational perceptions of risk. Therefore, too many workers are hired, the firm has inefficient safety incentives, and workers are undercompensated for risk.

Despite these problems, the results show that when bankruptcy is likely, a liability system may well reduce social welfare for two primary reasons. First, the potential for bankruptcy reduces capital investment because the firm discounts the marginal return to capital by the probability of bankruptcy. This effect tends to decrease capital intensity in hazardous sectors.

The second element leading to a possible reduction in welfare is workers' misperception of the economic value of liability. This is a logical consequence of their tendency to misperceive the probability of injury. These workers will underestimate the number of suits that will be filed and, as a result, the probability of bankruptcy. The source of this problem is that valuation of liability forces workers to evaluate the financial health of the firm far in advance of when liability payments are expected. Hence, liability does not preclude workers' need to understand

occupational risks, but instead compounds the problem by forcing employees to evaluate the likely impact of occupational risks on the financial health of the firm. The new inference problem, moreover, can be even more complex than inferring the true nature of occupational risks. Firms can employ numerous strategies to avoid damage payments, including low capitalization, high debt levels, and sequential dissolution of corporations managing risky activities. Thus, worker assessments of the probability of collecting damages are likely to be highly variable, just like their assessments of occupational risks.

Our analysis then shows that as the probability of bankruptcy increases, workers receive less compensation for injuries than they would with a simple wage. Reduced compensation then reinforces firms' incentive to use labor-intensive production for hazardous activities and lowers workers' compensation for injury. The net result is that liability is Pareto-inferior to a wage and thus provides highly questionable incentives in the context of occupational carcinogens.

The underlying problems also suggest substantial weakness in the use of liability for other types of large-scale, long-term hazards. Our empirical analysis shows how small firms are increasingly taking over high-risk production activities. There is similar anecdotal evidence that small firms are becoming more active in other high-risk areas. For example, it appears that large oil companies are increasingly subcontracting the shipment of oil to smaller firms, presumably to avoid potential liability problems.

These results convincingly illustrate that a liability system has serious flaws when it is applied to large-scale, long-term hazards. The magnitude of liability risks creates powerful incentives for firms to minimize their exposure. Small, inexperienced firms often take on risks, forcing out larger firms who are better equipped and more experienced at handling the hazards. Further, when risks are organized in small firms, liability damages are effectively uncollectable. Hence, the primary impact of liability is often not to guarantee damage payments, but instead to provide small-firm operation of serious hazards. Clearly, alternative institutional arrangements should be considered for these risks.

3. Direct Regulation

The second institutional alternative for large-scale, long-term hazards is direct regulation, which addresses potential market imperfections associated with limited worker and consumer information in a qualitatively different way. Rather than overcoming informational imperfections by assessing a new set of payments after injuries become manifest, as a liability system does, regulation selects a government agent to develop superior information, and ideally to align incentives among the regulated firm, its customers, and its workers.

The obvious advantage of direct regulation is that it provides instruments that can be used for ex ante intervention. Hence, regulation addresses the central failure of liability because it permits active intervention long before injuries or damages emerge and, in principle, allows the government to limit risks in advance.

The use of regulation is controversial because of the well-known incentive problems in its implementation. Still, in the present context, neither ordinary markets nor the courts seem capable of providing an effective governance structure. Evaluating the use of direct regulation is therefore critical because these more widely used institutions have major flaws in the context of the large-scale hazard problem.

As with liability, however, the extant literature contains little discussion of the application of regulation in this setting, so our understanding is based primarily on discussion of regulation in other contexts. These parallels are informative, but there are unique elements of large-scale, long-term hazards that further compound the issue. The problems posed by occupational carcinogens provide the prototypical example for evaluating the limitations of liability in the large-scale hazard setting. For regulation, a prime example is the problems generated by federal provision of deposit insurance and its associated regulations.

The need for some form of government involvement in savings institutions emerges from problems in depositor evaluation of financial stability, which are in turn related to issues that people commonly encounter in assessing low-probability events. In the financial sector, these problems begin because individuals generally hold relatively small deposits and thus have little incentive to acquire information about the financial solvency of the institution holding these funds. Poor information results because deposits, unlike stocks or bonds, are not traded in well-developed markets. Individuals cannot buy or sell others' deposits, and it is easy to show that these limitations reduce the incentive to acquire information. These small, potentially poorly informed depositors also cannot use market prices to free-ride on the superior information of larger depositors or shareholders, so information flows in deposit "markets" may be relatively poor.

This situation is worsened because there are relatively small probabilities of financial failure for a given depository. Individuals will therefore use highly specific frames in probability evaluation, and small amounts of new information can lead to large revisions of the probability of failure (Tversky and Kahneman [1981]). Just as individual workers may have noisy estimates of occupational risk, depositors may have highly imperfect estimates of the likelihood of financial failure. Because risk estimates may be rapidly updated using small amounts of new information, panics and runs can emerge from small bits of news that have little information content.

Deposit insurance can be seen as an effort to avoid the instability created by this overreaction to unfavorable news, as it obviates the need for individuals to track

the financial health of their depository institution by shifting the risk to the government. Hence, deposit insurance provides a solution to the failure of individuals to properly evaluate low-probability events.

Although deposit insurance forestalls panics, it creates other problems. The provision of insurance enables savings institutions to attract deposits at effectively risk-free rates and then to allocate capital to potentially risky projects. A noncompetitive wedge exists between depositor risks and social risks, which creates rents because the potential earnings on risky investments are effectively subsidized with insured funds. These rents insulate the industry from competitive forces, reducing market discipline. More important, this wedge creates a potential prize to be attained in the political process. Noncompetitive returns brought on through the insurance subsidy introduce an incentive for industry participants—the managers of the institutions, the suppliers of deposits, and the users of the funds—to compete for the rents to regulation.

The long history of the savings industry in this country has been a series of allocations and reallocations of the regulatory prize among various industry participants, depending on shifting political clout. The early winners of regulation were depositors and the home building industry. Depositors won because they could safely make deposits that would be used in risky investments and because they earned a corresponding risk premium without having to bear the risks. The home building industry won because it had a captive share of the subsidized capital, allowing it to obtain funds at rates well below the opportunity cost of capital. This general inefficiency associated with political rent-seeking, however, is now standard fare in economics. Such regulatory effects are hardly surprising, and in fact are quite similar to those in other industries.

Deposit insurance and the associated regulations, however, differ from other types of regulation because of the large-scale, long-term nature of risks, which can effectively separate regulatory changes and rent-seeking activities from outcomes. The reason is that the large damages associated with a given set of regulatory changes may occur with only a small probability. Regulators can therefore implement substantial policy changes and potentially not see significant consequences for long periods—until there is an unlikely set of unfavorable outcomes that test policy effectiveness.

This problem directly parallels the use of liability for large-scale hazards. With liability, the potentially high probability of bankruptcy when damages are filed may not be observed for years as injuries lie latent; with savings regulation, the small probability of large-scale disaster may go unobserved for years if there are a series of favorable draws that avert disaster. To see how such gradual regulatory changes led to the current crisis, it is useful to review the history of savings institutions, deposit insurance, and regulation.

3.1 A History of Savings Industry Regulation

The savings industry emerged in the 1950s as a result of New Deal legislation.[5] Tax incentives were created that effectively limited savings institution loans primarily to home mortgages. A key element of this industry, however, is that federally chartered savings institutions were entirely mutual organizations until the early 1970s, and new federally chartered institutions could not be organized as ordinary capital stock associations until the 1980s. Furthermore, except for Ohio and about a dozen southern and southwestern states, state charters were also restricted to mutual organizations. During the postwar era, depositors were the primary owners of savings institutions, and funds were used mainly to finance home loans and small multifamily dwellings. Hence, the two big winners in deposit insurance were the depositors themselves and the housing industry.

Another beneficiary of the enabling legislation was the group of small entrepreneurs and others who became the managers of savings institutions. While mutual savings institutions are technically owned by the customers, they are effectively controlled by the managers who operate them (Rasmusen [1988]). Some sound economic justification can be advanced for this form of organization. Rasmusen argues that managers of mutuals can earn supranormal returns from their entrenched positions. These returns become an effective bond or efficiency wage because the manager must keep the institution solvent to continue collecting rents. The mutual form of organization then becomes an effective bonding device. It raises the cost of ousting the manager, enabling commitment to the bond, but then ties the bond to the implicit continued survival of the institution, aligning incentives between depositors and management. Hence, the mutual format may actually lower the expected cost of providing deposit insurance, because managers of institutions that become insolvent will lose their jobs. This reasoning suggests that the initial restriction of federal and most state charters to mutuals may have made considerable sense.

The difficulty with this solution is that the mutuals were restricted to making loans within a small, 40-mile radius of their base of operations (Strunk and Case [1988]). This led to the creation of a large class of small savings institutions, each run by a well-compensated manager, and to the emergence of a powerful lobby. As the savings industry developed in the late 1940s and 1950s, this lobby grew in strength and began to exhibit the characteristics commonly associated with other special-interest groups who have successfully molded regulation to their own purposes.[6] Most communities had substantial savings institutions, and their managers were prominent community members who had large incentives to band together to create advantageous new regulations. Together, these characteristics seem to augur political influence and effective regulatory lobbying. Evidence strongly suggests that their lobby enjoyed considerable success.

The managers of mutual savings institutions appear to have had two main regulatory objectives. The first was growth, because managers of larger institutions were likely to hold more local prestige and to command higher salaries than leaders of smaller institutions.[7] The primary limitation of growth during the 1960s and 1970s was the requirement to build reserves for losses. The enabling legislation creating the Federal Savings and Loan Insurance Corporation (FSLIC) required member institutions to build reserves against losses of 5 percent of deposit share accounts. These reserves became part of the Federal Insurance Reserve. Established institutions could not pay dividends to depositors unless they met this standard. New institutions had at first 10, and then 20, years to meet the reserve requirement.

This requirement effectively placed a limit on how far savings associations could stretch their accumulated capital, creating an incentive for managers to lobby for reduced reserve requirements. Under lobbying pressure, the Federal Home Loan Bank Board significantly liberalized the reserve regulation in 1972. Specifically, it allowed institutions to use a five-year moving average of year-end deposits in determining the account base for reserve requirements. On its face, such a change seems efficiency-based. Problems emerge, however, when there is rapid growth. The effective reserve requirement is then reduced to much less than the nominal 5 percent, because the reserve base is calculated using earlier data, when the institution was smaller.

The second primary limitation on savings association managers was generated by the mutual form of organization, which has the attractive property of limiting the agency problem between depositors and managers by aligning incentives. From the managers' perspective, however, the mutual form limited their ability to take advantage of deposit insurance because their compensation was effectively constrained by salary. Furthermore, by being forced to guarantee solvency—to continue collecting their salary—managers were limited in their incentives to shift risk to the government. Hence, the mutual form of organization distributed many of the benefits of insurance to depositors and failed to take full (private) advantage of the ability to lever investments and to shift risk to the government.

Savings and loan associations controlled by their managers thus had a significant incentive to lobby for capital conversion rights. This lobbying proved successful: By the 1960s, most states had stock associations, and federally chartered associations were allowed to convert to a stock form of organization beginning in the early 1970s.

Managers also had an incentive to lobby to allow the charter of new associations as stock organizations. Existing managers possess industry-specific skills, which makes them low-cost entrants. In the extreme, these managers would also prefer sole ownership to capture the full benefits of deposit insurance for themselves. Once associations were transformed into stock organizations—many owned by existing or former managers—savings institutions had a motive to lobby for a relaxation of regulations restricting their investment portfolio.

Finally, managers had an incentive to lobby to make investments outside the housing sector to circumvent restrictions in interest rates resulting from making loans to only a single industry. These restrictions were also important because they limited the risk of savings institution loans.

Savings institutions lobbied successfully in each of these areas, leading to an entirely new form of organization and regulatory environment by the early 1980s. These new, small organizations could attract insured deposits and invest them in a wide variety of risky activities. By shifting the risk-bearing function to government, these institutions could lever small amounts of assets to create the potential for extraordinary returns, while risking little should the enterprise fail. The disastrous events that followed are sufficiently well known that there is little need to repeat them here.

Rather, it is important to evaluate the effectiveness of deposit insurance and federal regulation in light of the savings and loan collapse. FSLIC insurance was designed to prevent panics such as those that occurred during the 1930s, and it succeeded well in this limited arena. The problem was that it created a price wedge between the social cost of capital and the private cost, producing a rent available for expropriation. As originally formulated, this rent resulted in modest inefficiency. Depositors, builders, and savings institution managers all shared in the returns, and it is likely that capital was misallocated as a result. Still, the subsequent inefficiencies appear to have been modest.

The more serious problems emerged as certain participants in the savings industry sought to mold regulations. Their lobbying efforts gradually transformed regulation and industry structure into a form where participants could extract the rents of deposit insurance. Further, by implicitly allowing the government to bear extraordinary risk, the industry levered its position to the maximum extent possible.

The important perspective of this discussion regards its ramifications for risk-bearing and large-scale, long-term hazards. One key weakness of regulation is that it creates incentives for rent-seeking, but this notion is fairly standard. The novel problem here is that when risks are large, and there is a relatively small probability of disaster, unfavorable outcomes become rare. This makes it difficult for regulators to evaluate the practical consequences of changes in regulation. Small but substantive regulatory modifications can accumulate over long periods with few meaningful consequences.

4. Conclusion

We have examined the use of tort liability and regulation for controlling large-scale, long-term hazards. Such hazards pose unique enforcement problems in part because of their size. When damages can be potentially extraordinary, agents have

unique incentives to shift the risk to other parties. This means that risk-shifting efforts must be foreseen and actively incorporated into institutions designed to handle these problems. Such hazards also pose unique enforcement problems because of the long separation between activities and potential damage. This occurs for occupational carcinogens because of the long gestation period for disease, while it develops for financial institutions because of the small probability of unfavorable outcomes.

The long temporal separation between activity and outcome means that modifications in either regulation or tort liability rules can generate subtle changes in economic incentives that may be difficult to evaluate for long periods. This issue must be taken into account when changes in institutional control are contemplated, as well as in policy evaluation.

Our discussion also pointed out the important role of changing organizational form in evaluating both liability and regulation. For liability, a classic example is occupational carcinogens, and the analysis showed how small organizations have emerged as a common response to changes in liability rules. The emergence of these organizations casts doubt on the effectiveness of liability in the large-scale damage arena. For regulation, a classic example is savings institutions. Regulatory changes permitted and encouraged both the emergence of small organizations and lever risk-shifting to the government. These activities substantially undermined the effectiveness of deposit insurance as a remedy for potential depositor information problems. Thus, changes in both regulation and liability created subtle long-run incentive effects that were initially difficult to evaluate.

The evaluation of both regulation and tort liability for large-scale, long-term hazards is different from the case in which risks are immediate and small in scale. Information problems strain the effectiveness of both remedies for these hazards, raising questions about how well they perform compared to market alternatives. A full resolution of this question, however, must await considerable additional research.

Notes

1. The analysis here considers only the case where all agents have the same monetized damages. Our earlier analysis, however, shows that the qualitative results are generally reinforced when one allows for heterogeneous perceptions of possible damages.

2. The list in the text is merely suggestive. For a more complete discussion, see Ringleb and Wiggins (1990).

3. All workmen's compensation statutes provide that "[T]he Compensation remedy is exclusive of all other remedies by the employee or his dependents against the employer and insurance carrier for the same injury, if the injury falls within the coverage formula of the Act." See Larson (1978), 2A, Section 65.00.

4. Burdens of proof were eased with the advent of strict liability. See, for example, *Borel* v. *Fiberboard Prods. Corp.,* 493 F. 2d 1076 (5th Cir. 1973), *cert. denied,* 419 U.S. 869 (1974).

5. The specific legislation included the Federal Home Loan Bank Act (1932); Section 5 of the Home Owners' Loan Act of 1933, which created the Federal Savings and Loan System; and Title IV of the National Housing Act of 1934, which created FSLIC. See Strunk and Case (1988).

6. The reasons for the success of these interest groups are, at least in our opinion, still not well understood. The best theoretical analysis is in Peltzman (1976), but a careful reading of his paper still leaves unanswered why some types of groups are so successful at regulation, while others fail. The discussion below, however, helps to explain at least one reason why regulation emerged as it did in the case of savings institutions.

7. The desire of savings institutions to grow is clearly established by Strunk and Case (1988), though the motivation of this desire is not addressed. The prestige argument is fairly clear. The salary argument has not been tested by the data due to a lack of time, but evidence from other industries suggests strongly that this argument will be supported by the empirical evidence.

References

Kunreuther, Howard. 1976. "Limited Knowledge and Insurance Protection." *Public Policy* 24 (Spring): 229–261.

Larson, Arthur. 1978. *Workmen's Compensation Law.* New York: Matthew Bender.

Peltzman, Sam. 1976. "Toward a More General Theory of Regulation." *Journal of Law and Economics* 19 (August): 211–240.

Rasmusen, Eric. 1988. "Mutual Banks and Stock Banks." *Journal of Law and Economics* 31 (October): 395–421.

Ringleb, Al H., and Wiggins, Steven N. 1990. "Liability and Large-scale, Long-term Hazards." *Journal of Political Economy* 98 (June): 574–595.

Spence, A. Michael. 1977. "Consumer Misperceptions, Product Failure, and Producer Liability." *Review of Economic Studies* 44 (October): 561–572.

Strunk, Norman, and Case, Fred. 1988. *Where Deregulation Went Wrong.* Washington, D.C.: U.S. League of Savings Institutions.

Tversky, Amos, and Kahneman, Daniel. 1974. "Judgment under Uncertainty: Heuristics and Biases." *Science* 185 (September): 1124–1131.

Tversky, Amos, and Kahneman, Daniel. 1981. "The Framing of Decisions and the Psychology of Choice." *Science* 211 (January): 453–458.

Tversky, Amos, and Kahneman, Daniel. 1986. "Rational Choice and the Framing of Decisions," *Journal of Business* 59 (October): S251–S278.

Wiggins, Steven, and Ringleb, Al H. 1992. "Adverse Selection and Long-term Hazards: The Choice between Contract and Mandatory Liability." *Journal of Legal Studies,* forthcoming.

Commentary

John C. Morrison

As a private consultant in the area of underwriting and reinsurance of risks, I feel that I can offer a somewhat different perspective on some of the points presented by Al Ringleb and Steven Wiggins, particularly in the case of the liability of employers.

Ringleb and Wiggins consider two vastly different but highly significant examples of what I call low-frequency, high-severity events—carcinogenic risk in the workplace and financial risk as demonstrated by the savings and loan crisis. Other risks that fall into this category of events include earthquakes, floods, nuclear accidents, drug failures, and environmental disasters. Two questions are brought forward: First, what are some of the cost-effective ways of dealing with these hazards so that we can mitigate the probability or the severity of the risk? Second, how do we appropriately compensate the victims of those events?

With respect to mitigation, some efforts can include training, safety engineering, and the development of alternative processes. But the fact that these are very low-frequency occurrences gets in the way of mitigating the possibility of damage, because many people believe that these events "will never happen to them." Others assume that the government will compensate them if the unthinkable does occur. These two perceptions are large motivating factors, and dealing with them is a critical problem.

With respect to compensation, the injured parties generally lack information or have faulty perceptions of the results of disasters. One of the ideas we have considered at the Wharton School is the origin of some of these perceptions and how they affect individuals' decisions about risk. We all know that it is socially desirable to reduce the effects of the risks and to somehow compensate the victims. Ringleb and Wiggins have suggested several possibilities for managing these situations. First is direct regulation, which is intertwined with government risk-bearing, in my estimation. Next are taxation policies. Then there is tort liability, which I combine with workmen's compensation and ordinary market forces.

Ringleb and Wiggins choose not to address taxation, probably because such policies would have little bearing on the risks evaluated in their paper. Because of the heavy potential impact of low-frequency, high-severity events, however, the subject of taxation should not be entirely dismissed: We need the ability to put aside long-term resources in order to absorb the impact when a disaster does happen. The earthquake insurance industry is a good case in point, as it collects a significant volume of insurance premiums for earthquake exposure over a long period of time. However, because of accounting regulations and tax policy, it cannot put aside all

of those premiums and build a reserve to compensate victims when an earthquake happens. We therefore either pay out those premiums in taxes on profits, or, as has been the case in most recent years, the funds go into the general pot and end up subsidizing other unprofitable lines of business. In either event, the funds will not be available to pay losses when a big quake hits. At Wharton, we are now working on a project to attempt to influence government thinking on this issue—either to make it possible to set aside those resources or to have government pick up the tab and allow the insurance industry to repay that transfer of risk over time. In other words, this would build resources after the event rather than beforehand.

In dealing with carcinogenic risks in the workplace, Ringleb and Wiggins find the tort system deficient. Unquestionably, the tort liability system has changed over the years considered by the authors, and there have been a number of cases in which the exclusive remedy of workmen's compensation has been eroded by certain court decisions. Usually, these cases involve gross negligence or information withholding on the part of the employer. In the real world, however, workmen's compensation is still the remedy for almost all on-the-job injuries; only in a small number of cases has an employee been successful in bringing suit against his employer.

An exception is the case of asbestos, where injured workers were quite successful in using the tort liability system not against their employers, but against corporations that supplied this material (albeit with a slow rate of reimbursement). Many asbestos suppliers, such as Johns-Manville, consequently went into bankruptcy or went out of business altogether. But the liability system continued to be effective, and workmen's compensation is still the main way employees are compensated for injuries.

Between ordinary market forces and the workmen's compensation system, then, I think we are doing a good job of managing long-term, large-scale hazards in the workplace. Certainly, market forces are at work in the insurance system. When insurers take on risks, they are eager to try to charge the right price for the particular exposure and to work with insured parties to engineer the risks.

The savings and loan crisis, which Ringleb and Wiggins use as a primary example, provides an interesting case of how the mutual system works. More intriguing is the story of how the collapse ensued as regulations were changed and the original purpose of protecting the participants was perverted. Because of either negligence or naivete, lawmakers had no idea of the magnitude of the consequences as they modified industry regulations, and the system ultimately failed. A threefold set of problems was revealed: a lack of insight on the part of regulators, a lack of integrity in the areas of monitoring and enforcement, and most important, a lack of accountability, which is probably endemic to the regulation and government risk-bearing areas. In my estimation, only a few people are being singled out for

culpability in the savings and loan collapse: There have been very few court cases, and not many firings. Who is *really* being held accountable for this vast failure?

In conclusion, since World War II we have seen a tremendously rapid change in the implications for large-scale, long-term hazards because of advances in technology, new chemical elements, the advent of wonder drugs, and the like—many of which entail unanticipated risks. In most cases, neither government nor industry nor academia could have predicted these developments. In order to best serve society, then, we must explore every means possible for effective management of these risks and for adequate compensation of the victims.

In the case of natural hazards, such as earthquakes and floods, some ideas for mitigation are avoidance of highly susceptible areas, better building design and construction, and safer gas distribution systems. We then must find efficient ways to compensate the victims—several possibilities of which (as well as potential flaws) have been presented by Ringleb and Wiggins.

Central to all of these issues is the problem of *lack of information.* Perhaps one of the government's priorities should be to promote better dissemination of information on hazardous areas and to couple that information with stringent regulations. Perhaps the government should deny individuals the right to build in floodplains, rather than just provide incentives for avoiding these areas. Perhaps the government should deny commerce and industry the right to build major structures on highly susceptible fault areas.

So far, the message has been "build at your own risk." However, most people still believe that the government will bail them out even if they lack insurance. That perception is possibly the biggest problem in dealing with these low-severity, high-consequence events.

2 Ambiguity and Government Risk-Bearing for Low-Probability Events

Howard Kunreuther

What is the appropriate role of the federal government in dealing with ambiguous risks, where the insurance industry is reluctant to offer coverage and homeowners and businesses have a limited interest in voluntarily adopting loss-reduction measures? This question is of increasing importance today because of the potentially high costs to society from low-probability events.

Earthquakes—Catastrophic earthquakes have the potential of producing losses far greater than those from any other natural hazard. Estimates of property damage from major quakes in the Los Angeles and San Francisco areas (in 1990 dollars)

Many of the ideas in this paper are based on joint work with colleagues and students. In particular, the discussion on earthquake risks reflects research undertaken with Ann Butler, Neil Doherty, Anne Kleffner, and Jack Morrison; Carrie Ericson helped to summarize the legislative and regulatory history associated with the underground storage tank risk. This research was partially supported by NSF Grant #SES88-09299 and a grant from the Russell Sage Foundation.

are in the $45 billion range, more than five times as high as the worst-case projections from hurricanes along the East Coast (Litan [1991]). With respect to financial protection, earthquake insurance has been widely available in California since 1916 (Steinbrugge, McClure, and Snow [1969]). In recent years, it has been written by private insurers throughout the United States, although most policies are purchased in California.

Few homeowners have had an interest in voluntarily purchasing protection, and financial institutions have normally not required such coverage as a condition for obtaining a mortgage. In 1976, fewer than 5 percent of California homeowners were covered by an earthquake policy. This figure rose to about 20 percent in 1990 after the California state legislature passed a ruling that insurance companies were required to inform all policyholders with homeowners' coverage that they could add an earthquake rider to their policy for an additional charge (Palm, Blanchard, and Lyons [1990]). The insurance industry is reluctant to provide coverage on a widespread level, claiming that a catastrophic quake would cause insolvency of a number of companies. A recent study using the thrift crisis as an analogy supports the insurance industry's concern (Litan [1990]).

On the consumer side, there has been limited interest among individuals in adopting loss-mitigation measures against earthquakes. In a 1974 survey of 1,000 California homeowners in earthquake-prone areas, only 12 percent adopted protective measures against earthquake damage (Kunreuther et al. [1978]). In a 1989 survey of 3,500 homeowners in four California counties subject to earthquake damage, the shares were even lower, ranging from 5 to 9 percent (Palm, Blanchard, and Lyons [1990]). The most important reason given for not adopting these loss-prevention measures was the excessive cost relative to the benefits that could be reaped.

Underground storage tanks—In the United States, there are approximately 1.5 million regulated underground storage tanks (USTs) containing petroleum or hazardous chemicals. The Environmental Protection Agency (EPA) estimates that 25 percent or more of all USTs have corroded and are leaking hazardous substances into the groundwater (Duus and Telsey [1990]). Regulations covering the inspection and use of USTs are covered by the 1984 Resource Conservation and Recovery Act (RCRA). All tanks must be tested for leaks and have leak-detection equipment installed by 1993, and all existing tanks must either be protected from corrosion or removed by 1999 (Oullette and Maestri [1990]).

Many owners, particularly small businesses, have been reluctant to incur the costs of testing (approximately $1,000) and cleaning up these tanks (ranging from $7,500 for a leak to more than $1 million for major damage, including third-party liability claims). For this reason, the Superfund Amendments and Reauthorization Act (SARA) requires that the EPA develop financial responsibility requirements for owners and operators of USTs to ensure that they have sufficient funds to upgrade leaking

tanks or to cover cleanup, bodily injury, and property damage claims from leaks.[1] Commercial lenders also run the risk of being found legally responsible if they are actively engaged in the management of a property containing leaking tanks.

Few insurers have offered coverage against potential leaks from underground tanks. A principal reason for this lack of interest by the private sector is that state funds have been set up for helping UST owners meet their $1 million financial responsibility requirements. These funds are financed by taxes on gasoline distributors and fees paid by tank owners and operators. It has been estimated that the implied premiums are 10 percent of what commercial insurers would charge for similar risks (Shalowitz [1990]). Given the existence of these state funds, the only reason why a tank owner or commercial lender would want to purchase private insurance is to protect himself against the chance that the state fund itself will not be able to cover losses.

These examples suggest two policy questions with respect to the role of government in dealing with low-probability, high-consequence events:

1. What type of loss protection (if any) should the government provide to insurers to encourage them to offer coverage in cases where the risks are ambiguous and potential losses may be catastrophic?
2. What is the appropriate role of regulations forcing homeowners and businesses to take protective action for reducing potential losses from the hazard in question?

This paper argues that the government may want to bear some of the risks for catastrophic disasters, such as an unusually severe earthquake in a populous portion of California, because of the limited financial capacity of the insurance industry to cover the resulting claims if most of the victims were insured. In return for this protection, loss-prevention measures should be required to reduce potential damage in the event of a severe disaster.

On the other hand, it is much less clear whether the public sector should offer protection against individual risks where there is no catastrophic potential, such as leaky USTs, particularly if the insurance industry has the interest and capacity to cover these losses. The key issue in these cases is how to deal with the claim by small businesses that they are unable to pay for private insurance and hence are willing to go unprotected rather than to attempt to buy coverage. Forced inspections and financial responsibility requirements may be necessary to reduce the health risks from hazards that would otherwise go undetected.

The next section of the paper examines the impact of ambiguity of probability and loss on the supply of insurance. I summarize the results of two surveys: first, a survey of underwriters who were asked to price earthquake and UST insurance policies; and second, a related survey of actuaries. Contrary to the predictions of expected utility theory, both underwriters and actuaries charge much higher premiums for ambiguous than for nonambiguous risks.

Section 2 examines the role of individuals or businesses facing the potential risk of earthquake or UST losses. I develop a simple benefit–cost model depicting what type of protective actions individuals should want to take regarding mitigation and insurance and examine reasons why they do not follow these guidelines in practice. The final sections of the paper examine the policy implications of these findings and propose a joint private–federal program for dealing with risks such as earthquakes and USTs.

1. Insurer Decision-Making under Ambiguity

1.1 Theoretical Considerations

The decision regarding what premium an insurance company should set for a given risk is made by the underwriters with advice from actuaries. Until recently, economists assumed that agents acting on behalf of firms are risk neutral and hence make choices that maximize their firms' expected profits. This assumption has been challenged by Greenwald and Stiglitz (1990), who suggest that managers (for example, underwriters) may be risk averse because they will suffer substantial personal costs if their company becomes insolvent. Hence, they have strong incentives to reduce the probability of bankruptcy to a point lower than that which is optimal for stockholders. Supporting empirical evidence on this point in the case of insurers has been provided by Mayers and Smith (1983, 1990) in their studies of corporate demand for insurance and reinsurance.

Consider the premium-setting decision for a risk-averse underwriter facing a single risk with known probability p and known outcome L. He wants to determine the premium r where he is indifferent between offering insurance coverage or maintaining the status quo. To simplify the exposition without loss of generality, assume that the underwriter is offering a full insurance policy to his client. If A represents the insurance company's assets prior to providing coverage and U is the underwriter's Von Neumann–Morgenstern utility function, then r is determined by setting

$$U(A) = p\,U(A - L + r) + (1 - p)U(A + r). \tag{2.1}$$

It should be clear from this expression that as the variance of the loss around a given mean L increases, the indifference premium r will also rise because of the underwriter's risk aversion. If there is ambiguity or uncertainty surrounding the probability, then this should *not* affect the premium for a single risk. To see this, consider the case where there are k different expert opinions of the probability of a given loss occurring within a specified time period. These probability estimates are denoted by $p_i = 1....k$, with the underwriter estimating the probability of a loss

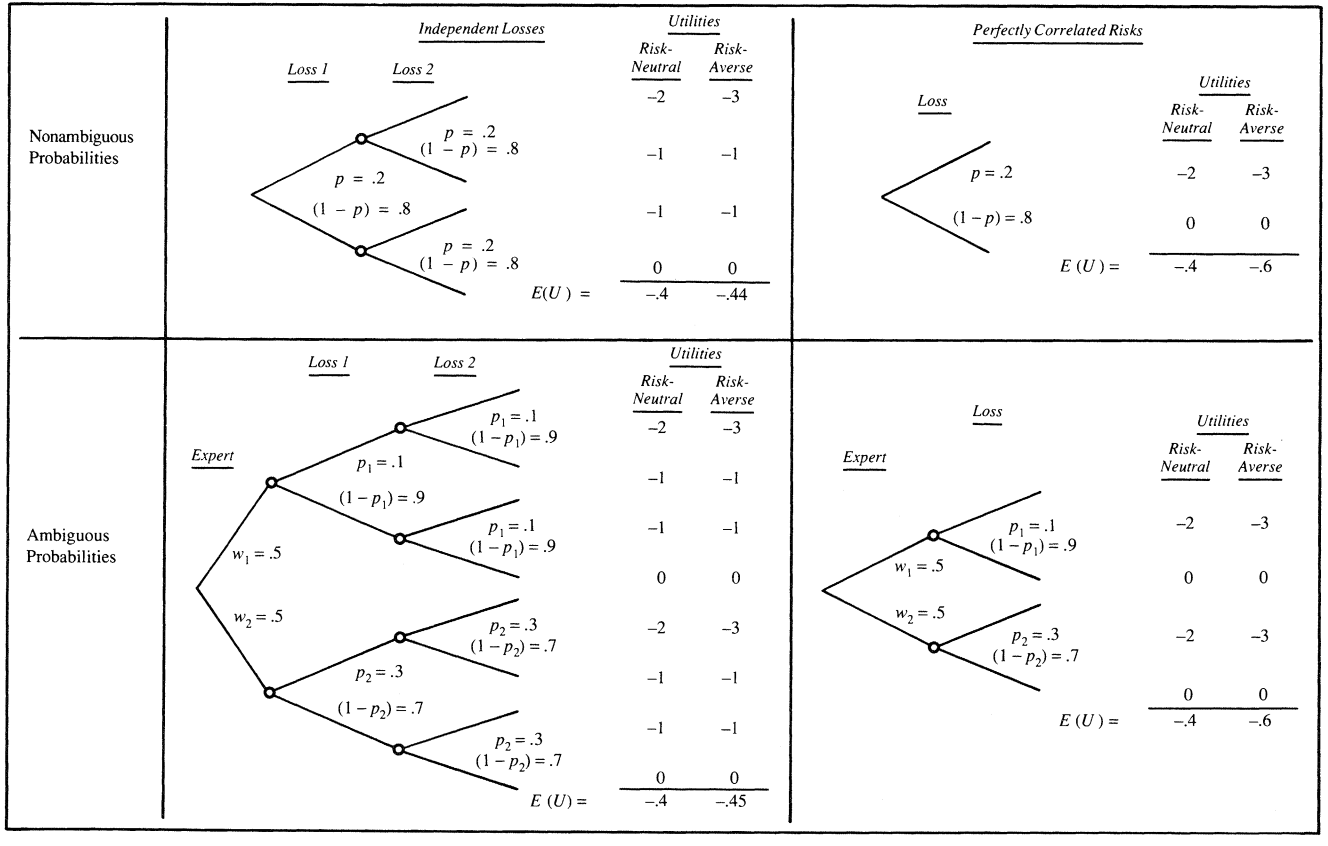
to be $f(p_1,...p_k)$. As long as this probability estimate is the same as p, then the premium should not change from r given by equation (2.1).

For a portfolio of risks, the problem becomes more complicated because the underwriter now has to determine the degree of independence among the individual policies. A somewhat counterintuitive theoretical result based on expected utility maximization is that probability ambiguity will lead the underwriter to charge a higher premium for independent, identically distributed risks but not for perfectly correlated risks (Hogarth and Kunreuther [1992]).

A simple example illustrates these differences and contrasts the behavior of a risk-neutral and risk-averse underwriter. Let there be two experts, 1 and 2, each of whose estimates of the probability of a known loss L are considered equally credible. Expert 1 estimates $p_1 = 0.1$ and expert 2 estimates $p_2 = 0.3$, so that $f(p_1, p_2) = 0.2 = p$ (the well-specified probability). The underwriter is considering insuring two risks, each of which has the same potential loss, $L = 100$. With respect to the underwriter's utility function, let $U(A) = 0$ and $U(A-100) = -1$. A risk-neutral underwriter would set $U(A-200) = -2$, while a risk-averse underwriter would set $U(A-200) < -2$, say $U(A-200) = -3$.

Figure 2–1 depicts the decision trees required to determine the specified indifference premium for four different cases based on the nature of the probability and loss conditions. When the premium is zero, the resulting expected utilities reveal that a risk-neutral underwriter will find that $E(U) = -0.4$ for all four cases. This implies that the indifference premium remains the same whether or not probability is ambiguous and whether losses are independent or perfectly correlated.[2] When the underwriter is risk averse and losses are independent, then his expected utility with a zero premium will be lower if probability is ambiguous [$E(U) = -0.45$] than if probability is well specified [$E(U) = -0.44$], thus implying that the indifference premium must be higher for the ambiguous case. For a perfectly correlated risk (which is really the same as a single risk), the expected utilities remain the same whether or not the probability is ambiguous [$E(U) = -0.6$]. Due to risk aversion by the underwriter, this implies that catastrophic losses will require higher indifference premiums than independent losses.

Figure 2–1. Decision Trees and Expected Utilities for Two Risks under Different Probability and Loss Conditions



1.2 Underwriter Survey

Recent empirical data on underwriter behavior suggest that these managers have a strong aversion to probability ambiguity as well as to uncertainty on losses (Kunreuther et al. [1991]). A questionnaire was mailed to underwriters in 190 randomly chosen insurance companies of different types and sizes to determine what pure premiums they would set for three different types of losses or risk contexts: neutral, earthquakes, and USTs.[3] The earthquake scenario involved insuring a factory against property damage from a severe quake; the hazardous waste scenario provided liability coverage to the owners of a UST containing toxic chemicals against damages caused by leakage from the tank. The neutral risk, which acted as a reference point for the two context-based scenarios, described only a probability and loss level for an unnamed peril.

Each questionnaire included two scenarios, the neutral risk plus either the earthquake or UST context. A scenario consisted of four cases representing uncertainty and ambiguity conditions specified in table 2–1:

Table 2–1. Uncertainty and Ambiguity Conditions

	Loss	
	Known	*Uncertain*
Well-specified	p, L	p, UL
Ambiguous	Ap, L	Ap, UL

Source: Kunreuther et al. (1991).

In the p, L case, both p and L are well specified (for example, $p = 0.01, L =$ \$1 million). The probability is ambiguous in the Ap, L case, meaning that there is a high degree of uncertainty around some given value of p such as $p = 0.01$. The best estimate of loss is given in the p, UL case (for example, \$1 million), but the uncertainty associated with loss is indicated by specifying a minimum and maximum loss equidistant from the best estimate.[4] An illustrative set of scenarios for the neutral risk is presented in the appendix.

One measure that provides a perspective on how underwriters feel about probability and loss uncertainty is the coverage per dollar of premium charged (c/\$).[5] As premiums increase, c/\$ decreases. This standardized measure enables one to compare premiums across risks of different magnitudes. For example, suppose that $L =$ \$1 million and $p = 0.01$. An actuarially fair pure premium would be $r =$ \$10,000, which would imply c/\$ = 100.[6] This value acts as a reference point for determining how underwriters feel about uncertainty and ambiguity. Table 2–2

Table 2–2. Mean Coverage per Dollar of Premium (c/\$) for Different Scenarios and Experimental Conditions (Underwriter Survey)

$p = .005, L =$ \$1 million
Actuarially fair c/\$ = \$200

	p, L	*Ap, L*	*p, UL*	*Ap, UL*	*n*
Neutral	127	87	94	74	29
Earthquake	115	90	97	65	17
UST	105	55	59	38	12

$p = .005, L =$ \$10 million
Actuarially fair c/\$ = \$200

	p, L	*Ap, L*	*p, UL*	*Ap, UL*	*n*
Neutral	129	100	100	58	31
Earthquake	143	109	111	90	8
UST	121	79	83	61	17

$p = .01, L =$ \$1 million
Actuarially fair c/\$ = \$100

	p, L	*Ap, L*	*p, UL*	*Ap, UL*	*n*
Neutral	63	41	56	37	24
Earthquake	51	43	42	34	23
UST	57	37	41	31	32

$p = .01, L =$ \$10 million
Actuarially fair c/\$ = \$100

	p, L	*Ap, L*	*p, UL*	*Ap, UL*	*n*
Neutral	67	44	53	37	47
Earthquake	83	60	72	58	6
UST	60	44	44	29	11

Source: Kunreuther et al. (1991).

depicts different values of c/\$ for the different experimental conditions of our questionnaire survey.[7]

These figures clearly show that underwriters charge a much higher premium when there is probability ambiguity and/or loss uncertainty. To illustrate, consider the UST scenario where $p = 0.01$ and $L =$ \$1 million and the actuarially fair

Table 2–3. Actuary Estimates of Coverage per Dollar Premium ($c/\$$) for Computeez Scenarios for both Nonambiguous Probabilities (p) and Ambiguous Probabilities (Ap) (Median Values)

100,000 Units Insured
L = \$100

	Independent Risks			*Perfectly Correlated*		
	$p = 0.001$	$p = 0.01$	$p = 0.10$	$p = 0.001$	$p = 0.01$	$p = 0.10$
Actuarially fair	1,000	100	10	1,000	100	10
p	909	95	10	1,000	82	8
Ap	200	50	8	100	9	4

Note: The number of actuaries responding to these scenarios ranged from 14 to 22.
Source: Hogarth and Kunreuther (1992).

premium is \$10,000. Even for case 1 (p, L), the average $c/\$ = 57$, which is equivalent to a premium of \$17,500. For case 2 (Ap, L), the average $c/\$$ drops to 37, implying that the premium has increased to \$27,000. For case 4 (Ap, UL), the average value of $c/\$ = 31$, which translates into a premium of \$32,300. Both the neutral and earthquake scenarios show the same pattern among the four cases as the UST case, although the premiums are generally lower. This may reflect a greater uncertainty by these underwriters about the nature of the UST risk relative to the other two policies.

1.3 Actuary Survey

The underwriter survey focuses on a single risk so that no conclusions can be drawn between the impact of independence or correlation on the premiums charged. In an earlier survey, 489 actuaries were exposed to different scenarios where the probability of a loss was either known or ambiguous (Hogarth and Kunreuther [1992]). One of these scenarios, Computeez, involves a manufacturing company that wants to determine the price of a warranty to cover the \$100 cost of repairing a personal computer component. In this scenario, the actuaries were asked to specify premiums when losses were independent or perfectly correlated.

The median values of $c/\$$ presented in table 2–3 indicate that the actuaries specified considerably higher premiums for perfectly correlated risks than for independent risks when 100,000 units were insured. This behavior suggests that the actuaries are extremely risk averse. Contrary to the predictions of expected

utility theory, they reacted by increasing the premium (that is, by reducing c/\$) for the perfectly correlated case. For example, when $p = 0.01$, the actuarially fair c/\$ value is 100. The data in table 2–3 reveal that when losses are perfectly correlated and p is well specified, the median value is 82; it decreases to 9 when the actuary faces an ambiguous probability. The true probability would have to be $p = 0.111$ for this median premium to be actuarially fair.

These findings provide strong empirical evidence that both underwriters and actuaries are concerned with ambiguity and uncertainty when setting premiums for certain risks. A number of explanations for this behavior are possible, ranging from concern about having to justify their pricing decisions to others (Tetlock [1985], Curley, Yates, and Abrams [1986]) to the use of safety-first models, which are motivated by stability and insolvency constraints (Stone [1973]), and the use of anchors and reference points to set premiums (March and Shapira [1987]).

The empirical results also suggest that if these managers can accurately assess the risk associated with a particular hazard, they will considerably reduce the premium charged to the client. If information is available on the probability of a defective UST and on the expected replacement cost, private insurers may feel more comfortable providing coverage against this event. Earthquakes allow fewer possibilities in this regard, because they are relatively infrequent and because existing data on past quakes have been published and collected by the insurance industry. However, there may be opportunities to collect more detailed data on the nature of damage to different structures, which I will discuss in the concluding section of the paper.

2. Protective Actions by Homeowners and Businesses

What should constitute the decision-making process of a consumer or business considering the purchase of protection against a particular risk? Two protection options are possible: voluntarily purchasing insurance, and adopting loss-prevention measures. Each will be considered in turn.

2.1 Voluntarily Purchasing Insurance

Consider the following case, in which the prospective buyer has the option of buying full coverage or remaining unprotected. Figure 2–1 depicts a decision tree for the case where the buyer has wealth W and faces a loss L with probability p. If the individual purchases insurance, then her wealth is decreased by the premium z. If she decides to remain unprotected, in the event of an accident or disaster, she either loses L or declares bankruptcy (if $W < L$).

Individuals may not want to purchase insurance coverage for several reasons. People may underestimate the probability of a disaster or the magnitude of a loss, so that they perceive the premium to be too high relative to the potential benefits (Zeckhauser and Viscusi [1990]). A related form of behavior is the use of very simple heuristics or rules of thumb for coping with low-probability, high-consequence events. These rules reflect individuals' discomfort with probability as well as their limited ability to process information.

Tversky, Sattah, and Slovic (1988) conclude that individuals use a contingent weighting model in dealing with uncertainty. More specifically, people make biased trade-offs between the different probability and outcome dimensions associated with different alternatives. The perceived probability of an accident or disaster is the critical dimension for some problems. In such cases, people may decide not to purchase insurance because they feel the chances of their suffering a loss or injury are below a given threshold value. For example, presuming that a person's threshold probability level was $p^* = 0.01$, if this person perceived the chances of an earthquake occurring next year to be less than 0.01, then she would be likely to respond that the event "cannot happen to me."

If individuals or businesses have limited wealth, then they may not be able to afford insurance due to budget constraints, or they may decide to take their chances, and if an accident occurs, declare bankruptcy. Ringleb and Wiggins (1990) provide empirical evidence that since 1967, large firms have attempted to avoid liability for long-term latent hazards such as groundwater contamination by vertically divesting production tasks associated with these risks. Should specific consequences from such hazards be discovered, these small firms will declare bankruptcy when suits are filed. Thus, no incentive exists for these firms to purchase insurance against such risks. For example, a small business with assets of $500,000 may prefer not to voluntarily purchase UST insurance of $1 million for covering cleanups and third-party liability should a leak be discovered in its tank.

In the case of USTs, there is another good reason for not buying coverage. Let z equal the premium offered by a private company, and let s equal the premium for joining a state fund. The premium z normally consists of an annual fee per tank (say, $40) and a tax on the gasoline sold by the distributors who service the tank owner (say, 2 cents per gallon). If the tank owner runs a small business with severe budget constraints, he is likely to choose the cheapest policy (that is, the state fund) if required to show financial responsibility by the EPA. In making this decision, he may recognize that the state fund has limited reserves, so that he may still have to declare bankruptcy if his tank leaks. Larger businesses and commercial lenders may prefer to purchase private insurance coverage rather than take the chance that the state fund will be unable to pay off a large future claim they might make.

2.2 Adopting Loss-Prevention Measures

The decision by a homeowner or a business to adopt a loss-prevention measure is similar in spirit to a decision on whether to purchase insurance. There is a cost (M) of adopting the measure, and there are benefits in the form of either a lower probability (p') of a disaster or accident occurring and/or a smaller magnitude of the resulting loss (L'). The first case is illustrated by retrofitting a UST with corrosion protection, thus reducing the probability of a leak during the life of the tank. An example of the second case is installing a lead-detection device on a UST so that any damage from a corrosive tank can be contained, hence limiting the loss to L'. In the case of earthquake measures, there is little that a homeowner can do to reduce the probability of a quake short of moving his structure further from the fault line. With respect to loss-prevention measures, the owner can strap large appliances to the dwelling's structural frame to reduce the damage to L' should a quake occur.

To illustrate the trade-offs associated with either type of loss-prevention measure, assume that the individual is risk neutral so that a simple benefit–cost comparison can be made.[8] If the structure is expected to last for T years, then the annual amortized cost for the measure is determined by finding m so that

$$\sum_{t=0}^{T} m/(1+d)^t = M .$$

For example, if $T = 5$ years, the annual discount rate $d = 0.05$, and $M = \$1{,}000$, then $m = \$231$.[9]

For the case where the annual probability is reduced from p to p', loss-prevention measures would be viewed as desirable if $m < (p - p')L$. For example, if $p = 0.01$, $p' = 0.005$, and $L = \$100{,}000$, then if $m < \$500$, such a measure would be considered attractive. In the case where the action reduces losses from L to L', the relevant comparison for adoption is that $m < p(L - L')$. Thus, if $L = \$100{,}000$, $L' = \$60{,}000$, and $p = 0.01$, then a measure with a discounted cost $m < \$400$ would be a desirable one to adopt.

As pointed out in the introduction of this paper, there is considerable evidence that few homeowners adopt loss-reduction measures for earthquakes and that a large number of USTs are currently leaking, implying that relatively few of the tanks have been inspected. Some of the reasons why individuals have not adopted these measures may be similar to those that have led homeowners to remain uninsured: underestimation of p, threshold models of choice, and budget constraints.

Homeowners or businesses may not adopt a protective measure for yet another reason. They may focus on the relatively large up-front expenditure associated with the measure (M), not recognizing that the potential benefits will be reaped as long

as the structure is in place. If one thinks of the investment as reaping a return only over the coming year rather than over a longer time horizon, then the investment will often be viewed as unattractive. Recent empirical studies suggest that individuals are myopic and do not consider long time horizons in their planning decisions (Lowenstein and Prelac [1989]).

Finally, if insurance is purchased for protection against losses, then mitigation measures may be discouraged. In their seminal piece, Ehrlich and Becker (1972) indicate that market insurance has two opposite effects on the incentive to adopt these measures. On the one hand, it discourages the adoption of protective activities by reducing the difference between the incomes in the disaster and nondisaster states of the world. On the other hand, it encourages individuals to adopt mitigation measures if the insurance premiums reflect the decrease in expected loss. The actual impact depends on the degree of risk aversion by the individual, the loading charge on insurance, and the costs of the mitigation activity relative to the reduction of risk.

3. Implications for Policy

The above discussion indicates that the private market for insurance and mitigation against ambiguous risks such as quakes and USTs is likely to be very thin because of imperfections on both the supply and demand sides.

With respect to the supply side, underwriters and actuaries will want to place a surcharge on their premiums for risks where there is uncertainty in either p, L, or both. Data on underwriter and actuary pricing behavior suggest that both of these agents will want to charge a premium on ambiguous risks that is high enough to justify offering coverage to themselves and others in the firm.

Regarding the demand for protection, most homeowners and firms are reluctant to purchase insurance coverage or to adopt loss-reduction measures, because they do not perceive that the expected benefits from such actions are worth the costs. This could stem from a combination of factors ranging from misperceptions of the risk, the use of threshold models of choice, myopic behavior, and the knowledge that they can declare bankruptcy should they be personally responsible for repairing any damage or covering the loss from a specific event.

Why should we be concerned about the failure of the private market to provide adequate protection prior to a disaster? First, some risks have the potential of creating severe financial and environmental disruption on a rather broad level. Consider the record of disaster relief in the mid-1960s to the early 1970s for graphic evidence on the special measures that were passed to help uninsured victims of floods, earthquakes, and hurricanes. For example, following tropical storm Agnes in 1972, the federal government offered forgiveness grants of up to $5,000 as well

as 1 percent loans to those uninsured homeowners and businesses who suffered damage, providing more than $1.2 billion in loans and $544 billion in grants (Kunreuther [1973]). Flood insurance at highly subsidized rates had been available in many areas hit by the storm, but very few policies had been sold.

Indirect losses may be incurred from a disaster or accident, which may not be part of an individual's calculation when determining whether to adopt mitigation measures voluntarily. In the case of earthquakes, losses due to injury, death, or business interruption may be as great as the direct property losses.[10] But because these factors are not part of property insurance coverage, the premium reduction from adopting mitigation measures will not reflect these elements. In the case of USTs, severe health and environmental risks arise from the thousands of leaky tanks that owners have not inspected for fear the tanks would have to be repaired or replaced at a cost perceived as prohibitively expensive.

4. A Proposed Private–Federal Insurance and Mitigation Program

A proposed program outlined below is designed to encourage the insurance industry to provide coverage against risks such as earthquakes and USTs at lower rates than are currently available. At the same time, it appears necessary for either the government or financial institutions to require homeowners and businesses to purchase insurance protection and adopt loss-mitigation measures. To the extent that data are collected on the status of USTs, the insurance industry should be able to estimate the probability that a tank will leak and the potential damage this would cause.

4.1 Improving Risk-Assessment Techniques

The basic principle of insurance is to set premiums based on risk. In the case of earthquake risk, limited data are available on which to base premiums. In the past few years, the insurance industry and the Federal Emergency Management Agency have undertaken a number of studies, whose results have enabled them to more accurately characterize the risks of different structures (Earthquake Project [1990]) and the impact of alternative mitigation measures on damage from a quake (Dames and Moore [1990]). Insurance premiums should reflect these differences in risk so that consumers pay a fair price and have incentives to adopt loss-prevention measures.

4.2 Financial Responsibility or Mandatory Insurance

In order to provide protection to victims of a natural disaster (earthquake) or environmental disaster (UST leakage), it is essential that the homeowner or business show financial responsibility to cover its losses. With respect to earthquakes, banks and

financial institutions that issue federally insured mortgages can require homeowners to purchase an earthquake rider that would be attached to their standard homeowner policy.[11] This requirement would severely reduce the chances that the federal government would be forced to offer liberal disaster relief should a catastrophic quake occur.

In the case of USTs, there is no reason why the financial requirements stipulated by the EPA should be delayed any further. State funds need to provide a plan for covering losses from USTs if their limited reserves are exhausted; otherwise they should cease to exist, because they are likely to provide a false sense of security to potential victims. A private insurance market exists for coverage against USTs, and this type of protection should be encouraged.

4.3 Require Mitigation Measures

In the case of earthquakes, a number of cost-effective mitigation measures can provide substantial benefits in the form of minimizing damage to property, saving lives and injuries, and reducing disaster relief for such expenditures as temporary housing and business interruption. Few homeowners adopt these measures voluntarily, and mandatory insurance will make them less attractive than if the homeowners were uninsured (Kunreuther and Kleffner [1992]). Building codes and investment incentives, such as subsidized loans, may be necessary in order to avoid large-scale damage and federal assistance following a catastrophic quake.

For USTs, insurers can require all small businesses to have an inspection or environmental audit to determine the current condition of their tanks and the nature of the risk. If certain tanks need to be repaired or removed, then the EPA must enforce these regulations. Many small businesses claim that they cannot afford these expenditures and may have to declare insolvency if such action is required. In such a situation, the choices facing the EPA and other federal agencies are not easy ones: If they want to preserve these small businesses, they could institute a long-term, low-interest loan program to assist them if their balance sheet indicates a need for funds. The other alternative is to call the firm's bluff and see whether it can scrape up enough money to repair or replace the tank.

4.4 Federal Involvement in Insurance

Given the impact of ambiguity and uncertainty on the insurance pricing-decision process, some type of federal government involvement may help to reduce premiums over what they would otherwise be. In the case of catastrophic losses, it appears that probability ambiguity will lead to much higher premiums than if the chances of a disaster were well specified. A consortium of insurance companies has recommended that the government set up a new federal earthquake corporation

to collect premiums and cover losses (Litan [1991]). A principal motivation for this program is to reduce rates from their current levels so that ambiguity would become less of an issue and so that the federal corporation would not be taxed on reserves for a big quake, as private companies are.

Another option that could be considered for either earthquakes or USTs includes elements of the German pharmaceutical pool and the U.S. nuclear liability insurance protection pool. This proposed three-tiered system involves a well-specified risk-sharing arrangement among the insured party, the insurer(s), and the federal government (Doherty, Kleindorfer, and Kunreuther [1990]). The first layer of protection is self-insurance by the homeowner or business, equivalent to a deductible on an insurance policy. This feature produces an incentive for the insured to adopt loss-mitigation measures beyond those that are required if it determines that by taking these steps it can reduce its potential losses. In addition, the deductible reduces or eliminates moral hazard problems.

The second layer could be offered by private insurers and mutual insurance pools. A consortium of insurance companies could form an earthquake pool and combine the premiums received from mandatory coverage to build up reserves for a catastrophic quake. Similarly, an insurer could form a mutual company consisting of UST owners, all of whom contribute to a fund for covering potential losses. Precedence for such an arrangement comes from the German pharmaceutical pool, a group of insurers and reinsurers from all over Europe, and from the two U.S. insurance pools formed in 1957, as part of the Price–Anderson Act, to provide nuclear power plant operators with liability coverage. Mutual pools are difficult to form because each potentially insured client may feel she is the safest on the block and therefore would not be comfortable taking coverage from such a concern. Hence, premiums need to be based on risk, and the operations of the insured should be closely monitored and controlled to reduce the potential for moral hazard.

Finally, the third layer requires some type of government involvement for losses above a specified limit in the second layer. For example, in the case of earthquakes, the limit could be a catastrophic quake exceeding $10 billion in damages. For USTs, there would be a limit (currently between $500,000 and $2 million, depending on the scale of the operation) on the insurer's responsibility for paying the costs of groundwater contamination from tank leaks. A government agency would be responsible for levying fees on the insurer for catastrophic quake losses or on the UST owners for covering losses in excess of the limits in layer two. The Price–Anderson Act offers a precedent for such an arrangement. The fee would be based partially on the degree of risk faced by the insurer or UST owner.

The principal objective of the third layer is to provide compensation to victims. The incentives for encouraging risk-reduction measures by homeowners and businesses lie in the first two layers of coverage and the required mitigation measures.

5. Conclusion

The two examples presented in this paper illustrate the impact of ambiguity and uncertainty on the failure of the private market to allocate risk between key stakeholders. Insurers are reluctant to provide coverage except at highly inflated premiums; homeowners and businesses behave as if the event in question will not happen to them. The costs of protection are generally viewed as too high relative to the expected benefits in the form of reduced losses or insurance coverage.

The program outlined above has a carrot-and-stick quality. The government assumes some of the risk-bearing with respect to catastrophic losses while imposing requirements for homeowners and businesses to reduce the chances of such large losses occurring. Risk assessment is an important part of the program so that costs can be allocated appropriately across all interested parties. Each particular problem has its own institutional arrangements that need to be recognized in designing the details of any specific program. The challenge is in finding an appropriate mix of public- and private-sector involvement for dealing with risks where there is considerable ambiguity and uncertainty.

Notes

1. Deadlines for compliance with these financial responsibility requirements were postponed by the EPA. Those owning between 13 and 99 tanks were required to meet these requirements by April 26, 1991; those with fewer than 13 tanks had until October 26, 1991, as did local governments who own and operate USTs. Federal and state governments are immune from the rules (Schachner [1990]).

2. The indifference premium to charge for the risk-neutral case is $r = 0.2$. One can easily determine that at this value, the expected utility equals 0, the same as if no insurance policies had been issued.

3. The questionnaire instructions stated that pure premiums should exclude "loss-adjustment expenses, claims expenses, commissions, premium taxes, defense costs, profits, investment return, and the time valuation of money."

4. If the best estimate is $1 million, then the respective minimum and maximum values might be 0 and $2 million.

5. Because the underwriters are providing full insurance in all cases, coverage is the same as the actual loss.

6. In general, $c/\$ = 1/p$ for an actuarially fair pure premium. Thus, whenever $p = 0.01$, $c/\$ = 100$; if $p = 0.005$, then $c/\$ = 200$ no matter what the loss.

7. For the case in which loss was uncertain (UL), the best estimate of loss (which by definition was L) was utilized to determine $c/\$$.

8. If the person is risk averse, then one must compare utilities in different states of the world, but the same type of trade-off as described below will be appropriate.

9. This calculation is based on the assumption that there will be no accident or disaster over the five-year period, or that if there were a disaster the mitigation measure would be intact, so that the $1,000 cost would not have to be incurred if the structure were rebuilt.

10. See Kunreuther and Kleffner (1992) for a comparison of the impact of two specific loss-reduction measures on direct property losses as well as indirect losses.

11. A homeowner policy is normally required as a condition for a mortgage to protect the bank against fire, wind, and other potential losses to the property and contents.

Appendix

Your insurance company has been asked to underwrite four different risks. You are given some information on which to base an annual premium. No other information is available, and no new information will become available before setting the premium.

For each of the four risks, assume that the policy limit is $2 million. That is, the maximum your company will pay out is $2 million for the year coverage is offered.

1. ***p, L***

For risk one you learn that:

- Estimates of possible insured loss: All experts agree that if a loss occurs, it will equal $1 million.
- Estimates of annual probability of loss: All experts agree on 5 in 1,000.

Question: What is the minimum premium you would charge to accept this risk? _____

Comments: _____

2. ***Ap, L***

For risk two you learn that:

- Estimates of possible insured loss: All experts agree that if a loss occurs, it will equal $1 million.
- Estimates of annual probability of loss: 5 in 1,000. However, there is wide disagreement on this figure and a high degree of uncertainty among the experts.

Question: What is the minimum premium you would charge to accept this risk? _____

Comments: _____

3. ***p, UL***

For risk three you learn that:

- Estimates of possible insured loss: Experts' best estimate is that if a loss occurs, it will equal $1 million. However, estimates range from negligible to $2 million.
- Estimates of annual probability of loss: All experts agree on 5 in 1,000.

Question: What is the minimum premium you would charge to accept this risk? _____

Comments: _____

4. ***Ap, UL***

For risk four you learn that:

- Estimates of possible insured loss: Experts' best estimate is that if a loss occurs, it will equal $1 million. However, estimates range from negligible to $2 million.
- Estimates of annual probability of loss: 5 in 1,000. However, there is wide disagreement on this figure and a high degree of uncertainty among the experts.

Question: What is the minimum premium you would charge to accept this risk? _____

Comments: _____

References

Curley, S., Yates, F., and Abrams, R. 1986. "Psychological Sources of Ambiguity Avoidance." *Organizational Behavior and Human Decision Processes* 38: 230–256.

Dames and Moore. 1990. *Loss-Reduction Provisions of a National Earthquake Insurance Program.* Prepared for the Federal Emergency Management Agency, FEMA-200, September.

Doherty, N., Kleindorfer, P., and Kunreuther, H. 1990. "Insurance Perspective on an Integrated Hazardous Waste Management Strategy." *Geneva Papers on Risk and Insurance* 57: 407–427.

Duus, G., and Telsey, A. 1990. "Underground Storage Tank Update." *Journal of Property Management* 55 (March/April): 54–57.

Earthquake Project. 1990. *Catastrophic Earthquakes: The Need to Insure against Economic Disaster.* Boston: National Committee on Property Insurance.

Ehrlich, I., and Becker, G. 1972. "Market Insurance, Self-Insurance, and Self-Protection." *Journal of Political Economy* 80: 623–648.

Greenwald, B., and Stiglitz, J. 1990. "Asymmetric Information and the New Theory of the Firm: Financial Constraints and Risk Behavior." *American Economic Review: Papers and Proceedings* 80: 160–165.

Hogarth, R., and Kunreuther, H. 1992. "Pricing Insurance and Warranties: Ambiguity and Correlated Risks." *The Geneva Papers on Risk and Insurance Theory,* forthcoming.

Kunreuther, H. 1973. *Recovery from Natural Disasters: Insurance or Federal Aid?* Washington, D.C.: American Enterprise Institute.

Kunreuther, H. 1989. "The Role of Actuaries and Underwriters in Insuring Ambiguous Risks." *Risk Analysis* 9: 319–328.

Kunreuther, H., and Kleffner, A. 1992. "Should Earthquake Measures Be Voluntary or Required?" *Journal of Regulatory Economics,* forthcoming.

Kunreuther, H., Ginsberg, R., Miller, L., Sagl, P., Slovic, P., Borkan, B., and Katz, N. 1978. *Disaster Insurance Protection: Public Policy Lessons.* New York: John Wiley and Sons.

Kunreuther, H., Hogarth, R., Meszaros, J., and Spranca, M. 1991. "Ambiguity and Underwriter Decision Processes." Working Paper #91-10-03, Wharton Risk and Decision Processes Center.

Litan, R. 1990. "Insurer Insolvency and Earthquake Insurance: Lessons from the Thrift Crisis." Address to the Government Briefing Luncheon of the Insurance Information Institute, Washington, D.C., June 12.

Litan, R. 1991. *A National Earthquake Mitigation and Insurance Plan: Response to Market Failures.* Boston: The Earthquake Project.

Lowenstein, G., and Prelac, D. 1989. "Decision-Making over Time and under Uncertainty: A Common Approach." Russell Sage Foundation.

March, J., and Shapira, Z. 1987. "Management Perspectives on Risk and Risk Taking." *Management Science* 33: 1404–1408.

Mayers, D., and Smith, C. 1983. "On the Corporate Demand for Insurance." *Journal of Business* 55: 281–296.

Mayers, D., and Smith, C. 1990. "On the Corporate Demand for Insurance: Evidence from the Reinsurance Market." *Journal of Business* 63: 19–40.

Oullette, R., and Maestri, B. 1990. "Conducting the Environmental Audit." *Journal of Property Management* (March/April): 16–20.

Palm, R., Michael, H., Blanchard, R.D., and Lyons, D. 1990. *Earthquake Insurance in California: Environmental Policy and Individual Decision Making.* Boulder, Colo.: Westview Press.

Ringleb, A., and Wiggins, S. 1990. "Liability and Large-Scale, Long-Term Hazards." *Journal of Political Economy* 98: 574–595.

Schachner, M. 1990. "Rules Will Reduce Storage Tank Leakage." *Business Insurance* 24 (May 14): 67.

Shalowitz, D. 1990. "Insurers Blast Funding of State EIL Agencies Despite EPA Approval." *Business Insurance* 24 (October 3): 18–21.

Steinbrugge, K., McClure, F., and Snow, A. 1969. *Studies in Seismicity and Earthquake Damage Statistics.* Washington, D.C.: U.S. Department of Commerce (Appendix A), COM-71-00053.

Stone, J. 1973. "A Theory of Capacity and the Insurance of Catastrophic Risks." *Journal of Risk and Insurance* 40 (Parts I and II): 231–243 and 339–355.

Tetlock, P. 1985. "Accountability: The Neglected Social Context of Judgments and Choice." *Research in Organizational Behavior,* vol. 7. Greenwich, Conn.: JAI Press.

Tversky, A., Sattah, S., and Slovic, P. 1988. "Contingent Weighting Judgment and Choice." *Psychological Review* 95: 371–384.

Zeckhauser, R., and Viscusi, W.K. 1990. "Risk within Reason." *Science* 248: 559–564.

Commentary

Edward J. Kane

Howard Kunreuther develops some intriguing hypotheses about the appropriate role of federal government intervention in markets for catastrophic insurance. His analysis is based on a generalized binomial model of a high-severity and low-frequency loss. His ungeneralized stochastic model has two known parameters: one for severity, L, the amount of the potential loss; and one for frequency, p, the probability with which L occurs.

His generalizations of this model consist of subjecting each of these parameters to symmetric Knightian uncertainty, which he terms "ambiguity." Formally, either type of parameter uncertainty converts the discrete binomial loss process into a symmetric continuous distribution. To keep the exposition intuitive, Kunreuther treats cases in which the parameter uncertainty can be assumed to follow a rectangular distribution.

Seeing the word "ambiguity" linked with "government risk-bearing" in the paper's title led me to expect a different model. The model I anticipated would have included a third uncertain parameter, X, designed to capture the government's anticipatable "bailout potential." This severity-mitigating additional random variable would measure the extent to which government officials could be pressured in the event of loss to deliver free coverages that they had not formally contracted in advance to provide. The insureds' effective loss is $L - X$. In our compassionate society, X may be portrayed as an *increasing* function of the variable L, the extent of popular and bureaucratic identification with the victims, and a time trend of some kind. Zero relief is a special case that, because it stands asymmetrically at one end of the spectrum of variation, cannot be an unbiased estimate of $E(X \mid L)$.

To me, this unpriced potential for voluntary ex-post bailout is the most "ambiguous" feature of federal insurance and guarantee programs. In catastrophic situations, government managers have proved remarkably willing not to enforce—as a private insurer would—the coverage limits and underwriting standards that were written into their formal contractual commitments. In this respect, a mitigating or risk-bearing government behaves more like a loving parent with deep pockets than like a profit-maximizing insurance company. If a private corporation were to behave so generously toward its insureds, its insurance reserves would rapidly become inadequate and its insurance guarantees worthless. Limited liability would cap its stockholders' losses, and its stock price and customer base would fall toward zero to encourage the firm's takeover by more efficient management.

Government managers are tempted to expand insurance coverages and to lower underwriting standards unilaterally when substantial losses occur. They do so for two reasons. First, generous treatment of troubled clients mutes public criticism of their prior performance in controlling risk-taking, thereby preserving their reputation as shrewd public servants until they can make a clean getaway to another job. Second, they are playing with other people's money. The government's *unlimited liability* makes their enterprise's explicit reserves unimportant and greatly attenuates the extent of any observable decline in the value that customers attach to their insurance services.

I believe that, in earthquake and underground-tank-leakage insurance markets, potential suppliers and customers clearly recognize the value of the government's bailout or relief propensity. This leads me to blame the government's unlimited liability and the short horizons and career conflicts of public servants for generating much of the empirical evidence of market breakdown or of twin "reluctances" that Kunreuther observes. On the demand side, it is reasonable for parties at risk to scale back on costly loss-reduction activities when they believe that the government will pick up a good portion of any losses. On the supply side, private insurers—such as mortgage insurers—need not build up the financial capacity to cover ruinous losses because they can rationally expect to be bailed out if losses turn out to be too large for them to handle. In fact, stockholders of relatively well-capitalized institutions ought to *expect* to be penalized for having capital or reserves to throw at the disaster.

Please understand that I am merely offering an alternative reading of the survey data that Kunreuther uses. Where he sees an exogenous private propensity to be myopic and to underestimate risks as reasons why individuals operate in an underinsured state, I see an endogenous private response to a propensity for government officials to underprice and mismanage implicit insurance programs. I don't deny that his reading might be part of the story; I just don't think that it is the most important part.

In any case, I find it rash to build a case for government intervention in a class of markets on a few shards of possibly unrepresentative empirical data that may be interpreted alternatively as evidence that market participants already anticipate economically inefficient government intervention. A more conservative path of policy reform would be to repair the glaring defects that exist in the accountability of state and federal government insurance and relief programs before expanding government insurance schemes.

Accountability must start with collecting information on movements over time in the *actuarial potential* for loss from different types of catastrophe and on the costs and effects of policies meant to reduce this actuarial value. Next, the information collected must be framed to measure the *economic performance* of officials specifically responsible for catastrophic relief. Finally, government officials must face rewards or penalties that are keyed in some way to the quality of their performance.

The point is twofold. First, what is not adequately measured cannot adequately be managed. Second, managers who are not held to *meaningful* performance standards will tend to underserve their principals' interests.

In recent years, such underperformance has proved to be the rule for deposit-insurance managers. Risk assessments made as part of the examination process have been and continue to be kept secret, even though such information could be used to strengthen market discipline. Protective measures such as capital requirements have been administered in perverse ways that have delayed and prevented the exit of insolvent and inefficient firms. This has expanded rather than controlled the losses accruing to the bank and savings and loan insurance funds.

3 Public Insurance of Private Risks: Theory and Evidence from Agriculture

Brian D. Wright

Government risk-bearing in the financial sector has been increasing rapidly in recent years, apparently without any overall economic rationale. Now that the appropriate government role in handling private-sector risks is being reassessed, it is worthwhile to examine both the long history of public involvement in agricultural risk-bearing and its economic implications, which may hold some lessons for the financial sector. The economic puzzles in the two industries are refreshingly different, yet intriguingly similar.

Farming is an inherently risky activity encompassing unusually great price risk, as well as yield risk from weather and other natural disturbances. Farmers' susceptibility to these risks is exacerbated by the generally limited diversification of their investment portfolios.

Heavy government involvement in agricultural risk-bearing in the United States dates from the start of the Roosevelt administration, during the Great Depression. Most major programs involving transfers to farmers cite help with risk management as a major explicit rationale, even if that is not their *raison d'être*. Such programs include price supports through target prices and deficiency payments; nonrecourse loans; farmer-owned grain reserves; marketing loans; acreage controls; supply controls via marketing orders; public irrigation investments and water supply subsidies; favorable tax treatment; and crop insurance and disaster payments. Support is also important at the intersection of the agricultural sector and the financial system, represented by the Farm Credit System and the Farmers' Home Administration.

The cost of all these interventions is quite significant relative to the agricultural sector's share of GNP, and the diversity of instruments provides a variety of telling experience. In particular, the most direct "risk protection" mechanisms are related in the financial and agricultural industries. In agriculture, price risk for major crops is covered by target price schemes that, in combination with loan programs, guarantee a minimum price for participants — a kind of implicit put option. (Quantity risk is covered separately under federal crop insurance programs, which guarantee a minimum yield.) Participation in these programs is voluntary for farmers. Similarly, in banking (broadly defined), the Federal Deposit Insurance Corporation (FDIC) and the Federal Savings and Loan Insurance Corporation (FSLIC) convert risky deposits into risk-free loans via an implicit put option (Merton [1977]). This gives a bank the right to sell its assets to the insurance fund at an exercise price equal to the face value of its obligations to insured depositors.

In addition, both industries benefit from emergency assistance on an ad hoc basis. Disaster assistance covers farmers' losses when aggregate losses are significant, usually regardless of participation in crop insurance programs. In banking, uninsured deposits are frequently protected from loss by ex post government intervention.

The *private* responses to, and management of, agricultural risks may be even more relevant for banking policy than the history of public interventions. Bankers (understood to include savings and loan [thrift] managers for purposes of this discussion) appear to face risk-management challenges similar to those of farmers. Like farmers, they must evaluate the prospects of potential investments that carry both a high degree of idiosyncratic risk and significant market-related risk. In both professions, skill, experience, and intimate local knowledge are vital in reducing the risk of resource allocation decisions. Moreover, the agricultural sector produces commodities that are held in inventories, the demand for which is analogous to the demand for bank deposits.

In what follows, I concentrate on those features of banking for which insights from agriculture and the commodities markets might be most pertinent. These include fractional reserves, bank runs and speculative attack, idiosyncratic versus

systematic risks, and the pitfalls of publicly protecting against such risks. The paper then turns to the crop insurance program and agricultural disaster assistance, the histories of which are most informative for discussions of deposit insurance reform.

1. Fractional Reserves

What distinguishes banking from other industries? Government guarantees to back up fractional reserves are one obvious answer. Fractional reserves mean that circumstances can arise in which some parties' claims must go unsatisfied, absent government intervention. Currently, the government stands in the background ready to expand the supply of reserves as needed. In the absence of such support, could depositors tolerate a fractional reserve system that usually satisfies their demands for settlement of claims, but sometimes fails to do so?

Some depositors certainly could. The commodity trade provides three examples. Commodity futures markets, which provide liquidity to the trade, often have much more open interest (and thus outstanding commitments for future delivery) than amount of deliverable stock. Open interest typically declines as the maturity date approaches. Although the percentage of contracts delivered on is much greater than commonly believed (10 to 20 percent of peak open interest, according to Williams and Peck [1991, p. 6]), most are liquidated by offsetting transactions, without delivery.

Occasionally, however, more longs want delivery than shorts can offer. When this happens (often called a "squeeze"), some allocation method rations the available supply, and at least some parties (usually the longs) are quite disappointed, to say the least. Does this mean that such contracts are avoided? Not at all! The risk of such liquidation problems makes the contracts imperfect instruments for long hedging, but judging by the volume of use, they are still valued by traders relative to the best substitutes (for example, forward contracts fully backed by deliverable supplies). Presumably, the price of the contract adjusts in equilibrium for the expected possibility of delivery problems.

A second example is *force majeure* in forward contracts. A contract for forward delivery may be interrupted by the supplier, without full liability, when an "Act of God" makes delivery impossible. The definition of such a condition involves a rather broad interpretation of divine intervention; sometimes, it seems that "the price is too high" is all that is needed. This possibility of nonfulfillment means that the contract comes with a type of call option for the supplier, which is presumably factored into the price. It does not prevent such contracts from being written.

A third example, for which I am indebted to Jeffrey Williams (1984; 1986, pp. 155–156; and 1991), is less clear but perhaps more directly relevant to banking. Between 1859 and 1870, certain grain warehouses in Chicago acted as depositories, issuing certificates to the grain owners that were negotiable and usable as collateral

for loans. Occasionally, when a warehouse burned down, it became apparent to all (via the insurers) that the claims represented by the certificates exceeded the physical stocks lost. (Sometimes, the "floor" under the grain held in the warehouse was found to be higher than customers had expected.) In effect, the situation represented an informal fractional reserve system in the market for grain, with reserves totaling perhaps 50 percent of deposits. This appears to have had implicit recognition in the market: Evidence shows that bankers made distinctions between different warehouses based on the reliability of their collateral (Williams [1984]).

It is not at all clear that this fractional reserve grain system was suboptimal or economically undesirable. It did not need government backing to make it work. On the contrary, it took the force of law to *stop* it. The effects of prohibiting such practices have not necessarily been benign. By artificially increasing the benefits of vertical integration, the ban on fractional reserves may well have encouraged the high concentration seen in the grain-handling market.

These examples show that at least some depositors are willing to participate in a system that they recognize will not always immediately or completely honor their claims when it comes time for withdrawal. But this does not mean that the average consumer will be willing to patronize banks that do not consistently honor their deposits. I think an excellent case can be made for the kind of "narrow" bank that Robert Litan (1987) proposed a number of years ago. By using such banks, average small depositors with no special monitoring ability could be sure that aggregate personal deposits approximately equal to their monthly paycheck (or even perhaps to their annual income) would be honestly and safely handled, in exchange for a lower rate of return. The government, if it insured such deposits, would restrict narrow banks' investments.

But the U.S. deposit insurance system provides a much wider guarantee of deposits than needed to cover the above requirements. The average consumer does not need guaranteed immediate access to anything approaching $100,000. I know of an executive at a major stockbroking firm whose primary responsibility was to allocate money balances from the company among insured $100,000 deposits in banks across the country. I understand that this task had not been worthwhile when the insurance ceiling was $40,000, but that it became cost effective when the limit was raised to $100,000. What this means is that much of the private surplus coming from the operation was going right back into administrative costs. The transfer from the government to depositors must have been tremendously inefficient. Thus, the argument for guaranteeing very large deposits (more than $1 billion per depositor, with one deposit per bank) seems much weaker than the case for publicly subsidizing small deposits in narrow banks.

If large depositors need this security, then let them have it — as long as they are willing to pay the full cost of the operation, including public monitoring. By

analogy with other insurance markets, I suspect that an unsubsidized "safe" bank would find that many of its customers prefer an arrangement that includes copayments of losses. For example, one might observe uninsured exposure at least equal to the annual rate of interest offered on the deposit. The only rationale I can think of for not stipulating copayments is the concern that such exposure would lead to bank runs.

2. Bank Runs and Speculative Attack

A plausible argument for government intervention is that, in its absence, bank runs will occur as a sporadic depletion of reserves. A run on one bank, the argument goes, could spread to others and generate negative externalities, disrupting the workings of credit markets if a large-enough portion of the banking sector is affected. If the credit markets are so disrupted, their valuable intermediation function might be curtailed to the point that economically productive investment opportunities would go begging, significantly reducing overall economic activity. (Bernanke [1983], for example, argues that this happened during the Great Depression.[1])

Notice that the government intervention argument has several parts. To take the last part first, the claim that a closed, crippled, or overcautious banking sector could significantly disrupt the economy seems reasonable. But today, banks are relatively less important features of the financial landscape than they were in 1929. Thus, one must ask to what extent the rise of close substitutes for banks would make a collapse of true banks less catastrophic now than in the 1930s.

I find the first part of the argument less convincing. A multitude of studies defending the performance of private banking in the United States since the turn of the century has been used to support both sides of the issue regarding banks' vulnerability to runs. A brief reading of this history indicates that a fractional reserve system has worked effectively in well-managed private banking systems. For example, consider the Suffolk System in effect in New England between 1824 and 1858 (see England and Huertas [1988]). Runs were prevented by prudent private-sector monitoring of the management of correspondent banks, which held deposits in the Suffolk Bank to back the redemption of their notes. As Hammond (1957) puts it:

> The Suffolk was in effect the central bank of New England. It was doing what the Bank of the United States should and might have done for the country as a whole. (p. 554)

His summation of the Suffolk Bank's performance is instructive:

> The operations of the Suffolk Bank show laisser-faire at its best. With no privileges or sanctions whatever from the government, private enterprise developed in the Suffolk an efficient regulation of bank credit that was quite as much in the public interest as public regulation could be. (p. 556)

I quote these passages neither as the last word on private central banking nor with pretensions to be a financial historian, but to encourage a second look at an apparently widespread impression among economists that the history of the last century demonstrates that public guarantees are necessary for the proper operation of a banking system. I add as a postscript for those whose interest has been sparked that the decline of the Suffolk System may have been at least partly due to government intervention, rather than to the lack of same. In 1858, the Bank of Mutual Redemption challenged the legality of Suffolk's redemption of New England bank notes, claiming that its own charter from the State of Massachusetts gave it the exclusive right to engage in this activity (see Hammond, pp. 554–555, for more on this).

The historical digression above suggests that private banking is not necessarily unstable.[2] But if this is true, why do bank runs sometimes occur? In addressing this question, it is helpful to note that runs have taken place on commodities other than money. But runs occurring as discontinuous changes in an institution's stocks have not, to my knowledge, been seen in private markets that are free to adjust prices. Runs are not a sign of failure of the free market. Rather, they are artifacts of governmental or other constraints on price adjustments. In agriculture, runs appear as a "speculative attack" by private storers on a public buffer stock that is offered for sale at a fixed price. If the public stock declines to a certain level S^*, it will be bought in full by the private sector in a run or attack on the stockpile. When private stocks rise to the same level S^*, they are all dumped into the public stockpile. Large offsetting changes of this type are seen in grain stocks held both by the Commodity Credit Corporation and by private storers in the United States. Runs might also be seen when a country defends a disequilibrium exchange rate by selling gold or other reserves.

These attacks are generally viewed as pernicious, especially by planners and public stockpile operators. I am not so sure they are right. When the buying attack occurs, the change in stock ownership is abrupt. However, the price does not jump, but changes smoothly with further declines in total stocks (Salant [1983]). If, on the other hand, the run is prevented (by banning private holdings, for example), the price stays constant and stocks remain in public hands until exhausted. *Then* the price jumps discontinuously. In Wright and Williams (1989), we claim that speculative attack on a commodity stock is consumption-stabilizing for commodity markets, enabling the market to anticipate shortages and to make the price path less risky than it would otherwise be. The abrupt shift in stocks is due to the stock manager's refusal to adjust prices as supply and demand change.

Does this rather heterodox insight have relevance for bank regulation? I think it might. Why not make the cost of withdrawals to speculators reflect the cost to the economy? When reserves are adequate, this figure would be negligible. When reserves are low, the cost *should* be high. If the depositor pays the full social marginal cost when he makes a withdrawal, runs would be no problem from society's viewpoint.

I realize that attempting to apply this idea directly to banks in the current operating environment would cause problems, even if such temporal discrimination between depositors were legal. Deposit insurance on the one hand, and limited manager liability on the other, would prevent efficient market pricing of withdrawals. Therefore, the government would have to set the shadow price, which would be different for each bank in each time period. This is a formidable problem. One way around it is to approximate such pricing with a step function, where the step is located by a reserve-ratio requirement, with penalty rates imposed on public loans to cover shortfalls. Craine (1991) suggests that this is a reasonable approach. Using Black–Scholes pricing, he shows that the private value of deposit insurance (the value of the put) is a highly nonlinear (upward-bending) function of the required ratio of subordinated debt plus capital to assets. For a range of portfolio risks that he considers reasonable, a 15 percent capital requirement would keep the portion of publicly insured bank liabilities highly secure, as long as uninsured depositors are made to recognize their exposure and do not anticipate the kind of de facto public protection they have recently received. (Crain finds the value of the put to be less than the old insurance premium of 1/12 of 1 percent.)

The idea of controlling runs through capital requirements is not new; it is essentially the policy that was followed successfully in the United States from 1934 to the early 1970s. If public insurance policy indeed exists to protect depositors, it should be designed along these lines. Current policy, however, seems to have a quite different function: protecting banks against credit risk, interest-rate risk, and fraud in an environment where the permitted capital structure encourages exposure to all three.[3]

Given the current deposit insurance system, depositors have little incentive to monitor banks. (Empirically, however, depositors' risk price does not appear to be zero. Risky banks are reported to offer higher interest rates on federally insured deposits than do safe institutions.) The main private-sector control on banks' behavior rests with those who hold banks' capital *other than* insured deposits; that is, with equity and subordinated debt holders. What the latter have to lose is limited to their stake. The upside, on the other hand, is unlimited for equity owners. If these investors are risk averse and if their share is high enough, then they, along with other uninsured suppliers of capital, will exercise a constraining influence on managerial risk-taking.

Under these conditions, we can expect reasonably conservative operation. This is the logic behind both Craine's argument and the historical record. Moreover,

there is a bonus here. A sufficiently large capital requirement would also help greatly in preventing runs for any given degree of portfolio risk, making deposit insurance less costly and less necessary.

If, on the other hand, equity approaches zero or becomes negative, the incentives to take risks will be overwhelming regardless of the underlying attitudes toward risk. That is why failure to close fragile banks promptly can be so costly.[4]

As an outsider, I am amazed by the low levels of capital required by bank and thrift regulators. Major banks have operated with about a 2 or 3 percent capital-to-assets ratio, banks with losses have paid dividends, and institutions with low ratios have been allowed to increase loss provisions by reducing retained earnings while maintaining dividends (see Brumbaugh, Carron, and Litan [1989]). Why?

If bank regulators know anything, it is that an increased capital stake decreases the risk of failure. It not only provides a larger cushion, but changes managers' incentives in the direction of prudence. This is certainly confirmed in agriculture. Farmers who are subject to extreme income risk handle it well in the long run, without much government help, when they have both a high average ratio of equity to debt and a long-run relationship with their bankers. (See Wright and Hewitt [1990] for an Australian example.) When, as in the United States, farmers are favored with government-subsidized insurance, disaster assistance, and deficiency payments in the name of stabilization, farm financial structure adjusts in the direction of greater leverage, and farm failures are higher than in naturally riskier situations with less public protection.

3. Idiosyncratic versus Systematic Risks

In my view, understanding the distinction between risks that are specific to a given borrower and those that are highly correlated across borrowers is crucial for risk management by banks. Indeed, the roles of the bank in managing each type of risk differ greatly, at least in principle.

For a number of reasons, idiosyncratic risks should be easily handled by competent bankers. First, repayments are secured by collateral, so overall risk should be negligible. Second, borrowers who get into trouble will be dispersed throughout the healthy economy. Finally, foreclosure will not generally threaten asset values or the viability of the vast majority of other borrowers in the sector. Accordingly, there should be relatively little pressure for forbearance in enforcing commitments to the bank.

Of course, in banking, the definition of idiosyncratic risk depends on the sector's structure. In the United States, laws have often encouraged, or even enforced, local specialization. What would be an idiosyncratic risk for the Bank of America might be a systematic risk for a local bank in a rural Iowa county. Banks cannot efficiently

handle local idiosyncratic risk unless they can either diversify geographically or resell their assets to more-diversified buyers.

Difficulty in diversifying spatially is endemic in agriculture because of problems associated with managing large, geographically dispersed enterprises. The banking industry, on the other hand, is not as hampered by natural barriers to spatial and sectoral diversification. Instead, the barrier appears to be *political.* My understanding is that the main objection to interstate branch banking is fear of monopolization. This, frankly, is puzzling to me. Wouldn't a bank of a given size have *less* market power if its market were more geographically dispersed?

On the other hand, one can make a case against allowing banks to grow too big, especially if they are undiversified in important dimensions. (When Continental Illinois failed, it had just one office.) A less diversified bank is more likely to threaten failure, ceteris paribus, and history has shown that large banks will not be allowed to fail in this country. The logic seems to be that a large bank's failure affects the rest of the economy to an unacceptable degree; that is, its risk is not idiosyncratic from the point of view of the economy as a whole. Even if this is not true, large banks' political influence helps them to pass on the cost of failure to the general public. Knowing this, these institutions take excessive risks. So why not penalize large banks for the extra explicit and implicit risk of their operations that is borne by the public? This could be accomplished either through higher reserve ratios or insurance premiums, or by imposing more-stringent capital requirements. Large banks would then offer depositors lower interest rates, unless their size-related efficiency were significant enough to offset the extra cost of the risk it imposes. Reducing the importance of bank support for political campaigns through reform of campaign financing laws would be another important contribution to sound long-run banking policy.

There is another angle on correlation of the risks in a bank's portfolio. Even when a bank is well diversified across risks, if productivity of all of a certain type of productive asset is affected by a common negative factor, the asset's price will fall. Its value as collateral decreases just when its owner's debt-service ability is diminished. In such circumstances, foreclosure, which is always costly, is especially unappealing. Loans on farm acreage and on petroleum properties encountered this problem during recent periods of economic stress in these industries.

A more extreme version of this problem is observed on the international lending scene, where collateral is essentially unavailable to foreign lenders. Banks themselves behave somewhat like insurers in such cases, regardless of what their loan contracts say. They share some of the downside risks with their debtors by accepting modification of payment obligations, and receive higher returns in good times to compensate. Case (1960) provides examples of how this worked in practice in the agricultural sector during the Great Depression.

Ken Kletzer and I applied the theory of repeated games to markets for sovereign lending (Kletzer and Wright [1990]). Our findings show how loans without collateral can exist when lenders are competitive and respect the seniority of existing loans. Borrowers are willing to pay in good times for the degree of smoothing they receive in bad times if, by so doing, they ensure continuation of such services in the future.

An interesting aspect of this type of relationship, and one that is particularly pertinent here, is the effect of government intervention. If it is efficient for banks to share the risks of asset-value fluctuation with their borrowers, then I conjecture that an extension of the argument would make it optimal for depositors in these banks to share some of this risk in their role as bank creditors. There seems to be a strong argument for allowing a distinction between 1) narrow banks holding highly regulated portfolios with low-enough risk to virtually guarantee depositor liquidity (as suggested by Litan [1987]) and 2) wider banks that offer a richer risk–return mix. Depositors can choose their institution according to their preferences. Why should the government instead make citizens bear the burden of risk in proportion to their marginal tax incidence, which has no necessary relationship to risk preference or to the benefits of insurance?

Beyond the effect of deposit insurance on bank decisions, direct participation by the government in loss protection would be expected to alter the results of private-sector risk-sharing via loan agreements. Examples from agriculture are perhaps relevant. Federal disaster payments shift the risks of losses common to farms in a geographical area to the federal government, at least partly substituting for a service that would otherwise be available from private lenders. The latter should be far superior in their ability to monitor private responses to such difficulties, and should also be better able, using loan renegotiations as the tool, to keep borrowers focused on efficient handling of their problems. This assumes, of course, that the private lenders have their own capital at stake.

Another government agency is even more bizarre in its incentive effects. The Farmers' Home Administration requires that a borrower first be rejected by two banks to be eligible for assistance. This not only removes the most risky cases from private management by bankers, but also reduces the control banks have over debt servicing of their other debtors when collateral is weak (to the extent that control stems from banks' command over access to risk-management facilities). A comparison of the performances of U.S. and Australian banks in protecting farmers against the risks of drought and low agricultural prices would be informative regarding this type of government intervention in banking.

4. Public Guarantees against Systematic Risk: Special Pitfalls

In these times of government budget limitations, federal guarantees for government-sponsored enterprises such as Fannie Mae, Freddie Mac, Sallie Mae, Farmer Mac, Connie Lee, the Farm Credit System, and the Federal Home Loan Banks System have risen meteorically. Since 1970, the amount of government-sponsored securities in these programs has soared from next to nothing to more than $1 trillion (see Labaton [1991]), but these issues are backed by less than 1 percent capital. Already, both the Farm Credit System and the Federal Home Loan Banks System have had to be bailed out by government action.

The risk exposure of primary concern here is not the idiosyncratic, cross-section risk that affects many private insurance programs. Rather, the risk to government stems from the time-series behavior of the value of real estate, including homes and agricultural land. Because this risk is inherently difficult to evaluate, its evaluation is hard to monitor. It is easy to underprovide for risk in program design, either knowingly or unknowingly, without strong voter opposition. When a crisis develops later on, a bailout becomes necessary to prevent real or imagined macroeconomic catastrophe. The private stockholders share the profits but not the downside risks.

These guarantee programs remind me of the government buffer-stock "stabilization" programs that many countries have implemented for various commodities. Such schemes put a floor under the market price to guarantee against severe losses. (The location of the floor is often determined by the previous two to 10 years of price experience.) All such schemes ultimately fail, generally within a decade or two.[5] This happens in one of two ways: Many establish too high a floor at the outset and quickly run up deficits. Others start out prudently, accumulating funds, but in short order producers complain that the floor is ineffective and press for an increase in the minimum price. The floor is raised, and it then becomes so "effective" that it bankrupts the program.

The problem, both in agriculture and in banking, is that we do not know enough about the time-series behavior of commodity prices to determine clearly when a program poses an unacceptable risk of failure. But we have been learning. Recent work on a rational expectations model of the market for a storable commodity (Williams and Wright [1991]) has shown that it is all too easy to infer a permanent shift in price from five or 10 years of data when in fact none has occurred. I suspect the opposite also holds: True regime shifts may take a long time to recognize. Even over much longer periods, it is difficult to distinguish cycles from trends, or even to determine whether or not a series is stationary.[6]

In the absence of better methods for ascertaining the risks of guarantees, it is easy to give too much weight to short-run experience. Recently, the chairman and chief executive of Freddie Mac stated, "The bottom line is you start with the fact

that this company is financially sound, so you don't need financial requirements substantially different from what they are now."(Labaton [1991]) This comment is evocative of confident statements made by many a buffer-stock manager in the good times preceding the historically inevitable financial collapse.

As an outsider, I ask, What economic justification is there for the public assumption of mortgage risks in a developed economy like the United States? Surely, private institutions could provide a market for repackaging mortgages as securities; after all, insurance contracts are traded privately on an international scale. Mortgage risk could be widely diversified without government intervention. It seems to me that government-sponsored enterprises need a strong reason to exist, since they have an important disadvantage as instruments of public policy when they become as big as Fannie Mae or Freddie Mac. That is, they exert so much political influence that, in practice, it is impossible to pass and enforce laws designed to make them behave in the general public interest until a disaster of huge proportions besets them. In my experience, competitive private enterprises, even if they are large, are more easily persuaded to behave in the public interest than are those with direct government sponsorship. This seems to be true for both advanced and less-developed nations.

I have one further question. Much has been written about the obsolescence of savings and loans. Have subsidized public guarantees of home mortgages artificially depressed the demand for the risk assessment and risk management functions that these institutions are so well placed to provide? That is, is the often-discussed obsolescence of thrifts partially an artifact of careless public risk guarantees that have spoiled the market for their major function without providing a sound substitute? This brings me to another question that does not receive much play in the literature of public risk-bearing: Who gains?

5. Who Gains?

Studies of deposit insurance concentrate almost exclusively on efficiency considerations. But most public interventions redistribute much more than their net efficiency effects. In agriculture, sophisticated analysts recognize this, as well as the importance of capitalization for distribution. Thus, it is widely accepted that price supports affect landowners more than farm operators. So does crop insurance. If crop insurance makes farming more profitable, land prices rise.

Who gains from federal deposit insurance and loan guarantees? The answer is not always obvious. One authority states, "In the case of deposit insurance, the biggest winners are the managers and stockholders of high-flying deposit institutions that force deposit insurers into funding their plays at subsidized interest rates, and politicians and government officials whose jobs are made more comfortable."

(Kane [1989, p. 177]) These players may be the most prominent winners, as their winnings have been huge relative to ordinary earnings from honest work or basic theft. But I doubt that they have gained the bulk of the transfer.

Deposit insurance favors large depositors (the old and/or the rich) over taxpayers to the extent that it increases the yield on insured deposits. To the extent that it lowers the cost of loans, deposit insurance is presumably capitalized in the value of fixed and quasi-fixed assets financed, such as existing houses, land, other real estate, and other capital. Those who own such assets when government policies become more generous — generally citizens who are older and richer than the average taxpayer — profit from the shift. These are also the persons with the greatest political clout per capita. More-generous policies do not, in general, favor especially risk-averse people; younger and poorer risk averters have probably been permanently harmed, on a net basis, by existing government interventions in financial risk-bearing.[7]

6. Lessons from Crop Insurance and Disaster Assistance

To this point, I have said little regarding deposit insurance reform because I think the broader issues of the need for, and effects of, public intervention in risk-bearing merit greater attention. But it is probably realistic to expect that some kind of deposit insurance is here to stay. For those interested in the reform issue, the agricultural sector's experience with crop insurance and disaster assistance in the United States and elsewhere is well worth considering.

Since 1938, this country has had, with some interruptions, a crop insurance program. The government has also maintained a separate disaster assistance program. Many other countries have also implemented such schemes.[8] Below, I consider four questions about crop insurance and related programs that are relevant for deposit insurance.

1. *What happens when a public insurance scheme is designed ex ante to be actuarially fair, but the design remains under political control?*

The original sponsors of the institution of crop insurance in the U. S. Farm Bill of 1938 stressed the importance of financial soundness (Pope [1937]). How has it worked out? In the private sector, a maximum loss ratio (indemnities to premiums) of 0.7 is considered acceptable given the costs of administration (see Patrick, Lloyd, and Carey [1985]). Because of the skewed nature of the distribution of agricultural risks, however, the loss ratio in an average year must be well below 0.7 to keep the average long-run ratio below that limit. In disaster years, indemnities greatly exceed premiums. For public crop insurance, a long-run loss ratio of 1 appears to be acceptable. Even judged against this weaker standard, however, the Federal

Crop Insurance Corporation (FCIC) has performed miserably. The program started by losing money in each of its first five years and has had a loss ratio below 1 just 19 times in 50 years. The loss ratio for the 1980s is reported by the FCIC as 1.6. However, when direct subsidies are removed from the premium figures, the ratio rises to about 2, and when administrative costs are factored in, to 2.5. On average, then, more of the program's costs have been paid from the public purse than by the protected farmers.

Many other countries have provided similar programs. Some have initially recorded favorable loss ratios, but this has generally given rise to political pressure to make the program more generous. A commitment against doing so is not credible in a democracy. As evidence, no public all-risk farm insurance program has a long-run record of loss ratios of less than unity (see Wright and Hewitt [1990]).

2. *Can ad hoc rescues of uninsured parties be refused when voluntary insurance is available at fair rates?*

It might be argued that availability of actuarially fair insurance for deposits exceeding $100,000 would alleviate pressure for ad hoc relief of losses on such deposits. But if the experience with crop insurance is any guide, this will not happen. The 1980 Federal Crop Insurance Act provided expanded coverage — up to a 30 percent subsidy of premiums — with the expressed aim of eliminating political pressure for ad hoc relief measures. Any logic in such program changes is overwhelmed by a single picture: that of an uninsured farmer and his family dejectedly walking away from their farm after foreclosure. Bills to provide disaster relief to farmers (in addition to crop insurance) were passed in the United States in 1983, 1986, 1987, 1988, and 1989. Congress may have sincerely wished in 1980 to commit itself, via the Farm Bill, to forgo farm disaster relief thereafter. But any intended commitment proved, in the language of modern economics, not to be "time consistent."

Only if private insurance of bank deposits were compulsory would commitment against provision of extra bailout relief be credible. If not, a single televised interview with a gentle, aging couple who has lost their $300,000 life savings via a bank failure will likely be far more politically persuasive than a fistful of studies on the importance of commitment to a hands-off policy by government. However, if narrow banks were established and highly publicized as the only fully safe institutions for depositors, commitment against bailing out depositors in other banks might be more credible, especially if the narrow firms were kept from growing too large.

3. *Would program performance be improved by partial privatization, that is, by decentralized operation of deposit insurance via private insurers, with public reinsurance?*

The 1980 Farm Bill enabled private insurers to offer coverage with FCIC reinsurance. By the end of the decade, the reinsured companies sold the bulk of all FCIC insurance; the rest was sold by the FCIC using "master marketers" who performed a sales function only.

Reinsurers received grossly inadequate supervision from the FCIC, and audits show that they failed miserably at providing adequate claims adjustment.[9] A 1987 audit of 125 loss payments conducted by the inspector general of the U.S. Department of Agriculture revealed that farmers were overpaid $5.1 million of $10.2 million paid out. Furthermore, a General Accounting Office audit (U.S. General Accounting Office [1987]) reported that of $9.4 million paid out in their sample, $3 million represented overpayments and only $32,000 underpayments. Reinsurers passed the losses on to the FCIC.

As in the case of banks and thrifts, this hybrid system of private profit maximization by insurers, coupled with public risk-bearing without adequate public supervision, has been a recipe for disaster in crop insurance. The problem is not just the complexity of the rules and the lack of adequate information: Though losses handled directly by FCIC adjusters also showed numerous errors, these were negligible net overpayments.

One lesson from this experience is clear. If private deposit insurance were instituted, explicit or implicit public reinsurance of losses could make such coverage even more costly than it is now. How, in a democracy, can government effectively commit itself to not providing such reinsurance ex post? This brings us back to questions 1 and 2.

4. *In an industry in which risk of loss seems important, does evidence show that actuarially fair insurance, where not available privately, would be highly valued?*

One of the striking features of all-risk crop insurance both in the United States and in the many other countries where it has been tried is that no unsubsidized private program has ever been successful (see Wright and Hewitt [1990] and references therein). The reluctance of farmers to buy even heavily subsidized insurance is one reason. The FCIC has resorted to using private insurers to increase coverage, which has historically taken in less than half the eligible acreage.

Would farmers buy unsubsidized, actuarially fair insurance that covers its own administrative costs? Surprisingly, few researchers have addressed this issue. In Australia's Mallee region, 60 wheat farmers experiencing high variability in yields and prices were asked whether they would be interested in hypothetical, actuarially fair, multiple-peril crop insurance with adjustment for operating costs.[10] Most were not. Economists might immediately invoke explanations involving insight by farmers that problems of moral hazard (cheating and lack of preventive care) and adverse selection (domination by the worst or riskiest farmers) would ruin the

program. But a majority of the respondents also rejected rainfall insurance, for which the adverse selection problem is moot and moral hazard (in rainfall measurement) seems minor.

The next obvious explanation might be virtually the reverse of the above: farmer ignorance. This is empirically ridiculous. The farmers surveyed recognized rainfall as the number one source of risk. Furthermore, they were not unfamiliar with or averse to the idea of insurance; more than 90 percent carried private fire insurance, hail insurance, private health insurance, *and* supplemental automobile insurance (Patrick, Lloyd, and Carey [1985, pp. 24-25]).

The most likely explanation is that the insurance just is not worth much to the farmers unless it is subsidized. They have other means of diversifying their risks and can use savings and long-run banking relationships to smooth consumption between years. In this, they are very effective. Their businesses have good long-run viability. (Most of the respondents had lived on the same farm since completing high school several decades earlier.) Income risk does not translate into equivalent consumption risk, contrary to the assumption of many models of the value of government risk-bearing. Modern research has shown that this is true not only in advanced economies, but in less-developed ones as well. For example, in a seven-year study of Illinois farms, Langemeier and Patrick (1990) find a short-run marginal propensity to consume of between 0.7 percent and 2 percent; no more than 2 percent of income variation translates into short-run consumption variation. Existing theories of the cost of risk are, of course, based on variation of consumption, not of income, but this distinction is too often ignored in policy analyses.

Has anyone tried to estimate similar numbers for the effects of risky savings deposits on consumption variability? Has anyone measured the benefits of financial "deregulation" (read "the license to take risks without bearing the free-market consequences") against the costs of the crises in banking, insurance, and pensions? And why do we spend so much money on "risk-reduction" programs but totally neglect research on their rationale, design, and prospects for success?

7. Conclusion

Various types of market failure make the private market for risk-bearing less than optimal. In principle, public interventions can be conceived that would increase the efficiency of the market. But many of the interventions we see in practice do not seem to be of this type. In particular, numerous examples of public insurance of private risks mix public assumption of losses with private capture of a substantial portion of any gains. Thus, the insurance rarely comes close to actuarial fairness. For example, evidence from government crop insurance from many countries over many years shows a uniform tendency for these programs to make large net

transfers to farm owners and to encourage wasteful and inappropriately risky farming practices. Similarly, price-support schemes are principally transfer mechanisms, not means of reducing risks. They are driven by rent-seeking of potential transferees, not by administrators concerned with social welfare.

Economic theory is sometimes used as window dressing for these transfers to make them more palatable to an uninformed public. But economic analysis in such cases is not taken seriously: I know of no agricultural study that relates risk-related interventions to their actual effects on the stability of individual consumption.

In the financial sector, interventions are not justified by any direct relationship with consumption smoothing. The argument that deposit insurance is needed to prevent bank runs that might cause or prolong a drop in aggregate output sounds plausible, but it has received little critical analysis. Both theory and practice have shown that runs can be prevented by prudent reserve requirements and proper monitoring. They can also be forestalled if bank deposits are managed like money market funds. In short, panic prevention does not justify the kinds of public interventions we see in practice.

As in agriculture, financial interventions based on risk-reduction rationales are best explained by the political clout of interest groups who receive transfers from these policies. Such groups cover a larger segment of the population than recognized in the literature, and they remain powerful and effective despite the rising cost of such intervention to the public at large. This cost is still understated because of off-budget financing and the great amount of unfunded contingent liabilities implicit in loan guarantees. When these come due, society's ability to fund other social objectives will be curtailed even further than indicated in official projections. Not everyone is disappointed by such a prospect, of course. But those who find it possible to support heavy constraints on future public spending while approving current levels of expenditure on public interventions in banking display an impressive selectivity in their application of conservative principles.

None of the above should be understood to mean that all government interventions in the financial sector are wrong. Far from it. The government should be active in protecting the public. Governments set and enforce fire codes, teach fire safety, and prosecute arson. They should perform similar functions in banking. But recently, government has accomplished the equivalent of relaxing the fire codes by subsidizing insurance and encouraging people to play with matches.

I have little confidence that economic theory will have much influence on banking policy in the near future, though superficial economic analyses will continue to be used when obfuscation is needed. Such neglect of economics is not totally unjustified. After all, economists have been more prominent as paid defenders of the efficiency benefits of ex post irresponsible "deregulation" than as

prophets of its rather dire consequences for efficiency and distribution, as revealed by the current crisis in the banking industry.

At present, identification of the main elements of a reasonable short-run economic prescription for government financial risk-bearing does not require advanced theory. Deposit insurance coverage should not only be reduced, but it should be calculated per individual, not per account. Furthermore, premiums should reflect riskiness. Insurance premiums for large banks should be loaded to reflect the moral hazard associated with large size, which is related to externalities of failure. If flexible premiums cannot be efficiently imposed, restriction of insurance to deposits in narrow banks with regulated investments and appropriate capital requirements is well worth considering. The government should get out of the business of loan guarantees for government-sponsored enterprises unless it can come up with a sensible rationale for continuing its current interventions.

On the positive side, government should strengthen its role as the provider of information for the public good. It should act to increase the transparency and accuracy of financial reporting and to tighten ethical and professional standards. Apparently, under currently accepted accounting standards, an auditor can get a loan from a bank he/she is auditing without meeting the institution's usual guidelines, and can join an institution just audited — at a lucrative salary. To note that these and other abuses are candidates for correction is to enunciate the obvious. It is also apparent that creative accounting that understates liabilities, disguises losses, and overstates net worth should be abandoned in both the public and private sectors.

I do not think that much of the broad prescription above is very controversial among economists not employed by or consulting for the banking industry. The key problem is not how to identify worthwhile reforms, but how to get them implemented in a system where the general interest has little influence in the public decisionmaking process until a major disaster occurs.

In studying this question, perhaps bank economists can learn something from their counterparts in agriculture, who have a long history of studying ill-formulated, badly administered, and wasteful policies. Agricultural economists are moving beyond analyses that merely confirm and lament the above characterization of government interventions and are beginning to ask not only how such interventions came to exist in the first place, but whether and how they might be modified to advance the general interest given the reality of political constraints (see, for example, Rausser and Foster [1990]).

If bank economists become interested in studying how to deal with or to change constraints imposed by interest groups, and how to move bank regulatory policy in a desirable direction, they should start with a closer analysis of the incidence of the current institutional structure of the banking sector. We hear a lot about waste and

losses, but very little about who is gaining, and how. What are the implications of capitalizing gains in asset prices?

At a more fundamental level, we need to direct some resources toward re-examining government interventions undertaken in the name of market stabilization, using the yardstick of their effects on consumption risk — the ultimate source of risk premiums in current utility theories. Though research on the theories themselves is currently very active, the connection of individual risk attitudes to the measured consumption effects of actual public policies has received scandalously little attention. Such research is indispensable if we are to achieve more than marginal improvements in the currently disastrous government policies implemented in the name of risk reduction.

Notes

1. No banks failed in Australia during the Depression, yet the economy was seriously affected.
2. Other relevant references include Rolnick and Weber (1983) and Gorton and Mullineaux (1987).
3. See Jaffee (1987) for a forceful expression of this view.
4. Given the failure to mark to market and the nebulous nature of goodwill, some apparently solvent banks may well have negative net worth. See Brumbaugh, Carron, and Litan (1989).
5. For useful reviews of this subject, see Gardner (1985) and Gilbert (1987).
6. See the controversy concerning the existence of a trend in the net barter terms of trade between primary commodities and manufactures, as reported in the *Economic Journal* over the past decade. One of the hot issues in which I have become involved is whether a permanent shift occurred in 1921! (See Ardeni and Wright [1992].)
7. The redistribution can also have a strong geographic bias. The regional concentration of recent savings and loan failures has meant that the bailout has transferred resources from northeastern and midwestern states to 18 states located mostly in the Sunbelt. Hill (1990) reports that Texas led the nation in funds received, with a net gain of $3,510 per capita.
8. See Hazell, Pomareda, and Valdes (1986) for a survey, and Wright and Hewitt (1990) for updated information.
9. In 1988, claim reviews occurred in less than 10 percent of the counties involved; for one reinsurer with business in 1,500 counties, claims for just three were examined. See Ingersoll (1989).
10. The coefficient of variation of yield was 41 percent per year.

References

Ardeni, Pier–Giorgio, and Wright, Brian D. 1992. "The Prebisch–Singer Hypothesis: A Reappraisal Independent of Stationarity Hypotheses." *Economic Journal* 102, forthcoming.

Bernanke, Ben S. 1983. "Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression." *American Economic Review* 73 (June): 257–276.

Brumbaugh Jr., R. Dan, Carron, Andrew S., and Litan, Robert E. 1989. "Cleaning Up the Depository Institutions Mess." *Brookings Papers on Economic Activity* 1: 243–283.

Case, H.C.M. 1960. "Farm Debt Adjustment during the Early 1930s." *Agricultural History* 34: 173–181.

Craine, Roger. 1991. *An Efficient Deposit Insurance Pricing Rule.* Berkeley: University of California Press.

England, Catherine, and Huertas, Thomas (Eds.). 1988. *The Financial Services Revolution, Policy Directions for the Future.* Boston: Kluwer Academic Publishers.

Gardner, Bruce L. 1985. "International Commodity Agreements." Mimeograph, World Bank.

Gilbert, Christopher L. 1987. "International Commodity Agreements: Design and Performance." *World Development* 15: 591–616.

Gorton, Gary B., and Mullineaux, Donald F. 1987. "The Joint Production of Confidence: Endogenous Regulation and Nineteenth Century Commercial Bank Clearinghouses." *Journal of Money, Credit, and Banking* (November): 457–468.

Hammond, Bray. 1957. *Banks and Politics in America.* Princeton, N.J.: Princeton University Press.

Hazell, Peter, Pomareda, Carlos, and Valdes, Alberto (Eds.). 1986. *Crop Insurance for Agricultural Development.* Baltimore: Johns Hopkins University Press.

Hill, Edward W. 1990. "The S&L Bailout: Some States Gain, Many More Lose." *Challenge* (May/June): 37–45.

Ingersoll, Bruce. 1989. "Farm Fiasco: Crop-Insurance Fraud and Bungling Cost U.S. Taxpayers Billions." *The Wall Street Journal,* May 15: A1.

Jaffee, Dwight M. 1987. "Comments and Discussion on the Thrift Industry Crisis: Causes and Solutions." *Brookings Papers on Economic Activity* 2: 378–381.

Kane, Edward J. 1989. *The S&L Insurance Mess: How Did It Happen?* Washington, D.C.: The Urban Institute Press.

Kletzer, Kenneth E., and Wright, Brian. 1990. "Sovereign Debt Renegotiation in a Consumption-Smoothing Model." Discussion Paper 610, Yale University.

Labaton, Stephen. 1991. "More Supervision Is Being Sought for Government-Backed Lenders." *The New York Times,* April 29: A1.

Langemeier, Michael R., and Patrick, George F. 1990. "Farmers' Marginal Propensity to Consume: An Application to Illinois Grain Farmers." *American Journal of Agricultural Economics* 72 (May): 309–325.

Litan, Robert E. 1987. *What Should Banks Do?* Washington, D.C.: The Brookings Institution.

Merton, Robert C. 1977. "An Analytic Derivation of the Cost of Deposit Insurance and Loan Guarantees: An Application of Modern Option Pricing Theory." *Journal of Banking and Finance* 1: 3–11.

Patrick, George F., Lloyd, Alan G., and Carey, John W. 1985. "Crop and Rainfall Insurance: Some Results from the Victorian Mallee." Staff Paper 85-14, Purdue University.

Pope, James P. 1937. "Crop Insurance in the U.S." Speech reported in the *Washington Star,* March 1: 9.

Rausser, Gordon C., and Foster, William E. 1990. "Political Preference Functions and Public Policy Reform." *American Journal of Agricultural Economics* 2: 641–652.

Rolnick, Arthur, and Weber, Warren E. 1983. "New Evidence on the Free Banking Era." *American Economic Review* 73 (December): 1080–1091.

Salant, Stephen W. 1983. "The Vulnerability of Price Stabilization Schemes to Speculative Attack." *Journal of Political Economy* 91: 1–38.

U.S. General Accounting Office. 1987. "Crop Insurance: Overpayment of Claims by Private Companies Costs the Government Millions." Briefing report to Congress, GAO/RCED-88-7.

Williams, Jeffrey C. 1984. "Fractional Reserve Banking in Grain." *Journal of Money, Credit, and Banking* 16: 488–496.

Williams, Jeffrey C. 1986. *The Economic Function of Futures Markets.* New York: Cambridge University Press.

Williams, Jeffrey C. 1991. "The Law Reacts to Technological Change: Regulation of Grain Warehousing." Mimeograph, Brandeis University.

Williams, Jeffrey C., and Peck, Anne E. 1991. "The Timing Option in Commodity Futures Contracts." Mimeograph, Stanford University.

Williams, Jeffrey C., and Wright, Brian D. 1991. *Storage and Commodity Markets.* Cambridge, England: Cambridge University Press.

Wright, Brian D., and Hewitt, Julie A. 1990. "All-Risk Crop Insurance: Lessons from Theory and Experience." Mimeograph, University of California.

Wright, Brian D., and Williams, Jeffrey C. 1989. "Speculative Attack and Market Stabilization." Mimeograph, University of California–Berkeley.

Commentary

Mark V. Pauly

As a nonbank economist reviewing risk in the banking and agricultural sectors, I have decided that a prudent course of action is simply to point out some of the questions that occurred to me as I tried to reconcile the various perspectives from bank insurance, from insurance in the agricultural sector, and from insurance theory in general. Let me begin at the end by first reviewing some approaches that have been used to address questions about government's role in risk-bearing.

Anyone (at least any economist) who talks about government is probably condemned to be schizophrenic. Economists frequently employ a kind of market-failure analysis; we are used to thinking about deviations from the ideal of perfectly competitive markets. In public economics, there is a long list of things that can go wrong — and an accompanying list of potential improvements that government could bring about. This is what economists know best, and certainly what is most developed in the literature. The problem, of course, is that real-world governments do not seem to be particularly interested either in avoiding market failure, in promoting economic efficiency, or in distributing income in accordance with some prespecified social welfare function. So, economists face some obstacles in arousing people's interest when we use that kind of approach.

The alternative, and one I wish were more developed in Wright's paper, is to talk about public choice, or positive models of political economy. Having said that, however, I do want to mention two perils associated with such models. First, all of them make regulators, regulated firms, and basically all other agents endogenous — and thus unhappy. Regulators do not want to be told *why* they're doing what they're doing. They want to be told either what they should do or why their current approach is appropriate. Is there a demand for models that explain what people in the public sector will do? What public policymaker would be interested in them?

The other issue concerns voters and paternalism. Let me illustrate with an example from health insurance. The original version of the Medicare catastrophic-coverage bill, which was passed about three years ago, was fairly sensible. It simply added coverage for catastrophic illnesses to existing Medicare insurance, which had the peculiar feature of cutting off benefits for those unfortunate enough to be hospitalized for an extended period. In the 1960s, Medicare coverage was typical of that offered by other public and private health insurance agencies. In the ensuing decades, however, the private sector modernized its policies by adding stop–loss catastrophic coverage. The original Bowen–Burke proposal was intended to bring Medicare up to date, basically by adding such protection at the back end. However,

that simple proposal was not the one that was adopted. Instead, Congress added fairly generous coverage (with some deductibles) for prescription drugs. The reason was that, without this added benefit, many people (read "voters") were less than enthusiastic about the new coverage because they thought so few would likely ever need it. Congress perceived that most people want the kind of insurance they will be certain to use at some point, a phenomenon Howard Kunreuther calls the "insurance investment theory." Americans, it seems, believe that if they invest in insurance for many years, they deserve to reap some benefit from it. We usually criticize individual consumers for buying, and private markets for offering, this type of coverage. In effect, the same sort of misperception has found its way into the public sector. Perhaps that should come as no surprise, since the same misinformed consumers elect the politicians who, of course, must please the voters.

Deposit insurance was held up in my money and banking classes as a marvelous invention that provided actuarially sound coverage; depositors rarely made claims on it. Because nothing disastrous happened in the banking industry over the years, voters were perhaps tempted to get something out of deposit guarantees by increasing the level of coverage from $10,000 to $100,000. Then, when the once-in-a-century disaster struck as the nation's real estate markets declined, the insurance was of course overextended.

The main problem, then, is that individuals as consumers and voters believe they should reap some kind of benefit from insurance. There may be no easy solution to this dilemma. Paternalistic models of a government that corrects consumer misperceptions in a kind of public-choice world are faced with a paradox. Those governments have to deal with the same voters who have presumably carried their mistaken ideas into the voting booth. The problem with public-choice models is that although they are great fun for disproving claims of efficiency improvements by government, they do not always leave us with much of a positive nature.

One solution to this public-choice paradox can be found in what some have called quasi-constitutional arrangements. These are institutional structures designed to deal automatically with market imperfections — probably not perfectly, but at least reasonably well. They are somewhat insulated from political tampering.

"Quasi-constitutional" is not an easy term to pin down, although we all undoubtedly have a sense of what it means. Certain laws, though not enshrined in the Constitution, are intended to be difficult to change and are expected to exist for some time without a lot of fine-tuning. We might want to think about such arrangements as they apply to government risk-bearing. That is, frequent adjustments in the extent of public insurance coverage should be regarded as undesirable, and programs, once put in place, should be changed only rarely.

Wright's basic message regarding the fractional reserve system, based on experience from agriculture, is that we do not need a 100 percent guarantee of deposits. But what amount of insurance do we need? Insurance theory suggests that

government could offer some coverage, but require cost-sharing in the forms of coinsurance and copayments. Insured depositors, both large and small, should share the risks associated with major disasters. That idea is firmly entrenched in the general theory of insurance, going back to Karl Borch. Ideally, one would want to spread the risk around the whole economy, which typically means leaving some of it on the insured. This seems sensible. It would also be useful to make a distinction, as Wright did, between systematic risks and what one might call random risks. For the latter, banks could probably offer nearly 100 percent coverage without any serious harm. Indeed, a large bank could likely handle a substantial amount of risk-pooling by itself. But, of course, random risks are not the major problem. Rather, policymakers' biggest concern is the systematic risks associated with perils such as secular declines in the value of assets. It does seem sensible to expect depositors to bear some fraction of the risk in those rare cases when not all claims can be paid, at least not instantly. The government bailout option seems less desirable than just telling people that in some circumstances the insurance being offered will not pay off.

Such depositor risk-sharing is what Wright was referring to in the case of the Chicago grain elevators. If an elevator burned down, depositors did not expect to recoup all of their stores. I am not convinced, however, that the government bailout option for financial institutions is all that bad, since ultimately the government *is* the taxpayers, and most taxpayers are holders of demand deposits. An interesting question is whether some kind of tax-financed bailout, though perhaps not ideal, is really such an undesirable way of spreading risk. The drawbacks of such a scheme are twofold: People who are heavy on tax liability and short on demand deposits would probably incur more liability under such a system than is warranted, and variations in individual taste for risk are not taken into account. But what if we think of tax-financed bailouts as a public insurance policy that we as voters actually choose? Does the income elasticity of the tax structure, so to speak, correspond to the income elasticity of the willingness to bear risk? I could convince myself that this is in fact not too far off. One could even argue that people with high incomes are less risk-averse. It might be interesting to consider situations in which risk is generally spread, such as the potential risk of default on demand deposits and, of course, taxes. One might ask whether risk and taxes are reasonably well correlated or connected.

This discussion suggests a reason why the U.S. government provides a 100 percent guarantee for demand deposits. For agricultural risk, however, the notion of requiring all of the taxpayers to bail out the few farmers is harder to justify.

Wright's comparison of runs and reserves in both sectors was also informative. My only concern is whether the distinguishing feature between banking and agriculture is the immediate time value of withdrawing money from a deposit account. If one has stockpiled some grain and wants to retrieve it, a short wait would likely cause no appreciable harm. But presumably the reason why demand deposits

are so named is because people often want their money on very short notice. If you have ever driven to an automated teller machine on a Saturday evening just before going out for dinner, only to find the "temporarily out of service" screen displayed, you know what frustration can mean.

Suppose one goes back go Musgrave's original distinction between public provision and public production. The idea behind public provision is to influence the public sector's allocation of resources, which are usually tax financed. One could, of course, handle the resource allocation problem more effectively by passing a law that would force people to carry insurance, instead of taxing them and then providing that service as a public good. However, most of the problems in government risk-bearing programs come not so much from activities involving public provision as from those involving public production. The nation decided (for reasons not fully thought through) to require deposit insurance, and to have it provided by government rather than by private industry. Many problems have arisen because this decision created a government monopoly with no pressure to behave efficiently, to judge risks accurately, or to adjust conditions under which it was making insurance available in a cost-effective way. Why should the deposit insurance agencies worry about competition or turning a profit when they know a government bailout is always a possibility?

The quasi-constitutional solution to this incentive problem is to require deposits to be insured, but to have that insurance provided by private firms, much as for mature municipal bonds. I realize, of course, that this scheme will not work perfectly. For instance, what would happen if private insurers did not have enough money to pay off depositors in the event of a financial disaster? A third, public tier would probably have to step in if the private sector's resources dipped below a certain level.

Another problem that arises when the government bears risk is that consumer decisions may be based on imperfect information. The solution lies in better provision of information by government. But how do we motivate efficient public provision of information once we have assigned that obligation to the federal authorities? One virtue of private insurance is that it internalizes the information-gatherer's incentive to perform this task vigorously and accurately, since the data will be used to set premiums and to determine the conditions of coverage.

And how do we solve the fundamental problem of public choice, or of rent-seeking? Sooner or later, some people will try to convince the government to take action not because the proposed change would solve the problem of market failure, but because it would mean money in their pockets. One way to deal with this problem would be to adopt quasi-constitutional provisions that make clear to anyone who cares to listen the distinction between a risky way of doing something and the less perilous path. Then people who opt for the riskier course would no longer have any claim on our sympathy; we would be completely absolved of that concern and altruism.

Finally, we might require government to make explicit the transfers that are embodied in these programs: Who gains and who loses? This kind of explicit accounting might at least help us to avoid some of the more egregious attempts to use government as a means of redistributing income.

4 Government Risk-Bearing in the Financial Sector of a Capitalist Economy

Mark J. Flannery

For many years, the potential costs of government risk-bearing attracted scant attention. The recent wave of depository institution failures has caused widespread concern about the government's ability to regulate these entities and, more broadly, to control the financial risks it assumes. In the United States, these risks include

1. a federal safety net for depository institutions, comprising statutory deposit insurance and (occasionally subsidized) discount window lending;

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2. government guarantees of private obligations, including pensions, brokerage accounts, and the "government-sponsored enterprises"[1];

3. direct government lending to (among others) homeowners, farmers, small businesses, and students; and

4. extensive Federal Reserve payments services to private banks, which sometimes include extensions of substantial intraday credit.

Federal financial risk-bearing in the U.S. economy is both widespread and substantial.[2] A broad public debate has sought to evaluate the best means of implementing and enforcing financial regulations, but the debate is handicapped by its reluctance to specify the fundamental economic goals of financial regulation and government risk-bearing. Effective regulatory implementation cannot be properly evaluated without a clear sense of regulatory purpose. As in architecture, "form follows function" in the design of government economic activities.

This paper evaluates the conditions under which government intervention in financial risk-bearing might be economically justifiable. I apply standard notions of market failure to financial-sector products in order to assess whether microeconomic theory indicates a potentially salutary role for government intervention. (Boyd and Kwast [1981] provide an unusual and early discussion of these same issues for the case of bank regulation.) I focus particularly on the potential need for government risk-bearing in a capitalist economy. It must be emphasized from the start that identifying a market failure does not necessarily justify government intervention, because regulation entails its own inefficiencies.[3] Accordingly, I do not seek to justify or to critique particular regulations, but only to assess which potential motives for regulation appear most compelling. A further analysis would then be needed to determine whether government regulation can be implemented in a way that improves social welfare.

Regulatory reformers can benefit in several ways from an economic evaluation of the rationale for government intervention in the financial sector. First, the form of financial regulation should mirror its goals, and these goals must therefore be explicitly justified.[4] Second, such an analysis illuminates the basic economic issues, without the distractions of existing institutional arrangements or regulations. Because institutional arrangements evolve over time, this sort of functional perspective on regulation provides a more durable basis for evaluating change. Finally, identifying the market failures that government regulation might rectify permits a rough assessment of the potential gain from correcting those failures. Obviously, the size of this gain limits the regulatory costs we would bear to correct a private-sector misallocation. In other words, explicitly identifying the need for government intervention helps us distinguish situations in which government intervention is *not necessary* from situations in which it is *not practical.*

The paper is organized as follows. Section 1 explains why the government may sometimes be able to improve upon private market allocations. Applying these

ideas to the economy's multifaceted financial sector requires some categorization of financial services. Section 2 divides financial-sector products into three broad classes: primary securities, bank-type institutions, and payments system services. Section 3 evaluates the extent to which each potential reason for government intervention applies to the three product categories from section 2. Section 4 provides an overall assessment of the paper's arguments and describes the implications for regulation and regulatory reform.

1. Economic Reasons for Government Risk-Bearing in the Financial Sector

The Fundamental Theorem of Welfare Economics demonstrates that private market allocations are Pareto optimal under perfect competition and free information. However, these preconditions do not prevail in all markets. Public finance theory identifies up to six distinct reasons that government intervention might be able to improve upon private allocations for a good or service.[5]

1.1 Imperfect Information

When information is costly, security prices need not convey appropriate neoclassical signals, and the resulting market allocations may be Pareto inferior to what can be produced with at least certain stylized types of government intervention.[6] Costly information can reduce the efficiency of real resource allocations in two broad ways. First, some types of information are privately valuable but socially irrelevant (Hirshleifer [1971]).[7] Private markets incur excessive costs in producing this kind of information, and the economy would be better off if the practice were somehow prohibited. Second, costly information about project quality or borrower actions can render some positive-NPV projects economically (financially) infeasible, leaving the economy operating inside its (full information) production possibility frontier. These misallocations can occur for several reasons.

1. If outside investors must incur costs to ensure that insiders honor their financial obligations, some profitable projects will be unable to obtain financing (see Townsend [1979] and Diamond [1984]).

2. Private markets do not always function well when sellers know more about product quality than buyers do. Akerlof (1970) demonstrates that some markets may fail to exist, and Leland (1979) shows that equilibrium product quality is always inefficiently low. In financial markets, this means that some valuable investment projects will go unfunded if lenders cannot perfectly differentiate among borrower risks.

3. A firm's equityholders and creditors share a collective interest in monitoring managers' decisions in order to ensure consistency with firm value maximization (Jensen and Meckling [1976]).[8] But this monitoring entails a classic "free-rider" problem: When the monitor owns only a fraction of the firm, he must bear the entire cost of his efforts, but reaps only a fraction of the benefits.[9] At a firm's inception, investors will anticipate subsequent monitoring failures, which means (again) that some socially valuable investment projects will be uneconomical.

In summary, costly information may cause private market allocations to generate deadweight losses. Successful government intervention must be able to reduce these losses, net of the costs associated with that intervention.

1.2 External Effects

Resource misallocations occur when one individual's actions affect others in an uncompensated way. Government action to tax (or otherwise limit) external costs or to subsidize (or otherwise encourage) external benefits can then improve upon market allocations. In the financial sector, many observers suggest that bank failures may generate external costs, because one bank's failure induces other banks' depositors to infer (rationally or otherwise) something about their bank's credit quality. If these inferences occur, individual bankers will take inadequate precautions against credit deterioration in their own institutions. If bank failures generate social costs, the economy would experience an inefficiently high rate of such failures. Welfare could be improved by government actions that reduce bank insolvencies. Another financial externality involves the market supply of monitoring services, discussed above.

1.3 Public Goods

The market fails to provide public goods in sufficient quantity because the goods' beneficiaries cannot be forced to contribute to their costs. In the extreme, a highly valued good might not be produced at all. Possible public goods in the financial system include macroeconomic (monetary) stability (Friedman and Schwartz [1963]), a stable supply of financial underwriting services (Bernanke [1983]), or a reliable and safe payments system (Corrigan [1987]). Financial information also possesses public-good qualities.[10]

1.4 The Government as Least-Cost Producer

Establishing that the government has a comparative advantage in production can be difficult for at least two reasons. First, the relevant cost of capital is difficult to

compute for government projects.[11] Second, efficiency has both static and dynamic components: Even if the government can apply existing technology more efficiently than the private sector can, will it innovate properly over time? Conversely, if the government is inefficient in a static sense, it might still be the least-cost producer if it has better incentives to innovate than the private sector has.

1.5 Merit Goods

The Fundamental Theorem of Welfare Economics assures efficiency *conditional on* the initial allocation of income, whose appropriateness is a noneconomic issue. If citizens dislike the market's allocation of a good, the government may choose to subsidize the good's production or consumption.

1.6 International Competitiveness

Some recent discussions of bank regulation assert that the U.S. financial system's ability to compete successfully in world markets is an important policy consideration (see, for example, Dugger [1991] or U.S. Treasury [1991]). The implicit argument underlying this suggestion seems to involve a "vital industry" need, or the long-standing populist tradition that banks must be locally controlled to ensure an adequate supply of credit and financial services.

A parsimonious evaluation of these six potential reasons for government intervention requires that we broadly categorize financial-sector products.

2. Categorizing Financial-Sector Products

Classic (Fisherian) financial markets permit borrowers and savers to exchange claims on real purchasing power and to control their risk exposures. In a frictionless equilibrium with free information, producers' marginal rates of transformation equal consumers' marginal rates of time preference. If information is costly, deadweight losses can occur because these marginal rates are not equalized across market participants. Institutional financing arrangements can then have real social effects, to the extent that they influence the impact of costly information on the economy's ability to implement desirable projects. Gurley and Shaw (1960) categorize financial claims according to the obligor's identity. Nonfinancial firms sell *primary securities* to capital market lenders; financial firms sell *indirect securities* to savers, then use the proceeds to make loans to nonfinancial entities.

Because primary and indirect securities exhibit distinct economic characteristics, they can also generate distinct arguments for government financial intervention.

In addition to exchanging claims on real purchasing power, the financial sector elicits payments among economic agents. An efficient payments system encourages specialization in production and risk-bearing by allowing traders to exchange value promptly, cheaply, and reliably (Garbade and Silber [1979]). The economic challenge is to effect these exchanges at minimum social cost, which includes the level of credit risk exposure associated with particular payment procedures.

The balance of this section defines three broad financial-sector products: primary borrowing and lending, indirect borrowing and lending, and payments system services. These products are defined along functional, as opposed to institutional, lines to permit direct application of microeconomic principles to each one.[12]

2.1 *Primary Borrowing and Lending*

Nonfinancial firms sell primary securities directly to capital market investors (for example, stocks and bonds traded in public markets). Security prices reflect society's preferences and investment opportunities when investors are effective at gathering information and monitoring firm performance. Firm managers then receive accurate indicators about which real investments to implement. However, if outside investors do not properly understand a firm's true quality, managers are freer to pursue their own agendas instead of maximizing shareholder (and presumably also social) value (Stiglitz [1985]).

Some individual investors produce financial information for themselves, while others prefer to utilize the services of specialized financial firms. For example, mutual funds take advantage of scale economies in information processing and transaction costs to assemble a more diversified portfolio than small investors could economically assemble for themselves. Other common financial-market services include credit analysis and investment advice. A defining characteristic of all these institutions (as opposed to banks) is that they do not generally risk their own funds in the course of providing valuable services. Presumably, some reputation mechanism makes their advice valuable in the marketplace.[13]

2.2 *Indirect Securities: The Distinguishing Features of "Banks"*

Gurley and Shaw's (1960) indirect security is the obligation of a financial firm, such as a commercial bank, thrift, credit union, finance company, or certain insurance companies.[14] For expositional simplicity, I refer to all such institutions as "banks." The particular assets and liabilities differ substantially across types of firms, but they share the characteristic that their owners hold a junior claim on the asset portfolio's

cash flows. Furthermore, because banks specialize in efficiently processing credit information and monitoring borrower performance, borrowers with high information costs would rather negotiate a bank loan than issue primary securities. Consequently, bank assets tend to be illiquid because outsiders cannot cheaply determine their true risk properties. It seems plausible that a firm financing illiquid, long-term assets should operate with high equity and (similarly) long-term debt. However, banks routinely 1) issue fixed-payment claims, 2) are highly leveraged, and 3) finance a portfolio of long-term and illiquid assets with shorter-term obligations.[15] Indeed, Diamond and Dybvig (1986) properly insist that the crucial defining characteristic of banks is the asset transformation services they provide.

Banks' unusual financial structure makes them appear potentially unstable, which has motivated several important aspects of bank regulation. Any doubt about a bank's solvency can become self-fulfilling, because the bank must incur liquidation costs to pay off nervous depositors promptly. Furthermore, if one bank's publicized difficulties lead depositors at other banks to doubt their bank's solvency, the potential for contagious runs—a classic externality—arises. Why do banks expose themselves to this liquidity risk? Shouldn't they prefer to operate with lower leverage and with closely matched asset and liability maturities? Some observers (Kareken [1985], U.S. Treasury [1991, p. VII-29]) contend that this financial structure serves no valuable social purpose and is merely the optimal private response to a subsidized government safety net.[16] Consequently, proponents of "narrow bank" reforms assert that matching insured deposits to liquid assets would promote financial system stability. But modern finance theory maintains that a firm's financial structure influences its investment decisions and other agency costs (see, for example, Myers [1977], Green [1984], and Myers and Majluf [1984]). If banks' unusual financial structure enhances the supply of valuable financial services, regulatory restrictions on bank leverage or liquidity will entail social costs.

In Flannery (1991), I argue that a dynamic portfolio of informationally intensive assets will optimally be financed with high leverage and short-term debt *even in the absence of government guarantees.*[17] The government safety net surely exacerbates these tendencies, but it does not create them. My reasoning can be summarized as follows. A bank's essential business is lending to borrowers whose true risk characteristics are difficult to identify. Moreover, bank assets mature quite frequently, which provides the firm frequent opportunities to change its portfolio risk without advance notice to outsiders. Effective covenants against asset substitution are unworkable with costly and asymmetric information. Bank insiders thus possess an unusual opportunity to extract value from outside bondholders. A bank wishing to match the maturity of its liabilities to the maturity of its assets would have to pay a sufficient risk premium to compensate the bondholders (depositors) for its anticipated incentive to substitute assets. The resulting increased deposit costs would prevent the bank from

making low-risk loans, even when it would be the least-cost supplier of the required financial services. In other words, banks increase their value when they can credibly promise to avoid asset substitutions.

One potential palliative for the investment distortions associated with long-term bank debt is to maintain sufficiently low leverage so that deposit values cannot be affected by attainable types of asset substitution.[18] In other words, bank entrepreneurs sell equity to outsiders, instead of selling debt. Although this strategy would reduce investment distortions, increased reliance on outside equity generates its own costs, in the form of higher corporate tax liabilities and deleterious agency costs. When bank asset payoffs are not contractually verifiable, Diamond (1984) proves that the optimal security to sell to outside investors is a debt contract. Moreover, if managers must expend unobservable effort to monitor bank borrowers effectively, diluting their ownership in the firm similarly dilutes their incentive to monitor. Thus, high proportions of outside equity may impede a bank's ability to deliver valuable monitoring services.

One plausible solution to this conundrum is for the bank to issue only short-term deposits. This limits the gain from any asset substitution, thereby providing bank insiders with more appropriate incentives than are possible with long-term debt. These improved incentives come at the cost of illiquidity risk, however; depositors may mistakenly believe the bank to be insolvent, and run against it. Given the deadweight cost of liquidating bank assets, a run may cause the bank to fail.

In equilibrium, banks select the cheapest attainable combination of short-term debt and outside equity. Removing the federal safety net would no doubt shift managers toward less leverage and less liquidity risk, but there is no reason to believe that these features of banking derive entirely from the present regulatory structure.[19] Rather, banks' existing financial structure may minimize the net effect of costly information on real-sector allocations. Regulated changes in bank financing arrangements would either induce the emergence of new institutions with similar financial structures, or force some borrowers into more costly financing arrangements.

2.3 Payment Services

Financial payments are required to offset net imbalances in the value of goods, services, and financial assets exchanged among economic agents. In principle, trade imbalances could be settled with any type of asset flow (Niehans [1971], Brunner and Meltzer [1971], Fama [1980]); in practice, fiat money (or some claim on such money) is almost universally employed. A financial transaction includes two distinct components: recording the parties and the amounts to be transferred, and exchanging the required value (Fama [1980]).[20] Cash transactions combine these two components, but the risk of loss, theft, or accident makes cash impractical for large payments. For the vast

majority of dollars transferred in the United States, transactors employ agent banks to pay or to collect value on their behalf. Banks exchange claims on fiat money via correspondent relationships, private clearinghouses, and the Federal Reserve's electronic (Fedwire) and paper-based exchange facilities.

The primary complicating feature of making large-denomination payments is that, under existing payments system conventions, large transactions do not exchange value concurrent with the delivery of a good or security. *Most payments require one of the parties to bear some credit risk.* Consider the example of a check payment for, say, a new bowling ball. (The same principles apply to other electronic or paper-based bank payments.) The store owner (payee) delivers the ball against the payer's assurance that his check will permit the payee to receive "good funds" (fiat money). This payment arrangement generates three distinct instances of credit risk exposure.

1. In accepting the check, the store owner has extended credit to her customer. Government intervention in this part of a payment transaction can be discussed under the general topic of primary security transactions.

2. Payments system risk generally refers to the payee's credit risk exposure in relation to other banks involved in the check-clearing process. In the simplest clearing arrangement, the payee's bank presents the check directly to the payor's bank and receives good funds at some later time. Because the paying bank may fail before it transfers funds to the presenting bank, credit risk is borne either by the payee (if he presents checks for collection on a "best efforts" basis) or by the payee's bank (if it permits immediate, final access to the funds upon deposit of the check).[21]

3. Another type of credit risk exists between the payer and his bank: Will the bank permit overdrafts?[22] If the bank makes payments in excess of a customer's collected balances, it has extended a loan that should be properly underwritten and priced. Alternatively, a bank may refuse to extend overdraft credit. In order to make payments, the transaction customer must deposit collected balances with the bank, which exposes him to the risk that his bank will default on its deposit obligations. Normally, an investor can minimize the impact of credit risk by diversifying his portfolio. In the case of transaction accounts, however, the economics of arranging and receiving payments make it advantageous to concentrate one's collected balances in a small number of agent banks.[23] Transaction accounts' default risk will therefore be more expensive to diversify, leaving investors with potentially important credit risk exposures.

These credit concentrations may be particularly important for securities and foreign exchange markets. A relatively small number of traders dominates these markets, and one trade frequently begets additional trades as the parties seek to hedge or diversify their (noncredit) risk exposures. Accordingly, we cannot necessarily dismiss the importance of transaction account credit risks for payments system stability.

Table 4–1. Organization of Section 3

Possible Reason for Government Intervention	*Product*		
	Primary Securities	*"Banks"*	*Payments System*
1. Imperfect information			
a. Information production	X	X	X
b. "Lemons" market failure	X	X	X
2. Externality			
a. Contagious runs		X	
b. Investors' monitoring	X	X	
3. Public goods			
a. Money supply		X	
b. Credit service		X	
c. Payments system			X
4. Government as least-cost producer			
a. Monitoring	X	X	
b. Credit evaluation	X	X	
c. Credit collection	X	X	
d. Payments system finality			X
e. Bank reorganizations		X	
5. Merit goods	X	X	
6. International competitiveness			
a. Payments system		X	
b. Security market liquidity	X		

Note: "X" indicates that the cell is explicitly discussed in Section 3.

This schematic description of payments system risk illustrates two essential points. First, the cost of making payments includes a potentially substantial exposure to credit risk.[24] Second, the economics of cash collection and securities trading result in large concentrations of deposit balances (both positive and negative), which may limit the market's usual ability to diversify these credit risks. Both of these effects appear to be particularly important for large-dollar electronic payments.

3. Evaluating Market Failures for Financial-Sector Products

Government intervention in financial markets can be justified only when a particular product's market fails to perform efficiently. Sections 1 and 2 define a taxonomy of

possible interactions between financial-sector products and the potential reasons for government intervention in market allocations. Table 4–1 summarizes this taxonomy and lists particular policy issues for each type of market failure. This section, which is organized by financial-sector product, discusses the cells in table 4–1 that are marked with an "X".

3.1 Primary Securities Market Failures

Stiglitz (1985, 1987) asserts that imperfect information occurs often enough to invalidate the Fundamental Theorem of Welfare Economics, especially for security markets. Within the class of all security transactions, information costs are especially severe when the relevant information is complex, or when public dissemination of the information reduces the firm's competitive position (Campbell [1979]). Information costs may reduce private market efficiency in four ways, and we must determine whether government intervention can reduce any of these effects.

Inefficiency #1: Information's private value exceeds its social value, and it is therefore overproduced.

A tax on security trades would correct this problem by reducing the private value of information (Summers and Summers [1989]). But any effort to reduce the value of private information would simultaneously reduce the private return to monitoring, which may already be underproduced, as discussed later. Accordingly, in the absence of indications that this type of waste is large, it seems unlikely that government intervention would provide positive net benefits.

Inefficiency #2: Costly information makes it impossible to finance some socially valuable projects with external funds.

An appropriate government response to this inefficiency must increase the number of private projects that can be implemented. The problem involves private lenders' costs of evaluating or monitoring borrower performance; these costs exceed the excluded projects' net profits. The government can ameliorate this problem only if it is able to evaluate credit more accurately or less expensively than private lenders can, or if it is able to collect repayments more efficiently. If the government is a relatively efficient underwriter, it must lend directly to private parties (as it does with several farm programs). If the government collects payments more efficiently, it should prefer to purchase loans originated by private parties (as it does for students and homeowners).[25]

Inefficiency #3: When borrower quality is sensitive to the loan rate charged, a loan market may fail to exist or may exclude some borrowers.

With this problem, the equilibrium loan rate reflects the average borrower's quality, and profitable, low-risk investment projects cannot obtain financing at a rate that leaves the entrepreneur with a positive expected return. As in the previous

case, government can improve upon market allocations if it evaluates credit more effectively than do private parties. If not, the government could provide subsidies to lower the average loan rate, and hence could keep low-risk projects in the market.[26] (These subsidies would improve social allocations if the profits earned on newly implementable investment projects exceed the government's expenditure.)

However, bearing private-sector risk is only one possible form of subsidy, and it poses two potential problems if the government is not the least-cost risk assessor. First, providing a subsidy in the form of government guarantees for privately underwritten loans can create serious moral hazard problems (as we have observed with depository institutions and FHA-guaranteed loans). Second, direct government lending will generate an adverse selection (in relation to private lenders), which leaves the government with a portfolio of underpriced loans. Private-sector competition thus makes it difficult to compute the extent of the subsidy being provided. Rather than compete with more efficient, private underwriters, the government should subsidize their *information production* and leave private lenders to bear the credit risk. This type of subsidy insulates the government from its comparative disadvantage in credit evaluation, while encouraging loans to worthwhile investment projects that are difficult to evaluate.

Inefficiency #4: Outside claimholders have insufficient incentives to monitor firm performance.

If monitoring services are underprovided by market participants, the government could subsidize information dispersal or generate information itself. Though it might seem that any government information must improve market allocation, this is not necessarily true. As the government produces more information, private agents will find it optimal to produce less. The net effect on monitoring services produced is therefore problematic, and depends importantly on the relative quality of government information and whether it somehow complements the value of privately produced information. This constitutes an important, albeit difficult, subject for future research.

To summarize, the information-based arguments for regulating primary securities originations are complex and subtle. Inefficiency #1 provides no grounds for government risk-bearing. Inefficiency #2 or #3 might be improved by having the government bear private risk, but *only* if it can evaluate that risk or can effect repayments more cheaply than private agents can. Otherwise, it is cheaper to subsidize private lenders' information gathering. If the government is providing monitoring services (to ameliorate inefficiency #4), it may be optimal to design a mechanism to ensure that it monitors accurately. For example, Merton (1977) suggests that the government guarantee bank debt as a means of ensuring it will monitor banks' safety and soundness. (See the following section for further discussion.)

A rather subtle externality argument can also be made about the social value of efficient financial markets. It has become widely accepted that market microstructure can importantly affect the welfare of market participants. In particular, Pagano (1989) shows that concentrating trade of similar securities on a single exchange can raise at least some traders' welfare by reducing the amount of liquidity risk they confront. If some U.S. traders find it prohibitively costly to participate in foreign markets, regulatory efforts to attract foreign traders to the United States will deepen our markets and may therefore improve traders' welfare.[27] Hence, if deeper financial markets truly convey large benefits, U.S. regulators should consider their impact on the international competitiveness of regulated institutions.

3.2 Banking Market Failures

Because banks sell securities directly to investors, the informational issues attending primary securities also apply to bank equity and deposits. If investors find it especially difficult to evaluate bank asset values, the argument for substantial market failure in bank securities might be stronger than for other firms' issues. Banks self-select into financing securities that are among the most informationally intensive in the economy, and their daily business involves an unusual degree of asset substitution. Consequently, information costs would have their most severe impact on the market pricing of bank claims.[28] Measures such as government monitoring services and insurance might be justifiable for banks even if they are not socially desirable for other types of firms.

Merton (1977) recommends a centralized evaluation of banks' credit conditions, which avoids duplication of effort by a large number of small depositors. But a single evaluator suffers from Diamond's (1984) delegated monitoring problem: How can the depositors know that the monitor has diligently performed its task? The monitor could insure bank deposits, instead of merely evaluating them, but this approach raises the question of the monitor's ability to fulfill its guarantee. Merton asserts that the government is the best monitor because it can credibly honor a deposit guarantee. There remains the question of why a bank monitor must guarantee deposits, when the primary securities market can provide credible private information about other types of firms.

Government monitoring services or deposit insurance could also be justified as merit goods, which insulate small savers from the high fixed costs of evaluating financial risks.[29] While this perspective provides no definition of what makes a saver "small," the existing policy of insuring all bank deposits (liabilities) seems very hard to justify as a merit good. Moreover, the government need not bear banks' default risk in order to provide small savers with a safe investment opportunity: It could alternatively operate a postal savings system or issue divisible (and

transferable) Treasury bonds. Deposit insurance creates well-known moral hazard problems, which should be tolerated only if there are offsetting social benefits. For example, if banks enjoy scale or scope economies in providing small savers with safekeeping and payment services, it might be optimal for the government to bear small depositors' default risk while private banks provide financial services.

A substantial amount of government risk-bearing on behalf of bank creditors is justified by the contention that bank failures involve important, and perhaps unique, externalities. The potential external effects fall into two distinct categories, but unfortunately, both are commonly described as bank runs. The first type of bank run involves a *systemwide* withdrawal of deposits. Such a "flight to currency" can have contractionary macroeconomic effects, which are considered below.

The second type of bank run involves an individual bank or a relatively small set of banks. Some well-known models of bank runs (Diamond and Dybvig [1983] and their followers) imply that these events impose substantial real costs on the economy. But these models apply most naturally to a widespread loss of confidence in the banking system, rather than to runs against an individual bank. Saunders (1988) points out that the implied social costs of bank runs occur in these models because depositors' alternative investment opportunities are severely limited. He concludes that if these models "...were to...allow for a multibank system with a rich array of financial assets, then an individual bank run (*barring any major contagion effect*) might have very little effect on the aggregate supply of transaction accounts." (p. 158, emphasis added)

If one bank's failure leads depositors to demand prompt repayment from other banks, the system suffers from a classic externality in the form of contagious runs.[30] This type of run requires that depositors be substantially uninformed about the characteristics of individual banks in the system. Each banker will take too little care to avoid failure, because she bears only a portion of the total social cost of her bank's demise. Thus, private market forces may produce banks that are too risky, and government intervention to make banks safer can have positive social value. The most extreme solution—blanket (100 percent) deposit insurance—ensures no external effects of bank failure.

One bank's failure might influence the market's assessment of other banks for either of two reasons (Aharony and Swary [1983]). First, if other banks shared a risk exposure with the failed bank, their claimants would *rationally* perceive greater risk. This constitutes a normal and desirable aspect of efficient financial markets, in which investors' actions convey appropriate signals to bank managers. Second, other banks' claimants might *irrationally* infer that their own banks' quality had deteriorated. Their irrational response—in the form of deposit withdrawals or higher required deposit rates—would impose inappropriate costs on other banks, perhaps to the point of forcing their failure.

Empirical evidence on bank contagion is difficult to develop. During the nineteenth century, U.S. banks failed in relatively large numbers, and occasionally in waves (Gilbert [1988], Gorton [1985]). But it is very difficult to separate Aharony and Swary's two possible effects. When Hasan and Dwyer (1988) statistically evaluate nineteenth-century bank failures, they find that the failure of one bank substantially increases the probability of another bank failing in the same county. Is this a pure contagion effect (as Hasan and Dwyer conclude), or were both banks harmed by the same poor local economic conditions?

Evidence from the post–1933 era may not reflect the full potential for contagious depositor reactions because federal insurance and closure policies have effectively removed default risk from all bank deposits. However, studies of stock market events can shed some light on the extent to which investors revise their assessment of one bank's value in response to information about another bank's problems. If bank shareholders react irrationally to information about another bank's problems, then arguably, uninsured depositors would behave similarly, and vice versa. Aharony and Swary (1983) analyze bank stock reactions to three large failures from the 1970s. In two instances, they find that other banks' stock prices did not respond at all. For the third case (Franklin National Bank, in 1973), they conclude "...the observed drop in solvent bank stock prices may be interpreted as investors' reaction to a common type of unfavorable signal, rather than a pure contagion effect." (p. 321)

Swary (1986) employs a similar methodology to evaluate market reactions to Continental Illinois' 1984 troubles. He reports that other banks experienced market value declines when Continental's problems were announced, and that these negative returns were larger for poorly capitalized banks. He interprets these negative market reactions as rational conjectures about the banks' true asset values, rather than shareholders' fear of depositor runs: "This finding is strongly consistent with the hypothesis that market reactions reflect a rational response under imperfect information to new evidence of regulatory policy and banks' asset quality." (p. 471)

We can also find evidence of rational credit risk responses in uninsured bank deposit rates. Wall and Peterson (1989) evaluate the market's reaction to Continental's problems and conclude that it was considerably more subdued than subsequent reactions to new information about the quality of troubled South American loans. Ellis and Flannery (1991) examine six money center banks' negotiable CD rates and find that market information about bank credit quality is promptly incorporated into CD rate spreads.

The pattern of recent depositor behavior in response to financial institution failures is also instructive. In discussing depositor runs during the 1985 collapse of the Ohio Deposit Guarantee Fund (ODGF), Kane (1987) reports that only insolvent, ODGF-insured institutions experienced serious deposit outflows. These runs were in fact rational, given that the ODGF became bankrupt with the failure of Home

Savings. Notably, six *uninsured* thrifts suffered no substantial deposit withdrawals during the crisis (Kane [1987], p. 313).

To summarize, the available evidence about contagious bank runs, though admittedly sketchy, fails to support the fear that bank investors irrationally generalize from the observed failure of one or several banks. Stock market and depositor reactions to past bank problems seem consistent with rational investors' efforts to process new information about the quality of their bank's asset portfolio. But finding that the market is rational *on average* does not necessarily imply that banks suffer no external effects. As long as the market sometimes perceives a truly solvent bank to be weak, costly failures can occur because the typical bank's financial structure can make this a self-fulfilling prophecy. Though deposit insurance represents one response to such market mistakes, the central bank's lender of last resort function can also counteract an irrational deposit run. It seems unnecessary to have both devices in place, particularly since their social costs are potentially nontrivial.

Another common justification for government intervention in the banking system is that a wave of bank failures can threaten macroeconomic stability. This argument includes two dimensions. First, a money supply contraction has real effects throughout the economy, and the experience of the Great Depression suggests that we should not rely on the Federal Reserve to stabilize the money supply when numerous banks fail.[31] A federal insurance scheme automatically stabilizes the total supply of bank deposits, with the "public good" effect that the macroeconomy will be more stable. As a backup guarantee for the Federal Reserve, deposit insurance might be worth having if its costs were small. However, the assessment that the Federal Reserve might not conduct appropriate monetary policy also implies that other government agencies—including the FDIC—might be mismanaged. Because the potential social costs of FDIC mismanagement appear to be quite large, it seems hard to justify the FDIC as insurance against a Fed policy failure.[32]

The second component of this macroeconomic stability argument for government intervention concerns the supply of credit services. Bernanke (1983) presents evidence that bank failures during the Great Depression had contractionary effects beyond their impact on the money supply. He attributes these effects to the loss of bank-provided underwriting and credit evaluation services when many banks failed. Unable to obtain financial services, some entrepreneurs could not implement profitable investment projects. The decline in investment expenditures apparently had a multiplied effect on real-sector activity.

Bernanke does not claim that his findings imply a need for government deposit insurance. Nor do they. A bank's failure reduces the available supply of credit underwriting services only if the institution is liquidated, which is a capital budgeting assessment distinguishable from the bank's solvency. If a failed bank's underwriting services are valuable, then it can be recapitalized to permit continued

operation. With perfect market information, there would be no role for government involvement in bank reorganizations. However, the unobservable nature of bank assets' true characteristics and the resulting nontraded nature of most bank liabilities may be strong impediments to private reorganization.[33] If the market cannot perform bank restructurings efficiently, federal intervention might improve the process.[34] But this process *need not* involve federal insurance of the failed bank's liabilities! The indicated market failure involves the restructuring, not the depositors' initial willingness to finance bank operations. Moreover, there remains the central question of why government can arrange bank restructurings more efficiently than the market can.

The arguments for government risk-bearing in the banking sector can now be summarized. The most plausible of these seem to involve private information and monitoring costs. Real resource allocations might be improved by government monitoring services or deposit insurance. These services could also be viewed as merit goods, although 100 percent deposit insurance cannot be justified on this basis. The macroeconomic arguments for government risk-bearing seem unconvincing (see also Murton [1989]). The Federal Reserve can adequately stabilize the money supply, and if the government must facilitate the restructuring of failed banks, it can do so without absorbing creditor losses. The need for federal deposit insurance to correct the negative externality of contagious bank runs is perhaps the most frightening possibility, but its justification relies most heavily on private market misperceptions and poor administration of the Fed's discount window.

3.3 Payment Service Market Failures

All else being equal, a larger payment cost means that more mutually beneficial trades will be forsaken because the sum of the traders' surpluses does not cover the cost of making the payment. For many transactions, these costs are too small to warrant serious attention. However, the presence of a proportional credit risk can substantially reduce the number of large-denomination trades in financial instruments, reducing the economic value of these markets.

Regulatory concern about payments system efficiency intimately involves the stability of financial institutions, because their solvency influences the payments system's stability. Consider the case of a generalized increase in creditors' anxiety about bank default. Because a payee cannot predict which banks will handle the clearing of his checks, he must assign a larger credit risk premium to all payments received. If the change in expected costs is sufficiently large, he will forgo some trades, with an attendant loss of consumers' surplus.[35] This constitutes an external effect, in the sense that one bank's perceived creditworthiness influences the number of trades that will be undertaken by unrelated economic agents.

Information and adverse selection costs could reduce the efficiency of a completely private payments system. Initially, suppose there were a single, risky payments system, on which all payees agreed to take the expected value of their payments. Payees would thereby pool and diversify their credit risks. Three problems may arise with this pooling equilibrium. First, if the system's operator (the entity ultimately responsible for making payments in good funds) became unable to make payments, the system would collapse. (In this case, each payee's credit risk would be undiversified, and hence much more serious than in a multilateral system.) Second, Akerlof's "lemons" phenomenon could occur, as some banks would seek low-credit-risk avenues for their collections. With their exit from the clearing system, the remaining transactions' average defaults would increase, making it profitable for still more banks to exit in search of alternative clearing arrangements. In equilibrium, such a fragmented collection system might be more costly than a system in which everyone was required to participate. Third, the system would have to discriminate among paying banks according to their perceived default probability, and timely information might be expensive to obtain.

The advantages of concentrating one's transaction accounts with a small number of paying banks make systemic risk considerations especially important. Some writers summarize the extent of past depositor losses as a proportion of banks' average deposit volume:

> ... in the 12 years between 1865 and 1933 that the FDIC identified as crisis years for bank failures, depositor losses averaged only 0.78 percent of total deposits in all commercial banks....During 1988 and 1989,... FDIC losses were approximately 0.25 percent of total deposits at insured banks. (Neuberger [1991], p. 2)

Though these numbers properly describe *society's* loss levels, individual, undiversified depositors would have lost a much larger proportion of their funds. Even if expected defaults are perfectly priced ex ante, realized defaults could still cause substantial problems. This danger seems most acute in the interbank market, and especially on CHIPS, which transfers about $825 billion daily in connection with foreign exchange and other large interbank payments. Large concentrations of credit are routine for banks servicing the small number of major trading firms in foreign exchange, swaps, or government securities. Though a limited number of minor institutional changes could reduce these exposures, some will undoubtedly remain (Flannery [1988]).[36] With large, undiversified credit exposures, any loss of confidence about the principals can quickly generate a systemic effect in which everyone becomes reluctant to trade over a risky payments system.[37]

The total cost of payments system disruptions will be large only if 1) the forgone trades generate large mutual benefits for the parties involved and 2) the cost of

substituting alternative payment arrangements is also large. Absent these two conditions, policymakers should bear only small costs to ensure continued stability of the payments system—even though disruptions may affect many individuals.

The Federal Reserve can provide payments finality at a lower cost than any private party because it has "deep pockets" and operates without limited liability (Kane [1982], especially p. 113). Under its Regulation J, the Fed currently provides payees with final (that is, unconditional) payment of good funds against checks presented and wire transfer orders received. Payees' banks can be certain that they will receive funds, regardless of the solvency of other banks in the System.

Should the government operate this credit-risk-free payments system? The information cost savings associated with government operation of the payments system seem obvious, but the Fed may also possess important disadvantages. First, in a static time frame, a private payments system might identify the paying banks' credit risk more accurately than the Fed can. A government agency may also be less able to *apply* price discrimination in response to the differences it perceives (see Stiglitz [1993] or Flannery and Protopapadakis [1984]). If riskier banks do not confront a higher price for payment services, a Fed-operated payments system may induce more overall risk than a private system would. A second consideration with government operation of the payments system is dynamic efficiency. It may be important to revise the payments system in response to new developments. An opportunity cost occurs if the Fed innovates less effectively than private operators would.

Another way to reduce payments system costs would be for the government to insure transaction account balances (including cash items in the process of collection). Without insurance, the cost savings from holding all one's transaction balances in a single account would be partly forgone by investors wishing to diversify their credit risk exposure. Government insurance would permit investors to enjoy greater savings from transaction account concentration. Notably, this argument does not apply to *investment* account balances, where private diversification devices seem entirely sufficient.

Finally, the international competitiveness of U.S. banks is sometimes associated with payments system stability: It is said that the Fed must ensure that payments are made reliably in the United States because other nations' central banks stand ready to provide free or underpriced payments system finality. This argument has positive (as opposed to distributional) consequences only if there is a social interest in having payments made through the U.S. system. If benefits accrue to securities market traders when foreign investors trade in U.S. markets, for example, the government might optimally seek lower payments system risk than the private market would supply.

4. Assessment

Financial-sector regulation should be evaluated in the same way as any other government intervention: according to its ability to improve real resource allocations or income distribution. Financial regulations should be designed to address specific market failures. Not all financial market failures can be improved with government intervention; nor is government risk-bearing the only (or even the most appropriate) solution for financial market inefficiencies. Indeed, a subsidy to private information-gathering seems to be more appropriate than government risk-bearing in some particular instances identified above.

Several general conclusions about government intervention seem warranted in light of the preceding discussion. The strongest arguments for government risk-bearing seem to involve the merit-good provision of deposit insurance to small savers, and measures to ensure payments system stability. The possible social benefits of maintaining deep and liquid U.S. securities markets may further justify regulatory expenditures on ensuring payments system reliability and fair information disclosure to the market.

Other common arguments for financial regulation seem less compelling:

1. Macroeconomic stability can be provided by astute monetary policy. The monetary authority seems no less likely to function efficiently than a federal deposit insurer would.

2. There is no convincing evidence that contagious bank runs would be a severe problem without government risk-bearing; and even if they were, the discount window could support illiquid, solvent banks.[38]

3. Large banks are not "too big to fail," though they may be too big for the market to reorganize in a timely manner. But the government need not bear depositors' default risks to correct a market failure in bank restructurings.

4. I have identified a number of reasons why government monitoring or information production might improve real allocations, but I have provided no evidence about the empirical relevance of these market failures. If the real effects of costly information are substantial, and market arrangements cannot overcome or reduce these costs, we should observe many unsatisfied borrowers. I am not aware of any evidence that they exist. Rather, recent financial-market innovations have materially improved most firms' and individuals' access to credit and investment opportunities. It therefore seems appropriate for policymakers to start with the presumption that market lending is adequate, while permitting affected parties to present evidence that government intervention in particular market segments is required. Salutary intervention need not involve direct government lending or guarantees.

5. Even if primary asset markets operate well, information-related failures might be much more serious for banks than for other firms. Government

monitoring or information production might thus be more appropriate for banks. Whether these activities require deposit insurance to make them credible is a separate, important question.

The theoretical analysis summarized in table 4–1 has identified many reasons why government intervention *might* improve real resource allocations. Evaluating whether government can *actually* improve social welfare requires a set of complex comparisons between private and public abilities to perform. This paper's analysis has identified several dimensions of public performance that are important for determining whether interventions are socially desirable.

1. *The relative efficiency of government vs. private production.* This determination includes both static and dynamic components, and applies to the possible role of government in subsidizing credit, operating the payments system, and restructuring failed banks.

2. *The market's relative ability to assess an individual bank's credit quality.* Randall (1989, 1990) asserts that markets do not recognize developing credit problems promptly, and that once these problems are recognized, depositors run. Under this scenario, bank deposit rates provide no discipline, leaving government agents as the only credible monitors of bank performance and risk. However, bank equity markets appear to function well, even when a large bank is in trouble (Aharony and Swary [1983], Swary [1986]). It would therefore be surprising if the same private market could not value uninsured bank debt rationally. Any discussion of regulatory reform requires a prior assessment of market participants' relative ability to identify bank and financial risks.

3. *The government's relative ability to influence private behavior.* Even if government agents could assess risk as well as private-market participants could, they may be so constrained by procedural issues of fairness that they cannot price perceived risks differentially. The government may therefore be less able to influence private behavior than the private market can (Stiglitz [1993]). In order to make informed judgments about the net benefits of government intervention in private markets, we need to measure the extent of any government disadvantage in influencing and pricing private-sector risks.

4. *The social cost of a payments system disruption.* These systemic costs will be small if *either* 1) the consumer surplus associated with interrupted trades is small, *or* 2) the representative trader can easily substitute a more secure form of payment (for example, collateralization) for the usual payment arrangements, *or* 3) the cost economies of concentrating transaction balances at a small number of banks are small. Many complex legal and technical issues influence these three factors. A credible evaluation of these costs will indicate whether payments system externalities are sufficiently important to warrant government intervention in the payments system.

An example of why these empirical issues must be addressed is provided by a careful consideration of the various "narrow bank" proposals that have been offered in recent years. I have become much more sympathetic to these proposals in the course of writing this paper. I believe that government should insure only small savers' accounts and transaction accounts, because this is where the merit-good and information-cost justifications for government risk-bearing are most compelling. (In particular, I fail to understand why large CD holders require more federal protection than the purchasers of a nonfinancial firm's commercial paper!) Private market inefficiencies can be addressed most directly by segmenting small savers' and transaction accounts in a separately capitalized holding company subsidiary, isolated from the rest of the company by fire walls.[39] The government's contingent insurance liabilities can be fairly priced based on a system of risk-based capital or premia applied to the insured subsidiary. The insurance agency should be able to impose more-aggressive risk discriminations than it can with the present institutional setup: If company managers believe that regulators are overcharging them for an asset's risk, they can transfer that asset into another, uninsured subsidiary where the market would price the risk.

The efficacy of this and other narrow bank proposals depends crucially on regulators' willingness to permit an uninsured bank affiliate to fail without intervention. This amounts to convincing regulators that the market can cope with affiliates' risk (both prospectively and in the wake of default) at least as well as the government can. The difficulty with this assessment is that holding companies will continue to finance informationally intensive assets, and will therefore continue to operate with mismatched maturities and high leverage (Diamond and Dybvig [1986], p. 57, Flannery [1991]). Uninsured affiliates—or perhaps even the parent firm—will bear potentially substantial illiquidity risks. The available empirical evidence provides no presumption the government should intervene in uninsured lenders' failures. Yet the political pressures to "do something" to mitigate voters' ex post financial losses may somehow confuse regulators about the proper course of action. If this is anticipated to occur, any narrow bank reform would leave us with a set of conjectural guarantees that continue to influence a broad range of private risk-bearing decisions. In order to determine whether nonbank liquidity risks are appropriately addressed with some form of government intervention, we must know more about the four issues listed immediately above.

5. Summary

This paper has evaluated the reasons why government regulation or risk-bearing might improve real-sector allocations in a capitalist economy. I have divided the

plethora of financial-sector products into three relatively homogeneous categories: primary securities, "banks," and payments system services. This categorization makes it possible to evaluate government regulation in terms of the fundamental financial services demanded by the economy. The analysis distinguishes between situations requiring government *regulation* and those requiring government *risk-bearing*. I was surprised at how difficult it is to support government risk-bearing on microeconomic grounds. While a number of situations could conceivably justify government risk-bearing, it is far from clear that such interventions would actually improve social welfare.

I have sought to define an analytical backdrop against which to evaluate financial-sector regulations and regulatory reforms. Having identified where government intervention *might* improve social welfare, we must now assess where such interventions *are likely* to yield positive net benefits. Undertaking this further evaluation in the context of functional regulation should keep it focused on the essential economic issues surrounding the need for government intervention in private market arrangements.

Notes

1. The government-sponsored enterprises (GSE) include Farm Credit Banks, Banks for Cooperatives, Federal Home Loan Banks, Federal National Mortgage Association (Fannie Mae), Federal Home Loan Mortgage Corporation (Freddie Mac), Student Loan Marketing Association (Sallie Mae), College Construction Loan Insurance Corporation (Connie Lee), and Federal Agricultural Mortgage Corporation (Farmer Mac).

2. Government legislation and court decisions also influence the allocation and assumption of private risks, although not as directly as the policies listed here.

3. Demsetz (1968), Posner (1971), Stigler (1971), and Wolf (1988) evaluate how governments can fail to perform their (putatively) intended functions.

4. Some recent reform proposals incorporate implicit, but contestable, assessments of the need for regulation or government risk-bearing. For example, the "narrow bank" proposals would protect only transaction account holders, and thereby imply that a contagious run against illiquid firms entails social costs only if the firms' liabilities include transaction accounts. Another policy, the "too big to fail" treatment of large institutions, implicitly denies the market's ability to distinguish solvent from insolvent financial institutions. Finally, proposals to ensure FDIC solvency by requiring high bank capital ratios imply that bank leverage conveys no real value.

5. Antitrust considerations provide an additional justification for government intervention in the private sector. I do not consider antitrust issues in this paper for two reasons. First, recent trends suggest that effective competition has been *increasing* in financial service markets, thus reducing the need for antitrust protection (Edwards [1988]). Second, even if financial-market concentrations are important, government risk-bearing does not seem to be the most appropriate corrective measure.

6. Greenwald and Stiglitz (1986) offer a particularly enthusiastic assessment of this potential role for salutary government intervention in the private sector. In particular, they conclude that whenever information is costly, "...Pareto improvements can be effected through government policies, such as commodity taxes." (p. 260)

7. For example, consider a set of loan applicants with exogenous characteristics. Lenders would have private incentives to sort them on quality, but the social benefits of sorting would be much smaller than the social cost. Moreover, the harder one lender tries to sort, the more effort other lenders must devote to sorting in order to avoid adverse selection. (I thank John Hamilton for pointing out this possibility.) Another example: Bond traders would pay dearly for a good forecast of this week's money supply data, though the social value of that information may be quite limited.

8. In addition, different claimants may have conflicting interests. For example, bondholders may wish to ensure that managers do not transfer value to equityholders by selecting risky projects.

9. Empirical studies indicate that the presence of a large stakeholder significantly increases firm value—presumably because other investors expect to benefit from the improved provision of monitoring services.

10. Still another type of public good is the establishment of standards for a shared system of communications or manufactured goods: Private competitors will not necessarily adopt a socially optimal standard. The Federal Reserve claims that it has an important role in defining payments system standards and in implementing valuable innovations in a timely way (Federal Reserve Board of Governors [1990]). Weicher (1988) suggests that the government's early involvement in mortgage securitization encouraged private innovations by establishing some basic principles for the market to follow. Because standard-setting does not necessarily require federal risk-bearing, it is not evaluated further in this paper.

11. For example, the Monetary Control Act of 1980 requires the Federal Reserve to price its clearing and settlement services at full cost, including a Public Sector Adjustment Factor (PSAF). Computation of the PSAF has been a frequent subject of dispute.

12. In a particular institutional setting, one firm might offer a combination of these products. I do not consider the potentially important possibility that such combined offerings might require regulatory interventions beyond those considered here.

13. Diamond (1984) formally evaluates the credibility of "delegated monitors"; Campbell and Kracaw's (1980) information producer is analogous to an investment advisory service.

14. Pension funds might also be placed in this category, because the employer's equity serves to separate the quality of the pension claims from the return on the underlying asset portfolio (at least for defined benefit plans). Because another paper in this volume deals exclusively with pension funds (Utgoff [1993]), I have avoided specific comments on this type of intermediary institution.

15. Goodhart (1988, especially pp. 95-96 and 98-99) strongly argues that the most important feature of banks for purposes of designing regulatory oversight is their illiquid asset portfolios. See also Benston et al. (1986, chapter 5), Diamond and Dybvig (1983, 1986), or Flannery (1991).

16. Kaufman (1991) provides conflicting evidence on this issue. He reports that banks were more highly capitalized before federal deposit insurance emerged in 1933, but banks have always held less capital than have nonfinancial firms.

17. Calomiris and Kahn (1991) also argue that maturity mismatching is a fundamental response to bank asset properties.

18. This statement presumes that bank insiders confront some cost of substituting into high-risk assets.

19. Other institutional reforms (such as loan sales and restrictive covenants) can also ameliorate the investment distortions associated with leveraged banks, but they are unlikely to eliminate those costs entirely (Flannery [1991]). Hence, some bank lending will optimally be financed with short-term debt.

20. Record-keeping transaction services are provided by credit card companies and mutual funds in addition to banks. It appears that the private sector can efficiently provide payment record-keeping services, which are therefore not discussed further in this paper.

21. With multiple banks in the collection chain, this credit risk would occur several times in the course of collecting a single check.

22. Black (1975) envisions an unregulated banking system in which each individual or firm has a line of credit whose balance can be negative or positive, according to the cumulative pattern of the account's inflows or outflows. On the Clearing House Interbank Payments System (CHIPS), banks frequently permit a customer to make payments against provisionally credited funds, even though the bank has not yet received clear title to those funds.

23. The federal safety net undoubtedly exacerbates transaction account concentrations.

24. Many transactions could be collateralized to eliminate credit risk, but presumably the private costs of collateralization exceed the cost of bearing credit risk (at least under present Federal Reserve policies). Some private transactions, such as CHIPS, have been moving toward arrangements that rely on more collateral and less credit exposure.

25. Separating the credit origination process from risk-bearing introduces a host of agency and moral hazard problems that raise the cost of government intervention.

26. Many writers have pointed out that subsidizing credit tied to a particular real-sector activity will not necessarily expand the supply of that activity. See Gale (1990) for a formal model of how government credit provision can influence real-sector allocations when information is costly.

27. As Pagano (1989) shows, deeper U.S. markets may not be Pareto optimal from a world perspective, but they can enhance U.S. residents' welfare.

28. Randall (1989, 1990) strongly argues that the market cannot effectively determine bank quality, leaving the government (with its access to "inside information") as the best source of external discipline. The accuracy of this assessment is fundamental in the design of effective and efficient regulatory devices.

29. Federal Reserve Board Governor Wayne Angell typifies this view: "I wouldn't want the Transportation Department to put up signs at every bridge saying, 'Cross at your own risk.' Similarly, I am uncomfortable with the idea of asking bank depositors to bank at their own risk." (Bacon [1991])

30. A recent U.S. Treasury study (1991) asserts that "...runs are a destructive form of 'market failure' in which unfettered market forces are unable to achieve the most efficient use of resources." (p. 3)

31. Note that monetary effects occur only if depositors demand currency in place of their deposits. By contrast, a flight from some banks to other banks need have no monetary effect (Kaufman [1988]).

32. Moreover, the need to backstop Fed policy seems to have declined: The Fed currently understands the effect of monetary policy much better than it did in the 1930s.

33. Haugen and Senbet (1978) argue that when a firm's debt and equity are both publicly traded, costly bankruptcy can be avoided if investors purchase all outstanding securities and (costlessly) reorganize the firm's financial structure.

34. Regulators frequently assert that they cannot immediately dispose of a failed bank. Several programs, such as bridge banks and the Management Consignment Program, have been designed to provide enough time and information for private operators to value the bank properly.

35. Alternatively, traders can switch to a different form of payment. If the alternative payment is more costly than a well-functioning system with low default risk, some beneficial trades will still be forgone when banks' perceived risks increase.

36. The Federal Reserve has been tightening its limits on daylight overdrafts since 1986 and may soon explicitly price daylight credit extensions to paying banks. Similarly, CHIPS has recently moved to collateralize several billion dollars of the System's daylight overdrafts, substantially reducing the potential for systemic credit risk problems.

37. The presence of a fully guaranteed alternative system (Fedwire) makes it easy for participants to flee the private system.

38. I am willing to countenance a government lender of last resort because I believe that the government can do this job reasonably well. For a contrary view, see Goodfriend and King (1988).

39. This assertion implies the manageability of a number of thorny issues concerning the insured subsidiary's permissible assets and transactions between holding company subsidiaries.

References

Aharony, Joseph, and Swary, Itzhak. 1983. "Contagion Effects of Bank Failures: Evidence from Capital Markets." *Journal of Business* 56 (July): 305–322.

Akerlof, George A. 1970. "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism." *Quarterly Journal of Economics* 84 (August): 488–500.

Bacon, Kenneth H. 1991. "Banking-Reform Proposals Are Already Rattling the System and Making the Credit Crunch Worse." *The Wall Street Journal,* Midwest Edition, April 16.

Benston, George, Eisenbeis, Robert A., Horvitz, Paul M., Kane, Edward J., and Kaufman, George G. 1986. *Perspectives on Safe and Sound Banking: Past, Present, and Future.* Cambridge, Mass.: MIT Press.

Bernanke, Ben S. 1983. "Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression." *American Economic Review* 73 (June): 257–276.

Black, Fischer. 1975. "Bank Funds Management in an Efficient Market." *Journal of Financial Economics* 2 (December): 323–339.

Boyd, John H., and Kwast, Myron L. 1981. "Bank Regulation and the Efficiency of Financial Intermediation." In *Public Policy and Capital Formation: A Study by the Federal Reserve System.* Board of Governors of the Federal Reserve System, April, 233–249.

Brunner, Karl, and Meltzer, Allan H. 1971. "The Uses of Money: Money in the Theory of an Exchange Economy." *American Economic Review* 61 (December): 784–805.

Calomiris, Charles W., and Kahn, Charles M. 1991. "The Role of Demandable Debt in Structuring Optimal Banking Arrangements." *American Economic Review* 81 (June): 497–513.

Campbell, Tim S. 1979. "Optimal Investment Financing Decisions and the Value of Confidentiality." *Journal of Financial and Quantitative Analysis* 14 (December): 913–924.

Campbell, Tim S., and Kracaw, William A. 1980. "Information Production, Market Signalling, and the Theory of Financial Intermediation." *Journal of Finance* 35 (September): 863–882.

Corrigan, E. Gerald. 1987. "Financial Market Structure: A Longer View." New York: Federal Reserve Bank of New York, January.

Demsetz, Harold. 1968. "Why Regulate Utilities?" *Journal of Law and Economics* 11 (April): 55–65.

Diamond, Douglas W. 1984. "Financial Intermediation and Delegated Monitoring." *Review of Economic Studies* 51 (July): 393–414.

Diamond, Douglas W., and Dybvig, Philip H. 1983. "Bank Runs, Deposit Insurance, and Liquidity." *Journal of Political Economy* 91 (June): 401–419.

Diamond, Douglas W., and Dybvig, Philip H. 1986. "Banking Theory, Deposit Insurance, and Bank Regulation." *Journal of Business* 59: 55–68.

Dugger, Robert. 1991. "International Banking Competitiveness." *Secondary Mortgage Markets, 1990/91,* 7: 20–23.

Edwards, Franklin R. 1988. "The Future Financial Structure: Fears and Policies." In W.S. Haraf and R.M. Kushmeider (Eds.), *Restructuring Banking and Financial Services in America.* Washington, D.C.: American Enterprise Institute, 113–155.

Ellis, David M., and Flannery, Mark J. 1991. "Does the Debt Market Assess Large Banks' Risk? Time Series Evidence from Money Center CDs." Working paper, University of Florida.

Fama, Eugene F. 1980. "Banking in the Theory of Finance." *Journal of Monetary Economics* 6: 39–57.

Federal Reserve Board of Governors. 1990. "The Federal Reserve in the Payments System." *Federal Reserve Bulletin* 76 (May): 293–298.

Flannery, Mark J. 1988. "Payments System Risk and Public Policy." In W.S. Haraf and R.M. Kushmeider (Eds.), *Restructuring Banking and Financial Services in America.* Washington, D.C.: American Enterprise Institute, 261–287.

Flannery, Mark J. 1991. "Debt Maturity and the Deadweight Cost of Leverage: Optimally Financing Banking Firms." Working paper, University of Florida.

Flannery, Mark J., and Protopapadakis, Aris A. 1984. "Risk-Sensitive Deposit Insurance Premia: Some Practical Issues." *Business Review,* Federal Reserve Bank of Philadelphia, September/October, 3–10.

Friedman, Milton, and Schwartz, Anna Jacobson. 1963. *A Monetary History of the United States, 1867–1960.* Princeton, N.J.: Princeton University Press for the National Bureau of Economic Research.

Gale, William G. 1990. "Collateral, Rationing, and Government Intervention in Credit Markets." In R. Glenn Hubbard (Ed.), *Asymmetric Information, Corporate Finance, and Investment.* Chicago: University of Chicago Press, 43–61.

Garbade, Kenneth D., and Silber, William L. 1979. "The Payment System and Domestic Exchange Rates: Technological Versus Institutional Change." *Journal of Monetary Economics* 5 (January): 1–22.

Gilbert, R. Alton. 1988. "A Re-examination of the History of Bank Failures, Contagion, and Banking Panics." In *The Financial Services Industry in the Year 2000: Risk and Efficiency.* Proceedings of a Conference on Bank Structure and Competition, Federal Reserve Bank of Chicago, 128–152.

Goodfriend, Marvin, and King, Robert G. 1988. "Financial Deregulation, Monetary Policy, and Central Banking." In W.S. Haraf and R.M. Kushmeider (Eds.), *Restructuring Banking and Financial Services in America.* Washington, D.C.: American Enterprise Institute, 216–253.

Goodhart, C.A.E. 1988. *The Evolution of Central Banks.* Cambridge, Mass.: MIT Press.

Gorton, Gary. 1985. "Bank Suspension of Convertibility." *Journal of Monetary Economics* 15 (March): 177–193.

Green, Richard C. 1984. "Investment Incentives, Debt, and Warrants." *Journal of Financial Economics* 13 (March): 115–136.

Greenwald, Bruce C., and Stiglitz, Joseph E. 1986. "Externalities in Economies with Imperfect Information and Incomplete Markets." *Quarterly Journal of Economics* 101 (May): 229–264.

Gurley, John G., and Shaw, Edward S. 1960. *Money in a Theory of Finance.* Washington, D.C.: The Brookings Institution.

Hasan, Iftekhar, and Dwyer, Gerald P. Jr. 1988. "Contagion Effects and Banks Closed in the Free Banking Period." In *The Financial Services Industry in the Year 2000: Risk and Efficiency.* Proceedings of a Conference on Bank Structure and Competition, Federal Reserve Bank of Chicago, 153–177.

Haugen, Robert A., and Senbet, Lemma W. 1978. "The Insignificance of Bankruptcy Costs to the Theory of Optimal Capital Structure." *Journal of Finance* 33 (May): 383–393.

Hirshleifer, Jack. 1971. "The Private and Social Value of Information and the Reward to Inventive Activity." *American Economic Review* 61 (September): 561–574.

Jensen, Michael C., and Meckling, William H. 1976. "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure." *Journal of Financial Economics* 3 (October): 305–360.

Kane, Edward J. 1982. "Changes in the Provision of Correspondent-Banking Services and the Role of Federal Reserve Banks under the DIDMC Act." *Carnegie-Rochester Conference Series on Public Policy* 16: 93–126.

Kane, Edward J. 1987. "Who Should Learn What from the Failure and Delayed Bailout of the ODGF?" In *Merging Commercial and Investment Banking.* Proceedings of a Conference on Bank Structure and Competition, Federal Reserve Bank of Chicago, 306–326.

Kareken, John H. 1985. "Ensuring Financial Stability." In *The Search for Financial Stability: The Past Fifty Years.* A Conference Sponsored by the Federal Reserve Bank of San Francisco: Asilomar, Calif., 53–77.

Kaufman, George G. 1988. "The Truth about Bank Runs." In C. England and T. Huertas (Eds.), *The Financial Services Revolution: Policy Directions for the Future.* Boston: Kluwer Academic Publishers, 9–40.

Kaufman, George G. 1991. "Capital in Banking: Past, Present and Future." Working paper, Loyola University.

Leland, Hayne E. 1979. "Quacks, Lemons, and Licensing: A Theory of Minimum Quality Standards." *Journal of Political Economy* 87 (December): 1328–1346.

Merton, Robert C. 1977. "An Analytic Derivation of the Cost of Deposit Insurance and Loan Guarantees: An Application of Modern Option Pricing Theory." *Journal of Banking and Finance* 1 (June): 3–11.

Murton, Arthur J. 1989. "Bank Intermediation, Bank Runs, and Deposit Insurance." *FDIC Banking Review* 2 (Spring/Summer): 1–10.

Myers, Stewart C. 1977. "Determinants of Corporate Borrowing." *Journal of Financial Economics* 5 (November): 147–175.

Myers, Stewart C., and Majluf, Nicholas S. 1984. "Corporate Financing and Investment Decisions when Firms Have Information that Investors Do Not Have." *Journal of Financial Economics* 13 (June): 187–221.

Neuberger, Jonathan A. 1991. "Depositor Discipline and Bank Runs." *Weekly Letter,* Federal Reserve Bank of San Francisco, April 12.

Niehans, Jürg. 1971. "Money and Barter in General Equilibrium with Transactions Costs." *American Economic Review* 61 (December): 773–783.

Pagano, Marco. 1989. "Trading Volume and Asset Liquidity." *Quarterly Journal of Economics* 104 (May): 255–274.

Posner, Richard A. 1971. "Taxation by Regulation." *The Bell Journal of Economics and Management Science* 2 (Spring): 22–50.

Randall, Richard E. 1989. "Can the Market Evaluate Asset Quality Exposure in Banks?" *New England Economic Review,* Federal Reserve Bank of Boston, July/August, 3–24.

Randall, Richard E. 1990. "The Need to Protect Depositors of Large Banks, and the Implications for Bank Powers and Ownership." *New England Economic Review,* Federal Reserve Bank of Boston, September/October, 63–75.

Saunders, Anthony. 1988. "Bank Holding Companies: Structure, Performance, and Reform." In W.S. Haraf and R.M. Kushmeider (Eds.), *Restructuring Banking and Financial Services in America.* Washington, D.C.: American Enterprise Institute, 156–202.

Stigler, George J. 1971. "The Theory of Economic Regulation." *The Bell Journal of Economics and Management Science* 2 (Spring): 3–21.

Stiglitz, Joseph E. 1985. "Credit Markets and the Control of Capital." *Journal of Money, Credit, and Banking* 17 (May): 133–152.

Stiglitz, Joseph E. 1987. "The Causes and Consequences of the Dependence of Quality on Price." *Journal of Economic Literature* 25 (March): 1–48.

Stiglitz, Joseph E. 1993. "Perspectives on the Role of Government Risk-Bearing within the Financial Sector." In Mark S. Sniderman (Ed.), *Government Risk-Bearing: Proceedings of a Conference Held at the Federal Reserve Bank of Cleveland, May 1991.* Boston: Kluwer Academic Publishers.

Summers, Lawrence H., and Summers, Victoria P. 1989. "When Financial Markets Work Too Well: A Cautious Case for the Securities Transaction Tax." Mimeograph, Harvard University.

Swary, Itzhak. 1986. "Stock Market Reaction to Regulatory Action in the Continental Illinois Crisis." *Journal of Business* 59 (July): 451–473.

Townsend, Robert M. 1979. "Optimal Contracts and Competitive Markets with Costly State Verification." *Journal of Economic Theory* 21 (October): 265–293.

U.S. Department of the Treasury. 1991. *Modernizing the Financial System: Recommendations for Safer, More Competitive Banks.* Washington, D.C.: U.S. Government Printing Office, February.

Utgoff, Kathleen P. 1993. "The PBGC: A Costly Lesson in the Economics of Federal Insurance." In Mark S. Sniderman (Ed.), *Government Risk-Bearing: Proceedings of a Conference Held at the Federal Reserve Bank of Cleveland, May 1991.* Boston: Kluwer Academic Publishers.

Wall, Larry D., and Peterson, David R. 1989. "The Effect of Continental Illinois' Failure on the Financial Performance of Other Banks." Working Paper 89-9, Federal Reserve Bank of Atlanta, December.

Weicher, John C. 1988. "The Future Structure of the Housing Finance System." In W.S. Haraf and R.M. Kushmeider (Eds.), *Restructuring Banking and Financial Services in America.* Washington, D.C.: American Enterprise Institute, 296–336.

Wolf, Charles. 1988. *Markets or Governments: Choosing between Imperfect Alternatives.* Cambridge, Mass.: MIT Press.

Commentary

Howell E. Jackson

It is difficult to be anything but wholeheartedly sympathetic toward Mark Flannery's undertaking in this paper. Whenever government intervenes into economic relations among private parties, one should be mindful of the purposes the intervention is supposed to serve, of the costs it may entail, and of alternative and perhaps preferable ways of achieving those purposes. Insisting upon coherent justifications for government intervention is particularly important in the area of financial regulation, where historical accident and political imperative, more often than considered and disinterested analysis, have determined and continue to influence regulatory policy.[1]

What is particularly appealing, even audacious, in Flannery's paper is its ambition not only to identify some economic rationales for financial-sector regulation, but to plot the entire universe of justifications—imperfect information, externalities, merit goods, etc. He then considers the extent to which they might warrant regulation of what he identifies as the three essential types of financial products: primary securities, "banks," and payment services. The scope of the paper, which is summarized in the analytical matrix in table 4–1, is thus broader than the topic of this conference: Flannery is considering not just when government risk-bearing might be warranted for financial activities, but also when any other sort of government intervention into financial markets might be theoretically defensible.

This project—sort of a unified theory of financial regulation—places heavy and conflicting burdens on its author. On the one hand, in order to cover the entire universe, one aspires to be encyclopedic. On the other hand, to make theoretical headway, one strives to distill and simplify. These are hard masters to serve simultaneously, and Flannery has for the most part balanced them quite nicely. A few areas remain, however, where the analysis could be fleshed out a bit more—that is, to favor comprehension over distillation—and it is on these points that my comments are focused.

1. Are Any Justifications for Government Intervention Plausible?

By framing the paper as an exhaustive review of policy justifications for financial regulation, Flannery invites criticism that he may have overlooked a certain justification that could lend support to further government regulation (and perhaps even to additional governmental risk-bearing). Given the nature of his undertaking,

he would have only a few possible responses to such a challenge. He could defend his presentation by arguing that the additional justification is simply a rationale already listed (for example, a special case of imperfect information) and is therefore implicitly encompassed within his analysis. Or, he could deny that the proposed justification constitutes a legitimate basis for government intervention. Or, he could expand his universe to include the justification. But what he cannot do—and still maintain the integrity of his unified approach—is to demur (as many of us are fond of doing) that the point is interesting, but beyond the realm of this paper.

The question then arises: Are any important justifications for financial regulation missing from the analysis? The answer, I believe, is not very many, but perhaps one or two.

Most of the justifications that Flannery identifies result from market failures associated with the liability side of financial-institution balance sheets. In discussing informational imperfections, for example, he focuses on the various reasons why financial intermediaries might not be able to raise a socially appropriate amount of debt or equity. Similarly, in his analysis of negative externalities, he considers the costs that defaults on the obligations of banks or of counterparties in payments systems might impose on third parties or on society at large. Although these are common themes in financial regulation, the existence of mandatory legal rules in this field is also sometimes justified in terms of other market failures associated with the unique structure and function of the financial services industry.

For example, an increasingly prominent feature of depository-institution regulation in this country is the Community Reinvestment Act of 1977 (CRA), which requires commercial banks and thrifts to meet the credit needs of lower-income and minority borrowers.[2] This kind of regulation could be understood as having merely a distributive purpose (which Flannery would designate a merit-good justification), but CRA-style regulations are also often justified as responding to deficiencies in how banks and thrifts serve low-income and minority credit needs in their local communities. This rationale is consistent with recent empirical evidence suggesting that traditional lending institutions underserve minority communities more than can be explained by observable differences in economic conditions.[3]

A number of explanations are possible for such apparent deficiencies in credit markets. One posits the existence of irrational but culturally ingrained norms on the part of decision-makers in lending institutions, such as are often associated with markets characterized by traditional redlining practices. This deviation from wider societal norms would presumably justify some form of governmental intervention (though not necessarily governmental assumption of risk) to encourage local institutions to make socially desirable loans. Alternative explanations of this kind of market failure do not depend on bad faith in credit allocation. For example, it is possible that local lending institutions have historically avoided certain neighborhoods and certain

types of lending arrangements, and that each local bank is individually disinclined to alter its historic lending patterns in order to avoid the costs of developing new markets singlehandedly.[4] Government regulation requiring a collective response to low-income or minority credit needs might therefore be justified to solve this sort of defect in market interaction, provided the costs did not outweigh the benefits.

Another omitted, but plausible, economic justification for government intervention arises from the international markets in which financial intermediaries now operate. Regulatory systems in other countries might conceivably support domestic government intervention that would not otherwise be justified. U.S. deposit insurance is occasionally defended on precisely this basis. While the United States has the world's most elaborate system of deposit insurance, most other industrialized countries, in one way or another, stand behind the deposits of their own banks.[5] Even though it might make economic sense for the entire industrialized world to eliminate or at least reduce these systems of comprehensive deposit insurance coverage, neither the United States nor any other single country would want to be the first to take such a step for fear that its depository institutions would be penalized in their competition for funds in the international capital markets.[6]

The distinguishing feature of these two categories of market failures is that they emanate from deficient interactions among financial intermediaries, rather than from the capital-raising activities of financial and nonfinancial entities with which Flannery's justifications are primarily concerned. Unless he can demonstrate that these interactive market failures are illogical or already subsumed in his analysis, he is bound to grant them a place in his universe.

2. How Should Financial Products Be Categorized?

I now turn to the second dimension of Flannery's analytical matrix—the horizontal axis on which financial products are divided into three separate groups: primary securities, "banks," and payment services. This division is central to the paper's project, which is to consider the extent to which various possible economic justifications warrant regulation of these financial products. Because the issue is so important to the paper's analysis, it is worth analyzing in some detail whether these horizontal classifications provide the most meaningful division of the financial sector.

First, consider the distinction that the paper draws between primary securities and "banks." In Flannery's framework, primary securities refer to traditional financial instruments, such as stocks and bonds, whether held by investors directly or through mutual funds or other pooled investment vehicles. "Banks," in contrast, comprise a range of financial intermediaries (including depository institutions, such as real commercial banks and thrifts, insurance companies, finance companies, and perhaps pension plans) whose shared characteristic is the existence of portfolio assets

funded through a combination of senior claims (such as deposits or insurance reserves) and junior claims in the hands of equity owners.

Though this is an interesting first cut at the division of financial products, further refinement may be in order. First, if the distinguishing characteristic of Flannery's "banks" is the potential conflict between equity owners and senior claimants, would mutual funds be better classified as banks rather than primary securities? Although mutual funds are not "owned" by junior claimants, the entity with practical control over these funds is the investment adviser, who can be characterized as having an equity-style interest in fund assets as a result of advisory fees, sales loads, and soft-dollar arrangements. Indeed, much of the federal regulation of mutual funds is directed at preventing investment advisers from taking unfair advantage of their shareholders, just as depository-institution regulation is aimed at protecting depositors from exploitative behavior by shareholders.[7]

Another aspect of the horizontal axis that raises questions is the breadth that Flannery accords the "bank" category. In his framework, "banks" include depository institutions, insurance companies, and (perhaps) pension funds.[8] This definition is troubling in several respects. To begin with, our current system of regulation proceeds on the assumption that these types of financial intermediaries warrant specialized systems of regulation. The regulation of commercial banks under U.S. law differs markedly from the treatment of pension plans under ERISA as well as from the regulation of insurance companies under various state laws. While the extent of our regulatory variation may be excessive in certain respects, I am not aware of any country that regulates these different types of financial intermediaries in a wholly unified manner. At the very least, Flannery bears the burden of explaining why these institutions should be grouped together in his analytical matrix.

In addition to not fully explaining the breadth of his "bank" category, Flannery also neglects to consider some important structural distinctions. His analysis tends to emphasize institutions that fund long-term, illiquid assets with short-term, fixed-payment claims. While this is an appropriate focus for the analysis of depository institutions and finance companies, these characteristics are not shared by all of the institutions that he includes in the term "bank." Insurance companies, for example, often issue long-term contingent liabilities.[9] Similarly, pension plans are financed with commitments to fund retirement benefits far into the future.

This distinction is potentially important for Flannery's project, because the structure of these long-term liabilities may present other kinds of market failures than those discussed in his paper. For example, there may be unique market imperfections in the pricing of long-term insurance policies with claims that take many years to develop or that entail high-cost, low-probability risks. These problems are substantially different from the illiquidity risks associated with depository institutions with short-term liabilities, and likely warrant different kinds of regulation.

By lumping all of these institutions within the single category of "banks," Flannery loses the opportunity to explore how the different policy justifications might play out in various institutional contexts. It could, therefore, be fruitful to segment the category further.

Even if Flannery and I were to agree on the divisions of financial products to be used on the horizontal axis, another problem could exist. An assumption implicit in the paper is that different systems of regulation are appropriate for different types of financial products. What exactly those systems should be—whether they should include government risk-bearing or other forms of regulation—we cannot determine until we analyze more completely the relative costs of implementation. The ultimate goal of the project, however, is to arrive at an appropriate set of regulations for each type of financial product, and the assumption is that different products will end up with different regimes.

The difficulty here, of course, is keeping the products under their appropriate regulatory regimes. From a lawyer's perspective, one of the lessons of the last few decades of financial regulation is that it is extremely hard to keep financial intermediaries within predetermined product lines. Distinctions in regulatory structures invite regulatory arbitrage. Insurance companies, which are "banks" in Flannery's framework, have aggressively developed products that are functionally equivalent to pooled investment vehicles, which he considers to be primary securities. Courts and counsel have spent countless hours debating whether these innovations should be regulated under insurance laws or securities laws, or both.[10] More recently, similar jurisdictional disputes have arisen as banks have begun to branch into the insurance business and as insurance companies have responded by developing their own brands of depository instruments.[11]

To put this comment in the context of the paper, I would suggest that there may be greater difficulty than the paper implies in isolating financial products for separate regulatory regimes. Moreover, to the extent that Flannery proposes a regulatory system that distinguishes among types of financial products, there will inevitably be costs associated with maintaining those distinctions. Presumably, the greater the variation in regulatory regimes across product lines, the greater the incentives for private parties to arbitrage among the systems.

The fact that financial products can be combined in novel and unexpected ways also has important constructive implications for the analysis of the paper. Recombination of financial products can expand the possible systems of regulation. Here is one example of how such recombination could be relevant to Flannery's analysis: In considering whether the government should be in the business of insuring transaction accounts—as opposed to maintaining a government-sponsored payments system such as Fedwire—Flannery suggests that the correct policy choice might hinge on whether private institutions enjoy some comparative advantage in

delivering payment services. His argument is that if such private advantages exist, government insurance for transaction accounts might be preferable to a publicly controlled payments system. But recombination of financial products may offer an even more attractive regulatory alternative. If payment services could be grafted onto pooled investment vehicles (as they are, in effect, with Merrill Lynch's CMA accounts), then private economies might theoretically be achieved without the costs associated with government insurance and without any measurable risk to payments systems users.[12] The optimal regulatory regime might therefore entail neither government insurance for transaction accounts nor government-sponsored payment services, but rather could consist of a legal requirement that access to the payments system be restricted to pooled investment vehicles that are limited to low-risk, short-term investments.

It is unclear how often such recombinations of products will be possible, but the general point is that in developing ideal forms of regulation, it may be relevant to consider combinations across product types that would permit less costly forms of regulation than would be available in regimes based on sector-by-sector regulation.

3. Regulation: Desirability versus Appropriateness

Finally, I would like to say a few words about the next step of analysis that the paper identifies, but does not undertake. Once the universe of theoretical justifications for regulation is mapped, it will be necessary to balance the costs of implementing theoretically beneficial initiatives against alternative forms of government intervention and the costs of doing nothing—that is, the costs of uncorrected market failures. As Flannery notes at several points, this further analysis is an essential precondition to proper evaluation of whether regulatory initiatives are theoretically desirable as opposed to theoretically justifiable.

But even if Flannery takes this second step of analysis—and I very much hope he does—there remains a large gap between regulatory regimes that are theoretically desirable and those that would be incrementally appropriate. One of the lessons to be learned from the ongoing crisis in the banking and thrift industries is that certain reforms may be highly desirable from a theoretical perspective, but very undesirable in practice. In this category, I would include various deregulatory efforts undertaken at both the federal and state levels in the late 1970s and early 1980s to expand the powers of federally insured institutions. While these reforms were wholly justified on various welfare economic grounds, in retrospect they may have been incrementally inappropriate because they disrupted the supervisory and internal industry controls that had held other market failures (most notably the moral hazards associated with fixed-premium deposit insurance) in check for the preceding 30 or 40 years. Arguably, the primary

consequence of these theoretically laudable reforms was to increase the overall costs of subsequent thrift and bank failures.

I therefore propose that after Flannery finishes the second stage of this project, he turn to a third level of analysis, which is adapting his theoretical insights into incrementally appropriate reforms. In the meantime, however, completing the first stage is a welcome beginning.

Notes

1. For a recent survey of the political origins of financial regulation in this country, see Mark J. Roe, *A Political Theory of American Corporate Finance,* 91 Colum. L. Rev. 10 (1991).

2. 12 U.S.C.A. §2901–2906 (West 1989 and Supp. 1991).

3. See Katharine L. Bradbury, Karl E. Case, and Constance R. Dunham, 1989, "Geographic Patterns of Mortgage Lending in Boston, 1982–1987," Federal Reserve Bank of Boston, *New England Economic Review* (September/October): 3–30.

4. Such an explanation is developed in William C. Gruben, Jonathan A. Neuberger, and Ronald H. Schmidt, 1990, "Imperfect Information and the Community Reinvestment Act," Federal Reserve Bank of San Francisco, *Economic Review* (Summer): 27–46.

5. These insurance systems are cataloged in the Treasury Department's recent study, *Modernizing the Financial System: Recommendations for Safer, More Competitive Banks,* ch. XXI (February 1991).

6. This international justification for U.S. deposit insurance, which is rooted in the need to offset the effects of extraterritorial legal regimes, is distinguishable from the international justification for financial regulation that Flannery identifies, which deals with essentially parochial interests in centralizing foreign business in U.S. markets.

7. See SEC Request for Comments on the Reform of the Regulation of Investment Companies, 55 Fed. Reg. 25, 322 (June 21, 1990), which summarizes current mutual-fund regulations. Similarly, one might wonder whether financial intermediaries that operate without traditional equity ownership—such as mutual banks and mutual insurance companies—belong in a category that is defined by the existence of a junior/senior claimant conflict. See Eric Rusmusen, 1989, "Mutual Banks and Stock Banks," *Journal of Law and Economics* 31 (October): 395–421; and Henry Hansmann, 1985, "The Organization of Insurance Companies: Mutual versus Stock," *Journal of Law, Economics, and Organization* 1 (Spring): 125–153.

8. To be fair, Flannery reserves comment on pension plans. I nevertheless discuss them here because certain pension plans logically belong within his definition of "banks" in that employer sponsors hold junior claims on plan assets, and his reservation is based solely on the fact that pensions are discussed elsewhere in the conference proceedings (see Kathleen P. Utgoff, "The PBGC: A Costly Lesson in the Economics of Federal Insurance").

9. Al H. Ringleb and Steven L. Wiggins make this point in greater detail elsewhere in this volume in "Institutional Control and Large-scale, Long-term Hazards."

10. See, for example, *SEC* v. *VALIC,* 359 U.S. 65 (1959); *SEC* v. *United Benefit Life Insurance Co.,* 387 U.S. 202 (1967); *Prudential Insurance Co.* v. *SEC,* 326 F. 2d 383 (3rd Cir. 1964).

11. See, for example, *Citicorp* v. *Board of Governors* 936 F. 2d (2d Cir. 1991), *cert. denied,* 116 L. Ed 2d 775 (1992); *First National Bank of Eastern Arkansas* v. *Taylor,* 907 F. 2d 775 (8th Cir.), *cert. denied,* 111 S. Ct. 442 (1990).

Guaranteed investment contracts (GICs) are a good example of this latter development. See Rule 151 under the Securities Act of 1933, 17 C.F.R. §230.151 (1991).

12. For a description of the CMA program, see *Krinsk* v. *Merrill Lynch Asset Management, Inc.,* 875 F. 2d 404 (2d Cir.), *cert. denied,* 493 U.S. 919 (1989).

5 Perspectives on the Role of Government Risk-Bearing within the Financial Sector

Joseph E. Stiglitz

In virtually all industrialized economies, governments assume a major role in risk-bearing. They provide a variety of forms of "social" insurance (retirement annuities and disability, unemployment, and medical insurance), issue credit and credit guarantees, and offer or organize insurance for those engaging in transactions with financial institutions (deposit insurance, pension funds, and guaranty funds for beneficiaries of insurance policies). The magnitude of these risk-bearing activities is enormous: In recent years, government loans and guaranteed loans (for

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which government bears the risk of default) have accounted for as much as one-third of all private lending in the United States.

But as government risk-bearing has grown, so too have the related problems policymakers must face. Although the enormous potential losses stemming from the federal bailout of the nation's savings and loans (S&Ls) have received the most attention, other programs, notably those guaranteeing private pensions, are also in trouble. The S&L bailout illustrates an important aspect of public risk-bearing; that is, its extent need not be limited to the terms of an ex ante contract. Ex post, the government has absorbed risks it was not obligated to bear.

The growth and pervasiveness of government risk-bearing, and the problems associated with it, make it important to ask why government has undertaken this role. Should it be so actively engaged in assuming risk, or is this function better left to the market? And if government is to undertake risk-bearing, how can it do so more effectively?

1. Market Failure

This paper provides an overview of the government's role in financial-sector risk-bearing and then uses that framework to make some tentative policy recommendations. I begin with the perspective presented so well by Mark Flannery (see chapter 4 of this volume), who asserts that when there is an incomplete set of risk markets and imperfect information — characteristics of even the best financial markets — the economy is not constrained Pareto efficient. The point of the Greenwald–Stiglitz theorem (see Greenwald and Stiglitz [1986, 1988b]) that established this result was to destroy the presumption that free and unfettered markets *necessarily* lead to efficient outcomes. A major theme in economic science over the past 200 years has been to determine precisely the conditions under which Adam Smith's invisible-hand conjecture is valid. Arrow and Debreu's (1954) great intellectual achievement in proving the Fundamental Theorems of Welfare Economics was to find that extremely special — and empirically irrelevant — set of conditions under which Smith's conclusion was true. Although Arrow and Debreu provided *sufficient* conditions for the validity of that result, we now know that when any one of their central assumptions is not satisfied (either the stated or implicit assumptions, such as those concerning information), markets may indeed be Pareto inefficient.[1] Flannery presents an excellent analysis of many of the more important market failures that characterize financial markets and that thus provide potential scope for government intervention.[2]

Beyond these general arguments for a government role in risk-bearing based on market failure is one that is particularly germane to risk-bearing in financial

markets; that is, much of this risk is associated with cyclical fluctuations. In most developed countries, governments assume it is their responsibility to stabilize the economy, a function they may perform badly or well. Economists have even claimed that government actions have exacerbated the economy's fluctuations. Whether one agrees with this view or not, one can still argue that government should bear some of the consequences of its failures in this regard—a policy that would provide further incentives for policymakers to stabilize the economy more effectively.

The pervasiveness and magnitude of business cycle risk in financial markets also help to explain why private markets fail. Business cycle risk is a form of social risk that cannot be diversified within the economy.[3] It can, however, be dispersed over many generations, so the government may be in an advantageous position for this type of long-term intertemporal risk-spreading.[4]

Business cycle risk presents a further problem for private markets. The cyclical risks facing different firms are highly correlated, meaning that along with limited liability (limited insurer assets) comes a chance that the insurer will fail to fulfill his side of the contract. The government is the only institution with deep enough pockets to guarantee that such an insurance contract will be honored.[5]

2. Government Failure versus Market Failure

The theory of market failure provides a natural starting point for analyzing government's role in risk-bearing. However, to argue for government intervention in general, or for a particular market intervention, one must present some reason for believing that government can improve matters. During the past two decades, a literature on government failure, paralleling that on market failure, has developed.[6] Advocates of limited government contend that—to put their claim somewhat bluntly—anything government can do, the private sector can do better. But the leap from instances of government failure, which no one would dispute, to the inevitability of such failure, or to the superiority of private markets, is not based on a set of logical propositions. It is not a theorem but an ideological statement.

The fact is, government differs in many ways from the other organizations that make up an economy.[7] Whereas participation in other groups is generally voluntary, people have no choice but to "belong" to the government. It has the power of taxation and other methods of coercion. These differences give it both advantages and disadvantages, and any analysis of the appropriate role of government in risk-bearing must take these elements into account.

3. Public and Private Risk-Bearing

To understand the government's role in risk-bearing, it is important to keep seven basic observations in mind. These are discussed in detail below. In brief, I argue that some government involvement in risk assumption is an inevitable consequence of its primary responsibilities of setting the legal framework, collecting taxes, and redistributing income. I then contend that government has some advantages over private industry, such as fewer adverse selection problems and, in some respects, easier monitoring and contract enforcement. But offsetting these advantages are a number of marked disadvantages, some of which arise from political pressures and constraints. Several of the recent problems associated with government risk-bearing can be traced to these underlying drawbacks.

3.1 Legal Framework and Limited Liability

A fundamental responsibility of government is to design and enforce the nation's legal structure, which underlies all private contractual arrangements. Part of that structure entails decisions concerning risk-bearing: Bankruptcy law and limited liability define who bears what risks when one party, say to a financial contract, cannot pay what is owed. Many of the problems discussed at this conference are a consequence of government policies that have allowed, or even encouraged, limited liability.

Limited liability has distinct advantages; it is hard to imagine the evolution of modern capitalist economies without it.[8] Yet, it also entails some specific disadvantages, particularly the moral hazard problems that arise as firms approach bankruptcy. These were all too manifest in the case of the S&L industry's collapse.[9] Whenever liability is limited, firms (or, more accurately, the agents who take actions on behalf of companies protected by limited liability) may not bear the full consequences of their decisions: Creditors may suffer even though a firm's expected returns increase. This represents a classic externality. The contractual arrangements between the firm and its creditors may attempt to mitigate these externalities, but contracts are always incomplete (see Grossman and Hart [1986]), and in any case, public-good problems arise both in monitoring and in enforcing contract provisions. (That is, all members of a class of creditors benefit if the expected returns to that class are increased, giving rise to a traditional free-rider problem. For further details, see Stiglitz [1985]).[10]

3.2 Government as a Silent Partner

Government, through its tax system and insurance functions, has a major stake in the performance of any enterprise within its jurisdiction. Inevitably, it bears much of the risk of failure — a fact brought home forcefully by the Chrysler bailout. Though a

variety of political pressures were brought to bear, some insisted that the rescue made sense, since the automaker's collapse would have cost the government upwards of a billion dollars through its guarantee of the company's pension fund.

This example illustrates a problem that arises in lending and risk-bearing programs in general. Once a party (here, the government) has made a loan or insured a risk, it may effectively be committed to providing further loans or funds (guarantees) in order to recover its original outlay or to reduce the losses under its original commitment.[11] In effect, the government (or any lender or insurer) cannot effectively commit itself to forgoing further support; indeed, the original loan or insurance may induce the borrower/insured party to act in a manner that will make it *more* likely to call upon the lender/insurer for additional funds. This is an example of a broader class of commitment problems, to which I now turn.

3.3 Commitment Problems and Government Risk-Bearing

In modern industrial economies, governments have an extraordinarily difficult time committing themselves to not providing a bailout in the event of a major industry disaster. One of the arguments for compulsory Social Security is that, should an individual fail to save for retirement, the government will find it impossible to look the other way and let that person suffer the consequences. Knowing this, people have diminished incentives to save for their later years.

The S&L Crisis: A Possible Example

The S&L collapse, along with other problems facing the U.S. banking industry more generally, may be at least partially interpreted as the consequence of these institutions' recognition that the government would bail them out in the event of a crisis. The unenviable situation in which they now find themselves is largely a result of bad investment policies. The question is, What fostered these policies?

The investment strategies of banks and S&Ls during the 1970s and 1980s have been characterized in several ways (see Stiglitz [1992]). Some analysts depict them as the result of bankers' failure to understand two of the basic lessons of economics: the importance of correlated risks (that is, the high correlation in the risks associated with Third World or commercial real estate loans) and the fact that asset prices can decrease.[12] Others blame "herd instinct" or, more generally, compensation schemes based, implicitly or explicitly, on relative performance. A consequence of such a strategy is that managerial risk is minimized when banks undertake actions similar to those of their competitors (see Nalebuff and Stiglitz [1983a, 1983b]). Finally, some have characterized these policies as the result of both moral hazard and the rapacious (or, perhaps more charitably, risk-loving) nature of those who were

attracted to the industry by the opportunities its near-bankruptcy situation afforded. I will return to this interpretation below.

But there is another explanation as well: Bank managers may have indeed recognized the risks they were taking, but because they were all traveling the same perilous path, they also knew that a government bailout was inevitable should any of the disaster scenarios occur. Thus, the total risks borne by the institutions themselves (as opposed to those shouldered by society as a whole) were less than they seemed. And knowing that their depositors were covered, managers were even able to enjoy the luxury of clear consciences and a good night's sleep. In other words, bankers' behavior may have been influenced by the recognition of *implicit* government insurance.

3.4 The Advantages of Government: Compulsory Membership and Adverse Selection

Government has a marked advantage over private industry in that it can force compulsory membership in insurance programs. This allows government to avoid the adverse selection problems that plague insurance/risk markets in general.[13] Government may also be in a stronger position when it comes to mitigating moral hazard, since it has greater powers of compelling disclosure of information and a wider range of indirect instruments of control.[14] Thus, government regulators may be in an advantageous position relative to private assessment firms, whose record in predicting bankruptcies has been notoriously bad.

3.5 The Disadvantages of Government: Assessing Risks and Determining Premiums

Government, however, faces a tremendous disadvantage in assessing risks and charging premiums based on risk differences. The reason for this, at least in part, is that risk assessments are basically subjective. Economic conditions are constantly changing, and no matter how rational the risk assessor may be, there is always a subjective element in choosing the relevant base for making such judgments. For instance, is a bank's loan default ratio over the last six *months* or over the last six *years* the appropriate standard? The former may be too shortsighted, while the latter may be weighted down by historical experiences that are no longer relevant. Is it plausible to believe that the government could charge banks in Texas a higher premium for insurance than banks in Idaho, or firms in Houston more than those in Dallas? Any such differentiation might be quickly labeled unfair.

The market, by contrast, makes such differentiations all the time, converting the subjective judgments of many participants into an objective standard. If some bank in Houston complains about the risk premium it is being charged by the market (in

the form of the higher rate it must pay to attract uninsured depositors), there is a simple reply: Provide evidence that the risk has been overestimated, and the market will render a verdict. If the information is credible, the risk premium will be reduced.

In short, government inevitably has to employ relatively simple rules in assessing risk — rules that almost certainly do not capture all of the relevant information, since political considerations will not allow government to differentiate on bases that the market would almost surely employ.

3.6 Rent-Seeking and Opportunities for Hidden Subsidies

The difficulties government has in assessing risk, and that citizens face in evaluating the government's performance on this score, provide an opportunity for granting huge hidden subsidies. A good example is the ability to charge interest rates below the rate reflecting the actuarial risk of nonrepayment, a practice that has benefited both students in the United States and owners of large farms in Brazil. The temptation provided by the potential of these hidden subsidies has been irresistible for many governments, particularly during periods of financial stringency, when outright grants are harder to get away with. Michael Boskin's efforts to reform the budgetary process, or at least to account for the actuarial value of the losses when implicitly subsidized loans or insurance is provided, are to be commended. Still, questions remain about the accuracy with which actuarial values can be calculated.

Proponents of these loan guarantees argue that they normally cost the government very little: The loan is repaid, so the borrower is better off as a result of the guarantee, while the government is no worse off. But this reasoning misses the basic point, which is that in providing loan guarantees, the government is interfering in the market's allocation of resources. The capital market has rendered a judgment concerning the likelihood that a project will not pay off. On the basis of that judgment, funds are withheld. When the government provides a guarantee, money is diverted away from some other project. Although it may be difficult to identify the marginal project (that is, the one that otherwise would have been funded), it is clear that *some* project was not funded, or was not funded as well as it otherwise would have been.

While the analysis above suggests that the market may indeed be less than efficient in its allocation of investment funds, the interventions of government, though frequently justified in terms of market misperceptions of risk, are more often motivated simply by political concerns.

3.7 Regulations and Regulatory Effectiveness

Most insurance gives rise to moral hazard problems; that is, the insured party has a reduced incentive to avoid the insured-against event. This is an inevitable

consequence of insurance. In spite of this, insurance, both explicit and implicit, is pervasive in our economy. People are risk averse and thus willing to pay the price to have the risks they face reduced.

Insurance firms attempt to mitigate the moral hazard problem by imposing restrictions—which we could just as well call regulations—on those they insure. For instance, fire insurance companies typically require sprinklers to be installed in the commercial buildings they cover. Furthermore, rates often differ according to whether the insured conforms to a particular regulation (houses with sprinklers qualify for lower rates; individuals who do not smoke may get a discount on their health insurance).

Private insurance firms have an incentive, provided by the profit motive, to seek cost-effective regulations. These are defined as regulations that are relatively inexpensive to enforce and that reduce the insured parties' chances of an accident by enough to warrant the inconvenience imposed on them. The public sector, by contrast, has no such direct incentive. Our task as public policy analysts is to look for cost-effective regulations.

Just as there may be insufficient incentives within the public sector to design efficient regulatory systems, there may also be a lack of motivation to enforce the regulations. A large body of literature focuses on this problem, noting that bureaucrats and politicians have incentives to postpone stringent enforcement of banking regulations, hoping instead that problem banks will simply disappear (or at least not reappear during their watch at the bridge). The costs of this postponement, which have proved to be significant, are borne by others.

Exacerbating these incentive problems are resource problems. During the Reagan years, resources devoted to regulation were slashed. But even more generally, restraints on government employees' salaries and other budgetary restrictions place government monitors at a considerable disadvantage relative to their counterparts in private industry.[15] Is it likely that a civil servant whose annual salary is $15,000, or even $45,000, will be able to detect the clever machinations of $100,000-a-year accountants?

There is a widespread impression in the media that the S&L industry's problems are the result of regulatory failure combined with the greed of avaricious bankers. (It is remarkable how quickly our image of bankers seems to have changed. When I was a youth, bankers were depicted as among the more boring, but more steadfast, members of the community.) This view, as I have already hinted, is clearly wrong. Avaricious bankers have played only a minor role in the industry's problems, and to the extent that they are involved, the blame can be traced to the incentive structure provided by our banking system, which served to attract this type of person. In this view, the regulatory failure that has taken place is not so much the fault of the regulators themselves as of the flawed regulatory structure in which they operate.

4. A Proposal

Where does all of this leave us? The Panglossian economic view of nineteenth century liberals — that is, markets, if left to themselves, will work perfectly — is only slightly more outdated than the Pollyannaish 1960s belief that a benevolent government can correct any market failure. But I do believe that out of a careful consideration of market and government failures can emerge a better understanding of government's role in risk-bearing. Any such analysis must take into account not only the distinctive advantages and disadvantages of the public and private sectors, but the interactions between the two areas. In particular, we must address the possibilities the government has for making use of the private sector's strengths, and vice versa. Let me illustrate by putting forward some tentative recommendations concerning certain issues bearing on the role of government in financial markets.

At the center of most bank reform proposals is some revision of deposit insurance. We need to put this insurance into perspective. First, there is considerable evidence that the distinction between insured and uninsured deposits is hard to enforce, particularly for large banks. The least expensive method of resolving bank crises typically entails the failed institution's being taken over by another bank; in the process, all liabilities, both insured and uninsured, are protected. Severe problems would ensue if, during the takeover, uninsured deposits were left partially unprotected.[16] Thus, a financial intermediary that elects to have its deposits insured must have them *all* insured, with one exception noted below. The rhetoric that focuses on small deposits as the motivation for deposit insurance is precisely that: rhetoric. Large uninsured depositors have benefited virtually as much, without premiums having been paid on their deposits.

Second (and equally important), I am completely unconvinced that the relevant market failure requiring government intervention is the private financial system's inability to provide, on its own, safe transaction vehicles for small depositors. Money market funds with checking account privileges that invest in T-bills or other government-insured assets provide a perfectly safe alternative. Many money market funds currently limit themselves to large accounts, but if they did not have to compete with banks, which implicitly receive a subsidy through deposit insurance, competition would likely result in these services being provided to small depositors at relatively low cost. Of course, there is always the risk of fraud, and the government might want to provide some insurance against that possibility. (Indeed, one might argue that such insurance represents a commitment by government to enforce those regulations intended to prevent fraud. In effect, it is a guarantee that government will do its job well.)

Moreover, there are decided disadvantages to limiting the size of insured deposit accounts. One of the functions of deposit insurance is to facilitate transactions; it allows individuals to place their savings in a checking account without worrying

whether their money will be there when they are ready to retrieve it. Standard inventory/buffer stock theory argues that with stochastic withdrawals and deposits, the risk of reaching the non-negativity constraint will be lower if an individual concentrates transactions through one account. The returns to scale from economies of transaction thus run contrary to the returns from risk diversification. Providing deposit insurance allows depositors to avail themselves of economies of scale without worrying about the failure to risk-diversify.[17] Attempts to limit the *aggregate* amount of insurance obtained by an individual appear, to say the least, cumbersome and extremely costly to administer.

From this perspective, since small depositors do not need deposit insurance, there is no compelling reason why any financial institution should be required to provide it. (The other argument for deposit insurance, that it prevents bank runs, is also unpersuasive as long as the Fed is effectively performing its role as lender of last resort.) But if a bank chooses to provide government deposit insurance, it is reasonable to require that, in return for this "service," the bank not only would have to pay a premium, but would also have to comply with certain other regulations, the most important of which are a capital requirement, a net-worth requirement, and a ceiling on interest rates paid to depositors. I propose a substantial increase in the capital requirement, to about 20 percent of (insured) deposits.[18] This could be satisfied either by uninsured deposits or by equity. (I cannot say precisely what the correct requirement is, but as I explain below, it must be high enough so that residual risk-bearing by the government is minuscule. This might be achieved with a capital requirement of 15 percent; it is surely not attained at the current level.) Beyond this, I would also impose a net-worth requirement of about 10 percent, slightly higher than the current standard. Rates on uninsured deposits would be unregulated, while those on insured deposits would be restricted to the T-bill rate.

It is important to view these regulations not as government intrusions, but akin to the restrictions that any prudent insurer imposes on those it insures. In short, my proposal consists of four central ingredients:

1. If a financial institution wants deposit insurance, it would have to pay premiums on all of its deposits.
2. The interest rate it could pay on those deposits would be regulated.
3. The institution would have to satisfy a high capital requirement (ratio of net worth plus bonds to deposits).
4. The institution would also have to satisfy a high net-worth requirement (ratio of net worth to deposits).

Below, I discuss in detail how this proposal reflects some of the basic concerns outlined above.

4.1 More Effective Commitment against Bailouts

Those who provide the uninsured capital to the bank will receive a higher return as compensation for the risks they bear. Thus, their ability to draw upon the public's sympathy in the event of a bank default will be limited, since they will be no worse off than bondholders or stockholders in any other enterprise, for whom the public (that is, the government) has shown no particular concern. The commitment of the government not to provide insurance will thus be more credible.

4.2 Provision of Useful Information to Regulators

Given that investors realize they are not insured, the market signal furnished by the interest rate or by the market price of shares will provide regulators with information that may prove useful in directing their investigatory efforts. (This information could also be used to set deposit insurance premiums.) I do not find credible the view that, in the absence of deposit insurance, small depositors will monitor financial institutions more effectively. They still would not have access to the relevant information, and given the public-good problem discussed earlier, they would have insufficient incentives for monitoring. On the other hand, those who decide to provide substantial amounts of uninsured capital to banks will be well aware of the risks they face and thus will devote at least some effort to monitoring.[19] The lack of insurance will certainly provide a greater incentive for them to do so.

4.3 Improving Bank Incentives

The fact that banks undertaking greater risk will face higher costs of capital (that is, they will have to pay uninsured depositors or bondholders higher rates of interest) will improve the incentives facing bank managers, since there will be an openly observable indicator of bank prudence. Certainly, some banks will agree to bear that cost if they believe their investment returns will be sufficiently great.

There are, in fact, multiple incentive problems associated with how the current banking system works. I have alluded to several of these already.[20] Limited liability means that firms approaching bankruptcy have an incentive to undertake undue risk. This is an argument for imposing a net-worth requirement on top of the capital requirement. If one believes that uninsured depositors are well informed about the risks they face, then one could argue that the net-worth requirement is not needed: Firms with low net worth would simply have to pay more for their capital. In this case, the risk of default is essentially borne by the uninsured depositors, and the interest they receive compensates them for this risk. But depositors are frequently not well informed, and banks cannot effectively commit themselves either to maintaining a particular level of capital or to avoiding undue risks. (Again, one

could make an argument for a voluntary net-worth standard. Banks that elect to commit themselves to such a standard, which would be enforced by the government, would presumably face lower capital costs.[21])

4.4 Eliminating Gresham's Law

Still another incentive problem is that faced by depositors. This is best explained through a process I have referred to as Gresham's Law of Banking.[22] With deposit insurance, depositors have incentives to seek out banks paying the highest rate of interest — generally those that undertake the greatest risks (with the risks ultimately being borne by taxpayers through deposit insurance). Thus, risk-taking banks drive out prudent institutions, since they attract funds away from them.

Given the nature of deposit insurance, this market response is rational; the greater the risk-taking, the greater the value of the insurance provided by the government. To maximize the government subsidy, one should maximize the risk undertaken (subject to what one can get away with under current regulations). Shoven, Smart, and Waldfogel (1992) have recently argued that the cost to the government of this insurance program may be far greater than the direct cost of the bailout, since the competition among S&Ls for deposits (which, because of government insurance, were essentially like T-bills) drove up the T-bill rate. The interest rates of the 1980s, which were extremely high by historical standards and which contributed so much to the federal deficit, may themselves be another unintended consequence of government insurance programs.

It makes no sense for government to allow the private sector to take advantage of this implicit subsidy. If we believe that government insurance is as credible as a federal guarantee to pay back a T-bill, then there is no justification for paying higher interest rates than are paid on T-bills. Since banks may be providing further services, rates could be *lower*. As I stated earlier, the proposed regulation on insured deposit rates is not intended to restrict competition, but to constrain banks' ability to take advantage of any implicit subsidy. In fact, the subsidy is likely to be small, since the risk exposure of the government (given the 20 percent capital requirement) will be minimal.

4.5 Reducing Problems Posed by Limitations on Government's Risk Assessment Capabilities

As I stated earlier, I do not believe that the government can effectively assess risk or differentiate risk premiums. Yet, with a 20 percent capital requirement, the residual risk borne by the government will be small enough to guarantee that the inefficiencies resulting from failure to price the insurance correctly should be minuscule.[23]

4.6 Reducing Problems Posed by Limitations on Government's Regulatory Capabilities

By the same token, limitations on the government's monitoring capabilities will have minimal consequences.[24] The issue is not whether the government can detect instantaneously and flawlessly when the capital requirement has been met, but whether it can (or will) do so quickly and accurately enough so that when a lapse is detected, the institution's assets will still exceed its insured liabilities. Thus, what I am arguing is that the regulatory standard must be set to reflect the "quality" of the regulation.

A higher capital requirement will reduce the importance of several other hotly contested issues, including marking to market, government-backed deposit insurance, and the Federal Reserve's role as the lender of last resort. Below, I discuss each of these in turn.

Marking to Market

First, consider the problem of marking to market a bank's assets. This falls within the general rubric listed above regarding government's inherent disadvantages in assessing risk. An essential aspect of determining the nature of the risk faced by a government insurer is knowing the financial position of the insured bank. As I noted above, while the private sector can make use of any subjective process of risk assessment it chooses, government agencies are inevitably restricted to certain procedures — any of which are necessarily imperfect. But again, with a 20 percent capital requirement, even faulty procedures will generally detect a problem before insolvency occurs.

As an aside, I should state that I believe marking to market is a good policy, for reasons that illustrate the disadvantageous position of the government in assessing risk. I am unconvinced by the complaint that because such policies generally entail marking to market only a portion of a bank's assets, they may not provide an accurate picture of the firm's financial position. Banks can decide whether to sell any of the assets in their portfolios. If they spot an asset that is undervalued, they can sell it — in effect, marking it to market. Under current procedures, troubled banks have strong incentives to mark to market assets whose worth has increased relative to book value, and to retain at book value assets whose worth has declined. Proposals for marking to market all assets basically correct this asymmetry.

Why Deposit Insurance Will Not Be a Problem

Many economists have advocated the total elimination of government-provided deposit insurance. If deposit insurance is valuable, won't markets provide it? The fact is,

deposit insurance is worth most during a severe economic downturn, but in such a crisis, insurers (as well as banks) are in a financial bind. Private insurance firms simply cannot provide the same kind of coverage that government can.

My four-point proposal essentially concentrates government risk-bearing on extreme situations, though it does not limit it to economywide downturns. The objections to deposit insurance focus on the decreased incentive for monitoring, a problem that would arise whether the insurance were privately or publicly provided. This is a nonissue for two reasons: First, my proposal calls for a group of depositors/investors with an incentive for monitoring. Second, if one believes that such monitoring is effective, the behavior of this group (that is, the returns it would require for risk-bearing) would provide the regulator with the information needed to take appropriate action. (More plausibly, for reasons stated earlier, I do not believe one can expect small depositors to monitor banks effectively.)

In brief, there is little cost associated with the government's providing residual risk-bearing, whereas the potential benefits, in terms of the stability of the financial system, may be significant.

The Federal Reserve as the Insured Lender of Last Resort

Finally, my proposal takes much of the heat out of the current controversy surrounding the Federal Reserve's role in propping up failing banks. In principle, the central bank is supposed to provide funds for solvent but illiquid institutions. Concern has been raised, however, that the Fed, like other government regulators, all too often attempts to keep troubled banks alive by lending to them. It does this knowing that should a bank fail, the government will step in and pick up the tab. Some have proposed that if the Fed extends credit to a bank over a prolonged period, it should not be reimbursed in the event of failure unless it had previously notified the government, and the government had agreed to provide, in effect, the coverage. The presumption is that, although it may be difficult to discriminate between insolvent and illiquid banks, any institution requiring repeated injections of funds is insolvent and should be treated as such by the Fed.

While it is clear that the Federal Reserve should not use its funds to sustain a bank that should be closed, some have voiced concern that proposals such as the one described above would interfere with the System's capacity to act as the lender of last resort. This debate has many facets. However, under my proposal, the issue loses its importance, since banks would normally be closed before deposit insurance became relevant.

5. On Meeting the Capital Requirement

Having detailed the advantages of my proposal, I now turn to a closer examination of how the increased capital requirement would be met. Note that I have not restricted the form in which capital can be provided. A convincing argument can be made that furnishing capital to banks and similar financial intermediaries in the form of short-term credit represents a more effective incentive scheme than providing it through either equity or long-term debt. For one, agency problems that might otherwise arise would be ameliorated. Though the ability of providers of capital to withdraw their funds would lead to the risk of bank runs, it would also impose important constraints on managerial behavior (constraints that, it should be noted, are removed when deposits are insured or when depositors believe their accounts are effectively insured). Thus, efficiency gains from the reduced agency problems would seem to imply (if this were the only relevant consideration) that capital should be raised in the form of short-term deposits.

But there are also disadvantages to short-term capital. Indeed, it would seem foolish, given the present state of knowledge regarding these matters, for government to attempt to prescribe the precise form in which capital must be raised. Presumably, however, if it is provided in the form of uninsured deposits, there must be provisions for quick and effective signaling to regulators when the 20 percent threshold has been passed. In this case, withdrawing capital would be proscribed until the financial position of the bank was clarified.

If the capital requirement is met by short-term uninsured deposits, it would be vital to keep the distinction between insured and uninsured deposits clear. Uninsured deposits would bear a higher interest rate and would form part of the capital used to meet the obligations on the insured deposits. Capital requirements would, accordingly, not be levied against them.

5.1 Can the Additional Capital Be Raised?

A major criticism of any proposal to increase capital requirements is that banks are already having difficulty meeting the existing requirements. Raising the standards, some say, would put banks in an impossible situation. But note that I include uninsured deposits within the capital requirements, and from this perspective, most institutions would already be in compliance. The only difference would be government's commitment that these were truly uninsured deposits, with the concomitant variation in interest rates paid reflecting the difference in risk-bearing.

I should, however, comment on the Bush administration's proposals to in effect allow nonfinancial corporations to invest in banks. There are two motivations at work here. One is the need for additional capital, with anything facilitating that end viewed as desirable. The second, on a more ideological plane, is the idea that eliminating

regulations is itself desirable; that is, free, unfettered markets work best. Recall that I began with the premise that, whatever validity one assigns to that proposition in general, financial market failures cannot be ignored, and some forms of regulation are beneficial. Moreover, as noted above, all insurance companies, when they can, attempt to regulate those they insure in order to reduce the insured's risk. This effectively mitigates the moral hazard problem.

Notice that the whole premise of the desirability of investment by nonfinancial corporations must itself be based on a recognition of a kind of market failure. If individuals are unwilling to provide capital to banks directly, why should the corporations they own be willing to do so? There are three possible reasons: First, corporations do not act in the interest of the bank's shareholders. Second, corporations must protect the interests of their own shareholders, even when those individuals are unaware of what their best interests are. Third, corporations may realize returns (for example, through diverting funds from the bank to their own coffers) that are not available to the individual investor, making investments by the corporation more attractive. One of the objectives of imposing restrictions on bank ownership is to avoid the potential for conflicts of interest.

Proponents of weakening these ownership barriers will undoubtedly say that we can pass regulations to prevent such abuses. But recall for a moment the perspectives on government that I provided earlier. Does government's ability to detect and to prevent abuses inspire confidence? The first two arguments for why corporations might be willing to invest in banks when shareholders are not hardly provide a compelling case for removing such barriers, while the potential abuses that can arise present a convincing case *against* removing them.[25, 26, 27]

6. Conclusion

The real world does not fit neatly into simple models. It is hard today, given our understanding of the problems of imperfect information and incomplete risk markets, to take seriously either the paradigm of perfect markets or the arguments for limited government derived from it. Although the experiences of the 1980s — including the S&L debacle and the corporate takeover battles — have graphically brought home the practical importance of moral hazard and agency considerations, advocates of the simple model of perfect markets may still claim that the problem was not one of markets but of government: If only we had followed the doctor's orders precisely, the patient would have fared better.

But this is a leap of faith based neither on rigorous economic theorems nor on a careful study of history, for indeed, history has provided us with too few controlled experiments to make such inferences with any degree of confidence. We are moving

in a murky world, trying to learn from possibly relevant experiences and from analytic arguments capturing as much as they can of our complex society. I have tried to provide a perspective of government, and of private markets, that will help to delineate guidelines for assigning each a role in risk-bearing. The appropriate roles not only should minimize the consequences of each sector's weaknesses, but should allow each to draw on its own strengths, as well as the strengths of the other.

Footnotes

1. The standard results are presented in terms of the concept of constrained Pareto efficiency; they establish that the government can make some individuals better off, without making others worse off, even when we consider the constraints imposed by imperfect and costly information and incomplete markets.

2. Discussion of market failures in the financial sector has proceeded at two levels. On one hand, some researchers have presented formal analyses of what happens to the standard proofs and arguments for Pareto efficiency when the assumptions of the Arrow–Debreu model (such as the existence of a complete set of markets and perfect information) are no longer valid. Such studies include Stiglitz's (1972, 1981, 1982, 1989a) and Newbery and Stiglitz's (1982, 1984) analyses of competitive equilibrium when risk markets are incomplete, and Arnott and Stiglitz's (1992) application of the general theory of moral hazard to loan markets. The former show that when markets are incomplete, they are constrained Pareto inefficient; the latter shows that whenever moral hazard problems exist (as they inevitably do with equity or loan contracts), markets are not constrained Pareto efficient. (There are, of course, a number of studies claiming that competitive markets are constrained Pareto efficient even in the absence of a complete set of risk markets (see Diamond [1967]) or in the presence of moral hazard (see Shavell [1979] and Prescott and Townsend [1984].) All such models employ special and unrealistic assumptions, such as the existence of a single commodity (Diamond, Shavell), or that the quantity consumed of every commodity by each individual is observable (Prescott and Townsend).

At the second level, and more relevant for purposes of this discussion, is the identification of the possibly important ways in which financial markets perform poorly. This is the perspective taken by Flannery (see chapter 4) and is one that I have pursued elsewhere (Stiglitz [1985, 1989b], Stiglitz and Weiss [1992]). Among the important market failures are the following. *Public goods:* (i) Information, including information about the characteristics of financial institutions, is a public good; (ii) Management (monitoring) is a public good: All holders of a class of securities benefit when a firm is managed in such a way as to increase the returns to that security. (For the usual reasons, there will be an undersupply of public goods. This conforms with the result that firms having some concentration of ownership show superior performance.) *Externalities:* (i) Actions that affect the returns to one security may have either positive or negative externalities on other securities. For instance, although banks may, in the process of supervising loans to ensure that the lender does not go bankrupt, have particularly positive externalities on holders of preferred shares, their actions can dampen the potential upside returns of the firm, so that the expected returns to common shareholders are reduced. In this case, there is a negative externality. (ii) With bankruptcy and incomplete contracts, the disruption of business by one firm may have an adverse effect on other firms, for which they are not compensated. One finds particularly important externality effects associated with macroeconomic disturbances, including bank runs (Greenwald and Stiglitz [1988a, 1988b, 1992b], Diamond and Dybvig [1983], Stiglitz [1987]). (iii) The Nash equilibrium in financial markets results in excessive expenditures both on early gathering of information having little social value (Hirshleifer [1971], Stiglitz [1975]) and on speedy recording of transactions (Stiglitz and Weiss [1992]). More broadly, principal–agent and adverse selection effects, which are

pervasive in financial markets, generate externality-like consequences that interfere with the constrained Pareto efficiency of these markets.

This list of problems is not exhaustive. Tversky and others have presented a convincing array of evidence that individuals may not make good decisions concerning low-probability events (see Kahneman, Slovic, and Tversky [1982]). Some might use this as a basis for a "merit good" argument for government intervention.

3. By contrast, private risks (such as the president of a company becoming incapacitated) can often be diversified out by the market.

4. See Stiglitz (1983) for a discussion of how public financial policy (debt, taxes, Social Security) can affect such intertemporal risk-sharing.

5. Of course, governments do go bankrupt and renege on their contracts, so it would be more precise to say that government's ability to fulfill an insurance contract is significantly *greater* than that of any private insurer. No private firm could have provided the kind of insurance to the S&Ls that the Federal Savings and Loan Insurance Corporation did.

6. See, for instance, Wolf (1988) and Stiglitz (1989c).

7. I have set out the nature and consequences of these differences in greater detail in Stiglitz (1989c).

8. For a fuller articulation of this view, see Greenwald and Stiglitz (1992a).

9. The general theory of why markets in which moral hazard problems arise are typically not constrained Pareto efficient is set out in Arnott and Stiglitz (1989).

10. Although I begin by discussing the government's role in establishing a set of rules that has profound effects on how risks are shared in the economy, the implications of this observation for the appropriate role of government in risk-bearing are unclear.

11. For earlier discussions of this problem in the context of loan markets, see Hellwig (1977) and Stiglitz and Weiss (1981).

12. Perhaps we as economists are partly to blame for the S&L debacle. For years, we taught students of macroeconomics about downward wage and price rigidities, but we seldom delved into either the facts of the Great Depression (prices actually did fall) or our remote, pre-Depression past, when markets evidenced even greater downward price flexibility.

13. There are problems associated both with selection in general and with adverse selection in particular. The general selection problem is that each private institution attempts to select the best risks for itself. Thus, what it gains, others may lose. The adverse selection problem focuses on the fact that as an insurance firm raises its premiums, those who are least likely to have an accident (that is, those who have the least need for insurance) drop out of the market, adversely affecting the mix of those who remain.

The social cost of the selection problem is that insurance firms may spend vast amounts of resources to improve the quality of *their* pool of insured parties. As a result, to the extent that insurance premiums reflect true actuarial risks, and to the extent that those "correct" premiums have allocative effects (for example, car drivers who are more accident prone are discouraged from getting behind the wheel), efficiency gains arise from such expenditures. On the other hand, a substantial portion of these outlays can be thought of as simply rent-seeking; allocative effects are weak, and the primary consequences are simply redistributive, with premiums going up for some individuals and down for others.

14. For a more detailed look at the latter, see Arnott and Stiglitz (1986), which shows how government can use its tax policies to mitigate the effects of moral hazard. In recent years, there has been some discussion of government's greater ability, in principle, to force repayment of student loans and to implement student equity loans. (Australia has a program of government loans for higher education that provides for repayment through the tax system.) Information possessed by the government as part of its income tax system can be used to reduce the risks of loan default and to design loan programs with repayment schedules contingent on income.

15. I am explicitly not addressing the kinds of political economy issues associated with regulation that have concerned Stigler (1971).

16. In particular, considerable emphasis must be placed on speedy resolution. The litigation that would almost surely result from any attempt to leave uninsured depositors partially unprotected would, at the very least, delay the takeover process.

17. I am not sure that much weight should be placed on this argument for two reasons. First, modern technology allows the problems that arise when a non-negativity constraint is reached to be overcome with automatic transfer from one account to another. Second, credit lines mean that having cash in the account is not required. Still, unless there is a full exchange of information among banks, the extent of the credit that can be extended may be less than if banking were concentrated in a single institution. This is because each bank may worry about the credit position outstanding in other banks.

18. Note, however, that under the first part of my proposal all deposits would be insured.

19. It is possible, of course, that private-market monitoring will provide relatively little information. If this view is correct, then it is all the more important that my proposed regulatory structure be maintained. It is also possible (but in my judgment unlikely) that private-market monitoring will reveal all of the relevant information. In that case, government monitoring should be relatively inexpensive and will only serve to confirm the judgments of the private market.

20. In particular, the incentives for suppliers of capital to monitor financial institutions, the incentives for regulatory forbearance (to delay the day of reckoning), and, once that fateful day has arrived, the incentives for regulators to engage in a bailout.

21. As I note below, premiums on deposit insurance should, in principle, also be adjusted, though the effect may be insignificant.

22. See Greenwald and Stiglitz (1991).

23. Government might attempt to differentiate premiums in terms of riskiness by using market signals; that is, banks that have to pay higher interest rates on their uninsured deposits are presumably less safe. Alternatively, government could resell part of the insurance in the reinsurance market and use the price obtained to determine the premiums levied. At a 20 percent capital requirement, premiums would presumably be low, so differences between what high- and low-risk banks pay would be small.

24. Kane (1989) has stressed regulators' lack of incentives to monitor banks effectively, or to close the ones that fail to come up to the regulatory standard. This problem would still be present under my proposal. The point is that when large gaps appeared, regulators would be forced to act. Under the current system, such gaps appear only when it is too late. Under my proposal, the likelihood of having to draw upon deposit insurance would be greatly reduced.

25. One other aspect of the administration's proposal that concerns me is the attempt to increase the efficiency of the regulatory process by putting it in the hands of a single agency. This suggestion reflects the same naivete about the nature of regulation (and about the regulatory failures of the 1980s) discussed earlier. One of the remarkable aspects of bank regulation in the United States is its relative immunity from corruption. This is perhaps partly attributable to the fact that the system was devised so that successful corruption would require the collusion of several regulators. Recent theoretical studies have shown the importance of peer monitoring as a way of mitigating problems of moral hazard (see Arnott and Stiglitz [1991]). Thus, one can view the use of multiple regulatory agencies as a way of benefiting from such mechanisms.

26. There is one further argument for removing these barriers. What is really at issue is the efficiency of the market for managers. But I am not convinced that nonfinancial institutions have a comparative advantage in managing financial institutions, or that management issues are really at the core of the discussion of the barriers with respect to ownership.

27. I have one final comment about the role of the Federal Reserve as the lender of last resort or, more generally, about the problem of runs by uninsured depositors. Presumably, there would have to

be some system in place to restrict these depositors' withdrawals when they would result in a bank's failing to satisfy its capital requirements.

The Fed would not want to intervene in such situations. If it did, and if the bank were truly close to insolvency, the government would end up bearing the risk, either directly through federal deposit insurance, or indirectly through the losses incurred by the Fed.

Certainly, there are externalities associated with bank runs, and these in part motivate the role of the Fed as the lender of last resort. The critical distinction between lending to banks that are illiquid but in strong financial shape and lending to banks that should be closed is often one that is difficult to implement in practice.

References

Arnott, R., and Stiglitz, J.E. 1986. "Moral Hazard and Optimal Commodity Taxation." *Journal of Public Economics* 29 (February): 1–24.

Arnott, R., and Stiglitz, J.E. 1989. "The Welfare Economics of Moral Hazard." In Henri Louberge (Ed.), *Risk, Information and Insurance: Essays in the Memory of Karl H. Borch.* Norwell, Mass.: Kluwer Academic Publishers, 91–122.

Arnott, R., and Stiglitz, J.E. 1991. "Moral Hazard and Nonmarket Institutions: Dysfunctional Crowding Out or Peer Monitoring?" *American Economic Review* 81 (March): 179–190.

Arnott, R., and Stiglitz, J.E. 1992. *On Moral Hazard.* Cambridge, Mass.: MIT Press, forthcoming.

Arrow, K.J., and Debreu, G. 1954. "Existence of an Equilibrium for a Competitive Economy." *Econometrica* 22 (March): 265–290.

Diamond, Douglas, and Dybvig, Philip H. 1983. "Bank Runs, Deposit Insurance, and Liquidity." *Journal of Political Economy* 91 (June): 401–419.

Diamond, Peter A. 1967. "The Role of a Stock Market in a General Equilibrium Model with Technological Uncertainty." *American Economic Review* 57 (September): 759–776.

Greenwald, B., and Stiglitz, J.E. 1986. "Externalities in Economies with Imperfect Information and Incomplete Markets." *Quarterly Journal of Economics* 101 (May): 229–264.

Greenwald, B., and Stiglitz, J.E. 1988a. "Imperfect Information, Finance Constraints and Business Fluctuations." In Meir Kohn and S.C. Tsiang (Eds.), *Finance Constraints, Expectations and Macroeconomics.* Oxford, England: Oxford University Press, 103–140.

Greenwald, B., and Stiglitz, J.E. 1988b. "Pareto Inefficiency of Market Economies: Search and Efficiency Wage Models." *American Economic Review* 78 (May): 351–355.

Greenwald, B., and Stiglitz, J.E. 1991. "Towards a Reformulation of Monetary Theory." Caffee Lectures, Rome.

Greenwald, B., and Stiglitz, J.E. 1992a. "Information, Finance and Markets: The Architecture of Allocative Mechanisms." *Journal of Industrial and Corporate Change* 1: 37–63.

Greenwald, B., and Stiglitz, J.E. 1992b. "Financial Market Imperfections and Business Cycles." *Quarterly Journal of Economics,* forthcoming.

Grossman, Sanford J., and Hart, Oliver D. 1986. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration." *Journal of Political Economy* 94 (August): 691–719.

Hellwig, M.D. 1977. "A Model of Borrowing and Lending with Bankruptcy." *Econometrica* 45 (November): 1879–1906.

Hirshleifer, J. 1971. "The Private and Social Value of Information and the Reward to Inventive Activity." *American Economic Review* 61 (September): 501–574.

Kahneman, D., Slovic, P., and Tversky, A. (Eds.). 1982. *Judgement under Uncertainty: Heuristics and Biases.* Cambridge: Cambridge University Press.

Kane, E. 1989. *The S&L Insurance Mess: How Did It Happen?* Washington, D.C.: Urban Institute Press.

Nalebuff, Barry, and Stiglitz, J.E. 1983a. "Prizes and Incentives: Towards a General Theory of Compensation and Competition." *Bell Journal of Economics and Management Science* 14 (Spring): 21–43.

Nalebuff, Barry, and Stiglitz, J.E. 1983b. "Information, Competition and Markets." *American Economic Review* 72 (May): 278–284.

Newbery, D., and Stiglitz, J.E. 1982. "The Choice of Techniques and the Optimality of Market Equilibrium with Rational Expectations." *Journal of Political Economy* 90 (April): 223–246.

Newbery, D., and Stiglitz, J.E. 1984. "Pareto Inferior Trade." *Review of Economic Studies* 51 (January): 1–13.

Prescott, E.C., and Townsend, R.M. 1984. "Pareto Optima and Competitive Equilibria with Adverse Selection and Moral Hazard." *Econometrica* 52 (January): 21–46.

Shavell, S. 1979. "On Moral Hazard and Insurance." *Quarterly Journal of Economics* 93 (November): 541–562.

Shoven, J.B., Smart, S.B., and Waldfogel, J. 1992. "Real Interest Rates and the Savings and Loan Crisis: The Moral Hazard Premium." *Journal of Economic Perspectives* 6 (Winter): 155–168.

Stigler, George, J. 1971. "The Theory of Economic Regulation." *Bell Journal of Economics and Management Science* 2: 3–21.

Stiglitz, Joseph E. 1972. "On the Optimality of the Stock Market Allocation of Investment." *Quarterly Journal of Economics* 86 (February): 25–60.

Stiglitz, Joseph E. 1975. "The Theory of Screening, Education and the Distribution of Income." *American Economic Review* 65 (June): 283–300.

Stiglitz, Joseph E. 1981. "Pareto Optimality and Competition." *Journal of Finance* 36 (May): 235–251.

Stiglitz, Joseph E. 1982. "The Inefficiency of the Stock Market Equilibrium." *Review of Economic Studies* 49 (April): 241–261.

Stiglitz, Joseph E. 1983. "On the Relevance or Irrelevance of Public Financial Policy: Indexation, Price Rigidities and Optimal Monetary Policy." In R. Dornbusch and M. Simonsen (Eds.), *Inflation, Debt and Indexation.* Cambridge, Mass.: MIT Press, 183–222.

Stiglitz, Joseph E. 1985. "Credit Markets and the Control of Capital." *Journal of Money, Credit and Banking* 17 (May): 133–152.

Stiglitz, Joseph E. 1987. "The New Keynesian Economics: Money and Credit." Fisher–Schultz Lecture presented at the Econometric Society meeting in Copenhagen, August.

Stiglitz, Joseph E. 1989a. "Monopolistic Competition and the Capital Market." Institute for Mathematical Studies in the Social Sciences Technical Report No. 161, Stanford University, February 1975; reprinted in G. Feiwel (Ed.), *Essays in Memory of Joan Robinson—The Economics of Imperfect Competition and Employment.* New York: New York University Press.

Stiglitz, Joseph E. 1989b. "Using Tax Policy to Curb Speculative Short-Term Trading." *Journal of Financial Services Research* 3: 101–115.

Stiglitz, Joseph E. 1989c. "On the Economic Role of the State." In A. Heertje (Ed.), *The Economic Role of the State.* Oxford, England: Bank Insinger de Beaufort NV and Basil Blackwell: 9–88.

Stiglitz, Joseph E. 1992. "S&L Bail-Out." In J.R. Barth and R.D. Brumbaugh (Eds.), *The Reform of Federal Deposit Insurance: Disciplining the Government and Protecting Taxpayers.* New York: Harper Collins Publishers, 1–12.

Stiglitz, Joseph E., and Weiss, A. 1981. "Credit Rationing in Markets with Imperfect Information." *American Economic Review* 71 (June): 393–410.

Stiglitz, J.E., and Weiss, A. 1992. "Banks as Social Accountants and Screening Devices and the General Theory of Credit Rationing." In *Essays in Monetary Economics in Honor of Sir John Hicks.* Cambridge, England: Oxford University Press, forthcoming.

Wolf, Charles, Jr. 1988. *Markets or Governments: Choosing between Imperfect Alternatives.* Cambridge, Mass.: MIT Press.

6 Government Risk-Bearing: What Works and What Doesn't

Dennis R. Connolly

In considering which government risk-bearing programs are successful — and what makes them that way — a number of difficulties must be noted and observations made at the outset. The 1990s are proving that underestimating financial risk can create substantial economic burdens for our society. The savings and loan crisis is only the clearest manifestation of this problem to date. But the nation's approach to other areas of liability, most notably our policy toward nuclear energy risk, has shown that there are ways to avoid or to limit adverse consequences. Pollution liability poses a similar challenge, but so far we have failed miserably at developing a rational approach. Our national policy toward environmental impairment, as reflected in Superfund and similarly structured federal and state programs, is grossly ill-considered. Unless radically altered, it will lead to huge financial losses that will ultimately have to be assumed by the government — that is, by taxpayers.

Government often ends up bearing risk it never intended to bear, and on occasion this works. Nevertheless, unplanned risk-bearing should not be our paradigm for future programs when we have the time and opportunity to plan in advance. Planned government risk-bearing is normally undertaken to help accomplish some public policy goal. This often results in a bifurcated analysis of the program, involving consideration of the worthiness of the goal on the one hand, and an analysis of the impact of risks that may arise from pursuing that goal on the other.

This paper examines the issue of planned risk-bearing, leaving questions about the worthiness of specific goals to be debated elsewhere. Whether nuclear energy is desirable, whether the swine flu program was needed, or whether cleanup of the nation's hazardous waste sites is worthwhile (and at what cost) are all important issues; however, this paper has a different focus: the optimal structure of a program for sound government risk-bearing. To gain clarity on the broad issue of government risk-handling, I assume that the public policy decision has been made, and that it has been made correctly. The public, through appointed officials and elected representatives, has decided that a goal, project, or activity is desirable.

Of course, in the real world, the decision process is rarely so neatly divided. Often, several issues are taken up at the same time, and many basic questions concerning goal worthiness and the costs of its pursuit are mixed together. Such questions include: What is the precise nature of the goal? How much risk is involved? Is the risk identifiable as to quantity and quality? Is the goal worth the risk? In regard to whether we should have nuclear energy, for example, all of these questions are posed, and each draws different responses from different experts. Even so, we can make some observations about what features go into an effective government risk-bearing program without deciding first whether nuclear energy is a good or desirable thing.

1. Nuclear Energy: Background for a Successful Risk-Bearing Program

Following the lesson of World War II that nuclear energy could be an extremely destructive force, there arose an intense desire worldwide to show that the power of the atom could be harnessed to peaceful, productive uses. The most obvious of these, of course, was the generation of electrical energy. The possibility of clean, cheap electricity that was not dependent on limited natural resources was a goal of many, including a substantial number of U.S. Congressmen. However, concerns about possibly unlimited liability in the event of an accident were a major impediment to developing such a program. After much debate, Congress passed the Price–Anderson Act, which, among other things, limited the liability associated with the operation of

nuclear-powered electrical facilities.[1] Price–Anderson presents a framework for government risk-sharing with the private sector that may be worth emulating, and the events leading up to its adoption are well worth reviewing.

The debate preceding this legislation featured starkly contrasting opinions about how best to proceed.[2] Proponents of nuclear energy were generally committed to limiting liability in order to promote energy production. Opponents typically contended that the potential risks associated with nuclear energy were too great for society to assume: Since no one could accurately predict the probability or magnitude of a loss, they maintained that the risks outweighed the benefits. Obviously, the loss of life and property arising from a nuclear accident could be horrendous. In addition, opponents noted that for these very reasons, the insurance industry was both unable and unwilling to insure nuclear facilities in the same way it insured other businesses. Many also contended that any reduction in private liability would have constituted an unwarranted public subsidy of a particular form of economic enterprise.

Ultimately, the utilities, insurers, and Congress crafted a compromise. Declaring the peaceful use of nuclear energy to be in the public interest, federal lawmakers established a special insurance and liability scheme that has advanced our nation's nuclear energy program for almost four decades while keeping related risks in check. Price–Anderson has stood up to legal challenge, with the Supreme Court finally asserting that its provisions for limiting liability properly balance goals and risks and are entirely enforceable.[3]

2. Some Provisos

To determine how policymakers in and out of government can best approach future risk-sharing programs, it is important to examine what has worked in the past and why. This process can be enlightening, but it must be pursued with the understanding that our experience to date can teach us only so much, since, fortunately, no past or existing program has been tested to the limit.

The program established by Price–Anderson in the nuclear energy arena has worked well so far, but the United States, though experiencing Three Mile Island, has not suffered a Chernobyl. Moreover, it is possible to develop hypothetical cases that no amount of planning can handle — disasters so out of proportion to the resources available to deal with them that they must be left to ex post responses. For instance, imagine that an earthquake registering 10 on the Richter scale hits a coastal city during the Superbowl, causing the stadium to collapse. At the same time, the shock contributes to a nuclear plant disaster that is exacerbated by serious human error. Quake aftershocks produce tidal disturbances, which in turn spread

nuclear waste and cause disruption at municipal sanitation plants. This leads to a cholera outbreak *and* a swine flu epidemic. Government responds with a vaccine program that, of course, fails to cure those already infected while simultaneously producing numerous, horrible side effects in the still-healthy population. And, oh yes, just before the quake hits, two planes, one a jumbo jet and the other a military craft carrying nuclear weapons, collide above the Superbowl during halftime.

No ex ante planning can ever cover such a doomsday scenario, so extended debate on remote, low-probability, high-consequence events is usually a waste of time. It is unfortunate that discussions of risk-bearing in the United States are often driven by fears of such extraordinarily remote incidents.

3. The Nuclear Energy Paradigm

Despite the absence of a Chernobyl-like test, Price–Anderson presents a sensible and workable approach to managing and planning for potentially catastrophic risks. Under its provisions, "loss control" has become a top priority. For the nuclear industry, this means adhering to stringent engineering and other regulatory standards designed to minimize losses. Although no absolutely foolproof technology exists to produce zero risk, experts recognize that an aggressive loss-control program entailing appropriate safeguards can lessen the possibility of a major catastrophe or, if an accident should occur, can reduce the damage it causes.

When the government decided it wanted a nuclear energy program, it also concluded that private participation in the production of that energy was desirable. But the architects of Price–Anderson understood that suppliers of capital, in the form of securities bought or insurance underwritten, would remain wary of nuclear energy as long as the possibility of undefined, uncertain, and unlimited liability persisted.[4] In the various risk-spreading programs devised under the Act and its amendments, the government sought to create an environment in which insurance from private insurers, or from the utilities themselves, could be made available to respond to an accident. This was done through channeling, liability limitations, defense waivers, and a promise of ex post government review.[5]

Channeling involves focusing all insurance on the nuclear facilities themselves. Since these facilities are limited in number (fewer than 120), it is possible for financial risk-bearers to know what their maximum exposure to nuclear losses would be. This is not possible, even today, for earthquake, flood, product liability, or just about any other exposure.[6]

Another important feature is the ability of risk-bearers to accumulate assets as reserves against potential losses without the usual tax consequences. This makes it unnecessary to have all of one's cash in hand on the first day of operation. Rather,

assuming good early loss experience, reserves can be gradually built up to amounts needed to fund increasingly larger potential losses. Pooling of resources also allows insurers and self-insurers of nuclear liability to develop technical loss-control capabilities that become possible only when funds are combined. The aircraft pools are another example of the same phenomenon.

Initially, the Price–Anderson program set a limit on liability exposure of $560 million. Now, this figure stands at $7.3 billion.[7] The limit was first funded by a combination of insurance, group self-insurance, and government indemnification, but as the program matured, the amount of government participation decreased.

Amendments to the Act in 1966 imposed a strict liability standard on facilities and their insurers for losses over a certain amount.[8] If an extraordinary nuclear accident occurred, a claimant would have to show only loss and causation, not negligence. In addition, the facility would have to waive its defenses. This trade-off reflects what was apparently the original intent of the drafters of Price–Anderson.

There is one other very important characteristic of the nuclear energy law. Having established liability limits, along with mechanisms for channeling private and public insurance funds, Congress went one step further. In the event a catastrophe exceeded the financial bounds of the system, Congress itself would review the situation and take appropriate action.

I believe that Price–Anderson has functioned well in promoting the public policy goal of a peaceful nuclear energy program. It has shown that careful planning and forethought can anticipate and respond to most contingencies. The major "flaw" in this thesis, as noted above, is that we have never had to test the system against an extremely adverse event. The lack of such a test has meant that the system is constantly being revisited and debated as new contingencies arise or are envisioned. This process is also driven by the controversial nature of many nuclear energy issues and by recent events, most notably Chernobyl.

4. Maintaining a Balance: An Ongoing Process

On balance, the assessment of risk and need is a productive process, and one that will likely be crucial to the program's operation, particularly since the benefits of nuclear energy must continually be weighed against the costs of Chernobyl-like incidents, the risks of global warming, depletion of fossil fuels, and other possible disasters. All sides in this continuing debate will surely find strong points to make — points that will merit serious examination. This is to be expected when the goal is to achieve a delicate balance of sometimes conflicting considerations.

The latest manifestation of this debate is the August 1990 Report to Congress by the Presidential Commission on Catastrophic Nuclear Accidents.[9] The

Commission, composed of 10 distinguished members, three staff members, and three consultants, heard numerous witnesses and presented a well-documented, carefully reasoned two-volume report. The Commission's goal was to develop a format that realizes Congress' commitment to full compensation, and it performed its work with admirable seriousness and resolve. Nonetheless, the report has its flaws. Some of the specific recommendations, such as the doctrine of proportional compensation, may be disputed, and the suggestion that compensation be given even "at the edges" (that is, where causation is less certain) seems ill-considered.[10] It may also lean toward awarding excessive damages in certain cases. In a mass tragedy, it seems particularly unhelpful to use up limited funds by awarding double compensation. This occurs when losses are already being reimbursed by collateral sources. The American Law Institute's Reporters' Study on Enterprise Liability advocates elimination of collateral-source recoveries for personal injuries, even in ordinary tort contexts.[11] Both reports favor scheduling of awards, as opposed to the highly unpredictable results one sees in ordinary tort litigation.

The overriding issue, however, is not whether the Commission report is right or wrong, either in its general position or in its specifics. Nor is it whether a nuclear energy program remains a worthy public policy goal. The key point, and the main value of the Commission's report, is that it provides relatively clear guidelines on how adverse nuclear consequences may be dealt with. Of further value is the report's focus on the reasonably anticipated consequences of low-probability, high-consequence events. This approach makes it possible for those who impose risk on others, and for those who bear the risk of financial loss, to know the rules before action is taken. Price–Anderson's history shows that the desirable is in fact possible.

Another important feature of Price–Anderson is that it has allowed private-industry participation. Both facilities and insurers have been encouraged to increase insurance capacity so that the government risk-sharing component can be reduced. Indeed, the growth encouraged by the program's financial risk-sharing component has been the key to its tremendous success.

5. Risk-Sharing in Other Sectors

This risk-sharing concept can be easily implemented in many other areas. But even where the benefits offered by channeling and limited liability cannot be replicated, alternative methods can be used. For instance, governments can offer reinsurance to insurers, with built-in periods of decreasing government participation. In other types of hazard where loss is more certain, Congress should consider allowing insurers to build tax-free reserves for catastrophic events one can reasonably expect to occur. This would enable insurers to build reserves to cover events such as floods,

earthquakes, and windstorms, where losses are certain to arise, but where one cannot be sure about their location or timing. It is unrealistic to assume that insurers can immediately develop and hold the reserves necessary to fund remote losses from the beginning of any program, especially if reserve earnings will be taxed. The essential ingredient in Price–Anderson is the acknowledgment in advance of a loss exposure and its insurance implications.

6. Superfund: How Not to Manage Risk

To better appreciate Price–Anderson, it should be contrasted with the federal Superfund law. The Superfund is also known as CERCLA, or the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.[12] So far, this law has not been particularly burdensome to the government or to taxpayers directly, though cleanup costs may be passed along to taxpayers as consumers. What it has done is to threaten the solvency of the entire insurance industry, as well as of many noninsurance enterprises, such as chemical and pharmaceutical companies.[13]

Superfund has all but eliminated the nonspecialized insurance market for environmental exposures. Before 1980, virtually every business in the United States had significant insurance for a precipitous event such as Bhopal. (Today, lawyers are making millions trying to decide whether coverage applied to gradual leaks as well, but that is another issue.[14]) In fact, we were better protected then, when businesses, particularly small and medium-sized ones, had coverage for their boomers. The insurance market for environmental exposures today is extremely circumscribed and responds only to limited needs.

Our current problems arose because Congress, in enacting Superfund in late 1980, failed to take into account the insurance implications of its scheme. By not considering these consequences, legislators created an enormous uninsured or partially insured exposure.

In the lexicon of Superfund, a defendant is known as a "potentially responsible party" (PRP), and under the law's provisions, PRPs are subject to joint and several liability.[15] This means that the full cost of the environmental cleanup may be imposed on parties who have contributed only 1 percent—or, in some cases, *nothing* — to the toxic waste at a site.

Cleanup costs average $25 to $50 million per site, not including the legal and other transaction costs associated with the liability program. With parties routinely sued for amounts vastly disproportionate to their contribution, if any, to the polluted site, no amount of legal expense seems unreasonable. Some experts estimate that these costs equal or even exceed the amounts spent on cleanup itself. Companies view this as life-or-death litigation, so it is no wonder that the entire Superfund

system has been stymied by legal maneuverings. Instead of effective public policy, needless and costly delays have ensued. Costs are also driven up by unrealistic cleanup standards, which are often based on worst-case modeling and routinely result in vast, wasted expenditures of limited resources.

The system is also premised on strict liability, which in practice operates more like absolute liability. Negligence is never required—simple, innocent action or inaction will do. In theory, Superfund provides for four defenses: Act of God, Act of War, Act of Third Party, and Innocent Landowner. In practice, these defenses have proven to be virtually useless. Parties who use state-of-the-art methods to detect possible pollution get no special consideration. The absence of fault or wrongdoing is simply irrelevant to the imposition of massive liability.

And finally, Superfund is retroactive. Thus, parties are liable for activities undertaken 10 or 20 years before the law went into effect, and those who complied fully with all of the regulatory standards on the books at the time get no special consideration.

This scheme, marked as it is by extreme liability imposed retroactively, has not worked, will not work, and in the long run will harm us all. Draconian liability has set off a government-sponsored rifling through the "deep pockets" of all supposedly wealthy parties — owners, operators, generators, transporters, and even banks— ever associated with a polluted site. Fundamentally, the guiding ideas behind Superfund reflect the posture of those in our society who fail to recognize the impossibility of avoiding all risks in human existence. This unrealistic view will, in the end, cause government to be viewed as the insurer of last resort against losses stemming from remote hazards. Policymakers should carefully consider the implications of imposing this mammoth additional burden on government.

In sum, Superfund is the very antithesis of a rational system for encouraging participation by private insurers. Price–Anderson, on the other hand, is a paradigm for designing an effective risk-sharing system, since it anticipates consequences and plans for timely responses.

Notes

1. See Atomic Energy Act of August 30, 1954, P.L. No. 85-256, 71 Stat. 576 (1954).
2. See J.A. Booknight, Jr. 1981. "Balancing Risks and Rewards to Reduce Financial Disincentives to Power Plant Construction," *Public Utilities Fortnightly* 107 (February 12): 21–25.
3. See *Pacific Gas and Electric Co.* v. *State Resources Conservation and Development Commission,* 461 U.S. 190,207 (1983), citing H.R. Rep. No. 2181, 83 Cong. 2 Sess. (1954). See also *Vermont Yankee Nuclear Power Corp.* v. *N.R.D.C.,* 435 U.S. 519 (1978); and *Power Reactor Development Co.* v. *Electrical Workers,* 367 U.S. 396 (1961).
4. Ibid.
5. See statement by Richard Schmalz before the Joint Committee on Atomic Energy, U.S. Congress, January 31, 1974.

6. See, for example, "The National Flood Insurance Program: Agency and Insurer Perspectives," Insurance Research Council, July 1990.

7. See Price–Anderson Amendments Act of 1988, §170 (1).

8. See Price–Anderson Amendments Act of 1966, §170 (n), 42 U.S.C. 2210 (n) (1).

9. See Report to Congress from the Presidential Commission on Catastrophic Nuclear Accidents, August 1991.

10. The rationale for granting such compensation is simply that people will naturally think that "If I have the appropriate injury, then it was caused by the accident"—even if it wasn't. But full compensation seems an overgenerous remedy when doubts about causation run high.

11. See American Law Institute, Enterprise Responsibility for Personal Injury, Reporters' Study, April 15, 1991.

12. See 42 U.S.C. §9601 et. seq.

13. See testimony of the U.S. General Accounting Office and the U.S. Office of Technologic Assessment before the Subcommittee on Policy Research and Insurance of the Committee on Banking, Finance, and Urban Affairs, U.S. House of Representatives, September 27, 1990.

14. See Dennis R. Connolly. 1988. "Litigation Schizophrenia: Insurance Coverage and the Superfund Law," *BNA Toxics Law Reporter* (February 10): 981–985.

15. See Dennis R. Connolly. 1988. "Toxics Too Risky to Insure? Yes, No, Maybe So," American Bar Association, Toxic Tort Claims, November.

Commentary

Dan R. Anderson

1. Price–Anderson Act

I agree with Dennis Connolly that the Price–Anderson Act brought together the private and public sectors to deal with a difficult risk situation, namely, the injuries and damages to the public that could result from an accident at a civilian nuclear power facility. I believe that some important lessons can be learned from our nearly 35 years of experience under the Price–Anderson system, and that some of these lessons may be applied to the Federal Deposit Insurance Corporation (FDIC).

Connolly states that Price–Anderson effectively channels nuclear risk. This is certainly true, and was accomplished by the insurance industry's excluding such risk from virtually all property and liability policies and channeling it instead through specific nuclear liability policies. Thus, liability claims for injuries and damages resulting from a nuclear accident flow only through the insurance and compensation mechanisms set up by Price–Anderson.

While it may be necessary to channel certain extreme risks, it is important to note that channeling reduces the *spreading* of risk — a key ingredient in the operation of any insurance system. To illustrate my point, let me digress for a moment by referring to flood and earthquake risks, two areas that have seen involvement with government risk-bearing programs.

It has been my opinion since the early 1970s that the channeling of earthquake and flood perils through exclusions to standard property insurance policies has reduced the risk-spreading effect to such an extent that coverage for these events has never adequately developed in the private insurance market. Although it would demand a great deal of ingenuity in setting premiums and deductible levels, and probably participation by the federal government as a catastrophe reinsurer as well as legislation permitting the tax-free accumulation of reserves, flood and earthquake damages could be better handled by requiring their inclusion in standard property insurance policies. I believe one of our great national tragedies is going to occur following the next major California earthquake, when large numbers of homeowners and small businesses will incur substantial uninsured losses. This situation is being discussed at both the private and government levels, but whether something can be worked out before the Big One hits is a subject for another conference.

Losses stemming from bank insolvencies have effectively been channeled to the federal government via the FDIC: To my knowledge, coverage is not available through private insurance markets. There was a temporary leak in the channel's

dike when the FDIC brought claims against Directors and Officers (D&O) liability carriers, but this has since been plugged by an exclusion in D&O liability policies.

The subject of limited liability, which has been mentioned more than once at this conference, is probably Price–Anderson's most controversial feature. I remain a strong opponent of this limit because I believe it externalizes a risk cost of nuclear power while partially reducing the deterrent effect. If the national interest and national policy dictate that nuclear power is needed and that a limit on liability is necessary for its development, then the national interest requires that the government take over where the limit cuts off liability claims. However, in light of the $200–$300 billion federal deficit and the government's responses to the asbestos and Agent Orange situations, I have little confidence that the promise of ex post government review will result in adequate compensation for all injured parties in the event of a serious nuclear accident. I strongly favor an established or scheduled benefit system, possibly modeled along the lines of workers' compensation. Although I have not read the report of the Presidential Commission on Catastrophic Nuclear Accidents, referred to in Connolly's paper, to the extent that it helps to formalize a compensation system for injured parties impacted by the liability limit, I strongly support the Commission's efforts.

The potential adverse effect of Price–Anderson's liability limit on injured parties has been reduced in the most recent renewal of the law. The original limit of $560 million, established in 1957, was increased slightly in the 1980s, to $700 million, and then was raised substantially in the 1988 renewal, to more than $7.5 billion. This tenfold-plus increase, which significantly lowers the risk that injured parties will not receive compensation, was made possible by what I consider to be one of the best features of the Price–Anderson system — the retrospective premium assessment scheme.

This provision calls for an assessment against the utilities on a per-reactor basis if losses exceed the amount of private insurance available, currently $200 million. The upward adjustment in the liability limit was accomplished when the per-reactor assessment of $5 million was raised to approximately $66 million in 1988. Assuming 112 operating reactors that year, the total assessment layer ballooned from $560 million to $7.4 billion. Because this layer is funded by assessments on utilities, the cost is internalized.

For a risk such as a serious nuclear accident, which is characterized by extremes in terms of low probability and potential high severity (see Ringleb and Wiggins, chapter 1 of this volume), it is virtually impossible to calculate an expected loss with any degree of accuracy. Thus, prospective premium calculations essentially become a guess.

The retrospective system under Price–Anderson resembles the pure assessable mutuals used widely in the early years of insurance. Although the science of actuarial rate determination has developed significantly in many risk areas, the

statistical credibility of expected losses for nuclear accidents is still quite primitive. The retrospective premium scheme makes good sense for this type of risk because substantial pre-loss reserves are not tied up, but a planned funding mechanism is set up in the event of a loss. One drawback would be the utility's post-loss insolvency, which would result in the facility losing its assessment. It is interesting to note that Nuclear Mutual Limited, a utility-captive insurer for providing nuclear property insurance, but not liability insurance, is also set up on a partial retrospective premium basis.

It appears that the FDIC may be forced into an "unplanned" (to use Connolly's term) retrospective assessment system to supplement its planned prospective premium fund. While obviously we all wish that this were unnecessary, I see no problem with requiring additional assessments from banks to meet these unanticipated losses. To those who believe that this may force some banks into insolvency, I suggest that institutions whose capital is so low as to be impaired by such assessments will in all likelihood become bankrupt for other reasons. These assessments could also be structured to be paid over time, as is done under the Price–Anderson system.

I have one final point to make about Connolly's comments on the Price–Anderson Act. He proffers the much-mentioned insurance industry opinions that the Act allowed participation by private industry and encouraged insurers to increase capacity. Since private insurers are on the first layer and thus are unaffected by retrospective assessments and the liability limitation, I have never understood why Price–Anderson is necessary for private insurance to exist. Indeed, when the Act was passed in 1957, the insurance industry, through the nuclear power insurance pools, provided $60 million both for liability insurance (which was inside the Price–Anderson system) and for property insurance (which was outside the system). Although liability amounts have increased to only $200 million under Price–Anderson, available property insurance limits have swelled to more than $2 billion, a tenfold difference. In addition, utility captives — Nuclear Mutual Limited and NEIL I and II — have been formed to provide property coverage. Thus, it might be argued that absent Price–Anderson, *more* rather than less liability insurance capacity might have been provided by the private insurance market.

2. Superfund

Connolly states that the Superfund system has not worked as well as the Price–Anderson system. It is critical to point out that the two schemes deal with very different risk situations. The Price–Anderson Act set up a liability, compensation, and insurance system to handle potential losses from future nuclear accidents. The Superfund Act, or CERCLA, was designed to deal with the costs of handling past

improper hazardous waste disposal. Price–Anderson can thus be considered a prospective system, while Superfund is a retrospective system.

It seems to me that the national policy regarding Superfund is quite clear: The American people and Congress want hazardous waste cleaned up. Recall that the 1986 renewal of Superfund, or SARA (Superfund Amendments and Reauthorization Act), was passed unanimously by both the Senate and the House of Representatives. The current debate regarding Superfund centers on the means and the parties required to finance the cleanup of hazardous waste sites. The present system basically relies on two financing schemes: 1) a general tax levied against obvious past disposers of hazardous waste, namely, chemical companies, petroleum companies, and large corporations, and 2) efforts by the Environmental Protection Agency (EPA) to identify and to seek cleanup-cost financing from specific firms, or "potentially responsible parties" (PRPs), who generated or disposed of hazardous waste in the past.

These two risk-financing methods produce different results. The first promotes efficiency; that is, lower transaction/legal costs and increased funding for cleanup costs. However, it loses specific accountability. The second scheme promotes accountability by requiring the polluter to pay, but it also decreases efficiency, since more transaction/legal costs are required to identify, force settlement with, and litigate against PRPs. Moreover, a whole new set of transaction/legal costs has been created by PRPs attempting to pass their Superfund liabilities on to their insurance companies, as Connolly notes. In many cases, claims are being brought against insurance policies written as far back as the 1940s. I agree with Connolly that this situation is producing tremendous financial problems for the insurance industry as it struggles to deal with, in his term, "unplanned risk-bearing."

Because of the strong national commitment to hazardous waste cleanup, Superfund established potent tools to assess accountability, namely, retroactive, strict, and joint and several liability. Although new to Superfund, these rules have long been established in liability law. Though the generators and disposers of hazardous waste, and their insurers, understandably complain, these provisions have given the EPA an effective lever to finance cleanups. The problem is the high transaction/legal costs that ensue.

Of these three liability rules, joint and several liability has received the most attention. This rule means that a party who has generated only part of the hazardous waste at a site could be required to finance the entire cleanup if other parties cannot be found or are unable to pay. I am quite interested in this issue from a research standpoint and have done some work in the area. It is my impression (and I would welcome data showing otherwise) that the EPA has used joint and several liability more as a tool to force "deep-pocket" PRPs to assist in the search for other PRPs than as a means of making them pay a disproportionate share of the cleanup costs.

Regarding the future, I am relatively confident about the handling of hazardous waste disposal. I believe that the combination of Superfund and RCRA (Resource,

Conservation, and Recovery Act) has generated a positive risk-management attitude toward waste disposal. New technologies are being developed, much waste is now handled on-site rather than being transported to disposal areas, and in general, substantial efforts are being made to control this risk. Although the initial costs have been high, I believe that the risk-management approach is a very positive development — exactly the type of effect we anticipate in economic theory when we assess or internalize the costs of a particular activity to specific firms.

I am also optimistic about the development of insurance products and markets for hazardous waste and pollution risks. Having studied extensively the dilemma of insurance companies being forced to pay for Superfund cleanup costs under old insurance policies, I can certainly understand both Connolly's and the insurance industry's distaste for any type of pollution coverage. But I feel that a clear distinction should be made between the substantial problems that insurance companies are encountering under Superfund with their old policies, and the opportunities that have been created by the development of new policies to insure future waste and pollution risks. In my opinion, the latter area provides controllable and predictable insurance opportunities through the use of claims-made policies, damages and defense costs within aggregate limits, appropriate retroactive dates, limited discovery periods, and environmental audits. At present, only two insurance companies, American International Group (AIG) and Reliance Insurance, agree with me. I predict that other firms will enter the market as these risks become clearer. But if that does not happen, then I would suggest buying stock in AIG and Reliance Insurance.

7 The PBGC: A Costly Lesson in the Economics of Federal Insurance

Kathleen P. Utgoff

The inherent conflict created by federal insurance programs is the tension between compassion and productivity—the struggle to compensate people who suffer losses without destroying the incentives that create wealth. An analysis of the Pension Benefit Guaranty Corporation (PBGC) illustrates how difficult this struggle can be.

The PBGC was created in 1974 to protect workers and retirees from the losses that can occur when an underfunded pension plan is terminated. Although there are more complex explanations for the creation of the PBGC, federal pension insurance is not unusual in light of other federal programs that protect against misfortunes such as floods, unemployment, or disability.[1] Nor is the timing of this program surprising: It was enacted during a period that witnessed the passage of major

environmental, occupational, and consumer protection legislation, roughly 25 years after the establishment of the first modern pension plan.[2]

The history of the agency to date is noteworthy for two reasons. First, design flaws in the original program became obvious very quickly. By the mid-1980s, the PBGC had a large and growing deficit despite several significant increases in employer-funded premiums. Even more disturbing, the agency was clearly not accomplishing its original mission. Rather than protecting pensions, the insurance program had become an industrial welfare system, providing large subsidies to troubled companies that abandoned their pension plans.

Second, in 1986 and 1987, two laws were passed that made substantial changes in the structure of the program, addressing most of the design flaws. Although problems remain, the new system is more financially sound and less economically disruptive. The sweeping changes in pension law that occurred in 1987 in particular are an exception to the rule that subsidies are rarely removed.[3]

This paper provides an overview of the PBGC to date—the creation of pension insurance in 1974, the significant problems that have faced the agency, and the improvements that were enacted roughly a dozen years later. The purpose of this annotated chronology is to contribute to the process of learning from these experiences.

The failures in our financial system—among savings and loans, banks, pension plans, and more recently, insurance companies—have given rise to a number of questionable conclusions, particularly concerning the role of fraud and federal regulations. These conclusions need to be examined thoroughly to ensure that the costly mistakes of the past are not repeated.

1. Pension Insurance—The Original 1974 Version

The PBGC was created by the Employee Retirement Income Security Act of 1974 (ERISA). In addition to instituting a mandatory insurance program for defined-benefit pension plans, ERISA established restrictions on the operation of pension plans, including rules on vesting, funding, and diversification.[4]

A defined-benefit pension is one that pays a retirement amount according to a formula that is usually based on compensation and the number of years of service.[5] A typical plan might pay an amount equal to 1.5 percent of the final salary for each year of service, or 45 percent of the final salary for 30 years of service. Defined-benefit pensions are the principal plans for most pensioned workers and are much more common in large, unionized firms than in smaller, nonunion shops.

Prior to ERISA, when the sponsor of a defined-benefit plan went out of business, a worker could lose benefits if the pension trust did not contain enough assets. The closing of the Studebaker auto plant in 1963, which caused substantial pension

losses for some workers, is widely regarded as a key event in the long stream of legislative efforts that led to ERISA.[6]

The PBGC administers two insurance programs. The one that has attracted great notoriety recently is the program for pension plans that are sponsored by a single employer. The other program, which covers employees who belong to the same union but often work for more than one employer, was established in 1980 by the Multiemployer Pension Plan Amendments Act (MPPAA). Union mine workers, truck drivers, and construction workers are usually covered by multiemployer pension plans that are guaranteed under MPPAA. Because this program was established with much stronger safeguards against abuse than the single-employer plan, it maintains a low premium and a growing surplus. The stricter design features of the multiemployer program are undoubtedly the result of fears in the late 1970s that such plans were much more likely than single-employer plans to cause drains on the insurance system.[7] Claims under MPPAA proved to be a pleasant surprise, however. In 1990, the multiemployer program, which covers about one-fourth of the participants insured by the PBGC, accounted for less than 1 percent of annual benefit payments.[8]

Under MPPAA, the PBGC does not take over troubled multiemployer plans. Instead, when a plan is in danger of becoming insolvent, money is loaned to the pension trust, which is operated jointly by management and labor trustees. When the PBGC enters into a loan agreement with the trustees, benefits are cut back to levels much lower than those guaranteed under the single-employer program.[9] While the single-employer program provides for a phase-in of benefit increases within five years of plan termination, no such increases occurring within five years of PBGC intervention are guaranteed under MPPAA.

These lower maximum guarantees are undoubtedly important in explaining the solvency and low premiums of the multiemployer program. Some plans have actually paid back the PBGC loan in order to grant benefit increases. In 1987, six plans were receiving financial assistance from the PBGC; in 1989, only three plans were being helped. Before MPPAA was passed, the PBGC estimated that 10 percent of the roughly 1,200 plans represented a threat to the federal insurance program.[10]

Probably the most important feature of MPPAA in limiting the number of claims is withdrawal liability.[11] This provision means that each contributing employer is liable for a proportionate share of the unfunded liability if it leaves the plan. Withdrawal liability internalizes the cost of underfunding and leaves the PBGC accountable only in rare cases. MPPAA has had a significant positive effect on the behavior of plan trustees. Multiemployer plans have become much better funded: During the 1980s, their average funding ratio increased faster than for single-employer plans.[12]

The financially troubled single-employer program pays vested benefits up to a maximum level ($2.250 per month in 1991) when a plan terminates without sufficient assets to cover guaranteed benefits. Under the 1974 version of ERISA,

Table 7–1. Average Net Loss from Underfunded Pension Plans

Years of Termination	*Average Net Loss per Terminated Plan*
1975–1979	$0.3 million
1980–1984	$1.0 million
1985–1990	$3.2 million

Source: PBGC (1990a).

the PBGC, in addition to inheriting the assets and claims of the plan, was entitled to 30 percent of the net worth of the plan sponsor. This feature of the insurance program created what became known as the "PBGC put," because a sponsor could elect to terminate a pension plan and make a profit whenever unfunded liabilities exceeded 30 percent of net worth.[13]

This put option led to the termination of underfunded pension plans by ongoing, solvent employers, an event virtually unheard of prior to the passage of ERISA. Because employers were able to increase the amount of underfunding prior to termination, the size of the average loss per termination rose dramatically over the span of a few years (see table 7–1). Not only does the termination of a pension plan foreclose all prospects of cost-of-living adjustments, but accruals are much more rapid at the end of a worker's career, so that a mid-career plan termination causes significant losses for many employees.[14] The PBGC single-employer program, which was designed to protect pensions, actually reduced pension security in many cases, because it set up the termination of the pension as the condition for obtaining a large federal subsidy.

The single-employer insurance program also had pernicious effects on the overall economy, diverting resources from healthy, well-managed companies to inefficient firms with low net worth. This industrial welfare program was particularly harmful to industries that were plagued by excess capacity, such as steel. The PBGC program subsidized the weakest players in the steel industry and, in the process, damaged the healthy firms by suppressing prices industrywide.[15]

This perverse result arose from tax incentives as well as from the structure of the insurance program. Because pension contributions are tax-deductible and the earnings on contributions are not taxed, the optimal strategy for most firms that earn enough income to pay taxes is to prefund pensions as much as possible. Thus, most profitable companies would make bigger contributions to defined-benefit pension plans if they were not constrained by IRS maximum funding limits. The PBGC put option was of no value to these successful firms.

The optimal strategy for firms that do not pay taxes is often just the opposite. These firms will try to minimize contributions. This two-track incentive system was another perverse feature of the original structure of the PBGC. Workers in weak companies

truly need the protection of assets set aside in a pension trust; workers in healthy firms are protected by the ability and obligation of plan sponsors to continue payments.

The dangers inherent in the PBGC put were exacerbated by several other features of the insurance program, outlined below.

1.1 Funding Waivers

The IRS can grant a company in financial difficulty a waiver of required contributions. The waived amounts are paid back over a fixed amortization schedule. Prior to 1987, a waiver was essentially a below-market unsecured loan from the pension plan to the plan sponsor, guaranteed by the PBGC. Waiver requests were commonly granted, even under very questionable circumstances.[16] Some companies received five consecutive funding waivers (the maximum allowed) in the period immediately preceding the termination of their pension plan. Funding waivers accounted for half of the losses to the PBGC when Rath Packing terminated its plans in 1982 and when Continental Steel terminated its plans in 1986. These two cases alone cost the PBGC more than $100 million.[17]

1.2 Shutdown Benefits

Shutdown benefits entitle workers to immediate, full retirement benefits when a plant is closed.[18] These benefits, which are common in the auto and steel industry, cannot be prefunded in any meaningful sense because they arise unpredictably and rapidly.

Shutdown benefits are expensive: In the steel industry, they can easily add $100,000 or more to the present value of liabilities for each worker who qualifies.[19] A 45-year-old worker with 20 years of service would be entitled to full benefits for at least an extra 10 years.[20] In addition to the normal benefits under the plan, the shutdown includes a supplement that lasts until Social Security benefits become available. In 1987, a typical monthly payment benefit for a qualifying 50-year-old worker was close to $1,000.

Shutdown benefits caused many problems for the steel industry and for the PBGC.[21] The added liabilities significantly increased the pension burdens of companies already weakened by the financial woes leading to plant closings. Over the course of 20 years, many steel companies' pension plans went from a ratio of two workers for each retiree to a ratio of three retirees for each worker. When shutdown benefits are available and the ratio of workers to retirees declines sharply in a plan that was typically not well funded to begin with, the pension plan is not viable.

Normally, the PBGC does not guarantee benefits that are added to a plan immediately prior to plan termination, a provision that prevents clear abuse of the program.[22] Shutdown benefits that begin immediately prior to plan termination

are covered by the PBGC, however, because they were usually added through the collective bargaining process in the 1970s and consequently were not considered to be benefit increases prior to plan termination.[23]

From the vantage of hindsight, it is easy to question the decision to cover shutdown benefits. These benefits are rarely funded because plans are frequently terminated shortly after shutdowns. It seems clear now that these are severance benefits rather than retirement benefits. In addition, they are inherently uninsurable because they are found in a small number of covered plans with highly correlated probabilities of presenting a claim. It is not clear, however, that the PBGC could have successfully excluded shutdown benefits. Every attempt to address this problem in recent years has been vigorously opposed by organized labor.

1.3 Claims in Bankruptcy

Many PBGC claims for underfunding end up in bankruptcy court. Despite some flexibility in the law with respect to the measurement of net worth, recoveries against a bankrupt company are often low relative to unfunded benefits, amounting to a share of less than 10 percent for terminations prior to 1986.[24]

The limitation on the PBGC's claim in bankruptcy and the availability of funding waivers meant that troubled companies could, in effect, promise benefits to workers that cost less than 10 cents on the dollar. Benefit increases suited the needs of other creditors as well; they substituted for wage increases, preserving assets for their own claims.

1.4 Funding Rules

Although 1974 ERISA funding rules specified maximum amortization periods for unfunded liabilities and required that actuarial assumption be "reasonable in the aggregate," it became clear that these restrictions were inadequate to prevent a systematic decline in the funding status of a plan.

The funding rules allowed unfunded liabilities for past service to be amortized over 30 years. When a plan covers many participants who are already retired, a 30-year funding schedule does not keep pace with benefit outlays. At minimum, a plan cannot have an amortization schedule longer than the remaining life of most participants. In addition, many plans with a high ratio of retirees to workers had another feature that resulted in persistent underfunding. These "flat-dollar" plans used a formula that based monthly benefits on years of service times a dollar amount—$20 per month for each year of service, for example. This amount was periodically increased in collective bargaining for all participants, including retirees, to adjust for inflation.[25] Any such increase immediately created unfunded liabilities because it applied to all years of service.

The termination of the flat-dollar plan sponsored by Allis Chalmers clearly demonstrates the weaknesses in the original ERISA funding standards. The plan was handed over to the PBGC in 1985 with only two months of benefit payments, an amount equal to 3 percent of the present value of guaranteed benefits. This plan, which was in complete compliance with minimum funding standards, had never received any funding waivers, yet the funded ratio declined from 60 percent to 3 percent in the five years prior to plan termination.[26]

The termination of LTV's Republic Steel retirement plan demonstrates another problem with the funding rules. The plan had $1.7 million in benefit payments due on October 1, 1986. Assets available to pay benefits amounted to $7,700, and the plan was underfunded by $230 million.[27] Again, it had no waivers and had not violated the minimum funding rules. The Republic Steel retirement plan had been stripped of assets because it allowed (and in fact encouraged, through a favorable interest rate) the lump-sum cash-out of all pension rights. In addition, it covered many executives with benefits above guaranteed levels. Retirees faced enormous incentives to take a lump-sum payment rather than an annuity that would be reduced to guaranteed levels if the plan terminated. This case illustrates a number of problems, but it clearly demonstrates the need for a funding rule that recognizes the cash flow out of the plan.[28]

1.5 Premiums

Until 1987, the PBGC charged an equal flat-rate premium per participant, no matter how well-funded the employer's plans. The premium was set at $1.00 in 1974, increased to $2.60 in 1978, and rose again to $8.50 in 1986.

This premium structure was unrelated to the probability of a claim. Healthy employers with overfunded plans paid the same charge as weak companies with plans that were underfunded by $25,000 or more per participant. This structure provided a significant subsidy to a firm with an underfunded pension plan. For the most part, the subsidies benefited large, unionized firms with above-average wages and generous pension plans.[29]

1.6 Other Problems

The PBGC quickly recognized some of the loopholes in the original law and took aggressive steps to close them. The agency has always feared that employers would try to separate an underfunded pension plan from the assets that could be subject to PBGC claims. A healthy company, for instance, might be willing to relinquish a unit with an underfunded pension plan rather than fund the plan or give the agency 30 percent of its net worth following a termination.

This is precisely what happened in the International Harvester (IH)–Wisconsin Steel case. In 1977, IH (now Navistar) sold Wisconsin Steel, a division with a

pension plan that was underfunded by $86 million, to Envirodyne, a small environmental engineering company with no experience in steel and virtually no net worth.

The sale was essentially a 100 percent leveraged buyout. Envirodyne borrowed most of the purchase price from IH and pledged Wisconsin Steel assets as collateral. Wisconsin Steel failed, and the pension plans were terminated.[30] The PBGC asserted claims against IH and litigated the issue for many years, maintaining that IH did not relinquish control of Wisconsin Steel and that the principal purpose of the transaction with Envirodyne was to evade the intent of ERISA.

Although the law at the time of the sale contained no explicit language that prohibited transactions designed to evade ERISA liabilities, the case was eventually decided in the PBGC's favor.[31] The judgment for underfunding plus interest has a value, according to the PBGC, in excess of $140 million.[32] The IH precedent has proved very advantageous to the agency, particularly in large cases such as LTV Steel and Eastern Airlines. Both companies are in a "controlled group" that contains companies with substantial assets.[33]

Another area in which the PBGC was vigilant and persistent despite lack of explicit statutory authority concerned the "follow-on plan" issue. Some companies wanted to exercise the PBGC put and then make up the resulting losses to workers by establishing new pension plans that paid what the PBGC did not. The PBGC, realizing that these follow-on schemes would make pension plan terminations virtually irresistible, fought hard to preserve the deductible feature of the insurance program.[34] This was a central issue in the long legal battle between the PBGC and LTV Corporation. The Supreme Court decided this case in favor of the PBGC in 1990.[35]

Despite aggressive efforts by the PBGC to reduce claims, the agency had a deficit (including the LTV plans) of nearly $4 billion in 1987. Administrative expenses alone were more than original estimates of annual benefit payments, and estimates of premium needs based on actual experience were 25 to 50 times greater than original projections.[36]

2. Legislative Changes

The termination of the LTV plans marked the financial nadir of the PBGC. As a result, however, Congress became acutely aware of the agency's problems, and by the end of 1987, legislation was enacted that made major steps toward correcting the structural flaws that plagued the single-employer program.[37]

The legislative overhaul of federal pension insurance actually commenced in 1986 with the passage of the Single Employer Pension Plan Amendments Act (SEPPA), but the most significant changes were included in the Pension Protection Act of 1987 (PPA).

2.1 Insurable Event

SEPPA changed the insurable event by eliminating the PBGC put for solvent companies. The 1986 law restricted the use of PBGC funds to firms in financial distress, as defined by four criteria, including a filing under Chapter 11 or Chapter 7 of the bankruptcy code. PPA added a new restriction on companies seeking termination under the Chapter 11 rule. It required the bankruptcy court to find that the company could not reorganize unless its pension plan was terminated.

2.2 Waivers

PPA significantly reduced the attractiveness and availability of waivers. The maximum number of waivers was reduced from five to three in any 15-year period; waivers can now be granted only if the entire controlled group is suffering temporary hardship. Also, the interest rate used to calculate the repayment of waived contributions was increased and the amortization period was reduced. One sign that these provisions are working is that some companies have complained that the new waiver terms are unattractive relative to other sources of financing.[38]

2.3 Claims in Bankruptcy

SEPPA gave the PBGC a claim in bankruptcy based on underfunding. Together with the net-worth claim, the total claim was limited in the 1986 legislation to 75 percent of underfunding, but that limit was raised to 100 percent of underfunding by PPA. Although the new claim is valuable in some cases, particularly when there are other members in the controlled group, the value is limited in many instances by its low ranking among claims of other creditors. Generally, claims based on underfunding are unsecured and are paid after claims by all other secured and priority creditors. Unsecured claims are rarely paid in full; unsecured creditors usually receive considerably less than half the value of their claims.

2.4 Funding Rules

PPA brought significant changes in funding rules. The amortization period for reducing a plan's past liabilities was shortened from 30 to 18 years. It also stated that new liabilities must be amortized more quickly, with severely underfunded plans subject to the shortest amortization periods. The amortization period for shutdown benefits was decreased from 15 to seven years. Actuarial assumptions were required to be individually reasonable, with allowable interest-rate assumptions tied to the return on 30-year Treasury notes.

2.5 Premiums

PPA also contained a significant move toward a risk-based premium. A variable premium was added to the new flat rate of $16, which was set equal to $6 per $1,000 of underfunding, up to a maximum of $50. While the $50 cap preserves a significant subsidy for plans that are severely underfunded and the $16 flat premium is too high for well-funded plans, the new premium was clearly an important step in the right direction.[39]

2.6 Other Provisions

Other protections were also instituted by PPA. It gave the PBGC an automatic lien when employers do not make required contributions to pension plans. The amount of the lien is treated as a tax claim, which has a relatively high status in bankruptcy proceedings. Another protection required the provision of security for benefit increases that bring the funding ratio below 60 percent.

3. Remaining Problems

It is too early to tell whether the 1987 PPA reforms were strong enough to produce a viable pension insurance program. Some of the new funding rules were structured to make sure that companies were not forced to make radical changes in their contribution to pension plans. As a result, some plans will remain underfunded for a number of years, and if these employers file for bankruptcy, large claims against the agency could still occur. Currently, the PBGC faces some substantial claims from the financially troubled airline industry. In addition, a number of other threats endanger the solvency of the single-employer program. The biggest of these are the current bankruptcy rules and the decline in the popularity of defined-benefit pensions.

3.1 Bankruptcy

The priority of PBGC claims in bankruptcy is still too low. The best way to make employers take their pension promises seriously is to give claims for unfunded pension benefits a higher status in bankruptcy. It is improbable that a premium will ever be adopted that reflects the true risks of a claim from an unhealthy sponsor with an underfunded plan. That approach would lead to a premium of at least several hundred dollars per person for struggling firms.[40] It is also very difficult to design funding rules that provide flexibility for different plan structures and yet close dangerous loopholes.

Many people believe that pension benefits do not need protection in bankruptcy because they are insured by the PBGC, but precisely the opposite is true. Before benefits were insured by the PBGC, workers had strong incentives to make sure

their benefits were funded, especially if the firm was in financial trouble. Pension promises could not substitute for wages unless the promises were protected through funding or by the assets of a healthy firm. With PBGC insurance, a firm can grant unfunded benefit increases in lieu of wages because these benefits are guaranteed. The only way to correct this situation is to give unfunded pension liabilities a higher status in bankruptcy. When creditors know that promises of unfunded benefits jeopardize their own recoveries, they will begin to oppose them instead of encouraging them. Bankruptcy status should be based not on the importance of the claim to society or to the worker, but instead on an assignment of liabilities that results in the most productive allocation of resources.[41]

Another serious problem is the bankruptcy process in the United States. The PBGC's claims are not viewed favorably by many bankruptcy judges. It is much easier to work out the competing claims of private creditors when the government chips in to pay pension benefits. This phenomenon is a symptom of a much broader problem in our bankruptcy system. The bankruptcy process should be designed to reorganize viable companies, to liquidate nonviable companies, and to ensure that the rights of creditors are protected. Instead, it has become a protracted and uncertain process that often promotes other interests over the valid claims of creditors.[42]

3.2 Survival of Defined-Benefit Pensions

The PBGC insurance program is threatened by a decline in the popularity of the defined-benefit pension. Thousands of these plans are terminated every year, and the number of participants covered by the program is declining. In 1980, the primary pension plan for 83 percent of workers with a pension was a defined-benefit plan. By 1987, that figure had dropped to 68 percent.

Some of this decline can be explained by shifts in employment patterns away from the manufacturing industries that typically offer these plans. But much of the change is attributable to a constant stream of complicated regulations that have been imposed in recent years to ensure that pension benefits are provided on an equal basis to all workers in a firm. The decline in defined-benefit plans is particularly apparent among small employers because the costs of the new regulations are relatively fixed and consequently put a heavier burden on smaller plans.[43]

Changes in the tax law have also made defined-benefit pension plans less popular. PPA contained a tax provision that reduced the maximum amount—known as the full funding limit—that an employer could contribute to a defined-benefit pension plan. This change made a dollar of pension benefits through a defined-benefit plan more expensive on an after-tax basis than a dollar of benefits provided through a defined-contribution plan. The change was enacted to raise revenue to finance government spending in other programs by reducing the tax deduction that plan sponsors could claim for pension contributions. The revenue estimates for this restriction ignored the

fact that pension liabilities must eventually be funded so that contributions and tax deductions are deferred rather than reduced.[44]

The PBGC is threatened by our nearsighted pension policy. Complicated and restrictive pension laws may reduce pension contributions, but they are a threat to our national retirement security and to the pension insurance system. Healthy plans are leaving the defined-benefit system; the PBGC could end up insuring only underfunded plans.

4. Conclusion

The problems faced by the PBGC are similar to those faced by other federal guarantee programs. The premium is 23 times higher than it was when the program was created in 1974, yet the single-employer program still has a sizable deficit. Many employers justifiably complain that the program forces them to subsidize their irresponsible competitors, and some companies have adopted defined-contribution plans or have purchased annuities from insurance companies to avoid PBGC premiums. Neither of these retirement arrangements is protected by federal insurance.

These spiraling costs and economic distortions cannot be blamed on fraud. Virtually all of the unanticipated costs have been caused by predictable and legal responses to economic incentives. Even aggressive behavior that relies on ambiguities in the law is not fraud, although it is frequently characterized as abuse. The Envirodyne buyout was a calculated move by a troubled company that demonstrated why the law needed to be clarified.

Many observers have attributed the problems in the savings and loan industry to a lack of regulatory zeal, a symptom of the antigovernment sentiment of the Reagan administration. It is clear, however, that the problems at the PBGC cannot be blamed on lax enforcement: The agency has used every tool available to reduce losses. In fact, many believe that the agency is too aggressive. These critics include bankruptcy judges, competing creditors, as well as many other observers who believe that the PBGC should be used to "arrest this nation's precipitous industrial deterioration."[45]

Although the PBGC may appear to be just another example of a government program in which the costs were intentionally understated to facilitate enactment, the facts do not support this view. For instance, the costs of the multiemployer program were significantly overestimated.

I believe the single most important lesson that can be learned from the history of the PBGC to date is that federal programs run into trouble because their incentive effects are routinely ignored. Claims of more than $100 million from a single employer were thought to be extremely unlikely when ERISA was passed.[46] However, larger claims have occurred at least every year since 1985. Because terminations of single-employer pension plans were relatively rare before 1974,

the program was enacted without the strong controls that were adopted in the multiemployer program (which, at the time, was believed to be a much riskier venture). Consequently, the later program was designed with incentives that increased plan funding and reduced the probability of claims against the PBGC. Program costs were overestimated because the impact of these incentives was underestimated. The incentive effects of the single-employer program were also underestimated; thus, few controls were adopted, and the costs of the program turned out to be far higher than expected.

Because incentive effects are usually ignored, federal insurance programs do not include enough design features to reduce activities that lead to spiraling costs and economically inefficient behavior. In other words, too little attention is paid to the moral hazards inherent in these programs.

Many of the program features that are needed to prevent abuse are highly unpopular because they are viewed as harsh or intrusive. It is very difficult to impose copayments or deductibles on individuals who suffer the misfortunes that are covered by federal insurance programs. Some of the aggressive actions taken by the PBGC, when viewed in isolation, appear to be meddlesome intrusions into the affairs of private business.

There are two alternative designs for federal insurance programs. One type of program has few controls and runs the risk of financial collapse. The other is a carefully designed program with unpopular controls. Because incentive effects are routinely ignored, the notion persists that the best of both worlds is possible. Many people continue to believe that we can have low-cost programs without unpopular controls. The lesson that should be learned from the PBGC and the savings and loan bailout is not that fraud is rampant or that free-market adherents are wrong. The real lesson is that people and firms respond to incentives in predictable ways and that these responses must be taken into account in the design of federal programs.

Notes

1. See Ippolito (1988).
2. In 1950, General Motors adopted the first major pension plan with a fund controlled by the company and managed by investment professionals. The fund was encouraged to invest in equities rather than the standard fixed-income investments.
3. The obstacles to reducing subsidies are described in Stockman (1986).
4. The full text of ERISA is found in Bureau of National Affairs (1990).
5. The other type of plan is a defined-contribution plan in which a portion of a worker's wages is deposited into an account that belongs to the worker after a short vesting period. TIAA-CREF, the plan that covers many academics, is an example of such a plan.
6. Studebaker workers were not covered by ERISA, however. Since 1974, several efforts have been made to provide benefits to workers who lost vested benefits prior to that year. The latest of these, H.R. 824, is the Pension Restoration Act of 1991, which was not enacted.

7. See PBGC (1978).

8. See PBGC (1990a).

9. Under MPPAA, the PBGC insures benefits up to $16.75 per month per year of service. With the same years of service and at the same age, a worker is typically entitled to half the maximum guaranteed benefit under MPPAA than in the single-employer program.

10. See PBGC (1978), p. 1.

11. See PBGC (1987).

12. See PBGC (1990b).

13. See Sharpe (1976) and Marcus (1987).

14. See Ippolito (1986).

15. The amount of the subsidies was substantial. In 1987, an internal PBGC calculation showed that the termination of the Wheeling–Pittsburgh plans reduced funding costs by enough to allow a permanent wage increase of $3 per hour. In the LTV case, the annual reduction in required contributions for pensions that would have resulted from a plan termination was more on a per-ton basis than were average profits per ton in the steel industry in 1987.

16. Since 1987, coordination between the PBGC and the IRS over funding waivers has improved dramatically. Waivers are granted less frequently and are usually conditioned on the posting of security acceptable to the PBGC. Some of these improvements can be attributed to the realization that waivers caused significant losses, but much credit should be given to Martin Slate, the IRS official who became responsible for waiver deliberations in 1987.

17. One little-known aspect of the Chrysler bailout is that the company received funding waivers in addition to a government loan. While the formal loan has been repaid, underfunding in the pension plans has grown since the bailout. Chrysler is second only to LTV on the PBGC's annual list of companies with the most-underfunded plans. On the 1991 list, guaranteed benefits are reported as underfunded by $2.6 billion using a measure that has proven to be quite conservative. In essence, the Treasury Department forced the agency to grant a loan to Chrysler and then stepped in front of the PBGC in the line of creditors.

18. This is subject to minimum age and service requirements, typically a "rule of 65," where age plus years of service equal 65.

19. I owe much of my limited understanding of the complexities of steel pension plans to Dave Gustafson, the PBGC's manager of actuarial policy, who was a principal architect of the new funding standards adopted in 1987.

20. This assumes eligibility for a 30-and-out benefit.

21. These problems are addressed in Utgoff (1988). Written text is available from the PBGC.

22. Increases in benefits that occur within five years of plan termination are phased in at the rate of the greater of 20 percent per year or $20 per month.

23. Supplements that end when Social Security becomes payable are not insured because they are not benefits that are paid at the normal retirement age.

24. This figure, which is based on an internal PBGC calculation, is a rough estimate. A long period commonly elapses before many bankruptcy claims are settled, and the PBGC often accepts relatively illiquid assets (in lieu of nothing) in settlement of a claim. In one case, for instance, the PBGC negotiated a settlement with an airline that called for a rebate based on government employees' use of the airline.

25. Plans based on final or average salary provide inherent inflation adjustments.

26. The figures are based on internal PBGC calculations that were used in speeches and testimony in support of new legislation. See, for example, Utgoff (1986).

27. Ibid.

28. Zvi Bodie described some of these problems in a letter to the Department of Labor on January 4, 1991.

29. According to Ippolito (1988), "Among the 100 largest pension plan insufficiencies processed by the PBGC from 1975 through mid-1986 (these represent over 90 percent of PBGC transfers), almost 95 percent of the monies have been claimed by union participants."

30. See Bensman and Lynch (1987).

31. In 1986, ERISA was amended to allow the PBGC to disregard transactions with a principal purpose to "evade pension liability."

32. See *In re Consolidated Litigation Concerning International Harvester's Disposition of Wisconsin Steel,* 681 F. Supp. 512 (N.D. Ill. 1988). Litigation is still pending over valuation techniques.

33. ERISA liability can be asserted against all members of a controlled group, defined in the tax code as a group in which 80 percent of the ownership is common.

34. The LTV bargaining agreement also contained another troublesome feature: a profit-sharing clause that channeled some of the savings from a plan termination (the liabilities assumed by the PBGC) into bonuses. Together with the proposed follow-on plan, the profit-sharing arrangement made it explicit that workers would be better off with a terminated plan.

35. See *PBGC* v. *LTV,* 110 S. Ct. 2668 (1990).

36. See Ippolito (1989).

37. Conventional wisdom in Washington is that nothing gets fixed unless there is a crisis. In the case of the 1987 PBGC legislation, the costs of the requisite crisis were never fully paid. The PBGC restored the LTV plans, and the restoration was eventually upheld in the 1990 Supreme Court decision.

38. Some of these complaints can be attributed to the decision to require security for waived contributions. A provision clarifying that security could be required as a condition for a waiver was added to ERISA (section 306[a]) in 1987, but the practice had been instituted earlier. See footnote 16.

39. In order to meet governmentwide budget targets, the flat-rate premium was increased in 1990 to $19, the variable charge was raised to $9 per $1,000, and the cap grew to $72. The new parameters were designed to maintain the percentage of revenue that was raised by the variable portion. Although the PBGC is not financed through any general revenues, it is part of the unified budget. Consequently, a hike in PBGC premiums allows increased spending on other government programs even though the revenues must be used to pay for PBGC benefits.

40. See Vanderhei (1988).

41. For an elaboration of this principle, see Utgoff (1987).

42. See "The Price of Distress: Survey of International Finance," *The Economist,* April 27, 1991, p. 23; and "Beware the Bankruptcy System," *The New York Times,* April 28, 1991, section 3, p. 11.

43. See Utgoff (1990).

44. The distortions caused by our current budget rules, which focus on immediate cash flows rather than on long-term costs, are outlined in Lindeman and Utgoff (1992).

45. See the dissenting comments of Michael S. Gordon in Ippolito (1989).

46. When I became executive director of the PBGC in 1985, claims in excess of $25 million were excluded from the data used to project future claims, because they were thought to be outliers that served to bias predicted claims upwards.

References

Bensman, D., and Lynch, R. 1987. *Rusted Dreams.* New York: McGraw-Hill.

Bureau of National Affairs. 1990. *ERISA: The Law and the Code.*

Ippolito, R.A. 1986. "Pension Economics and Public Policy." Pension Research Council Monograph. Homewood, Ill.: Dow Jones–Irwin.

Ippolito, R.A. 1988. "Study of the Regulatory Effects of the Retirement Income Security Act." *Journal of Law and Economics* 31 (April): 85–125.

Ippolito, R.A. 1989. *The Economics of Pension Insurance.* Pension Research Council. Homewood, Ill.: Dow Jones–Irwin.

Lindeman, D., and Utgoff, Kathleen P. 1992. "Pension Taxes and the U.S. Budget." *Pensions and the U.S. Economy: The Need for Good Data.* Philadelphia: University of Pennsylvania Press, forthcoming.

Marcus, A.J. 1987. "Corporate Pension Policy and the Value of PBGC Insurance." In various issues of *Pension Economics,* Zvi Bodie et al., eds.

Pension Benefit Guaranty Corporation. 1978. "Multiemployer Study Required by PL 95-214." Report to Congress.

Pension Benefit Guaranty Corporation. 1987. Address of Gary M. Ford, general counsel, to the National Coordinating Committee of Multiemployer Plans, December 3.

Pension Benefit Guaranty Corporation. 1990a. *Annual Report.*

Pension Benefit Guaranty Corporation. 1990b. Five-Year Multiemployer Study.

Sharpe, William F. 1976. "Corporate Pension Funding Policy." *Journal of Financial Economics* 3 (June): 183–193.

Stockman, David A. 1986. *The Triumph of Politics: Why the Reagan Revolution Failed.* New York: Harper and Row.

Utgoff, Kathleen P. 1986. "Toward a Well-Funded Future." Speech presented before the Institutional Investor Pension Symposium, Hilton Head, S.C., October 9–10.

Utgoff, Kathleen P. 1987. "Title IV of ERISA and the Bankruptcy Code." Speech presented before the American Bar Association, Section of Corporation, Banking, and Business Law, New York, N.Y., March 23.

Utgoff, Kathleen P. 1988. "Restructuring, Pension, and Health Issues." Speech presented at the John P. Murtha Steel Symposium, University of Pittsburgh, Pittsburgh, Pa., June 2.

Utgoff, Kathleen P. 1990. "The Proliferation of Pension Regulations." *Regulation* 13 (Summer): 29–38.

Vanderhei, J. 1988. "An Empirical Analysis of Risk-Related Insurance Premiums for the PBGC." University of Pennsylvania, report submitted to the PBGC.

Commentary

Zvi Bodie

I concur with almost everything that Kathleen Utgoff has written in her paper. I have the utmost respect for her as both a professional economist and a government regulator. Her account of the Pension Benefit Guaranty Corporation (PBGC), of which she was formerly chief executive officer, and its efforts to eliminate abuses of government pension guarantees is accurate to the best of my knowledge. I agree with her assessment of the main moral of the story—that government must consider not only its own intentions when it establishes a guarantee program, but also the incentives that it creates for economic agents affected by the program, who will inevitably act in their own interest.

I disagree with her only in that I believe there is still a substantial danger that the PBGC will become like the Federal Savings and Loan Insurance Corporation (FSLIC), that is, another government insurance program run amok. She seems reasonably confident that almost all of the major perverse incentive problems facing the government's pension guarantee program have been fixed, while I do not. In particular, I am concerned that unless the PBGC can impose some restrictions on the pension fund investment practices of financially weak plan sponsors, it may well face a FSLIC-type crisis. Indeed, failure to understand the important role of investment policy in determining the exposure of the government guarantee fund was the critical factor in the severity of the FSLIC crisis. I believe that similar factors are at work in the pension arena, and understanding them may help to avert a crisis for the PBGC. Because the scope of this conference is much broader than pension funds, I will try to frame my comments about this issue so as to make them easily applicable to insurance companies, savings and loans (S&Ls), and banks.

To set the stage for my analysis of the role of investment policy, let me start with a few brief comments on the FSLIC crisis.[1] In my view, there were two phases in the development of that crisis—before 1980 and after 1980. Because the FSLIC's assets were long-term, fixed-rate mortgage loans and its liabilities were short-term deposits, rising interest rates and the removal of deposit-rate ceilings in the 1970s wiped out the capital of many S&Ls. By 1980, the present value of the costs to the federal government (specifically, to the U.S. taxpayers) of fixing the mess was probably about $20 billion. Instead of fixing it, however, the government made it far worse by allowing S&Ls to invest in a much broader spectrum of assets, including equity real estate. The result is that the present-value cost of a cure is now conservatively estimated to be 10 times as great. I am convinced that even today, many of the public officials responsible for the crisis do not understand why

Table 7C–1. Pension Fund Balance Sheet

Assets		*Liabilities and Net Worth*	
Investments	I	Present Value of Benefits Owed to Employees	B
Guarantee of Pension Benefits	G	Net Worth	S

allowing S&Ls to diversify into equity investments was bound to make the FSLIC's problems worse rather than better.

1. The Conceptual Framework

To clarify the connection between investment policy and funding adequacy, think of a pension fund as a freestanding insurance company. Indeed, since the sponsor of a defined-benefit pension plan has the choice of either paying an insurance company to assume its pension liabilities or creating a trust and managing its own pension fund, the analogy between pensions and insurance is a very close one. To keep matters simple, assume no administrative or operating costs for the fund, and ignore mortality risk. This allows us to focus on the central issue of investment risk and capital adequacy. Initially, we ignore the question of who is providing the benefit guarantee—the corporate sponsor or the PBGC—and focus on how the cost of providing the guarantee varies with the plan's funding status and investment policy.

To help in conceptualizing the important relationships, consider the pension fund's economic balance sheet in table 7C–1. It differs from the conventional accounting balance sheet in that it explicitly includes the guarantee of pension benefits as an asset of the pension fund. In thinking about this balance sheet, it is important to recognize that the two sides must balance not only in terms of total value, but also in terms of risk characteristics. This means that although the risk characteristics of individual assets or claims against assets do not necessarily match each other, the risk characteristics of total assets match those of the totality of claims against those assets.

The balance sheet identity implies that

$$G + I = B + S. \tag{7.1}$$

Furthermore, because the benefits owed to employees are guaranteed to be paid regardless of the performance of the pension investment portfolio, G will be larger, the greater the mismatch between the risk characteristics of the pension liability and the investment portfolio.

Table 7C–2. Corporate Guarantee of Pension Benefits as a Put Option

Feature	*Put Option on a Stock*	*Pension Benefit Guarantee*
Underlying asset	Stock	Pension fund investment portfolio
Asset's current value	Stock price	Market value of pension portfolio
Maturity	Time until expiration of the put	Time until payment of pension benefits
Insurance coverage	Exercise price of the put	Face value of pension benefits

A numerical example will serve to illustrate this key point. Assume that the benefits owed to employees are a lump sum of $100 to be paid 10 years from now and that the benefits are guaranteed to be paid under all circumstances. Assume further that the risk-free interest rate is 8 percent per year, and therefore the present value of the benefit obligation is $46.32 ($100/1.08^{10}). This is the current fair market price of a risk-free claim to $100 to be received 10 years from now. In order to consider separately the effects of corporate pension funding and investment policy on the value of PBGC insurance, assume that the plan is exactly fully funded. Therefore, the sponsor contributes $46.32 to fund the accrued benefit.

Now consider how the composition of the investment portfolio affects the value of the benefit guarantee, G. At one extreme, if the sponsor invests in an immunized portfolio that exactly replicates the cash flows owed to the beneficiary (in this case, it would be a 10-year zero coupon bond with no default risk), the value of G is zero. In the balance sheet in table 7C–1, both the value of the guarantee of benefits on the left side, G, and the net worth on the right side, S, would be zero.

If, however, the insurance company invests in assets that do not exactly hedge the liability, the guarantee of pension benefits in effect becomes a put option on the investments of the pension fund with an exercise price equal to the face value of the benefits.[2] Table 7C–2 makes explicit the correspondence between a put option and the corporate guarantee of pension benefits.

Suppose, for example, that the company invests in a common stock index fund that mimics the performance of the S&P 500. The amount of overfunding required to guarantee the beneficiary against shortfall risk is equal to the value of a 10-year European put option with an exercise price of $100 on an index fund that is currently worth $46.32. To understand why the value of the guarantee is equal to the value of the corresponding put, it is useful to realize that one way to provide the insurance against shortfall risk is for the pension fund to actually buy an S&P 500 put.

Table 7C–3. Value of Benefit Guarantee as a Fraction of the Value of the Portfolio for a Fully Funded Pension Plan

	Proportion of Portfolio Invested in Stocks			
Maturity in Years	*0* $\sigma = 0$	*40%* $\sigma = .08$	*60%* $\sigma = .12$	*100%* $\sigma = .20$
1	0	.03	.05	.08
5	0	.07	.11	.18
10	0	.10	.15	.25
20	0	.14	.21	.35
30	0	.17	.25	.42
50	0	.21	.31	.52

Note: The table was derived using the Black–Scholes option pricing formula. The option is exactly at-the-money, in the sense that the present value of the exercise price equals the current market value of the underlying portfolio.

If the value of the stock index fund follows a diffusion process, then the Black–Scholes option pricing formula tells us that the value of the guarantee can be approximated by

$$G \approx 0.4\, I\, \sigma \sqrt{T}. \tag{7.2}$$

Suppose that $\sigma = 0.2$ and $T = 10$ years. Then G is approximately 0.25 times the dollar value of the stock portfolio. Thus, even if the pension plan is fully funded—that is, the market value of its assets equals the present value of its liabilities—the present-value cost of the benefit guarantee can be substantial if the investment policy of the fund is anything other than immunization.

Some maintain that because the liabilities of defined-benefit pension funds (and life insurance companies) are long term, common stocks are not a risky investment vehicle for them. But equation (7.2) implies the opposite.[3] Table 7C–3 presents the value of the guarantee as a fraction of the value of the portfolio for various maturities and asset mixes on the assumption that the standard deviation of the return on the S&P 500 is equal to its historic value of 20 percent per year.

Table 7C–3 shows that the value of the guarantee as a fraction of the present value of the pension benefits rises with the length of the time horizon and with the proportion invested in stocks. For example, consider a typical pension fund with 60 percent of the portfolio invested in stocks. If the benefits are due in five years, the value of the guarantee equals 11 percent of the value of the investment portfolio. If the benefits are due in 10 years, it is 15 percent.

2. The Exposure of the PBGC

For healthy plan sponsors, the cost of the benefit guarantee is borne entirely by the sponsoring corporation. If the pension fund net worth belongs to the sponsor, then this cost to the shareholders is completely offset—G is a corporate liability, and S is a corporate asset. But when the sponsor is in financial distress, the PBGC bears some or all of the cost of providing the benefit guarantee.

Option pricing theory offers an important insight into this situation. The pension fund net worth is equivalent to a call option on the pension investment portfolio with an exercise price of \$100. When σ is increased, both G and S rise by the same amount. If the government is bearing the cost of the guarantee (that is, G is the government's liability), but the plan sponsor owns the pension fund net worth (that is, S is a corporate asset), then the sponsor's incentive is to increase the variance of the pension investment portfolio.

What does this analysis suggest about government pension insurance? The similarity of the PBGC's position to that of the FSLIC is clear. Until now, the government has tried to prevent the development of an S&L-type crisis by enforcing stricter funding standards, by introducing a premium structure that penalizes underfunding, and by strengthening the PBGC's claim on the sponsor's assets in the event of a bankruptcy. It has not addressed the issue of pension investment policy at all.

But consider what happened in the S&L industry. The crisis started because these institutions had a mismatch between the maturities of their assets and liabilities in the 1970s. The huge deficits were created primarily in the 1980s, however, when these institutions were allowed to invest in a much broader range of assets, most of which had an even poorer match with their liabilities. The poorly capitalized institutions immediately became a much greater burden on the FSLIC.

Similarly, it is the underfunded pension plans of weak corporations that will cause huge losses for the PBGC. The LTV case has already made that clear. The PBGC and the other government regulatory agencies cannot predict now which firms will fail in the future. They can, however, minimize abuse of government insurance by preventing pension funds from becoming defunded, and they can prevent them from investing the pension portfolio in ways that do not match the guaranteed benefits.

Notes

1. For a clear exposition of this view of the S&L crisis, see Mayer (1990).
2. Merton (1977) shows the implications of this equivalence for government deposit insurance.
3. See Bodie (1990).

References

Bodie, Zvi. 1990. "Managing Pension and Retirement Assets: An International Perspective." *Journal of Financial Services Research* 4 (December): 419–460.

Mayer, Martin. 1990. *The Greatest-Ever Bank Robbery: The Collapse of the Savings and Loan Industry*. New York: Charles Scribner's Sons.

Merton, Robert C. 1977. "An Analytic Derivation of the Cost of Deposit Insurance and Loan Guarantees: An Application of Modern Option Pricing Theory." *Journal of Banking and Finance* 1 (June): 3–11.

8 Recent Federal Efforts to Measure and Control Government Risk-Bearing

Marvin Phaup

Although the long-term trend may be toward increased federal assumption of unmeasured and uncontrolled risks, both Congress and the administration have recently taken some steps to measure, disclose, and control government risk-bearing. These efforts can be grouped under four headings: the President's budgets for 1991 and 1992, credit reform, control of government-sponsored enterprises (GSEs), and reform of the budgetary treatment of deposit insurance.

1. The President's Budget

Richard Darman, director of the Office of Management and Budget (OMB), has shown a keen interest in federal risk-bearing, which is evident in both the 1991 and 1992 budget documents.

Under Darman's direction, the OMB combined the many separate budget documents into a single volume with the 1991 budget. In the process, much of the old "Special Analysis F" on federal credit programs was converted into "Recognizing Federal Underwriting Risks," a section in the new book. The text and tables cover the nature and amount of the aggregate dollar of risk exposure from federal direct loans and guarantees, government-sponsored enterprises (such as Fannie Mae and Freddie Mac), deposit insurance, the Pension Benefit Guaranty Corporation, aviation war risk insurance, and flood and crop insurance. A series of proposals to reduce this exposure is included in the budget proposals. The 1992 budget continues this effort with a similar treatment under the slightly changed title, "Recognizing and Reducing Federal Underwriting Risks." A table from the 1992 budget showing OMB estimates of the potential costs from this exposure is reproduced here as table 8–1.

2. Credit Reform

Under the Credit Reform Act of 1990, budgetary accounting for new federal direct loans and guarantees will change from a cash basis to a front-loaded accrual basis, effective in fiscal 1992. New federal direct loans and guarantees will be recognized in the budget (budget authority and outlays) in terms of their estimated long-term subsidy cost. That is, when the federal government makes a direct loan of $100, for which the present value of expected losses is estimated to be $20, the budget will show an increase both in current-period outlays and in the deficit of $20 (not $100, as has been past practice).

Other federal–private cash flows (except administrative costs) associated with this loan will be recorded below the deficit line, where they will have no effect on budget outlays or the deficit. Federal guarantees of private loans will be similarly treated: The estimated subsidy will be recognized in outlays and in the deficit when the guaranteed loan is disbursed, and other cash flows will be accounted for in the budget so that they do not affect either federal outlays or the deficit. The estimated subsidy rates for direct loans and guarantees from the 1992 budget are found in tables 8–2 and 8–3. Federal loans and guarantees outstanding on October 1, 1991, will continue to be treated in the budget on a cash basis, above the deficit line.[1]

3. Government-Sponsored Enterprises (GSEs)

The Treasury Department, the General Accounting Office, and the Congressional Budget Office (CBO) have recently issued reports on controlling federal risk from the implicit federal guarantee of GSE debt and mortgage pass-through securities.[2] Generally, these reports find that GSEs currently pose little risk of loss (the Farm Credit System being an exception), but recommend that GSEs be subjected to a regulatory authority that would restrict the risks they can assume and that mandate higher capital requirements, if warranted, at the discretion of the regulator. The reports also contain some proposals for fully privatizing these enterprises, withdrawing the implicit federal guarantee, or breaking up GSEs so that they would become "small enough to fail" and therefore not subject to a federal guarantee. The Omnibus Budget Reconciliation Act of 1990 (OBRA) required the committees of jurisdiction in both houses of Congress to report legislation by September 15, 1991, to ensure the financial soundness of the enterprises and to minimize the possibility that a GSE might require future government assistance.

4. Deposit Insurance Reform

OBRA also required the OMB and CBO to study and report to Congress on how federal deposit insurance should be accounted for in the budget (either cash, guarantees under credit reform, or a different basis).[3] A major objective is to define and then measure the costs of deposit insurance with sufficient timeliness that these costs can be controlled. The CBO report focuses on process and accounting options for more timely recognition and control. The OMB report emphasizes methods and procedures for estimating costs.[4]

Thus, although much government risk-bearing remains unmeasured or mismeasured and completely or partly unrecognized, there is a growing awareness of these risks and increasing interest in their measurement and control. The massive losses from the savings and loan disaster appear to have contributed to this new sensitivity.

Table 8–1. Potential Federal Costs (in billions of dollars)

Program	*Face Value 1990*	*Range of Potential Costs*
		Cumulative Outlays, 1991–1996
Deposit insurance:		
Commercial banks and savings banks	1,911	42–78
Thrifts	726	70–83
Credit unions	178	—
Total deposit insurance	2,815	112–161
		Present Value of Future Costs
Other insurance:		
Pension guarantee	943	6–20
Other insurance	738	3–6
Total other insurance	1,681	9–26
Government-sponsored enterprises:[a]		
Sallie Mae	—	—
Freddie Mac	317	—
Fannie Mae	372	—
FHL banks	117	—
FCS	50	1–2
Total GSEs	855	1–2
Guaranteed loans:		
FHA MMI	279	(6)–0
FHA GI/SRI	77	14–16
VA mortgage	161	3–6
Guaranteed student	53	30–37
Small business	12	1–3
Farmers' home	6	1–3
Export–import	5	4–6
Other guaranteed loans	37	5–15
Total guaranteed loans	630	52–86

(continued)

Table 8–1. Potential Federal Costs (continued)

Program	*Face Value 1990*	*Range of Potential Costs*
		Present Value of Future Costs
Direct loans:[b]		
Farmers home	53	19–33
REA and RTB	37	11–15
Export–import	9	3–6
Other direct	63	17–23
Total direct loans	162	50–77
Total of other insurance, GSEs, and loans	3,328	112–191

a. Net of borrowing from federal sources and federally guaranteed loans.
b. Excludes loans and guarantees by deposit insurance agencies, for which costs are captured in the top section of this table. Also excludes programs not included under credit reform, such as CCC farm price supports. Defaulted guarantees that become direct loans are accounted for in guarantee volume and costs.
Source: Office of Management and Budget, *The Budget for Fiscal Year 1992,* table A–2.

Table 8–2. Estimated Subsidy Rates, Budget Authority, and Outlays for Direct Loans

Agency and Program	*1992 Subsidy as a Percent of Disbursements*[a]	*In Millions of Dollars*					
		Subsidy Budget Authority			*Subsidy Outlays*		
		1992	*1993*	*1994*	*1992*	*1993*	*1994*
Funds appropriated to the President:							
Foreign military financing	12.7	40	40	40	3	15	33
Overseas Private Investment Corporation	9.6	2	3	3	—[b]	1	2
Agriculture:							
Agricultural credit insurance fund	21.6	157	127	111	147	126	112
Rural development insurance fund	14.7	69	61	56	4	21	41
Rural development loan fund	50.0	18	17	16	2	6	10
Rural housing insurance fund	27.2	330	302	280	176	262	271
Public Law 480 export credits	75.9	317	255	257	241	265	253
Rural Electrification Administration:							
Rural electric and telephone	10.8	129	129	129	21	57	78
Rural electric and telephone modifications	–22.4	–111	–186	—	–111	–186	—
Rural telephone bank	–4.1	—[b]	–1	–2	—[b]	–1	–2
Interior:							
Bureau of Indian Affairs	19.3	2	2	2	2	2	2
State Department:							
Repatriation loans	9.5	—[b]	—[b]	—[b]	—[b]	—[b]	—[b]

Veterans Affairs:							
Loan guaranty revolving fund	11.5	123	99	70	123	99	70
Guaranty and indemnity fund	9.4	7	16	25	7	16	25
Vocational rehabilitation	6.2	—[b]	—[b]	—[b]	—[b]	—[b]	—[b]
Small Business Administration:							
Business loans	29.6	1	1	1	1	1	1
Disaster loans	22.5	66	65	65	40	64	64
Export–Import Bank	3.4	27	27	28	2	45	81
Federal Emergency Management Agency	7.2	—[b]	—[b]	—[b]	—[b]	—[b]	—[b]
Total direct loan subsidies[a]	17.9	1,178	958	1,082	657	795	1,043

a. Weighted average.
b. $500,000 or less.
Source: Office of Management and Budget, *The Budget for Fiscal Year 1992*, table A–7.

Table 8–3. Estimated Subsidy Rates, Budget Authority, and Outlays for Loan Guarantees

Agency and Program	*1992 Subsidy as a Percent of Disbursements*[a]	*In Millions of Dollars*					
		Subsidy Budget Authority			*Subsidy Outlays*		
		1992	*1993*	*1994*	*1992*	*1993*	*1994*
Funds appropriated to the President:							
AID private-sector loans	—	—	—	—	—	—	—
AID housing and other credit	2.5	3	3	3	—	1	2
Overseas Private Investment Corporation	—	—	—	—	—	—	—
Agriculture:							
Agricultural credit insurance fund	3.6	98	106	114	78	103	112
Commodity Credit Corporation:							
Export credits	2.7	156	153	151	156	153	151
Rural development insurance fund	4.5	7	7	7	2	4	6
Rural housing insurance fund	13.9	97	99	101	68	96	100
Rural Electrification Administration:							
Rural electric and telephone	–0.1	–1	–4	–8	–1	–4	–8
Rural telephone bank	–1.7	—[b]	–1	–3	—[b]	–1	–3
Education:							
Guaranteed student loans, Stafford	22.6	2,317	2,336	2,437	1,386	2,050	2,116
Guaranteed students loans, PLUS	7.6	82	91	101	76	85	94
Guaranteed student loans, SLS	13.2	257	286	304	159	239	257

Health and Human Services:							
Health professions graduate student	11.8	22	12	6	22	12	6
Housing and Urban Development:							
FHA mutual mortgage	–2.6	–815	–1,254	–1,306	–815	–1,254	–1,306
FHA general and special risk	0.6	55	57	60	36	53	55
GNMA secondary mortgage guarantees	—	—	—	—	—	—	—
Interior:							
Indian loan guaranty and insurance fund	15.1	7	7	8	7	7	8
Veterans Affairs:							
Loan guaranty revolving fund	7.3	—[b]	—[b]	—[b]	—[b]	—[b]	—[b]
Guaranty and indemnity fund	1.2	168	152	150	168	152	150
Small Business Administration:							
Business loans	1.1	54	56	56	49	50	51
Export–Import Bank	4.4	371	430	446	126	183	204
Total loan guarantee subsidies[a]	2.5	2,876	2,534	2,627	1,516	1,928	1,995

a. Weighted average.
b. $500,000 or less.
Source: Office of Management and Budget, *The Budget for Fiscal Year 1992*, table A–7.

Notes

1. See U.S. Congressional Budget Office, *Credit Reform: Comparable Budget Costs for Cash and Credit* (December 1989) and "An Explanation of the Budgetary Changes Under Credit Reform," CBO Staff Memorandum (April 1991).

2. See U.S. Congressional Budget Office, *Controlling the Risks of Government-Sponsored Enterprises* (April 1991), *Report of the Secretary of the Treasury on Government-Sponsored Enterprises* (May 1990 and April 1991), and U.S. General Accounting Office, *Government-Sponsored Enterprises: A Framework for Limiting the Government's Exposure to Risk* (May 1991).

3. See U.S. Congressional Budget Office, *Budgetary Treatment of Deposit Insurance: A Framework for Reform* (May 1991) and Office of Management and Budget, *Budgeting for Federal Deposit Insurance* (June 1991).

4. Both reports benefited from a study done by Edward Kane for the CBO, "Economic Estimates of the 1986–89 Time Profile of Taxpayer Losses in the S&L Insurance Mess" (February 1991).

9 Information and Incentives to Improve Government Risk-Bearing

Justine Rodriguez

The papers presented at this conference have compared deposit insurance with a variety of different insurance programs. I would like to shift perspective to an encompassing view of government risk-bearing, highlighting some of the key insights that I have gleaned in recent years and addressing some issues that deserve more attention and research.

1. The Pervasiveness of Government Risk-Bearing

First, government risk-bearing—and its influence on private risk-taking—is massive and pervasive. Indeed, risk-bearing seems to have become one of the government's major roles. Previous authors have mentioned several ways in which this occurs:

the loss-cushioning effect of the tax system and its specific provisions affecting private risk-taking, the large and growing proportion of the budget consumed by social insurance, and the many ad hoc relief and bailout programs.

Just that part of risk-bearing most closely related to the focus of this conference—what we at the Office of Management and Budget (OMB) call federal underwriting risk, namely, credit and other insurance programs—had a face value of $6.1 trillion in 1990. This amount has increased nearly sevenfold in the past two decades, rising faster than either nominal GDP or federal outlays. Most student loans are federally guaranteed. Some federal assistance (including that from deposit insurance) is provided for 82 percent of home mortgages and for 73 percent of agricultural credit. Although government support for business credit is much smaller, more than $2 of every $5 of nonfederal borrowing is federally assisted.

2. The Growth of Federal Credit and Insurance Programs

Second, federal credit and insurance continue to grow rapidly, for reasons you can readily understand. From a Washington perspective, I would add the following:

- Regional disparities in the availability of credit, caused in part by regulatory barriers such as the restrictions on inter- and intrastate branching and banking, have stimulated the creation of several credit programs and government-sponsored enterprises. These tap both national and international capital markets and channel additional funding into housing and agriculture.
- A large proportion of changes in the financial sector (both public and private) require government decisions, often including new legislation. In these cases, adaptation to new circumstances is slowed—especially if consolidation or reduction in the federal role is involved.
- Policymakers like risk-bearing programs, because many constituents can be provided with credit or insurance for each dollar of default or closure cost. A program with a 20-percent subsidy is likely to be perceived by constituents as providing more help to each recipient than dividing the same dollar amount so that each recipient gets one-fifth of it as a grant.
- Finally, these programs—as seen through the budget process—seem to be "free goods." Until recently, loan guarantees were first visible in the budget as offsetting collections from fees. Disbursement of direct loans resulted in outlays, usually from revolving funds, but these were perceived as being repaid. Credit budget limits could be raised without decreasing anything else. Insurance programs were supposed to be covered by premiums, and their costs were not traded off against other programs. There were often no advance controls on commitments. Costs were not known or limited at the time of commitment; the bill came later.

Such a system provides incentives to postpone and deny costs. By the time these costs show up in the budget process, they are rightly perceived as uncontrollable.

3. The Balance Shifts to Risk-Taking

Third, the growing amounts of federal subsidies have resulted in a tilt toward risk that has become increasingly evident over time. To the extent that the government assumes the losses and leaves the gains to others, and to the extent that it misprices this risk-bearing service, it tilts the balance in favor of risk-taking.

- There has been a long-term, broad decrease in the amount of equity in depository institutions. In home finance, loan-to-value ratios have declined. In other credit transactions, borrowers now have a smaller stake in the project than was formerly required. We know that having less equity not only thins the cushion of protection for the lender, guarantor, or insurer, but it also affects the behavior of the borrower or the insured. The amount of equity is perhaps the strongest predictor of defaults. Experience in the thrift industry provides evidence of moral hazard. The borrower or the insured usually knows that he is headed for insolvency well before that is evident to the lender, the guarantor, or the insurer, and often uses this lead time to take even greater risks in a gamble for resurrection that balloons taxpayer costs.
- In many federal programs, the interest rates, fees, and premiums are underpriced in order to encourage certain activities or to subsidize certain beneficiaries. This may encourage risk per se, but even more significant is that the rates that are charged are seldom systematically and appropriately related to risk. Those who engage in the riskiest activities seldom pay more—or do not pay enough more to match their higher cost. Thus, many federal programs have large cross-subsidies that encourage risk-taking.
- The tools for risk management that have been discussed at this conference are often not applied in federal credit and insurance programs. Partial loan guarantees, deductibles, and coinsurance are not systematically used. Some programs are targeted specifically to assist poor risks; for example, a number of federal loan programs require borrowers to have been turned down by several private lenders before they are eligible. "Evergreen" loans, which are restructured time after time, and forbearance are sometimes politically encouraged.

4. Federal Costs Escalate

Fourth, these long-time practices are resulting in burgeoning federal costs. As Al Ringleb and Steven Wiggins noted, there is a similarity between latency in

occupational disease and the long lag and cumulative effect of subsidies and poor risk-management practices on federal costs. The cash outlays to cover credit defaults and other insurance losses amounted to $108 billion in 1990, up from $8 billion in 1982. Future losses are estimated to total from $112 billion to $161 billion for deposit insurance in 1991–96; losses with a present value of $112 billion to $191 billion are expected for credit programs, other insurance, and government-sponsored enterprises.

What should be done to improve risk management? Two plausible answers are better information and better incentives.

5. Information

In the 1991 budget, Richard Darman highlighted the disclosure of "hidden liabilities." The chapter on federal underwriting risk provided a comprehensive review of credit and insurance programs—the face value outstanding, an analysis of the programs, and proposals for reducing their risk and cost. For example, it included estimates of expected losses from the FHA single-family mortgage insurance program, which led to reform proposals that were enacted in the Omnibus Budget Reconciliation Act of 1990. These reforms required higher down payments, related premiums to default risks, and made a commitment to rebuild the program's reserves as a cushion against higher-than-expected losses.

The 1992 budget included an initial comprehensive estimate of the cost of these programs. In some cases, we took the best academic or agency estimate available. In others, we developed our own models, building on the work of others where possible, and fit them to all available data. In the case of mortgage and student loan guarantees, that was 20 years of experience.

OMB staff is working to improve all of these estimates, and we welcome your help in doing so. We are refining the housing and education models, which are based on options pricing, and fitting them to additional program data. We wish to expand the electronic data base on business and agricultural credit programs, in order to make options pricing estimates for these programs. And we intend to substantially upgrade the cost estimates of the Pension Benefit Guaranty Corporation, again using options pricing.

The report on "Budgeting for Deposit Insurance," which we are about to send to Congress, suggests a measure of costs as they arise, rather than when they are paid. It includes estimates using two approaches. One follows Edward Kane's method; the other is an innovative design developed by OMB staff that uses options pricing techniques, starting from data in the Call Reports. This new approach can be applied to all firms, not just those that are publicly traded. It estimates the cost

of insolvent firms without requiring an assumption about the degree of forbearance that regulators will exercise in closing an insolvent depository.

For effective policymaking, we need real-time cost concepts and high-quality cost estimates. We also need better cost projections, which provide early warning of trouble. The incidence of these costs is important, too; it would be useful to know more about where they are concentrated and why. We should also know more about the nature and size of the benefits from these programs. This is a long research agenda.

6. Incentives

The Federal Credit Reform Act of 1990 is a major step toward improving incentives for decision-making. No longer will loan guarantees first show up as offsetting collections from fees; no longer can direct loans be perceived as costless. The new law requires that when credit is extended, an estimate be made of the present value of the difference between expected cash outflows and cash inflows from the direct loan or loan guarantee. These costs of credit programs must be appropriated, so their costs will be traded off against those of other programs. The costs are recorded as a budget outlay when the direct or guaranteed loan is disbursed. The law requires that costs be controlled in budget execution. The new system rewards good risk-management policies and good management practices; they will now pay off in terms of prompt reductions in budget costs. Additional benefits should include better data and accountability.

Building on the work in our deposit insurance study and extending it to other insurance programs may make it feasible to extend concepts similar to credit reform to federal insurance programs.[1] Moreover, federal programmatic changes are beginning to provide incentives to the private sector to manage risk more carefully. The Treasury proposals for deposit insurance reform would reward higher capital. Some federal credit and insurance programs are beginning to lower their loan-to-value ratios, to charge risk-related premia, and in other ways to reduce their encouragement for risk-taking. These preventive measures are crucial.

High-quality analysis of the economics of financial services and attention to incentives for risk-taking are vital in these times. Technology, financial instruments, markets, and the regulatory environment are all changing rapidly. Actual and potential problems are visible in many segments of the financial services sector. It would be particularly valuable to look across specific financial sectors, public and private, rather than merely at each one separately. Where are the subsidies deepest and least appropriate? What policies would help the financial sector to adapt to change at the least cost and greatest advantage to the taxpayer? In this changing environment, what policies would help to reduce excessive risk and,

thereby, to allocate resources more effectively? Answers to these questions will determine the success of reining in government risk-bearing.

Note

1. Extension of credit reform concepts to insurance programs is recommended in Office of Management and Budget, *Budget of the United States Government, Fiscal Year 1993*.