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Comment

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Introduction

This chapter focuses on an important measurement issue: what is the Federal Government's exposure to catastrophes? In addressing this issue, the authors define "exposure" in two ways, both of which are commonly used by risk managers. One measure of exposure is the expected annual cost. The other measure of exposure captures the cost that might be experienced in a particularly bad year. More precisely, the second measure is the cost level that will be exceeded with a low probability—say, 1 percent—or equivalently, it is the ninety-ninth percentile value of the cost distribution. Given a probability distribution for annual catastrophe costs, calculating the expected annual cost and a specific percentile value is straightforward. The difficult task is estimating the probability distribution for annual catastrophe costs.

Before discussing the empirical methods used in the chapter, it is appropriate to step back and identify why it is important to measure the Federal Government's exposure to catastrophes. Certainly from a budgeting and planning perspective, it is important to estimate both the expected costs and the magnitude of the potential costs. In addition, measuring exposure is the first step in analyzing a number of important economic and public policy issues related to the impact of government disaster assistance, including the impact of this assistance on (a) the incentives to purchase private insurance, (b) the distribution of wealth, and (c) real estate development in catastrophe-prone areas. Thus, this chapter provides an important, initial step in a more comprehensive analysis of public policy related to catastrophes.

In the next section, I summarize and comment on the methodology and the main results of the chapter. In the final section, I briefly discuss some of the implications and possible extensions of the analysis.

The Probability Distribution for Catastrophe-Related Costs?

The Federal Government incurs costs related to natural and man-made catastrophes, and the authors consider costs from both of these categories. The chapter does a nice job of identifying the many different programs that are exposed to catastrophes, including the Federal Emergency Management Agency (FEMA) disaster relief programs, subsidized loans to households and businesses affected by catastrophes, aid to farmers through the US Department of Agriculture, the National Flood Insurance

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Program (NFIP), the Terrorist Risk Insurance Program (TRIP), and damage to government property. However, the focus of the chapter is on the largest exposure—disaster assistance. As a result, the estimates understate the actual exposure of the Federal Government.

The procedure for estimating the probability distribution for disaster assistance has three steps. First, the ratio of disaster assistance to catastrophe losses is estimated using historical data from 1989 to 2006: (disaster assistance) / (catastrophe losses). Second, the probability distribution for annual catastrophe losses is estimated: catastrophe loss distribution. Third, the ratio found in step one is combined with the probability distribution from step two to estimate the probability distribution for annual disaster assistance. Given this distribution, the authors calculate expected annual disaster assistance and various percentile values of the disaster assistance distribution.

Step One: Ratio of Disaster Assistance to Catastrophe Losses

The authors use a variety of approaches to estimate the ratio of disaster assistance to catastrophe losses. For the numerator, they either use emergency supplemental appropriations for disaster assistance and thus exclude all budgeted disaster costs, or they use total disaster spending. For the denominator, they use total damage estimates for catastrophe events that caused more than $1 billion in total damages. Most of the catastrophe events are weather related, but the data also include earthquakes and terrorist attacks.

The ratio of disaster assistance to catastrophe losses is calculated using nominal losses and losses that have been adjusted to 2006 prices. In addition, the ratio is calculated in aggregate, by event, and by year. These various approaches yield a ratio of disaster assistance to catastrophe losses that ranges from about 32 percent to 50 percent (see table 4.1).

An interesting result presented in table 4.1 is the ratio of disaster assistance to uninsured losses. The estimates for this ratio range from about 57 percent to 95 percent. Using the maximum value, this implies that 95 percent of losses that are not covered by private insurance are insured for free through disaster assistance. The upper part of this range certainly indicates a coverage ratio that exceeds the coverage ratio commonly available in the private market, in large part because private insurers understand the moral hazard associated with high coverage ratios. Disaster assistance at this level is likely to have an important moral hazard effect on where people decide to locate and the amount of private insurance that they purchase.

Step Two: The Catastrophe Loss Distribution

The authors use two approaches for estimating the probability distribution for catastrophe losses. One approach is essentially a black box approach—they use an estimated distribution for insured losses from a major catastro-

phe modeling firm, Applied Insurance Research (AIR). Catastrophe models simulate the impact of natural disasters on property damage in specified geographical areas. These models incorporate information about the characteristics of property in terms of its use and construction and are widely used by insurers to assess their property damage exposure. The AIR model indicates that expected total catastrophe losses are in the range of 35 to 43 billion dollars and that the ninety-ninth percentile value is in the range of 273 to 282 billion dollars.

The second approach uses Property Claims Services (PCS) historical data on insured losses from catastrophes. Importantly, these data are adjusted to account for price changes and economic development that have occurred over time. This adjustment, which allows one to estimate the losses that would have occurred today from storms that occurred in the past, leads to several interesting observations:

- Hurricane Katrina in 2005 has the largest nominal loss of $44 billion.
- Adjusted losses from a 1950 wind and thunderstorm event that hit from Maryland to Maine equal $227 billion.
- Adjusted losses from Hurricanes Carol and Hazel in 1954 equal $257 billion.

Using the adjusted catastrophe loss data, the authors estimate the annual frequency and severity distribution for catastrophe losses and then compound these distributions to estimate the total loss distribution. The PCS data indicate that expected losses are in the range of 39 to 48 billion dollars and that the ninety-ninth percentile value is in the range of 272 to 337 billion dollars.

It is important to note that both approaches consider only natural catastrophes (and thus omit man-made catastrophes such as terrorist attacks) and thus understate the actual catastrophe exposure. Also, it is notable that the two approaches lead to similar overall exposure estimates.

Step Three: Federal Government's Exposure to Disaster Assistance

Multiplying the ratio of disaster assistance to catastrophe losses (step one) and the expected annual catastrophe losses (step two) yields an estimate of annual expected disaster assistance between 10 and 25 billion dollars and an estimate for the ninety-ninth percentile value of annual disaster assistance between 80 and 170 billion dollars.

Discussion

According to the authors, the Federal Government currently sets aside about $2 billion for disaster assistance. If one takes the midpoint of the annual expected disaster assistance ($17.5 billion) and subtracts the amount budgeted currently, we are left with the country's liability for disaster

assistance—about $15.5 billion annually. Assuming that this liability grows at approximately the same rate as the discount rate over the next thirty-five years, the present value of the liability is over $500 billion. The conclusion is clear: taxpayers bear a significant liability for disaster assistance.

The magnitude of disaster assistance certainly leads one to suspect that there are potentially important moral hazard effects with respect to private insurance coverage and real estate development. Further research on these effects is important for the optimal design of federal disaster assistance policy. Another area of research would be on the distributional effects of disaster assistance. For example, it would be interesting to document the amount of disaster assistance received by people grouped according to income and wealth levels. There also are interesting political economy questions associated with disaster assistance: for example, is the cross-sectional variation in the ratio of disaster assistance to catastrophe loss related to the seniority and/or committee assignments of legislators?

As the authors point out, knowing the magnitude of liability is necessary information for policymakers to develop optimal disaster relief policy. The authors go one step further and suggest that the expected annual cost (between 10 and 25 billion dollars) should be part of the regular budgeting process. Note, however, that there is considerable variability associated with actual costs around the expected value; most years will have far lower costs and a few years will have far higher costs. The politics of government spending raise a concern that budgeting the expected annual cost will lead policy officials to spend the amount budgeted, even in years with relatively low actual catastrophe losses. Under the current regime, politicians must justify assistance beyond the low amount currently budgeted (about $2 billion) to fellow legislators. Granted, this may not be a significant hurdle, but budgeting more money without restricting special appropriations is likely to lead to even higher costs.

In summary, this chapter analyzes an important issue. The analysis is rigorous and carefully executed. Although the estimates of exposure depend on numerous assumptions, the authors justify these assumptions and in each case choose an approach that is likely to lead to a conservative estimate of the Federal Government's exposure to catastrophes. Moreover, the estimates are consistent across the different methods that are used, which lends greater credibility to the estimates. There are a number of interesting results. The main conclusion is that the Federal Government has a significant exposure to catastrophes through its disaster assistance programs. Now, we need additional research on the implications of the effects of this disaster assistance and on the optimal design of public policy for catastrophes.