

Dwight M. Jaffee

AGENDA

First, the conference planners must be complemented for their foresight to put catastrophe insurance on the agenda for this conference, long before Hurricane Katrina crashed into New Orleans. As Katrina illustrates, the problems affecting catastrophe insurance in the United States are taking on, well, catastrophic proportions. Major changes are required in how the government intervenes in each of the major catastrophic risks—earthquakes, floods, hurricanes, and terrorism.

Turning to the task at hand, it is always a pleasure and enlightening to read a paper by David Cummins (2006). This one is no exception. My comments follow the lines of David's paper, taking up these topics in turn:

- Why do private markets for catastrophic risks fail?
- Should the government pick up the slack?
- And, if so, how is this best done?

WHY DO PRIVATE MARKETS FOR CATASTROPHE INSURANCE FAIL?

Capital Market Imperfections Are a Key Factor

The paper begins with a cogent discussion of the key role that capital plays for insuring against catastrophic risks. Applying his earlier work in Cummins and Weiss (2000), Cummins computes the capital an insurer should hold, based on its

insurance liabilities and the stochastic processes generating losses. It is assumed the insurer collects premiums at the beginning of the period equal to the expected loss. Capital is therefore required to cover the actual losses in excess of the expected value. The computations are basically applications of the law of large numbers and the central limit theorem. Cummins assumes a normal distribution, although he properly states that comparable results are available for a wider range of distributions. Cummins shows that, when the risks are identically and independently distributed (i.i.d.), the required capital per policy approaches zero as the number of individual policies approaches infinity. In contrast, when the risks are correlated, some amount of capital is required even in the limit as the number of risks approaches infinity. Cummins reasonably interprets this as meaning that catastrophic risks, which sensibly imply correlated risks, require more capital than do independent risks.

I think it important to add that fat-tailed distributions raise an even more distinctive issue, which may help explain why most catastrophe insurance lines are generally not offered by private insurers. A key property of fat-tailed distributions is that the benefits of diversification may not arise. For example, let an insurer start with a portfolio consisting of just one catastrophic risk, say risk A. Now suppose the insurer decides to diversify by creating a portfolio with one-half risk A and one-half risk B. Remarkably, the risk exposure of the portfolio may actually rise, contrary to the normal case of diversification benefits. The intu-

Dwight M. Jaffee is a professor of finance and real estate at the Haas School of Business at the University of California, Berkeley.

Federal Reserve Bank of St. Louis *Review*, July/August 2006, 88(4), pp. 381-85.

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ition is that, with fat tails, each catastrophe is potentially so large that holding equal shares of two risks may entail more total risk than holding one risk only.¹ And the same result can extend over a large number of such risks; see Ibragimov and Walden (2005) and Ibragimov, Jaffee, and Walden (2006). Thus, it might not be surprising that insurers often prefer a corner solution in which they take on no catastrophe risks at all.

In summary, I believe more work on the role of fat-tailed distributions might be rewarding in explaining why private markets for catastrophe insurance fail so regularly. Still, I surely agree with the main point of David Cummins's analysis that catastrophe insurance market failures arise out of capital market frictions of one sort or another.

Capital Market Imperfections Are Necessary But Not Sufficient for Catastrophe Market Failure

Although capital market imperfections are likely a necessary condition for the failure of private catastrophe insurance markets, they seem not to be sufficient. For example, only 15 years ago, the United States had active private markets for hurricane, earthquake, and terrorism risks. Even today, the United Kingdom has an active private market for flood insurance (which is sold in clear recognition of the possibility that the Thames could flood London). We also see certain insurers willing to put their money at risk to insure against catastrophes. In 1996, for example, Warren Buffett's insurance firms pledged several billions of dollars in capital to reinsure the California Earthquake Authority. And Lloyds of London stands ready to provide terrorism insurance (at the right price). So, other factors must play a role in determining who will and who will not offer catastrophe coverage.

Agency Problems for Catastrophe Insurers

Basic finance theory suggests that capital markets face no special problem with taking on

catastrophic risks. First, catastrophes mainly reflect idiosyncratic risks, which implies that capital markets should not even require much in the way of a risk premium. Second, the special problems created by fat-tailed distributions could be solved by allocating the risk among a large number of equity investors in each insurance firm, with each such investor holding a well-diversified portfolio. Thus, the financial structure of insurance firms should diversify risks even if diversification is not achieved within each insurer's portfolio.

But insurance firm managers strongly disagree. The following quote from Edward Liddy, president of Allstate, in the *Wall Street Journal*, September 6, 2005, illustrates their position:

The insurance industry is designed for those things that happen with great frequency and don't cost that much money when they do. It's the infrequent thing that costs a large amount of money to the country when it occurs—I think that's the role of the federal government. (Francis, p. c.1)

This has the ring of a classic agency problem. An insurance firm manager is certainly at special risk—to lose his job and ruin his reputation—were he to be the one who bankrupted his firm by taking on a catastrophic risk that went bad. It is also intriguing that those insurers that do appear willing to take on catastrophic risks, for example, Warren Buffett and Lloyds of London, also appear to have special structures that eliminate the traditional manager-shareholder agency problem.

Zealous Regulators and Daffy Consumers

Insurance regulators compound the problem by restricting the degree to which primary insurers can use reinsurance and similar risk-sharing instruments. One issue is that regulators often do not allow primary insurers to include the full costs of reinsurance in their premiums. Another issue is that offshore reinsurance is often discounted as a means through which a primary insurer can meet its capital requirements. To be fair, regulators may have a basis for questioning the premiums charged by reinsurers and for discounting the credit worthiness of certain offshore insurers. Nevertheless, reducing or eliminating

¹ This may seem to conflict with Paul Samuelson's famous (1967) paper, in which he showed that diversification generally pays. Samuelson, however, carefully ruled out fat-tailed distributions that do not have finite moments.

such frictions certainly would help persuade private insurers to offer coverage against catastrophic risks.

Consumers, furthermore, are also not always rational in evaluating the contracts offered by insurers, which is another likely reason that catastrophe insurance markets fail to operate. The fundamental issue is that policyholders often consider the likelihood of a future catastrophe to be much lower than do the insurers. The result is that consumers often feel the premiums charged by the insurers are far too high. This is not a comfortable position for an insurer that has an otherwise profitable business writing auto and homeowner insurance for these same customers. An easy solution is just not to offer the catastrophe coverage.

Other Issues Seem Less Fundamental

Still other explanations are often offered for why insurers are reluctant to cover catastrophic risks, but these appear to me to be less fundamental than the capital market imperfections, fat-tailed risk distributions, agency problems, regulator problems, and daffy consumers already discussed. Here, I offer brief comments on two of these other issues.

Quantifying the Risk Parameters. It is often pointed out that, because of the infrequency of catastrophic events, it is difficult to obtain reliable estimates of their statistical frequency. It should be recognized, however, that estimation problems arise for all risks, whatever their frequency. For example, “parameter uncertainty” for the capital asset pricing model was studied long ago, with the conclusion that it created no fundamental problem. More recently, Froot and Posner (2002) have carried out a parallel analysis focusing on catastrophic risk estimates, reaching an equally sanguine conclusion. Furthermore, as a specific counterexample, telecommunications satellites were “insurable” from their very first launch, confirming that a long-established historical record is not an essential basis for firms to offer insurance coverage.

Time Diversification Versus Cross-Section Diversification. It is also sometimes suggested that catastrophic risks are more difficult to diver-

sify because the risk-sharing occurs across time more than across individual risks. To be sure, large catastrophic risks may have to be diversified across time, but capital market imperfections aside (discussed above), time-series diversification does not appear intrinsically more difficult. Indeed, asymmetric information, in which the insured party knows more than the insuring firm, is less likely to inhibit risk-sharing for catastrophic risks (where Mother Nature is the source) than for consumer lines such as auto insurance (where the propensity of individual drivers is important).

WHEN PRIVATE MARKETS FAIL, IS GOVERNMENT INSURANCE THE ANSWER?

Insurance, by sharing individual risks across a large number of agents, creates immense social benefits. Risk-sharing, by its very nature, is also arguably the most social of economic activities (self-insurance being interpreted as no insurance at all). It is thus not surprising that when private catastrophe markets fail, citizens dependably call on their government to fix the failure. And it is no more surprising that governments typically respond. So the question regarding government intervention is not so much “if” as it is “how” and “how long.” Before turning to some possible answers to these questions, it is useful to have a quick look at how government insurance is actually working in the United States across the four major catastrophe lines.

National Flood Insurance Program

Flood insurance is the longest standing of the government interventions in catastrophe insurance markets in the United States, dating from the 1960s. It is a federal program, initiated, expanded, and revised by Congress. Congress has required that the premiums be set on an actuarial basis, but at the same time it has required deep subsidies for homes that existed at the time each community entered the program. The effect is that expected losses on grandfathered properties are five times those on newly built homes, with an average annual grandfather subsidy of \$610

(compared with a total premium of \$310 on newly constructed homes) (see Government Accounting Office, 1999). It has reached the point that the National Flood Insurance Program (NFIP) is now considering a proposal to buy the grandfathered homes to save the high cost of future claims! At this writing, it is expected the NFIP losses from Katrina are likely to be about \$20 billion, virtually all of which will have to be provided as a one-time transfer from the U.S. Treasury.

In contrast, the United Kingdom appears to have a well functioning private market for flood risks. The plan operates as a private/public partnership, in which the government “guarantees” levees and requires good upstream practices, but the insurance rates and risks are all handled entirely within the private markets (for further details, see the Association of British Insurers; www.abi.org.uk/flooding).

Terrorism Risk Insurance Act

Following the terrorist attack of 9/11, Congress passed the Terrorism Risk Insurance Act, which provides reinsurance at the upper risk levels for qualifying terrorism insurance offered by the primary insurers. Premium setting is left fully in the hands of the insurance firms, but the government reinsurance is offered without charge. Assuming the subsidy is passed through to the policy holders, it creates an incentive against mitigation and induces new properties to continue to be built in risky locations. The Terrorism Risk Insurance Act was just renewed at year-end 2005, following, not surprisingly, the major endorsement of key parts of the real estate and insurance industries.

California Earthquake Authority

Although the government interventions in flood and terrorism risks are federal, the California Earthquake Authority (CEA) is a state program. This program was created by the California legislature in the aftermath of the Northridge earthquake of 1994. Although state funds are not committed to the CEA, it operates under rules set by the legislature and it is a good guess that state funds would be made available to support the

program if that became necessary. The enabling legislation requires that the premiums be “actuarially based,” but scientists disagree substantially over what the correct numbers are. This allows for substantial differences of opinion between the insurers and their customers. Indeed, less than 14 percent of applicable homeowners are currently purchasing CEA coverage. There is also consternation over the standard 15 percent deductible, although few consumers opted for a new 10 percent deductible (presumably because the premium is still higher).

In this context, David Cummins has raised the possibility that earthquake insurance be made mandatory on all homeowners, as a means to increase the participation rate. I have to disagree, certainly as long as the proper premiums are a matter of dispute. In addition, a government requirement would imply government backing for a potentially bankrupt plan, create the need for an “assigned risk pool” for those homeowners excluded from the regular program, and create pressure for further rate subsidies. It is also enlightening that mortgage lenders in California do not require earthquake coverage as the basis for a home loan, no doubt because earthquakes rarely create serious damage to wood-framed, detached homes.

Florida Hurricane Funds

The state of Florida created a complex of insurance structures following Hurricane Andrew in 1992, including an assigned risk pool for homeowners who could not otherwise obtain coverage and a state-backed reinsurance fund. These plans have taken substantial losses as a result of the bad hurricane seasons in recent years. In fact, the plans are surviving only because they provide for quite high deductible limits and for ex post additions to premiums going forward. Florida does not, however, face a low take-up rate, because mortgage lenders uniformly require wind-damage coverage as a requirement for obtaining a mortgage on a Florida property.

How the Government Should Intervene

In view of the rather dire experience with the existing government interventions in catastrophe

insurance markets in the United States, I will suggest a simple proposition: *When intervening in catastrophe risk insurance markets, government plans should mimic as closely as possible what operating private markets would have been expected to do.* (See also Jaffee and Russell, forthcoming). In particular, based on this principle, government plans would generally be expected to do the following:

- *Use risk-based premiums* in setting the price charged for each individual risk. Risk-based premiums, of course, create the proper incentives for policyholders to take actions to mitigate the underlying risks. In the case of location-based real estate risks, property owners may even decide not to build in particularly risky locations.
- *Do not offer subsidies* in setting the premiums on individual risks and certainly do not subsidize the riskiest locations. To do otherwise—that is, to provide subsidies—would be to actively induce people to put themselves in harm’s way. Such subsidies would also be sure to crowd out any potential private market initiatives. Of course, to follow this advice, the government must have the will to reject requests to provide special help to affected industries and/or regions.

CONCLUSION

In conclusion, David Cummins and I firmly agree the first best solution is to keep the government out of the insurance business entirely, or to retire the government from active duty as soon as practical after a major event. To reach this goal, we also agree that a key step is for the government to rapidly remove all existing impediments to catastrophe bonds. And if the government is willing to go further, a good next step is to create a facility that auctions off access to these catastrophe bonds.

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