Issue Analysis

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Insuring the Uninsurable:
Private Insurance Markets and Government Intervention in Cases of Extreme Risk

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Executive Summary

The American insurance market is vigorous, competitive, and innovative. Americans expect insurance to be available and affordable for a wide range of risks.

Insurance markets function best when certain conditions are met. Individual exposures should be independent of each other. There should be a large number of individual risk exposures to allow the use of statistical predictions of future losses. Losses should be accidental or unintentional in nature, so that the insured cannot affect the probability that a loss will occur. Losses should be generally predictable, allowing insurers to set premiums properly. Risks should be pooled over a short period of time, so that one year's premiums cover one year's losses. Insurance markets should be competitive, so that each insured pays the cost of adding that insured to the risk pool.

For some risks, however, private insurance markets are unable to provide sufficient coverage to meet society's needs. These risks – commonly called extreme or catastrophic risks – are uninsurable through conventional insurance markets because they defy the conditions private markets require for operation. Adverse selection can prompt only those at risk to buy insurance. Insurance markets can face problems in providing coverage for truly large events; the size and rarity of insured events can make them difficult to predict. Financial markets can be disrupted when an insured loss occurs, complicating the rebuilding of capital after a large payout. Losses may be intentional (as in terror attacks) or affected by unforeseeable trends in behavior (as in financial institution deposit insurance). The infrequency of insured events may also require risk pooling across several time periods. Public policy considerations may dictate that coverage should be subsidized, rather than having each insured pay the cost of being added to the risk pool.

While market failure is a necessary condition for the government to intervene in an insurance market, it is not, by itself, sufficient. There should also be a public policy interest in allowing the insured activity to continue. For example, the federal government would want to ensure that an adequate level of farming activity continues even in the face of potentially catastrophic weather risks, so that the nation is not excessively dependent on imported food. It would want savers to feel confident in their banks and credit unions, so that the supply of saving and lending is maintained. It would want people to continue to live and work in certain geographic areas where there are risks, though infrequent, of earthquakes, floods, or terrorist attacks.

A review of federal government programs providing coverage for extreme or catastrophic events shows that these programs do not function like insurance:

- Where premiums are charged, they may be explicitly subsidized (as in the

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The National Association of Mutual Insurance Companies is a full-service trade association with more than 1,400 member companies that underwrite 43 percent ($194.6 billion) of the property/casualty insurance in the United States.

Government "insurance" programs bear less resemblance to insurance than to targeted public spending or risk management programs aimed at discharging the government's sovereign responsibilities of providing national and economic security and economic stabilization.

case of flood insurance) or set based on incomplete measures of the risks involved, resulting in an implicit subsidy. There may not even be a clear statutory intent to subsidize coverage.

- The government's insurance commitment may extend over multiple time periods, allowing the government to recoup past losses through future premiums or other revenues.

- The government may have a unique power to mitigate risks, as in enforcing flood plain management standards or conducting financial examinations of insured financial institutions.

- The federal government may provide back-up coverage financed not through premiums paid by insureds but through general government revenues.

In short, these programs bear less resemblance to insurance than to targeted public spending or risk management programs aimed at discharging the government's sovereign responsibilities of providing national and economic security and economic stabilization.

A review of selected U.S. state as well as foreign government programs aimed at insuring catastrophic risks leads to similar conclusions: government backing, funding, or organization is required to make catastrophic coverage programs work. State programs are typically backed, implicitly at least, by the state. Foreign programs, in turn, are structured in a number of ways, ranging from government spending programs with little or no private insurer involvement (Israel) to industry-based programs where the government's participation is primarily regulatory or organizational (Switzerland).

Because federal programs that provide catastrophic risk coverage are not insurance, they do not confer on federal agencies any particular expertise in providing or regulating insurance. When the federal government provides insurance, it does so primarily for catastrophic risks and/or risks that it is uniquely equipped – or obligated – to meet. Therefore, such programs should not be considered justification for federal regulation of private insurance markets. Any debate over the proper locus of insurance regulation is, and should remain, a separate debate.

Introduction

The American insurance market is vigorous, competitive, and innovative. We insure our homes, boats, cars, personal belongings, and business assets. In planning a vacation, many of us investigate trip insurance. At our destination, we examine liability coverage options for our rental car. Americans expect insurance to be available and affordable for a wide range of risks.

Most property/casualty insurance is provided without intervention or participation by the federal or state governments (other than state regulation). For some risks, however, insurance markets are unable to provide sufficient coverage to meet society's needs. These risks – commonly called extreme or catastrophic risks – are uninsurable through conventional insurance markets.

This paper explores some of these cases and investigates what the role of government is and should be in providing coverage for such events. The paper explores the following topics:

- The conditions needed for efficient operation of private insurance markets;

- How extreme or catastrophic events can make it impossible to meet these conditions; and

- The federal government's current and potential future role in increasing the supply of insurance for such events.

This report reviews selected policy issues in covering catastrophic risks and discusses policy options for increasing the availability of coverage for such risks. It does not take policy positions on the desirability of various options, but does, where available, discuss evidence on their feasibility and operational features.

The report concludes that providing coverage for some risks requires government participation. In many such cases the federal government is the best-positioned entity to assume such participation. However, such programs are not insurance. They are not structured according to the basic principles of insurance markets. As a result, these programs can only be assured of meeting their obligations by virtue of the government's sovereign powers and responsibilities, including the power to tax and the responsibility to ensure the nation's physical and economic security. Because such programs are not insurance, they do not confer on federal agencies any particular expertise in providing or regulating insurance, and do not justify federal regulation of private insurance markets.

When Insurance Markets Function Well

Most insurance markets work efficiently and smoothly because they meet the conditions for efficient underwriting and risk pooling. This section discusses the general conditions that must be met for private insurance markets to function.[1]

Individual Exposures Are Independent of Each Other

One important condition is that individual insureds should be subject to independent risks. Each insured business, structure, or other entity is a separate risk exposure. If exposures are independent, the chances that many losses will strike an insurer in the same year are reduced.

Auto insurance provides a good example of independent risks – my chances of an automobile accident are largely independent of yours. On the other hand, there can be a fine line between independent and correlated risks. In the case of auto insurance, a storm can turn independent risks into correlated risks, since more auto accidents occur in bad weather.

There Is A Large Number Of Individual Exposures

Insurance markets need large numbers of insured exposures to function properly. With large numbers of exposures, insurers can use statistical techniques to project their future losses. Large numbers also facilitate risk pooling (creation of a portfolio composed of a large number of individual risks) and subdivision (the allocation of this portfolio among a large number of shareholders or investors). Risk pooling and subdivision help create a portfolio of investments that attracts capital to the industry.

Losses Are Accidental Or Unintentional In Nature

The decision to purchase insurance should be free of moral hazard and adverse selection. Moral hazard occurs when those with insurance can influence the chance of loss by taking on more risk than they would in the absence of insurance. Adverse selection occurs when those at higher risk of loss are more likely to seek coverage, or seek more coverage, than those at a lower risk.

Insurers can reduce moral hazard by rewarding customers who take positive actions to reduce their chances of losses. Such rewards can include lower insurance premiums for homes equipped with smoke detectors, for cars equipped with anti-theft devices, or for teenaged drivers who have completed a course of driver education.

Adverse selection can be reduced if buying insurance is required; all auto owners must be covered, or lien holders require that borrowers in at-risk areas carry hurricane or flood insurance. The impact of adverse selection can be reduced by risk classification and pricing systems that reflect expected losses.

The decision to purchase insurance should be free of moral hazard. … Insurers can reduce moral hazard by rewarding customers who take positive actions to reduce their chances of losses.

While property/ casualty insurance markets tend to work well in covering routine events, they can face problems when confronted with extreme, or catastrophic, events. A catastrophic or extreme event is a natural or man-made disaster that is unusually severe and that affects many insurers and policyholders.

Losses Are Generally Predictable

When individual exposures are independent and numerous, and losses are accidental in nature, they become more predictable than if these conditions are not met. An insurer can compute actuarial projections of the probability of such losses sufficient to assess the premium it must charge to be able to insure the risk.

Risks Are Pooled Over a Short Period of Time

Insurance markets work best at pooling risks over a reasonably short time such as a year or other policy period.[2] Yearly risk pooling is possible where insured events are relatively small and relatively frequent; auto and dental insurance are two good examples. If a year's premium essentially covers a year's losses, the risk to the insurer's capital is reduced.

Insurance Markets Are Competitive

The U.S. Congressional Budget Office (CBO) has observed that the market for property/casualty insurance is competitive nationally.[3] A competitive market has a relatively large number of sellers who sell a comparable product, and no one seller can dictate market prices. Such a market can provide consumers with a larger number of choices and better prices and service than one where only a few sellers supply the entire market. A competitive market functions well on behalf of the consumer and requires relatively little regulation.

In 2002, more than 100 company groups – comprising over 3,000 separately incorporated subsidiaries – sold property/ casualty insurance in the U.S. The four largest groups held 28 percent of the market (based on net premiums written); the next fifth through fiftieth largest held 50 percent of the market; and the remaining groups held the rest.[4]

Another measure of competitiveness is the Hirschman-Herfindahl Index (HHI), a widely used measure of industry concentration. An industry with a score below 1,000 is considered unconcentrated, and one with a score over 1,800 is considered highly concentrated. The property/casualty industry's HHI score is 312.[5] By comparison, the HHI score for the automobile and light-duty truck industry is 2,676.[6]

Problems In Insuring Against Extreme Events

While property/casualty insurance markets tend to work well in covering routine events, they can face problems when confronted with extreme, or catastrophic, events. A catastrophic or extreme event is a natural or man-made disaster that is unusually severe and that affects many insurers and policyholders.[7]

The ten most costly catastrophes in U.S. history occurred between the years 1989 and 2004 (Table 1). Nine of the ten catastrophes were weather-related disasters. The 9/11 attacks – the only man-made disaster on the list – were the single most costly catastrophe in U.S. history.

This section describes the ways in which extreme events defy the conditions private markets require for operation.

Adverse Selection Can Reduce Coverage

Insurance works best if everyone buys coverage. Adverse selection can mean that people only buy coverage if they see themselves at risk. Large numbers of risks tend to reduce adverse selection. Adverse selection can be a particular problem in insuring against extreme events because the actual or perceived risk of loss may be unevenly distributed: hurricanes are less likely to hit New York; earthquakes are less likely to hit Nebraska; terror attacks may be seen as a big-city problem.[8] Adverse selection in coverage for catastrophic events can also mean that even those at risk do not buy coverage, perhaps because they expect the government to step in if a large loss occurs.[9]

Insurers react to adverse selection by charging higher premiums or by not insuring

at all.[10] The problem of adverse selection can be exacerbated if properly priced insurance (in terms of expected losses) is seen as a "bad buy" – either because potential insureds believe there is little likelihood they will experience loss, or because they believe the government will compensate them for their losses.

Insured Events Are Large

Unlike the risks of an auto accident, some risks may strike a large number of insured individuals or entities at the same time. For example, adverse weather may cause crop failures in a large part of the country in the same year. If risks are not independent, they violate a key assumption that underlies insurance pricing theory.[11]

Since catastrophic events are rare but large, an insurer's losses will be more variable than if risks are small and not correlated. When losses vary widely, insurers need to hold enough capital reserves to bridge the gap between premium income and loss payouts.[12] Holding larger amounts of capital is expensive. Consequently, insurers would generally need to charge a higher premium for correlated (catastrophic) risks than for uncorrelated risks.

Capital itself also can become more expensive to obtain. The premium loading may have to be larger, to compensate investors for the greater risk they assume. Alternatively, the number of investors willing to invest in the portfolio of risks has to be large enough that each investor takes on a small enough share of the portfolio to be willing to participate at the higher risk level.[13]

Insured Events Are Rare

Private insurers use historical data on losses and claims generated by similar classes of risks to accept risks and set premiums. Many people have car accidents or home fires every year – even every day. Such events are frequent enough that insurers are able to make very fine distinctions among risks, and price coverage accordingly.

But for some risks – the federal war-risk programs are one example – insured events occur rarely.[14] Therefore, data on the likely occurrence of insured events over sufficiently long periods are not available. Without data, private markets find it more difficult to assess risk and set appropriate premiums.

Table 1
The Ten Most Costly Catastrophes in the United States

(in millions of dollars as of date of occurrence)

Date	Event	Insured Loss
September 2001	Terrorist attacks	$18,800[1]
August 1992	Hurricane Andrew	15,500
January 1994	Northridge, Calif., earthquake	12,500
August 2004	Hurricane Charley	6,755
September 2004	Hurricane Ivan[2]	6,000
September 2004	Hurricane Frances[2]	4,400
September 1989	Hurricane Hugo	4,195
September 2004	Hurricane Jeanne[2]	3,245
September 1998	Hurricane Georges	2,900
June 2001	Tropical Storm Allison	2,500

Source: Insurance Services Office, Inc. (ISO), reported in Insurance Information Institute (2005).

[1]Property coverage only. The September 11 attacks are projected to cost insurers $32.5 billion when all claims are resolved.
[2]ISO preliminary estimate.

Insured Events Disrupt Financial Markets

Extreme events disrupt more than lives and economic activity. They can also change the way the insurance industry does business – at least for a while – by reducing earnings and the value of capital of property/casualty insurers. The three largest catastrophic events to date – Hurricane Andrew (1992), the Northridge (CA) earthquake (1994), and the 9/11 attacks – all set off shocks in segments of the property/casualty insurance market.[15] After Andrew, the industry recorded its first operating loss of the decade, and 11 small insurance companies filed for bankruptcy.

For extreme risks, data on the likely occurrence of insured events over sufficiently long periods are not available. Without data, private markets find it more difficult to assess risk and set appropriate premiums.

Terrorism combines the potential loss magnitude of a large-scale natural disaster with the unpredictability of a single intentional act; this feature itself may make terrorism an inherently uninsurable risk. The goal of terrorists is to create uncertainty about the likely incidence, magnitude, and timing of losses.

Northridge caused a smaller financial shock, but that may have been in part because a large share of the resulting losses only became apparent in later years.

The 9/11 attacks exacerbated cyclical market conditions more than the two natural disasters had done. The 9/11 attacks wiped out annual earnings for the year, reduced global capital by more than $30 billion, and caused the failure of two insurers (one in Denmark and one in Japan).[16]

After these shocks, capital flowed into the industry as higher insurance prices – and the resulting prospect of higher returns – attracted new investment. However, extreme events can disrupt the long-term supply of insurance for some risks. Prices for some insurance may remain elevated for an extended period of time because an extreme event changes the perceived probability of future events.[17] Coverage for terrorism risks was restricted even a year after the 9/11 attacks, for example, because insurers had no viable way to price these risks. The industry may be able to absorb even major shocks given enough time, but the length of the adjustment period itself may cause hardship.

Losses May Be Intentional or Affected by Behavior

Most catastrophes stem from natural disasters, which are outside human control. But some losses may be intentional, while others may be exacerbated by the insured's efforts to self-protect against losses.

Intentional losses. The term "intentional loss" is typically used by insurers to refer to any type of loss that is not inadvertent. Arson, for example, is a common form of intentional loss, as are staged automobile accidents and other types of insurance fraud. Though insurers often seek to reduce the extent of such risks (through fraud detection programs and vigorous prosecution of arsonists), they are usually manageable. That is, insurers have the capacity to pay claims that result from relatively small-scale intentional acts, and they routinely do so. Unlike terrorism, most losses caused by intentional acts do not entail extreme risk.

Terrorism, however, combines the potential loss magnitude of a large-scale natural disaster with the unpredictability of a single intentional act; this feature itself may make terrorism an inherently uninsurable risk.[18] The goal of terrorists is to create uncertainty about the likely incidence, magnitude, and timing of losses.

Losses affected by behavior. Self-protective behavior by policyholders generally works in favor of insurers (see *Losses Are Accidental Or Unintentional In Nature*, above). But lack of insurance can lead to some types of self-protective behavior by the insured that is harmful. To reduce their own losses from terrorism attacks, individuals or businesses may move away from or refuse to do business in high-profile areas. Such behavior can hurt national prestige and morale if it is perceived as "giving in to the terrorists," and can reduce economic activity if businesses do not take enough risks.[19]

Self-protective behavior can also affect the degree and distribution of losses to entities that do not attempt to protect themselves or that protect themselves in ways that are not easily discerned. Visible self-protective behavior by terror targets – guards, jersey barriers, strict screening – can increase the risk of strikes against targets that are either not protected at all, or have protection that is less visible, such as security cameras.

The case for government insurance of deposits in financial institutions has a similar rationale. Without deposit insurance, depositors attempting to protect themselves against loss could cause bank runs and, ultimately, the failure of unrelated businesses that depend on the banks.

In the case of both terror insurance and deposit insurance, government-provided protection can reduce self-protective behavior that has the unintended effect of harming others. Because self-protection and insurance are to some degree substitutes, someone with insurance coverage may undertake behaviors that could be too risky without insurance. Normally, this type of

response to insurance would fall under the category of morale hazard. But when the "risky" behavior means patronizing local banks or working in downtown Washington, D.C. or New York City, society may be better off with individuals taking on a little more risk rather than less.[20]

Losses May Not Be Predictable

Even when extreme or catastrophic events are relatively frequent, they may not be predictable. Some risks – flood and crop damage are two examples – are predictable over the long term but can vary greatly from year to year.[21] Risks that vary from year to year may require several decades of data to even begin assessing risks.

Historic experience with losses from such events is inherently volatile and may not accurately represent what can be expected in the future.[22] Accordingly, insurers are increasingly turning to the development and improvement of scientific models that attempt to project the frequency, location, and severity of future natural catastrophes.[23]

But even efforts to predict extreme events that are grounded in "hard" science face limitations. Flood plains are frequently redrawn.[24] Likewise, the underlying probabilities of catastrophic events can change due to variations in climate, geology, and – in the case of terrorism – the global political environment.

Some natural risks may "average out" over enough time, but other risks may be uncertain even over the longer term. Insuring deposits in financial institutions or defined benefit pension plans offered by private firms on an actuarial basis would require predicting the long-term financial solvency of private firms.[25] Banks, business firms, and private pension plans generally provide advance signals of distress through such measures as declining profits in the case of banks or businesses and underfunding in the case of pension plans. But the future financial health of a bank or private firm will depend on future economic conditions as well as on how the bank or firm is managed. No insurer would be able to assess all these factors.

Terrorism insurance provides an extreme example of unpredictable risks. Terrorist events are fully intended by their perpetrators. Planning may be short-term, clandestine, or both, making advance information difficult to obtain.[26] And even if such information is available, it may be classified as a matter of national security and therefore not available to insurers, and is probably not useful for long-term planning in any event.

Risks May Need to be Pooled Across Time Periods

Infrequent events such as natural disasters or widespread crop losses, by definition, do not occur regularly.[27] Consequently, such risks may need to be pooled over a number of years.

Risk pooling across time periods requires that insurers hold additional equity capital. Because of the regulatory, tax, and accounting regimes insurers face, as well as other costs, holding the additional capital required against large and infrequent risks is costly.

Consider the following simplified example. Suppose a $50 billion event – comparable to the total losses in the 9/11 attacks – is expected to occur once in every 20 years. The expected annual cost of such an event is $2.5 billion. The event can occur in any one of those 20 years; suppose it occurs this year. The premium for the year would cover only 5 percent of the losses, leaving 95 percent to be covered by capital. An insurer could maintain a credit line of $47.5 billion per year, but even a credit line that goes unused would generate costs. And in any year in which the event did not occur, regulators could consider the premium excessive relative to claims incurred.[28]

A further complication arises from the fact that individual insurers – not the industry as a whole – pay claims, though risks can be spread to some degree through reinsurance and securitization. If individual insurers were reserving adequately against catastrophic events, a lengthy catastrophe-free period could lead to high and increasing

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Table 2
Statutory Subsidies and Policy Duration in Selected Federal Insurance Programs

Program[1]	Subsidy Intended by Statute?	Government Commitment Extends Over > 1 Year?
Aviation War-Risk Insurance	No[2]	No
Bank Deposit Insurance	Unclear	Yes
Catastrophic Nuclear Accidents	Unclear	Yes
Federal Crop Insurance	Yes	No
Maritime War-Risk Insurance	No	No
National Flood Insurance	Yes	No
National Credit Union Share Insurance	Unclear	Yes
National Vaccine Injury Compensation	No	No
Overseas Private Investment Corp. (OPIC) Political Risk Insurance	No	Yes
Pension Benefit Guaranty (PMGC) Pension Insurance	No	Yes
Savings Association Deposit Insurance	Unclear	Yes
Terrorism Risk Insurance	Yes	No

Source: Author's adaptation of data presented in GAO (1997, 2001) and Executive Office of the President, *Budget of the United States Government: Analytical Perspectives, Fiscal Year 2005* (Washington, D.C.; U.S. Government Printing Office, 2004), Chapter 7. Programs are listed in alphabetical order.

[1]Data presented in this table do not include certain government-sponsored insurance programs covering federal employees and disabled military veterans that were covered in the GAO study.
[2]After the 9/11 attacks, the U.S. Department of Transportation offered airlines short-term reimbursement for the increased cost of aviation hull and passenger liability war risk insurance under authority provided in P.L. 107-42. The Homeland Security Act of 2002 also expanded the scope of third party war risk coverage to include war risk hull, passenger, crew and property liability insurance. In addition, the federal government would pay any airline claims that exceed the balance in the aviation insurance revolving fund.

concentrations of catastrophe exposure. Insuring catastrophic risks thus requires good catastrophe management practices.[29] But even with such practices in place, the capacity of individual companies, not of the industry as whole, may limit the size of events that are considered insurable.

U.S. income tax rules also complicate the accumulation of reserves against low-probability, high-loss events. The effect of tax laws on the supply of insurance for an extreme event is further discussed later in this report.

Coverage May Need to Be Subsidized

In private insurance markets, each insured is charged a premium that reflects, as closely as possible, that insured's net impact on the risk pool. In markets where the federal government intervenes, however, there may be public policy reasons for explicitly subsidizing coverage in a particular program. For example, the catastrophic coverage under the federal crop insurance program is fully subsidized to reduce reliance on ad hoc disaster assistance.[30]

However, coverage offered by the federal government may be subsidized even in the absence of statutory intent. Even federal insurance that is intended to be unsubsidized may be sold at a premium that is lower than its long-run cost, if long-run costs are difficult to predict.[31] Those who are insured may then receive a subsidy because of the measurement and forecasting problems inherent in insuring the underlying risk. Profit-making companies, in contrast, cannot offer subsidized coverage, as losses on such coverage would limit their access to investor capital.

When the Government Intervenes

If the conditions for private provision of insurance are not met, private insurance markets fail. When national and subnational (i.e., state or local) governments or governmental entities act to increase the availability of coverage against extreme events, they do not always do so in the same way, nor do they always do so by providing

insurance. Governments have a wide range of policy options available for backing up private insurance markets or for creating insurance markets where the private sector would not be able to function unaided.

In this section we examine a variety of techniques that have been used in the U.S. and overseas to provide coverage against extreme events.

The Federal Role in Insurance

In an extensive review of the federal budget treatment of federal insurance programs, the U.S. General Accounting Office (GAO) noted, "[T]here is not universal agreement on which programs constitute federal insurance."[32] The scope of the GAO study was limited to programs the U.S. Office of Management and Budget—the budgeting agency that serves the executive branch of the federal government—and the Federal Accounting Standards Advisory Board had previously identified as federal insurance programs.[33] However, the GAO noted that even though the programs included in its analysis are considered federal insurance, they do not necessarily share all the characteristics of private insurance.

Most federal programs offering insurance deal with markets that face economic conditions leading to failure. Three major federal insurance programs—federal crop insurance, national flood insurance, and terrorism risk insurance—are explicitly subsidized by the terms of their authorizing statutes (Table 2). The GAO judged that it was unclear whether the statutes governing financial institution deposit insurance and nuclear catastrophe insurance intended to subsidize this coverage. Five of the programs included in Table 2 do not contain an explicit statutory intent to provide a subsidy.

Programs that offer multi-year fixed term, renewable term, or noncancelable coverage commit the government for extended periods. In about half of the federal programs considered in the present paper, the federal government commitment extends over more than one year (Table 2).

Table 3 categorizes major federal insurance programs according to the types of risks covered. Four programs cover political risks; four cover financial/macroeconomic risks; two cover natural risks; one covers risk that could arise from a variety of sources; and one covers public health risks. These programs provide coverage against events that are not easily predictable, that can result in very large losses, or both.

Design Features of U.S. Government Insurance Plans Against Extreme Events

A brief look at selected U.S. federal and state government insurance plans for catastrophic events suggests a broad range of design features (Table 4).

Design features of federal programs. The rules as well as the roles of government and insurers in federal programs vary widely. Purchase of coverage under such programs is often voluntary. For example, purchasers

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Table 3
Type of Risk Insured in Selected Federal Insurance Programs

Program[1]	Type of Risk
Aviation War-Risk Insurance	Political
Bank Deposit Insurance	Financial/Macroeconomic
Catastrophic Nuclear Accidents	Terrorism, negligence or natural disaster
Federal Crop Insurance	Natural
Maritime War-Risk Insurance	Political
National Flood Insurance	Natural
National Credit Union Share Insurance	Financial/Macroeconomic
National Vaccine Injury Compensation	Medical/Public Health
OPIC Political Risk Insurance	Financial/Macroeconomic
PBGC Pension Insurance	Financial/Macroeconomic
Savings Association Deposit Insurance	Financial/Macroeconomic
Terrorism Risk Insurance	Political

Source: Author's compilation based on GAO (1997); GAO (2001); and Executive Office of the President (2004). Programs are listed in alphabetical order.

[1]Data presented in this table do not include certain government-sponsored insurance programs covering federal employees and disabled military veterans that were covered in the GAO study.

Table 4
Main Features of Selected U.S. Federal and State Catastrophic Event Insurance Plans

Program	Participation	Government Role	Insurer Role
Federal Programs			
OPIC Political Risk Insurance	Voluntary	Insurer and risk bearer	None
National Flood Insurance	Voluntary	Insurer	Sell coverage
Terrorism Risk Insurance	Voluntary	Backup insurer, capped	Must participate, sell coverage
State Programs			
CA Earthquake Authority	Voluntary	No public funding[2]	Sell coverage
FL Citizens Authority Insurance Corporation	Mandatory	No public funding[2]	Must join, sell coverage
Florida Hurricane Catastrophe Fund	Not applicable	No public funding[2]	Must join

Source: Author's compilation based on GAO (2001); CBO (2002); and Citizens Property Insurance Corporation, "General Information," 2003 www.citizensfla.com.

[1]Indicates whether insured is required to purchase coverage. Insurance companies may be required to participate in programs; see last column of table and text for further discussion.
[2]No public funding is intended by statute. See text for further discussion.

Many risks assumed by the federal government – including those related to weather and to financial and macroeconomic conditions – are not independent in that losses may strike a large number of insureds at the same time.

decide for themselves whether to buy OPIC political risk insurance, national flood insurance, and terrorism risk insurance. Deposit and pension insurance, on the other hand, are mandatory. The federal government is the insurer for OPIC and flood insurance, and also provides backup insurance for terrorism insurance. Private insurers have no role in the OPIC program, but sell flood insurance, and both underwrite and sell terrorism insurance.

However, the risks insured by the government have important features in common. The lack of a historic pattern of similar insured events, an ever-changing environment, and low participation rates make it difficult to both assess the government's risk exposure and set premiums commensurate with that exposure.[34] Many risks assumed by the federal government – including those related to weather and to financial and macroeconomic conditions – are not independent in that losses may strike a large number of insureds at the same time.

Design features of state programs. A review of two of the major catastrophic loss programs maintained by California and Florida presents a somewhat different set of features. The California Earthquake Authority (CEA), the Florida Citizens Property Insurance Corporation,[35] and the Florida Hurricane Catastrophe Fund do not receive explicit public financial backing. Funding comes from premiums, investment income, assessments, and other sources. Since some state programs may be undercapitalized, however, a major insured event could prompt states to offer financial support regardless of statutory intent.[36]

Consumers are not required to purchase earthquake insurance in California, nor are insurers required to join the program. Nevertheless, as of 2002, the CEA insured about 66 percent of the residential market.[37]

Florida homeowners' insurance policies must cover hurricane losses in most areas of the state, though they may exclude them in areas covered by the Corporation. Insurers are required to participate in the Florida Citizens Property Insurance Corporation, as well as in the Florida Hurricane Catastrophe Fund, a state trust fund that reinsures hurricane exposure.

Design Features of Foreign Government Insurance Plans Against Extreme Events

Foreign approaches to covering catastrophic risks provide another perspective on possible policy options. Program designs may not be directly transferable among countries due to international differences in political and economic structure and institutions, laws, and attitudes. There are also inter-country differences in the risks covered, and such

differences can be expected to influence program design and participation. With these caveats, foreign approaches can be useful in demonstrating the range of program tools that can be used to address similar public policy problems.

A selection of five catastrophic event insurance plans sponsored by foreign governments shows a wide range of approaches (Table 5). At one extreme, the Israeli terrorism insurance program is not run on insurance principles. Rather, it is a government-financed spending program funded by a national property tax, levied primarily on businesses. The role of private insurers is limited to providing coverage for indirect damages such as business interruption costs, or for the difference between the property's current market value and its replacement value.

At the other extreme, there is no government exposure in the Swiss Catastrophic Insurance program for selected natural disasters (storms, hail, floods, landslides, and avalanches). The government serves as the program organizer and sets the rules for participation. Insurers must include catastrophe coverage in fire insurance policies for buildings and their contents. Claims exceeding premium payments would be paid from insurers' capital and assets.

The earthquake insurance programs in Japan and New Zealand, as well as the Terrorism Reinsurance Program (Pool Re) in the United Kingdom (UK), provide examples of mixed public and private approaches. In all three programs, the government shares risk with private insurers, but private insurers assume the first layer of losses. The New Zealand program reflects some of the difficulties in planning for a major disaster when the time horizon is uncertain. Because no major disaster has occurred recently, the program has accumulated substantial reserves. However, those reserves could be inadequate if a major earthquake hit the nation's capital.[38]

Table 5
Main Features of Foreign Catastrophic Event Insurance Plans

Program	Participation[1]	Government Role	Insurer Role
Israel: Terrorism Insurance	Mandatory, Automatic	Bears all risk; funded by property taxes	Provide supplemental coverage or coverage for indirect damage
Japan: Earthquake Insurance	Voluntary	Public-private risk sharing; government share increases as losses rise	
New Zealand: Earthquake Insurance	Mandatory	Provide insurance over cap	Provide insurance up to cap
Switzerland: Catastrophic Insurance	Mandatory	None	Voluntary
United Kingdom: Reinsurance (Pool Re)	Voluntary	Backstop and lender of last resort	Pool Re is owned by participating insurers

Source: Author's compilation based on GAO (2001); CBO (2002).

[1]Indicates whether insured is required to purchase coverage. Insurance companies may be required to participate in programs; see last column of table and text for further discussion.

Options for Increasing the Supply of Insurance Against Extreme Events

We now proceed to a discussion of non-insurance options that have been proposed as ways to increase the supply of coverage for extreme events. Such options include:

- Changing the tax treatment of capital reserves held by insurers.
- Deregulating insurance markets.

Foreign approaches can be useful in demonstrating the range of program tools that can be used to address similar public policy problems.

- Increasing reliance on financial markets.

All of these options would improve to some degree the insurance industry's ability to insure against catastrophic events. None, however, would resolve some of the other problems insurers face in covering catastrophic risks.

Deregulation would not solve certain underlying problems in catastrophe insurance. The problems of designing adequate reserves against infrequent events would remain unsolved if the incidence and magnitude of insured events cannot be reliably predicted.

Changing The Tax Treatment Of Capital Reserves

The tax treatment of insurers' catastrophic reserves is generally believed to reduce the supply of disaster insurance and increase its cost.[39] Insurers currently may not expense for tax purposes additions to reserves made against low-probability events. Changes in catastrophe loss carryback provisions and in the tax treatment of portfolio income could also make holding reserves more attractive.

However, these changes would only remove the tax disadvantage of holding reserves against low-probability events, and could leave other problems unanswered. If the incidence and magnitude of catastrophic losses cannot be predicted with sufficient accuracy, there is no certainty that the amount of reserves held would be sufficient to meet expected needs. A firm with cash reserves against large future losses could also find itself at risk of a takeover. An acquirer could let pending insurance commitments lapse and use the accumulated reserves for other purposes.[40]

Deregulating Insurance Markets

An alternative approach to increasing the supply of insurance would be for the federal government to encourage the states to deregulate insurance markets.[41] As discussed above, the property/casualty industry is considered generally competitive, and competitive markets are able to ward off excess profits and other misuses of market power. Deregulation could give consumers more choices and encourage new entry into insurance markets.

However, while deregulation could carry advantages, it would not solve certain underlying problems in catastrophe insurance. The problems of designing adequate reserves against infrequent events would remain unsolved if the incidence and magnitude of insured events cannot be reliably predicted. In addition, consumers in catastrophe-prone areas would pay more for insurance, at least in the short term.

Increasing Reliance On Financial Markets

Whether as an alternative to revising the tax and regulatory environments for insurers, or in conjunction with such revisions, insurers could increase their reliance on capital markets to spread the risks of catastrophic events among investors.[42] Perhaps the best-known type of financial market technique used for this purpose is the catastrophe (or "Act of God") bond, under which the investor agrees to forgive part or all of the interest and principal due in the event of a specified catastrophe.[43]

Catastrophe-linked securities and derivatives may carry benefits for both insurers – as an alternative to reinsurance – and for investors, who would benefit from additional portfolio diversification. Some observers believe, however, that such securities deliver excess returns to investors. Issuers may essentially overpay investors for investing in such securities because of the difficulty in predicting the true risk of loss.[44]

What Does Federal Coverage for Extreme Events Mean for Insurance Regulation?

The federal government's provision of coverage for certain risks can be justified or explained on a number of different grounds. The first explanation is some risks are simply too large or unpredictable to be insurable within the institutional, financial, and regulatory structure of private insurance markets.

But while market failure is a necessary condition for the government to intervene in

an insurance market, it is not, by itself, sufficient. A second condition or explanation for government intervention in insurance markets is that there should be a public policy interest in allowing the insured activity to continue. The federal government would want to ensure that an adequate level of farming activity continues even in the face of potentially catastrophic weather risks so that the nation is not excessively dependent on imported food. It would want to ensure that savers feel confident in their banks and credit unions so that the supply of saving and lending is maintained. There is also a national interest in ensuring that people are able to continue to live and work in areas at risk, though not frequently, of earthquakes, floods, or terrorist attacks.

Advantages Of The Existing Insurance Regulatory Scheme

It has been proposed that insurance companies should have the opportunity to be regulated by the federal government.[45] Since these proposals would not substitute federal for state regulation, but instead would offer a federal alternative, they are referred to as "dual charter" proposals.

While some components of the insurance industry have announced support for a dual charter option, NAMIC has voiced a number of concerns about federal regulation of insurance. These include the potential for regulatory and statutory conflicts and the loss of the ability of state legislators and regulators to respond to state-specific needs.

NAMIC has argued that the existing state-based insurance regulation system works for insurable risks. Any necessary reforms in insurance market regulation should be undertaken at the state level, to achieve a " … reformed, rationalized and consistent system that will benefit both consumers and the industry."[46]

Is it Insurance or Government Spending?

Are federal risk coverage programs properly considered insurance, or are they devices by which the government can discharge functions that are properly considered governmental in nature?

An assessment of the conditions that must be present for insurance markets to operate suggests that when the federal government provides or facilitates the provision of coverage for certain risks, this intervention shares many of the features of government programs intended to provide essential "social goods" such as national defense, public education, and public health. The government does not generally attempt to charge each insured a premium commensurate with the risk presented by that insured, and generally would not even possess the information necessary to do so.

Likewise, when the federal government, in the performance of its sovereign responsibilities, provides a service that, for want of a better term, is referred to as "insurance," the provision of this service has no implications whatsoever for the regulation of insurance markets where the essential criteria of an insurance market are present.

Summary and Conclusions

Researchers generally agree that U.S. markets for property/casualty insurance function well. Insurance is widely available, for a broad range of risks, at competitive prices, and from a large number of competing vendors.

But private insurance markets need certain preconditions to operate properly. When those preconditions are absent, private markets may not be able to supply enough insurance to meet society's needs in a timely manner, and in the extreme, may not be able to remain solvent.

Where private markets cannot meet the need for coverage, the federal government has stepped in. However, these instances have been limited, both in number and in kind. When the federal government provides protection against catastrophic risks, it is undertaking a function that it is uniquely equipped – or obligated – to provide.

When the federal government provides or facilitates the provision of coverage for certain risks, this intervention shares many of the features of government programs intended to provide essential "social goods" such as national defense, public education, and public health.

End Notes

[1] This discussion draws on U.S. General Accounting Office (GAO), *Budget Issues: Budgeting for Federal Insurance Programs* (Washington, D.C.: GAO, 1997); Howard Kunreuther, Erwann Michel-Kerjan, and Beverly Porter, "Assessing, Managing, and Financing Extreme Events: Dealing With Terrorism," *National Bureau of Economic Research Working Paper No. w10179* (December, 2003); and American Academy of Actuaries (AAA), *Insurance Industry Catastrophe Management Practices* (Washington, D.C.: American Academy of Actuaries, 2001), and other sources as noted. The U.S. General Accounting Office is currently called the U.S. Government Accountability Office. This report cites this agency's publications according to the agency's name when the publication was produced.

[2] This is called cross-sectional risk pooling. See Jeffrey R. Brown, J. David Cummins, Christopher M. Lewis, and Ran Wei, "An Empirical Analysis of the Economic Impact of Federal Terrorism Reinsurance," *National Bureau of Economic Research Working Paper No. w10388* (March, 2004).

[3] Congress of the United States, Congressional Budget Office (CBO), *Federal Reinsurance for Disasters* (Washington, D.C.: U.S. Government Printing Office, September 2002).

[4] Insurance Information Institute (III) and The Financial Services Roundtable, *The Financial Services Fact Book 2004:* Chapter 4 (New York: Insurance Information Institute and The Financial Services Roundtable, 2004). www.financialservicesfacts.org/financial2/insurance/pcfinancial/

[5] Data are for 2002 (III and the Financial Services Roundtable, 2004). The index is calculated by squaring the market shares of firms in an industry, summing them, and multiplying the result by 1000.

[6] Data are for 1992 (Smita B. Brunnermeier, Brooks M. Depro, Mary K. Muth, and Laura J. Bloch, *Automobiles and Light-Duty Trucks: Final Report* (Research Triangle Park, NC: Research Triangle Institute, 2000)).

[7] Insurance Information Institute (III), "Catastrophes: Insurance Issues" (January 2005) http://iii.org/media/hottopics/insurance/xxx/. For industry statistical reporting purposes, an event is designated a catastrophe when claims are expected to reach a certain threshold, currently set at $25 million. Some insurers may also apply their own internal criteria to designate events as catastrophes (AAA 2001). Most events designated as catastrophes for reporting purposes would not be considered catastrophic or extreme events for public policy purposes.

[8] "High-value" targets have, indeed, been the principal purchasers of insurance made available under the terms of the Terrorism Risk Insurance Act of 2002. U.S. General Accounting Office (GAO), *Terrorism Insurance: Effects of the Terrorism Risk Insurance Act of 2002* (Washington, D.C.: GAO, 2002).

[9] This result is often called the "Samaritan effect," where an expected good deed by the government (the "Samaritan") deters individuals from protecting themselves against loss. For a discussion of this effect, see Jeffrey R. Brown, Randall S. Kroszner, and Brian H. Jenn, "Federal Terrorism Risk Insurance," *National Bureau of Economic Research Working Paper No. w9271* (October, 2002).

[10] III (2005).

[11] J. David Cummins and Christopher M. Lewis, "Catastrophic Events, Parameter Uncertainty and the Breakdown of Implicit Long-Term Contracting in the Insurance Market: The Case of Terrorism Insurance," *Wharton Financial Institutions Center Working Paper No. 02-40* (October, 2002). knowledge.wharton.upenn.edu/papers/1126.pdf

[12] CBO (2002).

[13] Dwight Jaffee and Thomas Russell, "Extreme Events and the Market for Terrorist Insurance," Prepared for Presentation to National Bureau of Economic Research Insurance Conference, February, 2002.

[14] GAO (1997).

[15] CBO (2002).

[16] CBO (2002).

[17] Ibid.

[18] Congress of the United States, Congressional Budget Office (CBO), *Federal Reinsurance for Terrorism Risks* (Washington, D.C.: U.S. Government Printing Office, 2001).

[19] Darius Lakdawalla and George Zanjani, "Insurance, Self-Protection, and the Economics of Terrorism," *Rand Institute for Civil Justice Working Paper WR-123-ICJ* (December 2003).

[20] Lakdawalla and Zanjani (2003).

[21] GAO (1997).

[22] AAA (2001).

[23] Kunreuther et al. (2003); CBO (2002); AAA (2001). The property/casualty insurance industry has helped finance such efforts (III 2004).

[24] III (2004).

[25] Ibid.

[26] Some researchers are attempting to model terrorist events. An example is Gordon Woo, "Quantifying Insurance Terrorism Risk," Prepared for Presentation to National Bureau of Economic Research Insurance Conference, February, 2002.

[27] A given event may be infrequent but regular. An example of an infrequent but regular event is the 17-year breeding cycle of cicadas. In contrast, natural disasters are both infrequent and irregular.

[28] Some analysts believe that premiums for high-loss, low-probability events are, indeed, high relative to projected losses (see references discussed in CBO (2002)). However, the counter-argument to this assertion is that any estimates of what premiums "should" be are, of necessity, based on imprecise forecasts of actuarial losses for such events.

[29] AAA (2001).

[30] Catastrophic coverage compensates farmers for crop yield losses greater than 50 percent at 55 percent of the expected market price. Premiums for this coverage are fully subsidized by the government except for a small processing fee.

[31] GAO (1997).

[32] Ibid.

[33] The federal government maintains certain insurance programs as an employer of civilian and military personnel. These programs are not covered in the present paper, as they are not undertaken in response to market failure.

[34] GAO (1997).

[35] This agency, an insurer of last resort, was created by a 2002 law that combined the Florida Residential Property and Casualty Joint Underwriting Association and the Florida Windstorm Underwriting Association.

[36] CBO (2002).

[37] Ibid.

[38] Ibid.

[39] See research reviewed in CBO (2002).

[40] Jaffee and Russell (2002).

[41] See research and arguments reviewed in CBO (2002).

[42] This discussion is based on AAA (2001); Jaffee and Russell (2002); CBO (2002); and Kunreuther et al. (2003).

[43] Other techniques that can be used for this purpose are catastrophe options, contingent notes, contingent equity, and swaps (see CBO (2002) for definitions and examples).

[44] See evidence reviewed in CBO (2002).

[45] See the summary of recent proposals in NAMIC (2002).

[46] NAMIC, "The Regulation of Property/ Casualty Insurance: The Road to Reform," April 8, 2002.

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