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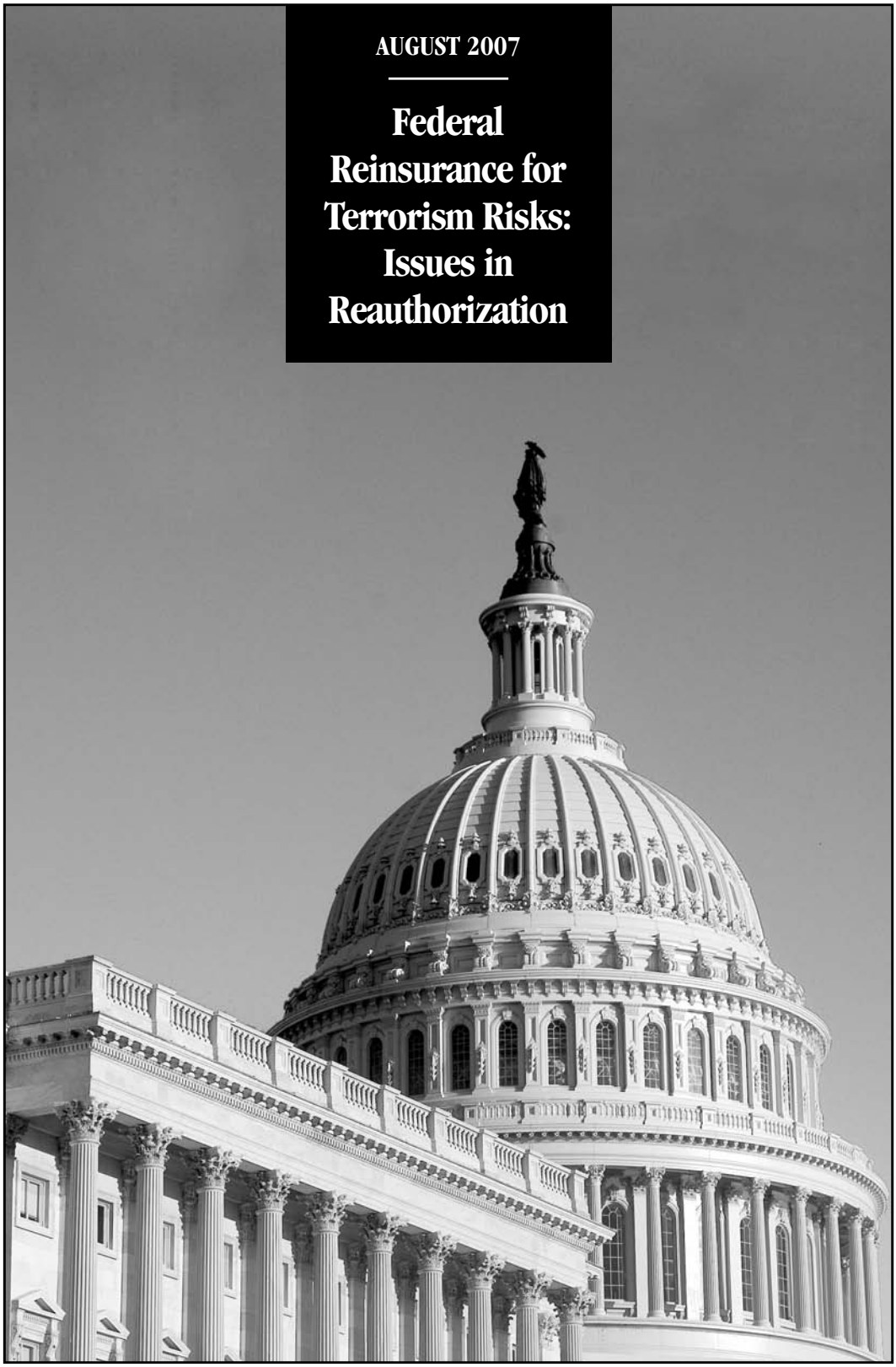
Federal Reinsurance for Terrorism Risks: Issues in Reauthorization



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The Congress of the United States ■ Congressional Budget Office

Note

Unless otherwise stated, all years cited in this paper refer to federal fiscal years.

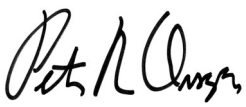
Preface

In November 2002, lawmakers enacted the Terrorism Risk Insurance Act (TRIA) to address disruptions in the insurance market following the terrorist attacks of September 11, 2001. Intended as a temporary backstop, the program was reauthorized in December 2005 and is scheduled to expire at the end of 2007.

This Congressional Budget Office (CBO) paper—prepared at the request of the Ranking Members of the Senate Budget Committee and the Banking, Housing, and Urban Affairs Committee—examines the federal reinsurance program established by TRIA and analyzes options that may prove relevant as the Congress considers reauthorizing the program a second time. The paper builds and expands on previous CBO work: *Federal Terrorism Reinsurance: An Update* (January 2005), *Federal Reinsurance for Disasters* (September 2002), and *Federal Reinsurance for Terrorism Risks* (October 2001). In keeping with CBO's mandate to provide objective, nonpartisan analysis, the paper makes no recommendations.

David Torregrosa of CBO's Macroeconomic Analysis Division wrote the paper under the guidance of Robert Dennis and Marvin Phaup. Perry Beider, Pete Fontaine, Mark Hadley, Arlene Holen, Daniel Hoople, Wendy Kiska, Mark Lasky, Donald Marron, Damien Moore, Judy Ruud, Susan Willie, and Tom Woodward, all of CBO, provided helpful comments on earlier drafts. The analysis also benefited from comments by Mary Jane Cleary of the National Council on Compensation Insurance; Ron Feldman of the Federal Reserve Bank of Minneapolis; Dwight Jaffee of the Haas School of Business at the University of California at Berkeley; Howard Kunreuther, Erwann Michel-Kerjan, and Kent Smetters of the Wharton School at the University of Pennsylvania; C. Christopher Ledoux and Roy Woodall of the Department of the Treasury; and James W. Macdonald of Navigant Consultants. Steve Atkins of Pool Re and Robert P. Hartwig of the Insurance Information Institute provided assistance with data, and Christopher Lewis of The Hartford and Debra Ballen of the American Insurers Association provided insights on terrorism insurance markets. (The assistance of external reviewers implies no responsibility for the final product, which rests solely with CBO.)

Loretta Lettner edited the paper, and Christine Bogusz proofread it. Maureen Costantino took the cover photograph and prepared the document for publication. Lenny Skutnik produced the printed copies, Linda Schimmel coordinated the print distribution, and Simone Thomas prepared the electronic versions for CBO's Web site (www.cbo.gov).



Peter R. Orszag
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August 2007

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Federal Reinsurance for Terrorism Risks: Issues in Reauthorization

Summary and Introduction

The terrorist attacks of September 11, 2001, cost insurers of all types nearly $36 billion in insured losses, reducing both their financial ability and willingness to cover future acts of terrorism.[1] Global reinsurers—private firms that purchase portions of the policies and premium income generated by other insurers—covered the majority of losses but subsequently limited the availability of that coverage sharply or priced it at such elevated rates that it was virtually unattainable. With the exit of private reinsurers from the marketplace and the reluctance of primary insurers to assume risk for acts of terrorism, the insurance industry began to show signs of disruption, which had the potential to reduce economic activity.

In response to that market contraction, lawmakers passed the Terrorism Risk Insurance Act (TRIA) in November 2002.[2] Intended as a temporary measure, the law was designed to help insurers recover from the economic shock of covering catastrophic losses and to give the industry time to develop more accurate ways of modeling terrorism risk. Another motivating factor was that the inability of private firms to obtain terrorism coverage seemed to exacerbate an already existing slowdown in the construction industry and a related loss of jobs. The TRIA program provided federal reinsurance to private insurers, increasing the availability of coverage and lowering the price of obtaining such coverage. Because the market disruption was expected to be short-lived, TRIA was set to expire at the end of calendar year 2005, and federal reinsurance was offered without charge. In late 2005, however, analysts were uncertain whether the market had recovered sufficiently to function without federal assistance, so lawmakers extended the act for two more years.

The Congress is again considering reauthorization of TRIA, which is scheduled to expire on December 31, 2007. However, the legislation raises difficult questions about economic efficiency and fairness in a climate of uncertainty. For instance, some analysts and policymakers maintain that TRIA does not lower the total costs of assuming terrorism risk but rather shifts some of the burden from commercial property owners and their tenants to the government and taxpayers. Others reason that it allocates the cost of assuming risks for acts of terrorism broadly across the citizenry.

TRIA's subsidies also appear to dampen the inclination of firms to relocate their operations away from high-risk areas, which may have both positive and negative effects. By encouraging continued commercial construction in major urban areas, TRIA helps preserve any "agglomeration economies" that are associated with clusters of related businesses concentrated in specific areas. However, such agglomeration also increases possible losses from a terrorist event. Some analysts believe that extending the life and coverage of the program is likely to weaken private incentives to mitigate risk and thereby

1. Estimates of losses are calculated in 2006 dollars and incorporate all insured losses, including group life and aviation. See Robert P. Hartwig, "9/11 and Insurance: The Five Year Anniversary" (New York: Insurance Information Institute, September 2006), available at http://server.iii.org/yy_obj_data/binary/773375_1_0/September%2011%20Anniversary.pdf.

2. TRIA applies to the following types of commercial insurance policies: property coverage, business-interruption coverage (which replaces financial losses when damages force companies to suspend operations), commercial liability coverage, and workers' compensation coverage. Excluded from eligibility would be losses covered by life insurance policies; private and commercial automobile and homeowners, condominium, and rental insurance policies; and aviation hull and liability losses. (A separate federal program provides terrorism insurance for air carriers.)

increase actual losses in the event of another attack. Faced with such trade-offs, policymakers may wish to consider various options that balance the need for market-based incentives with the goal of insuring firms against catastrophic terrorist events. Among those options are the following: extend TRIA in its current form on a temporary basis; extend TRIA but charge premiums for federal reinsurance; expand TRIA's coverage; and allow TRIA to expire.

This Congressional Budget Office (CBO) paper explores the budgetary and economic implications of each of those options. In addition, it assesses the effects of TRIA on the insurance industry and on the overall economy since the program's inception and first reauthorization.

Effects of TRIA

Under the current provisions of TRIA, insurance companies are required to offer terrorism coverage to their commercial property and casualty policyholders with terms (deductibles, coinsurance, and maximum claim payments or "limits") comparable to those available for other types of policies. But much of that mandated coverage is provided indirectly by the federal government, which commits to pay 85 percent of an insurer's loss, above a deductible, in the event of an attack. According to the terms of the law, the Secretary of the Treasury must certify that such attacks were committed by foreign terrorists or others acting on their behalf. Because the law was specifically designed to be short-lived, insurance providers are not required to pay premiums for the federal reinsurance. The price that insurers charge their commercial policyholders for coverage, including the federal reinsurance, is generally set by competition among insurers rather than by federal regulation. The law requires the government to recoup some or all of its costs by imposing taxes ("surcharges") on commercial insurance policies sold after a terrorist attack. The total cost of the insurance sold under TRIA is limited to $100 billion. If insured losses should exceed $100 billion, the Congress would revisit the issue to determine the sources and extent of any additional indemnity for losses.

Free federal reinsurance under TRIA helped increase the availability of terrorism insurance and reduce the price of obtaining such coverage. The reinsurance allowed insurers to better diversify their risks and lessened their likelihood of insolvency. It also gave them time to enhance their ability to model and price the risk of terrorism. A continuing decline in rates further increased purchases of coverage, which have more than doubled since 2003. The fall in rates has occurred even as the federal government's role has receded. In particular, insurers' deductibles and coinsurance payments as specified under TRIA have risen sharply over time.

As the private sector takes a bigger role, the disadvantages of TRIA—particularly the zero premium charge for federal reinsurance—may become more salient. For instance, in January 2006, the Congressional Budget Office estimated that the expected value of federal outlays from the two-year extension of TRIA through 2007 would be $1.7 billion and that the net value of governmental receipts from surcharges on policyholders would be $1.2 billion. Moreover, by keeping premiums for terrorism insurance artificially low, TRIA may encourage construction in areas at greatest risk of being targeted and thus could increase losses from a terrorist attack.

A possible advantage of TRIA is that federal support for the availability of insurance for terrorism risk, and more insurance in force, could reduce the need for federal assistance after an event. Many analysts view insurance as a more effective and equitable way of dealing with losses than federal disaster relief. However, the connection between postdisaster assistance and the cost of subsidized reinsurance is unclear. [3]

An efficiency argument in favor of subsidies for the purchase of terrorism insurance such as that provided by TRIA might be that the subsidies foster concentrations of certain types of economic activity in specific parts of urban areas that, in turn, have large positive effects on economic activity. For example, facilitating the rapid diffusion of knowledge and information may be fundamental to agglomeration economies in the central business districts of big cities. Those agglomeration economies could be diminished if either the scarcity or absence of terrorism insurance, or its high cost, caused firms to avoid locating in big cities that are perceived to be most at risk.

Policy Options

Options for continuing to encourage the recovery of the private insurance market and the industry's ability to

3. For further discussion of this issue, see Joseph E. Stiglitz, "Panel Discussion: What Is the Appropriate Role of the Federal Government in the Private Market for Credit and Insurance? What Is the Outlook?" *Review*, Federal Reserve Bank of St. Louis, vol. 88, no. 4 (July/August 2006), pp. 391–395.

manage terrorism risk include the following range of policy choices:

- Extend TRIA temporarily with progressively higher deductibles and copayments for insurers;
- Charge premiums for federal coverage instead of providing free reinsurance;
- Expand the types of losses covered by TRIA;
- Let TRIA expire;
- Replace TRIA with federal direct loans to insurers in cases of terrorism; and
- Provide subsidies to at-risk property owners for mitigation or for the purchase of terrorism insurance.

Currently, policymakers are considering extensions of TRIA of up to five years, as well as a permanent extension. A program with an explicitly short horizon gives policymakers periodic opportunities to assess changes in the market's ability to bear terrorism risk and to adjust program terms. However, a temporary program also adds to uncertainty about future policy and thus might weaken that program's effects on the insured. A long-term extension of TRIA could increase the size of losses from terrorism by the implied commitment to provide long-term subsidies to owners of buildings and other assets in high-risk areas. Development of private solutions could also be slowed, particularly if the extension was permanent. Those effects could be lessened by establishing a schedule of rising program "trigger levels" (the minimum amount of total insured losses that qualifies for financial support), deductibles, and coinsurance. Such a policy would also be consistent with the eventual elimination of TRIA.

Extending TRIA but charging insurers up-front premiums would reduce costs to taxpayers and raise costs incurred by commercial property owners, thereby strengthening incentives to reduce risk exposure. The major disadvantage of this option, however, is that setting premiums that vary according to a property's inherent risk is highly complex and requires more information than the government may be able to acquire. Alternatively, the government could more easily set a premium for terrorism risk equal to a fixed percentage of the basic coverage. Such a policy would provide only weak incentives for owners of high-risk properties to adopt measures to mitigate the risk of terrorist attacks. Auctioning federal reinsurance contracts might be a feasible pricing method because it could elicit insurance companies' valuations of risk. It would also allow prices to change over time. Because of the start-up costs involved, auctions are better suited to an intermediate or long-term extension than a temporary one.

Expanding TRIA to include acts of domestic terrorism would increase the availability of such coverage and lower costs to policyholders, as would requiring that insurers make available coverage for losses arising from attacks committed with weapons of mass destruction—described as nuclear, biological, chemical, and/or radiological (NBCR) attacks. TRIA did not require such coverage because it was typically excluded by insurers prior to 9/11. Covering domestic terrorism would also reduce the ambiguity of current law, particularly for cases in which domestic groups are acting in sympathy with, but not necessarily under the direction of, international terrorists. However, expanding the federal role would also increase the explicit risks borne by taxpayers, might weaken private incentives for mitigation, and could retard the development of private-sector solutions.

Group life insurance could also be covered in an expanded version of TRIA.[4] However, it appears that the supply of group life insurance has not been reduced by the threat of terrorism. Moreover, some life insurers are already securitizing mortality risk—that is, transforming the mortality risk of a pool of group life insurance policies into a tradable security, which allows providers to effectively reinsure those risks in the capital market.

Letting TRIA expire would reduce taxpayers' cost and could strengthen incentives for firms to consider terrorism risk when designing and locating new construction. But this option might also reduce the supply of commercial property coverage in the short run given the likely shortage of private reinsurance and increase the probable disruption in insurance markets resulting from a terrorist event—particularly an attack causing losses similar to those suffered in the assaults on the World Trade Center and the Pentagon or one involving weapons of mass destruction. The transition could be especially difficult

4. Group life insurance is a life insurance policy that is made available through an employer or association to participating employees or association members.

for workers' compensation insurers because of state regulations that limit risk-based pricing and the diversification of risk and that mandate coverage of risk from weapons of mass destruction.

Converting the program to one in which the government offered loans to insurance companies to permit them to finance claim payments and raise new capital in the event of large losses occurring from an act of terrorism is another alternative. This option could encourage the continuation of coverage immediately following a catastrophic attack without discouraging private risk-based premiums and induced mitigation in the long run. Such a program might require taxpayer subsidies—including loans with below-market interest rates—to induce insurers to offer the current level of coverage.

Substituting a program offering direct subsidies to at-risk property owners—in order to make insurance more affordable or to offset some mitigation costs—might be possible without an increase in the overall cost of the program. The cost of direct subsidies, however, would be more transparent in the budget than is the process for funding TRIA because the insurance subsidies are not reported in the budget as outlays. Currently, insured losses would be reported in the budget as paid after an event.

The Post–9/11 Market for Terrorism Insurance

Although there have been no major terrorist attacks in the United States since September 11, 2001, there is a growing awareness that the threat of terrorism will continue to be a national concern for the foreseeable future. The attacks in Europe and elsewhere—particularly the bombings in London on July 7, 2005, and in Madrid on March 11, 2004, as well as the attempted car bombings in London and Glasgow in June of 2007—serve as reminders that the risk is ongoing.

As policymakers contemplate the appropriate role of the federal government in assessing and managing terrorism risk, four questions may warrant consideration:

- How should gaps and inefficiencies in insurance markets—which can lead to failure by developers to undertake certain investments that, in a perfect market, would be undertaken—best be offset?
- How should future economic losses be limited? (With distorted mitigation incentives, some investments might occur that impose a larger risk than is justified by their returns.)
- Who should bear the cost of assuming and managing terrorism risk?
- How can government support be provided at the lowest possible cost to taxpayers?

A role for the government may exist when the market either does not provide insurance or provides insurance inefficiently or at too high a cost. In those circumstances, government participation could help correct deficiencies in the market and remove barriers to investment by developers of new commercial construction projects in major urban areas. If terrorism insurance was not available, investors might overreact to perceived risks and shy away from putting up capital.

The level and design of government intervention, however, are critical considerations. Just as markets can sometimes fail by not providing adequate insurance or by providing it inefficiently or at high cost, government policies can also be subject to failure or otherwise have unintended consequences. In particular, the government may have incentives to undercharge those who benefit from the intervention and provide subsidies to beneficiaries, especially when those subsidies are not transparent in the budget. The government may also foster policyholders' expectations of receiving assistance after an event, which in turn discourages the purchase of insurance even if it is subsidized.[5] Thus, the danger is that government intervention might solve the problem of inadequate supply of terrorism insurance but could worsen another one. If firms' mitigation incentives are affected by premium rates, then government subsidies might reduce their response to the terrorist threat and thus increase the potential for losses from a terrorist event.

A related issue is deciding who should bear the cost of assuming risk for losses linked to acts of terrorism. Left to the private market, terrorism risks would be borne most directly by property owners and their insurers, if insurance was available. Some people argue, however, that tax-

5. See Stiglitz, "Panel Discussion: What Is the Appropriate Role of the Federal Government in the Private Market for Credit and Insurance?"

payer subsidies may be justified because acts of terrorism are directed at all Americans. Under that reasoning, terrorism insurance is just one element in an overall national security response to terrorism. A downside of such reasoning is that shifting a large part of the cost to government could undermine incentives for mitigation and increase the total cost to society of a terrorism event.

The government might have a long-term interest in fostering an insurance market for terrorism risk if widespread insurance coverage reduced the need for federal assistance after an event. Taxpayers might still be liable for some losses related to terrorism whether or not an explicit program existed.[6] If part of the risk was covered by the private market, taxpayers could experience lower total costs in the long run.[7] However, other analysts are more uncertain about the amount of supplemental assistance that might go to property owners for uninsured damages and to businesses for lost revenues.

Addressing the Market's Comprehensiveness and Efficiency

Without federal intervention in the market for terrorism insurance, the scarcity or absence of terrorism insurance might deter businesses from making investments because they could not allay the risk associated with those investments. Thus, federal policy depends in part on the ability and willingness of insurers to accept and price terrorism risks on the basis of their estimates of the frequency and severity of losses, which are subject to significant uncertainty. Two factors are particularly important in determining the supply of terrorism insurance: the reliability of insurers' risk models, which allow them to price risk; and insurers' capital or net worth (assets minus liabilities), which allows them to take on risks. Those factors also affect the supply of reinsurance, which allows insurers to spread their terrorism risk and thus lower their risk of insolvency.

Even if risk cannot be priced with great precision, insurance markets may function reasonably well as long as those insurers bearing risks are compensated for the uncertainty that surrounds estimates of the probabilities of their incurring losses.[8] For instance, private markets for earthquake insurance exist despite differing estimates of the risk of loss associated with such natural disasters; and insurance was available for the early telecommunications satellites even though there is no historical record to forecast expected losses from technical glitches and launch failures. Estimating terrorism risk is more uncertain, however, because of the lack of historical data regarding the frequency and severity of such attacks and the need to predict the changing tactics, strength, and effectiveness of terrorists. The uncertainty that surrounds estimates of the frequency and severity of losses from terrorist events is unlikely to diminish significantly in the next two to five years; at best, insurers may get more comfortable with assuming greater risk.

Lack of capital may not be a major issue for insurance firms as long as terrorist attacks are expected to be carried out with conventional weapons, which are expected to have geographically limited effects. Many insurance companies avoid concentrating their exposure in small areas and thus would experience only a limited loss of capital even in the case of a catastrophic event such as the attacks of September 11. However, an attack with a wide geographic spread, such as one involving weapons of mass destruction or coordinated conventional attacks, could deplete much of the capital reserved by insurers for underwriting all their insurance risks, not just terrorism risks. In that case, the insurance industry could temporarily be unable to function, and many policyholders could lose terrorism coverage and possibly other types of property and casualty coverage as well. Indeed, 9/11 was followed by a sharp drop in terrorism coverage offered by the reinsurance markets, which led to primary insurers' dropping terrorism coverage, at least where they were allowed to do so by state regulators. (Some states, including New York and California, responded to the reduced

6. For examples of the problems that may complicate postdisaster spending, see Government Accountability Office, *Hurricanes Katrina and Rita Disaster Relief: Continued Findings of Fraud, Waste, and Abuse*, GAO-07-300 (March 2007), available at www.gao.gov/new.items/d07300.pdf.

7. See Howard Kunreuther and Mark Pauly, "Rules Rather Than Discretion: Lessons from Hurricane Katrina," *Journal of Risk and Uncertainty*, vol. 33 (September 2006), pp. 101–116, and Robert E. Litan, "Sharing and Reducing the Financial Risks of Future 'Mega-Catastrophes,' " *Issues in Economic Policy,* no. 4 (Washington, D.C.: Brookings Institution, March 2006), available at www.brookings.edu/dybdocroot/views/papers/200603_iiep_litan.pdf.

8. See Dwight M. Jaffee and Thomas Russell, "Terrorism Insurance: Rethinking the Government's Role," *Issues in Legal Scholarship,* Symposium on "Catastrophic Risks: Prevention, Compensation, and Recovery" (Berkeley Electronic Press, 2007), article 5, pp. 1–17, available at www.bepress.com/ils/iss10/art5.

coverage by requiring insurers to offer terrorism coverage.) This concern helped motivate the decision to enact TRIA.

In the absence of a federal mandate, insurers have a strong incentive to offer terrorism coverage to their commercial customers because to do otherwise risks their losing business on other property and casualty lines. Indeed, even with federal reinsurance under TRIA, private insurers and policyholders would bear many of the costs of a terrorism event similar in magnitude to that of 9/11.[9] Insurers are already writing and pricing coverage that exposes them to significant potential losses, which suggests that the market will function even if the federal backstop was removed. What could change, however, is the amount of insurance (the dollar limit on reimbursable claims) offered to firms.[10] Moreover, how well the market would function after a big event is uncertain.

Underdeveloped Markets. The market to protect against risks posed by weapons of mass destruction—nuclear, biological, chemical, and/or radiological risks—continues to be underdeveloped. Historically, such risks have been excluded, except in workers' compensation policies. Some analysts question whether a market designed to accommodate those risks will develop without government intervention, for several reasons.[11] First, the potential size of losses resulting from the use of weapons of mass destruction could exceed the net worth of the insurance industry.[12] This suggests that private insurers may not be able to bear all the risk. Second, estimating and measuring those losses may be more difficult than estimating and measuring losses from conventional terrorist attacks.[13] This factor leads some to question whether such risks are insurable; however, some NBCR risks are, in fact, already insured, and there is limited reinsurance available. Third, many policyholders either do not see themselves as at risk or, even if they do, do not find it economical to purchase coverage.[14] Fourth, those at risk may assume that the federal government will provide assistance after an attack.

Alternatives to Insurance. Purchasing insurance is not the only means of attempting to allay risk. For example, a firm that operates in different locations thereby diversifies its risk. The owners of the firm—its shareholders—can further diversify their risk by purchasing shares in different corporations. These risk-sharing mechanisms are powerful; indeed, in the absence of capital-market imperfections, such as high transaction costs, imperfect information, and government regulations, risk diversification could be entirely achieved without insurance.[15] Moreover, because insurers must cover administrative costs, insurance premiums are generally higher than the expected payouts under coverage. Some large firms go without insurance (that is, they self-insure) for ordinary risks and might also do so for terrorism risks.[16] For instance, some large chemical companies already deal with a variety of risks related to accidental releases (such

9. For example, see Howard Kunreuther and Erwann Michel-Kerjan, *Looking Beyond TRIA: A Clinical Examination of Potential Terrorism Loss Sharing,* Working Paper No. 12069 (Cambridge, Mass.: National Bureau of Economic Research, February 2006), available at www.nber.org/papers/w12069.pdf; *TRIA and Beyond: Terrorism Risk Financing in the U.S.*, report issued by the Wharton Risk Management and Decision Processes Center (Philadelphia: University of Pennsylvania, The Wharton School, August 2005), available at http://knowledge.wharton.upenn.edu/papers/1299.pdf; and Stephen J. Carroll and others, *Distribution of Losses from Large Terrorist Attacks Under the Terrorism Risk Insurance Act* (Santa Monica, Calif.: Rand Corporation, Center for Terrorism Risk Management Policy, 2005), available at www.rand.org/pubs/monographs/MG427.

10. For that reason, when considering a price measure, some analysts prefer the premium as a percentage of the limit of a policyholder's coverage over the premium as a percentage of total insured value.

11. *Terrorism Risk Insurance*, Report of the President's Working Group on Financial Markets (September 2006), pp. 72–80, available at www.ustreas.gov/offices/domestic-finance/financial-institution/terrorism-insurance/pdf/report.pdf. (That group included the Department of the Treasury, the Federal Reserve Board of Governors, the Securities and Exchange Commission, and the Commodity Futures Trading Commission.)

12. For example, see American Academy of Actuaries, *Comments on "Terrorism Risk Insurance, Report of the President's Working Group on Financial Markets"* (Department of the Treasury, Office of Financial Institutions Policy, April 21, 2006), available at www.actuary.org/pdf/casualty/tris_042106.pdf.

13. Government Accountability Office, *Terrorism Insurance: Measuring and Predicting Losses from Unconventional Weapons Is Difficult, But Some Industry Exposure Exists*, GAO-06-1081 (September 2006), available at www.gao.gov/new.items/d061081.pdf.

14. See Department of the Treasury, Office of Economic Policy, *Assessment: The Terrorism Risk Insurance Act of 2002* (June 30, 2005), p. 105, available at www.treasury.gov/press/releases/reports/063005%20tria%20study.pdf.

15. See Jaffee and Russell, "Terrorism Insurance: Rethinking the Government's Role," pp. 7–9.

16. See *TRIA and Beyond: Terrorism Risk Financing in the U.S.*, pp. 156–157.

as toxic spills or explosions) that could cause heavy losses, and, as a result, they invest heavily in mitigation.

Opportunities for investors to diversify their assets are widely available. Property owners can diversify their holdings through real estate investment trusts, debt holders can buy commercial mortgage-backed securities, and both stock and bond investors can diversify their portfolios through mutual funds. Holding a diversified portfolio provides investors with hedges against risky cash flow and thus largely eliminates the need for a firm to hedge or purchase insurance.[17] By contrast, the owners of small privately held businesses may not be well diversified, and thus those firms may benefit from insurance.

However, the ability of owners to diversify will affect a firm's decision to buy or not buy insurance only to the extent that the firm is operating exclusively in the interest of the owners. For a variety of reasons, including a lack of transparency on the part of a firm's officers, a company's behavior can deviate from the shareholders' interest and that can lead to managers' deciding to purchase insurance for the firm.[18] For example, managers may purchase terrorism insurance to protect themselves against negligence or wrongful-death suits in the event that their firm suffers losses in a terrorist attack. In fact, terrorism insurance is sometimes required as part of directors' and officers' liability coverage.[19]

A firm may also face pressure to seek insurance from its business partners and other investors. Bond contracts frequently require firms to purchase insurance to reduce the likelihood of default and thus the expected cost of financial distress (bankruptcy costs).[20] For example, debt holders typically require coverage for commercial mortgage-backed securities, in part to get a better credit rating for the issue. That, in turn, improves liquidity. Similarly, banks may require insurance on loans to protect their exposure to risk brought about by the possible default on commercial loans in the event of an attack. State regulations are also a big factor: For example, almost all states, including California and New York, require insurance coverage for workers' compensation claims, and they allow very few exclusions (see Box 1).

Limiting Future Losses: The Role of Mitigation

Owners of assets considered vulnerable to terrorist attacks can adopt measures to reduce their expected losses from such an attack. Those measures can include diversifying the locations in which they do business; constructing new offices, plants, or other commercial buildings that are inherently more secure and enhancing the structural security of already existing buildings; or introducing other forms of security, such as screening or monitoring devices. Insurance pricing potentially can reflect the benefits of taking action to reduce risk by offering discounts.

One step toward mitigation takes into account geographic considerations. Some analysts believe that the risk of terrorism reduces the desirability of locating businesses or other commercial enterprises in high-profile, landmark buildings in general and in high-density areas such as New York City and Washington, D.C., in particular.[21] Evidence exists that some post–9/11 business decisions regarding location have taken into account terrorism risk. For example, after 9/11, vacancy rates increased significantly for landmark buildings such as the Sears Tower in Chicago, which is the tallest building in the United States, and for buildings in close proximity. By contrast,

17. Hedges are used to offset risk through a set of transactions in financial markets. In this case, investors can protect themselves against big losses suffered by one company by buying stock in a variety of other companies. However, investors will still be exposed to market risk—the risk that stock prices in general, rather than just the stock of a particular company, will fall.

18. Jaffee and Russell, "Terrorism Insurance," pp. 7–9.

19. The growth of such coverage is partly attributable to the Sarbanes-Oxley Act. See Erwann Michel-Kerjan and Burkhard Pedell, "How Does the Corporate World Cope with Mega-Terrorism? Puzzling Evidence from Terrorism Insurance Markets," *Journal of Applied Corporate Finance*, vol. 18, no. 4 (Fall 2006), pp. 61–75, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=950419.

20. Daniel Aunon-Nerin and Paul Ehling, "Why Firms Purchase Property Insurance," Swiss Finance Institute Research Paper No. 07-16 (May 2007), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=972120.

21. Edward L. Glaeser and Jesse M. Shapiro, "Cities and Warfare: The Impact of Terrorism on Urban Form," *Journal of Urban Economics*, vol. 51, no. 2 (March 2002), pp. 205–224.

Box 1.

TRIA and Workers' Compensation

Workers' compensation insurance provides wage replacement and medical benefits on a "no fault" basis to employees who are injured on the job and death benefits to survivors of workers who die in a work-related accident, including a terrorist attack.[1] All states except Texas require employers to provide this type of insurance to their workers, and premiums are heavily regulated. Those regulations can limit the supply of workers' compensation insurance in the private market and increase the use of "involuntary placements," a practice that affects employers deemed to be at high risk of incurring workers' compensation losses. If those firms are denied coverage by private insurers at prevailing rates, they are forced into the involuntary (or residual) market for coverage. While there are differences in the structure of the workers' compensation market across states, some general observations are possible:

- Virtually no exclusions are allowed. Workers' compensation must include coverage against acts of terrorism, including losses resulting from the use of nuclear, biological, chemical, and/or radiological (NBCR) attacks. Little private reinsurance is currently in force that protects against NBCR risks—estimates range from $900 million to $1.6 billion.[2] However, under the current provisions of the Terrorism Risk Insurance Act (TRIA), private reinsurance is needed only for insurers' deductibles and copayments. The possibility of incurring large losses could threaten many insurers' solvency in the absence of TRIA and a cap on exposure.

- Regulatory constraints frequently result in rate suppression and cross-subsidies, both of which subsidize high-risk activities and reduce financial incentives for firms to mitigate losses.[3] Terrorism loss costs, which feed into rates in most states, are a uniform percentage of the base rate—typically $0.02 per $100 of payroll in the voluntary market to cover losses in 2006 under TRIA.[4] Moreover, most states—New York being the notable exception—require that an employer purchase workers' compensation insurance from a single insurer, which decreases opportunities for the diversification of big policies by insurance companies. As a result of regulation that limits the risk-rating of premiums, a firm with a small number of employees in a rural area would pay the same rate for the terrorism insurance component of workers' compensation as a large firm in a major metropolitan area in the same state. By contrast, a market solution would be to charge higher premiums for riskier locations.

1. "No fault" insurance means that coverage is provided without a finding of who is at fault for an accident. In return for employers' providing such coverage, workers generally lose the right to sue their employers after an accident.
2. See *Terrorism Risk Insurance*, Report of the President's Working Group on Financial Markets (September 2006), p. 26.
3. Patricia M. Danzon and Scott E. Harrington, "Workers' Compensation Rate Regulation: How Price Controls Increase Costs," *Journal of Law and Economics*, vol. 44 (April 2001), pp. 1–36, available at www.journals.uchicago.edu/JLE/journal/issues/V44n1/004103.web.pdf.
4. See *Terrorism Risk Insurance*, pp. 41–42.

Box 1.

Continued

- State regulation can increase the size of the residual market by denying firms the flexibility to set risk-based rates. Residual markets act as insurers of last resort and are established by law rather than as a result of market forces. Employers who cannot purchase insurance in the voluntary market where insurers willingly offer coverage typically purchase insurance in the residual market at higher rates. Typically the allowable loss cost, which is a major component of the premium, for terrorism risk is $0.03 per $100 of payroll. In many states, firms that write policies in the voluntary market are forced to participate in the residual market. (Some states have their own workers' compensation funds.) Workers' compensation insurers in many states have limited options to manage their exposure to terrorism risk. The size of the residual market grew significantly in the period between the attacks of September 11, 2001, and the creation of TRIA. For example, the *Washington Post*, *National Geographic*, and the Kennedy Center entered the District of Columbia's residual pool after the attacks.[5] Those employers present concentrated exposures of high-income workers at landmark properties that could be targets of terrorist attacks.

All of these factors suggest that workers' compensation markets could face disruption if TRIA was permitted to expire.[6]

5. National Council on Compensation Insurance, "Comments to the President's Working Group on Financial Markets on the Long Term Availability and Affordability of Terrorism Risk Insurance" (April 2006), available at www.ncci.com/ncci/media/pdf/Terrorism_NCCI_Presidents_Group.pdf.

6. *TRIA and Beyond: Terrorism Risk Financing in the U.S.*, Report issued by the Wharton Risk Management and Decision Processes Center (Philadelphia: University of Pennsylvania, The Wharton School, August 2005), p. 8.

vacancy rates increased much less in other areas of the city.[22]

This particular attempt at mitigation can have a downside, however. Shifting economic activity away from major urban centers could compromise the benefits that arise when businesses conduct their activities in areas heavily populated by other businesses—so-called agglomeration economies. Those agglomeration economies are often centered in the business districts of larger cities and reflect the rapid diffusion of knowledge and information that results in a dense grouping of related businesses. For example, New York has long been a center of finance, business management, and business services in part because its density facilitates face-to-face meetings and the immediate exchange of new ideas while offering proximity to large pools of qualified workers.[23] To the extent that economic activity in central business districts could be affected by changing perceptions of terrorism risk, as suggested by the post–9/11 changes in Chicago's vacancy rates, federal subsidies might be appropriate to help maintain those spillover benefits. Alternatively, if firms' managers differed in the degree of risk they were willing to accept or in their individual perceptions of terrorism risk, they still might decide just to relocate

22. Vacancy rates for three Chicago landmark properties and the immediate surrounding area rose from 9 percent in the first quarter of 2001 to 17.4 percent in the first quarter of 2006. By contrast, the vacancy rates in other areas of Chicago increased much less—from 7 percent to 12.3 percent. See Alberto Abadie and Sofia Dermisi, *Is Terrorism Eroding Agglomeration Economies in Central Business Districts? Lessons from the Office Real Estate Market in Downtown Chicago*, Working Paper No. 12678 (Cambridge, Mass.: National Bureau of Economic Research, November 2006), available at www.nber.org/papers/w12678.pdf.

23. Edward L. Glaeser, "Urban Colossus: Why Is New York America's Largest City?" *Economic Policy Review*, Federal Reserve Bank of New York, vol. 11, no. 2 (December 2005), pp. 8–23, available at www.newyorkfed.org/research/epr/05v11n2/0512glae.pdf.

within a given city, thereby avoiding a significant drop in agglomeration economies.[24]

A second mitigating response might be to construct or physically reinforce large buildings so that they're structurally more resistant to acts of terrorism. Some evidence exists that building codes for high-rise commercial construction in certain areas have changed in response to the attacks of 9/11and that terrorism-related improvements to both the interiors and exteriors of buildings are being made to improve safety. Those improvements range from creating better air-filtration systems, designing stairwells that facilitate evacuation, and installing barricades around the perimeter of buildings to keep vehicles away.[25] Insurance-premium structures often provide incentives to businesses to construct safer buildings and could provide incentives that would otherwise reduce exposure to terrorism risks, including relocating or protecting air-intake systems or installing shatterproof windows. Insurers could even go a step further and hire inspectors to evaluate the safety and security of high-risk plants seeking terrorism coverage.[26]

A third approach to mitigation would be for businesses to invest in technology designed to increase the security of existing properties. Such equipment might include metal detectors for screening visitors or security cameras to monitor activity both inside and outside a building. However, it is unclear to what degree this type of mitigation is cost-effective given the ability of terrorists to adjust their tactics in response to preventive measures. Although the optimal level of terrorism mitigation is difficult to determine, market forces alone may result in a level of security that is too low because firms do not have incentives to take into account how their actions may also benefit others. Government involvement might rectify such underinvestment.[27]

Assuming the Cost of Terrorism Risk

TRIA does not lower the total costs of terrorism risk but rather shifts more of the burden from commercial property owners and their tenants to taxpayers. In the absence of federal intervention, property owners and firms would have to either rely on private insurance markets to allocate terrorism risks to those most willing to bear such risks or retain those risks by self-insuring. Thus, those who accept or are unable to avoid the greatest exposure to terrorist attacks would pay the costs.

There are rationales for spreading some of the cost of risk across all taxpayers. To the extent that a federal terrorism reinsurance program is part of the nation's antiterrorism policy, some argue that its costs should be borne by taxpayers just as other national security expenses are.[28] This view is reinforced by surveys that indicate strong public support for federal aid to victims of terrorism.[29] Further, in the absence of insurance subsidies, firms might alter their investment decisions in ways that are costly to the economy—for instance, by choosing not to build high-rises in major urban areas, thus losing some of the benefits of locating businesses close together.

The federal government could collect premiums before an event, as private insurers do, or use its sovereign powers to recover some or all of its losses after an event. This timing decision involves significant trade-offs. The government may prefer to recoup its costs from commercial policyholders after an event rather than charging premiums ahead of time because it lacks the information necessary to model and price the risk of terrorism. But by subsidizing coverage, the government may be delaying or

24. See Glaeser and Shapiro, "Cities and Warfare."

25. James W. Macdonald, "Preparing for Catastrophes in the Workplace" (presentation given at the National Academy of Social Insurance Policy Research Symposium on "Health and Income Security for Injured Workers: Key Policy Issues," Washington, D.C., October 12, 2006), available at www.nasi.org/usr_doc/James_Macdonald_NASI_Presentation_10_12_06.pdf.

26. Statement of Peter R. Orszag, senior fellow, Brookings Institution, "Homeland Security and the Private Sector," before the National Commission on Terrorist Attacks Upon the United States, November 19, 2003, available at www.brookings.edu/views/testimony/orszag/20031119.pdf.

27. Congressional Budget Office, *Homeland Security and the Private Sector* (December 2004); and Orszag, "Homeland Security and the Private Sector."

28. Lloyd Dixon and Robert Reville, "National Security and Private-Sector Risk Management for Terrorism," in Philip Auerswald and others, eds., *Seeds of Disaster, Roots of Response: How Private Action Can Reduce Public Vulnerability* (New York: Cambridge University Press, 2006), pp. 292–304; and Peter Chalk and others, *Trends in Terrorism: Threats to the United States and the Future of the Terrorism Risk Insurance Act* (Santa Monica, Calif.: Rand Corporation, Center for Terrorism Risk Management Policy, 2005), available at www.rand.org/pubs/monographs/MG393/.

29. W. Kip Viscusi and Richard J. Zeckhauser, *National Survey Evidence on Disasters and Relief: Risk Beliefs, Self-Interest, and Compassion*, Working Paper No. 12582 (Cambridge, Mass.: National Bureau of Economic Research, October 2006), available at www.nber.org/papers/w12582.pdf.

reducing developers' and existing property owners' incentives to mitigate potential losses and thus could increase future losses to the economy after an event.

Providing Government Support at Minimal Cost

Increasing the availability of terrorism insurance might also reduce post-event assistance, which has been considerable in recent years. According to CBO's estimates, additional federal spending for hurricane-related disaster assistance—primarily for Hurricane Katrina, which resulted in $41.8 billion in insured losses (in 2006 dollars), according to the Insurance Information Institute—together with various forms of tax relief will add about $125 billion to the deficit over the 2006–2010 period.[30] However, federal disaster assistance to individuals, businesses, and state and local governments following 9/11 totaled $25 billion to $33 billion or more, depending on which outlays are assumed to be directly related to the attacks.[31] This suggests that even when most businesses and individuals have insurance, federal assistance can still be substantial. Nonetheless, when contemplating policy options, lawmakers may still want to take into account the effects that a federal terrorism reinsurance program may have on future assistance.

Federal Terrorism Insurance

The Terrorism Risk Insurance Act, enacted in November 2002 and amended in December 2005, created a temporary federal reinsurance program to transfer much of the risk associated with acts of terrorism to taxpayers. After the attacks of September 11, 2001, providers of commercial property and casualty insurance were reluctant to continue providing terrorism coverage because of the uncertainty associated with quantifying those risks—primarily, the difficulty in predicting the frequency and severity of such attacks—and the potential for extreme losses. Policymakers feared that a shortage of coverage could reduce overall economic activity, particularly in an already ailing commercial construction industry. However, analysts also expected that in the long run the insurance market would recover and be able to offer protection against terrorism risk through traditional insurance products and capital-market instruments such as catastrophe bonds.[32]

TRIA was intended to fill the gap in the supply of terrorism insurance until private insurers—including reinsurers, who according to the Insurance Information Institute bore about 60 percent of the losses from the September 11 attacks—could recover. Specifically, the federal backstop was designed to enable private insurers to spread their risks of catastrophic loss resulting from acts of terrorism. Because the program provides explicitly temporary assistance, the government does not charge private insurers for the reinsurance. TRIA's backers originally reasoned that the process of formulating prices would slow the program's implementation and necessitate a new bureaucracy to administer the premiums, which could also eventually encumber efforts to terminate it. TRIA is scheduled to expire at the end of calendar year 2007.

Original Provisions and Amendments

Under TRIA, companies that provide commercial property and casualty insurance are required to offer terrorism coverage with the same deductibles and limits (caps on the amount of coverage) as those applying to the underlying property and casualty policies. Terrorism coverage thus supplements the traditional property and casualty

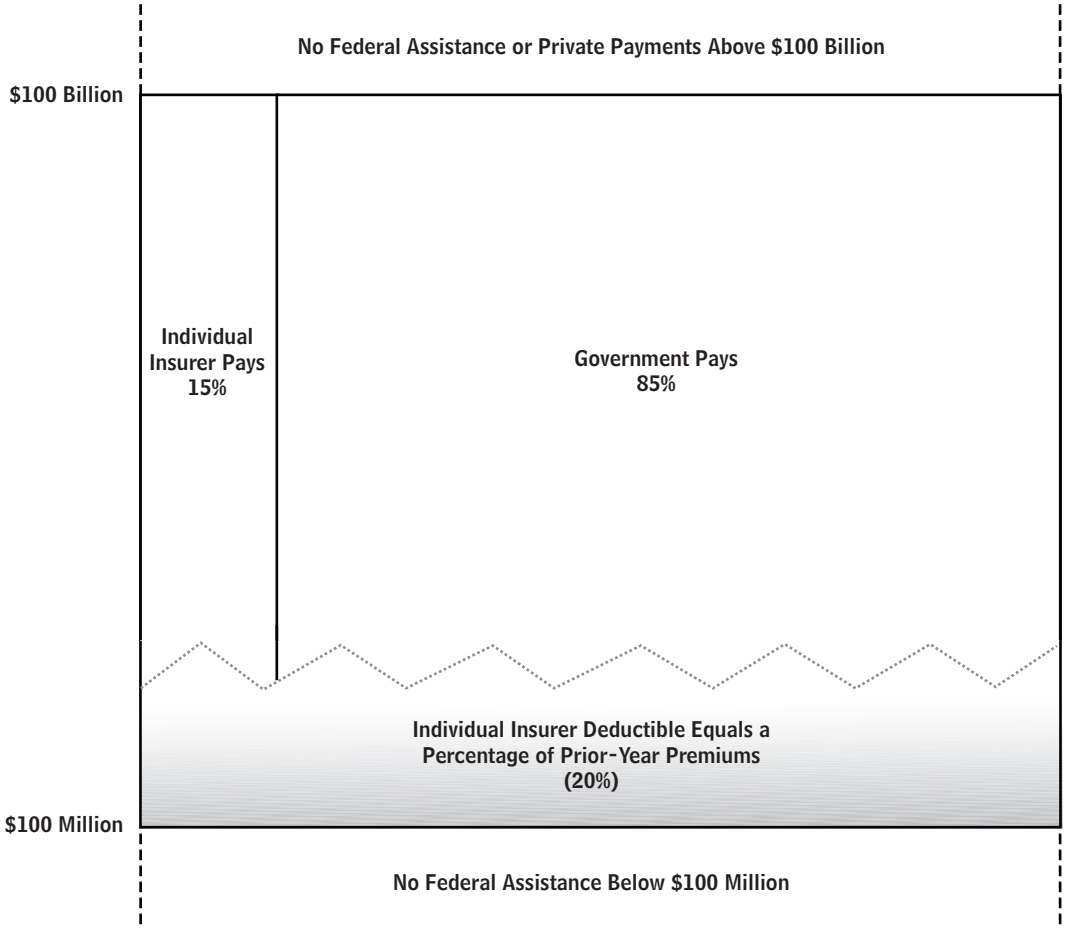
30. There were five supplemental spending bills through which direct assistance was provided. The first three supplemental bills appropriated $68 billion, including $37 billion for the Disaster Relief Fund of the Federal Emergency Management Agency. A fourth supplemental (Public Law 109-234) provided an additional $20.2 billion in spending. See President's Council on Integrity and Efficiency, Executive Council on Integrity and Efficiency, *Oversight of Gulf Coast Hurricane Recovery: A Semiannual Report to Congress, April 1, 2006–September 30, 2006* (October 2006), available at www.ignet.gov/pande/hsr/hksemi0906.pdf. The 2007 supplemental (P.L. 110-28) added $7.0 billion in spending, including another $4.1 billion for the Disaster Relief Fund. In addition to authorizing direct assistance, the Congress increased the borrowing authority of the flood insurance program to $20.8 billion, of which a total of $17.5 billion has been used, primarily to pay hurricane-related claims. The Congress also provided an estimated $14 billion in various types of tax relief to businesses and individuals, as well as tax incentives for residents of and investors in a newly designated "Gulf Opportunity Zone" composed of areas hardest hit by Hurricane Katrina. See Congressional Budget Office, *The Budget and Economic Outlook: Fiscal Years 2007 to 2016* (January 2006), pp. 107–109.

31. See Congressional Budget Office, *Federal Terrorism Reinsurance: An Update* (January 2005), pp. 25–26.

32. Insurance risks can also be securitized and thus transferred to international capital markets, whose size allows greater risks to be borne by investors. See J. David Cummins, "Should the Government Provide Insurance for Catastrophes?" *Review*, Federal Reserve Bank of St. Louis, vol. 88, no. 4 (July/August 2006), pp. 337–379.

Figure 1.

Initial Allocation of Claims Under TRIA, 2007



Source: Congressional Budget Office.

Notes: TRIA = Terrorism Risk Insurance Act (as enacted in 2002 and amended in 2005).

In a process known as recoupment, the federal government would recover some of its costs following a terrorist event by assessing taxes, referred to as surcharges, on property and casualty insurers (equaling a maximum of 3 percent of their prior-year premiums) until total industry payments reached a set "industry retention" amount or the government was fully repaid, whichever came first. The industry retention amount is $27.5 billion in 2007.

policy. Simply mandating coverage does not necessarily bring it about, however, because a provider could offer terrorism insurance but only at prohibitive prices. To lower rates for terrorism insurance, the federal government agreed to pay most of an insurer's losses, above a deductible, in the event of an attack by foreign terrorists. Insurers would pay the deductible (defined as a percentage of each individual insurer's prior-year premiums for TRIA lines) and a portion of the remainder of their losses—up to a combined limit to private insurers and the government of $100 billion per year. The deductibles for the largest insurers now exceed $1 billion. (Figure 1 illustrates the loss-sharing provisions.) Under TRIA's current provisions, if terrorism losses exceed $100 billion, neither private insurers nor the government will have any explicit liability for the amount over the limit. So, in principle, the remainder of the loss would be retained (assumed) by policyholders.

After an event, the government would recover some or all of its costs by taxing policyholders. The difference between the aggregate industry retention amount (essentially a deductible for the commercial property and casualty industry as a whole) and the amount of claims paid

by insurers through their TRIA deductibles and coinsurance payments determines the amount of losses that the Treasury must recoup over time through taxes, or surcharges, on policyholders. The industrywide retention level is relatively high—$27.5 billion. Thus, the federal government is ultimately at risk only for losses above $27.5 billion. By comparison, total insured losses stemming from the attacks of 9/11 were about $36 billion (in 2006 dollars), of which about $29.5 billion would have fallen under TRIA-eligible lines if the law had been in effect at the time, according to estimates by the Insurance Information Institute.[33] So even if another attack occurred that was similar in magnitude to those on the World Trade Center and the Pentagon, the federal government would bear relatively little of the insured losses in the long run under TRIA. However, commercial policyholders, including those with no insured losses and even those without terrorism coverage, could face a sizable tax burden.

Just two weeks before TRIA was set to expire on December 31, 2005, policymakers concluded that the insurance industry had not recovered sufficiently to operate without the program's support. As a result, the Congress reauthorized the program for two more years. The law was amended, however, so that in comparison with the original provisions, federal exposure to terrorism risk was decreased. In keeping with the intentions of the original act, the extension carved out a bigger role for the private sector each year. Specifically, the extension act modified the original legislation in the following ways:

- The "loss trigger"—the minimum amount of losses that would trigger federal involvement under TRIA—increased from $5 million in 2005 to $100 million in 2007;
- Insurers' deductibles as a percentage of their prior-year premiums rose from 15 percent in 2005 to 20 percent in 2007;
- Insurers' coinsurance payments (the cost-sharing provision above the deductible) rose from 10 percent of insured losses in 2005 to 15 percent in 2007;
- The aggregate industry retention amount increased from $20 billion in 2005 to $27.5 billion in 2007; and
- Some well-diversified insurance lines, including commercial automobile and professional liability (except that applying to directors and officers)—which should be available even in the absence of federal reinsurance—were eliminated.

The increase in the loss trigger for federal payments addressed an unintended consequence of the original legislation—it increased the incentive for corporations to establish wholly owned "captive" insurers as subsidiaries.[34] (Captive insurance constitutes a form of self-insurance through which the parent company transfers risk to another company within its holding-company structure rather than contracting with an outside company to assume such risk.) By establishing a captive insurer with the primary purpose of providing the parent company with terrorism insurance, a corporation could pass most of its terrorism losses, including otherwise uninsurable NBCR losses, to taxpayers and other policyholders after paying only a small deductible.

The 2005 modifications to TRIA—especially the increase in insurers' deductibles from 7 percent of their prior-year premiums in 2003 to the current rate of 20 percent—left insurers in the private market with an expanded role but also exposed more firms to the possibility that their credit rating would be downgraded following an act of terrorism. As a rule of thumb, credit-rating agencies would be concerned if losses exceeded 10 percent of net worth. (Insurers' net worth or capital, also called policyholders' surplus, is a safety cushion that they can draw down in the event of unexpected losses.) Credit ratings are important because they affect a firm's borrowing costs. A firm with a low rating has to pay a higher interest rate on its debt and may not be able to attract larger commercial clients, who prefer working with more highly rated insurers. A study conducted in 2005 found that over half of the providers of commercial property and casualty insurance (232 out of 451) had deductibles under TRIA that exceeded 15 percent of their net worth. The analysis also estimated that, as measured by their net worth, 18 of the top 30 insurers would have a TRIA deductible in 2007 that was greater than 10 per-

33. Communication to the Congressional Budget Office from Robert P. Hartwig, president, Insurance Information Institute, May 5, 2007.

34. See *TRIA and Beyond*, p. 5; and Department of the Treasury, *Assessment*, p. 31.

cent of their net worth; of those 18 insurers, the study concluded, 13 would have a deductible greater than 20 percent of their net worth. The mean ratio of deductible to net worth increased from 6 percent in 2003 to an estimated 20 percent in 2007.[35]

Although insurers pay no premiums for coverage under TRIA, the Treasury would be required in the aftermath of a terrorist attack to recoup some of the costs incurred by the government for paying the reinsurance claims. To accomplish that goal, the Treasury would assess taxes on all commercial policyholders, including those who elected not to purchase terrorism insurance. By law, the annual taxes imposed on policyholders could not exceed 3 percent of their prior-year premiums. Thus, rather than taxpayers in general, insurers and a subset of federal taxpayers—specifically, commercial policyholders—ultimately could pay for terrorism events that resulted in covered losses under $27.5 billion. However, immediately after a catastrophic event, all taxpayers would be exposed to most—85 percent—of the losses ranging from $27.5 billion to $100 billion, the annual cap for total insured losses. Insurers would pay the other 15 percent of the losses above $27.5 billion (see Box 2). In addition, the Treasury could choose to continue collecting taxes on commercial policyholders until it recovered all of its payouts.

The original $100 billion cap serves two purposes. By providing an upper bound on insurers' claims exposure, it reduces uncertainty about losses from big events and lessens insolvency risks. Thus, the cap may help keep insurance rates lower than the market would otherwise dictate. The cap also gives taxpayers an indication that the Congress and the President intended to limit the government's exposure to about $62 billion in 2007.[36]

TRIA does not address certain issues. It is silent on funding sources that might be used to compensate losses over $100 billion, which otherwise would be borne by policyholders. That is, private insurers are not responsible for any losses above $100 billion, nor is the federal government. There are no rules dictating if or how payments made by the federal government to insurers would be prorated when losses exceeded $100 billion or how insurers' payments to policyholders would be handled under the same circumstances. Some insurers are concerned that the lack of clarity could leave them unable to make payments to policyholders after an event that exceeded the $100 billion threshold. Moreover, insurers fear that they could be sued in state courts if, under federal rules, payouts ended up being below policyholders' insured amounts.

In addition, questions arise as to what constitutes a "certified" act of terrorism. In particular, it is not clear whether TRIA would apply to cases in which perpetrators remain unidentified, as was true for the anthrax attacks in the fall of 2001.

Moreover, TRIA does not provide coverage against all terrorism risks. For instance, domestic acts of terrorism—which potentially raise the same concerns for insurers and the economy as attacks carried out by foreign terrorists—are not covered. Losses from group life insurance are also excluded. TRIA would cover NBCR losses, but most policyholders are not insured against those risks. NBCR risks typically were excluded by insurers prior to 9/11, except in the workers' compensation market, which allows virtually no exclusions. (However, in some states, including New York and California, some exposure to NBCR risks exists through "fire following" clauses in property policies that require losses from fire to be covered following events. For example, losses from a fire that followed a nuclear explosion would probably be covered in many states even in the absence of NBCR coverage.) Neither the original version of TRIA nor the extension act removed those exclusions.

Costs to the Federal Government

In January 2006, the Congressional Budget Office estimated that extending TRIA for two additional years (through 2007) would increase direct spending by about $1.7 billion and increase net revenues by $1.2 billion (see Box 3). Those estimates are based on expected cash flows discounted at Treasury rates. The calculations required estimating the likelihood and magnitude of a TRIA-qualifying event.

CBO has no basis for estimating the probability that terrorist attacks might occur in any single year or for predicting the levels and costs of damages that might

35. See Kunreuther and Michel-Kerjan, *Looking Beyond TRIA*.

36. That amount is based on the government's 85 percent share of the difference between the $100 billion cap and the insurers' aggregate retention of $27.5 billion. It is possible that insurers could pay more than $27.5 billion if a large event resulted in all insurers' paying their maximum deductibles. Estimates of the maximum deductible put that amount well above $27.5 billion in 2007.

ensue. Rather, CBO's estimate of TRIA's costs represents an expected value of payouts from the program—a weighted average that reflects the probabilities of outcomes ranging in magnitude from zero damages to very large damages stemming from possible future terrorist attacks. (The expected value can be thought of as the portion of an insurance premium that would be necessary to offset the government's losses from providing this insurance, even though firms do not pay any premium under the act.) CBO assumed for that estimate that losses similar in scale to those sustained on September 11, 2001, would be likely to occur only in rare cases and that there was a significant probability no attack would occur in a given year.

Under those assumptions, if the Secretary of the Treasury had been authorized to charge premiums to cover the government's projected average annual outlays—rather than taxing policyholders after the fact—those amounts would have been about $850 million in calendar years 2006 and 2007, respectively.

Effects of TRIA on Insurance Markets

The terrorism risk insurance market has developed significantly since the attacks on the World Trade Center and the Pentagon.[37] TRIA has helped reduce premium rates for terrorism insurance and increased coverage while giving insurers time to recover financially and improve their modeling of risks related to terrorism. However, insurers' expectation of receiving free federal reinsurance may limit further development of private reinsurance markets.

Coverage. The availability of coverage initially increased sharply after the enactment of TRIA, and an upward trend continues. The percentage of companies buying terrorism coverage, or "the take-up rate," jumped from 27 percent in 2003 to 58 percent in 2005.[38] While the purchase of coverage increased by just 1 percentage point in 2006, the take-up rate jumped to 64 percent in the first half of 2007.[39] Take-up rates remain highest in the Northeast, where about two-thirds of firms purchase coverage.[40]

The level of take-up in the United States is significantly higher than in some other countries that have terrorism insurance programs. For instance, a recent analysis found that under Germany's program, Extremus, only 3 percent of eligible firms bought coverage in 2006, a share that is essentially unchanged since the program's creation in 2002. (Weighting purchases by a firm's size, however, reveals a larger market penetration rate—12 percent.) Because the premium charged by Extremus does not vary according to a policyholder's industry or geographic location, firms located outside of major cities and in sectors that are less exposed to terrorism risk might not find coverage attractive.[41]

Pricing. Since 2003, the price of coverage for terrorism insurance has declined both relative to property and casualty premiums and in absolute dollar amounts. As a percentage of a company's overall property insurance premium, costs fell from 4.4 percent in 2003 to 4.2 percent in 2006. Thus, for most firms, adding terrorism coverage to an underlying policy adds less than 5 percent to the premium. (Rates in Germany are about twice as high for a roughly comparable level of coverage under its

37. See *Terrorism Risk Insurance,* Report of the President's Working Group on Financial Markets. Also see Department of the Treasury, *Assessment*.

38. The survey by Marsh Inc., an insurance broker, covered 1,437 companies. It included Marsh's clients, most of whom are drawn from the nation's largest 5,000 firms. Consequently, the sample population generally does not include small companies. See Marsh Inc., *Marketwatch: Terrorism Insurance—2006 Market Conditions and Analysis* (2007), pp. 1–2, available at http://global.marsh.com/news/articles/terrorism/documents/MarketwatchTerrorism2006.pdf.

39. See statement of Jill Dalton, managing director and leader of the Terrorism Specialty Practice, Marsh Inc., *Terrorism Risk Insurance Act*, before the Subcommittee on Capital Markets, Insurance, and Government Sponsored Enterprises of the House Financial Services Committee, June 21, 2007.

40. Marsh Inc., *Marketwatch*, p. 4.

41. For a cross-country analysis of take-up rates, see Michel-Kerjan and Pedell, "How Does the Corporate World Cope with 'Mega-Terrorism?' " pp. 61–75.

Box 2.

Losses Under TRIA: Who Pays?

Although no claims have been filed under the Terrorism Risk Insurance Act (TRIA) since the program's inception, it is generally acknowledged that the risk of a terrorist attack resulting in significant loss of life and substantial property damage remains high. Determining who would be responsible for covering damages in the event of a terrorist attack that qualifies for federal support under TRIA depends on a variety of factors. Under the current provisions of TRIA, the federal portions of any loss would invariably be lower than total insured damages because the act places limits on eligibility for federal assistance and requires that insurers pay a share of covered losses. Before the government would make any payments, an insurer suffering losses would first pay claims up to a deductible, calculated as a predetermined percentage of its prior-year annual property and casualty insurance premiums (20 percent in 2007). The total amount of claims paid by insurers above their deductibles could range from a few million dollars to several billion dollars, depending on how many insurers provided coverage for losses resulting from a given terrorist attack. Once affected insurers paid claims up to their deductibles, the federal government would share a portion of the remaining losses (85 percent in 2007) with each individual insurer. Federal payments would not apply to losses exceeding $100 billion per event.

The federal government does not charge premiums to insurers for TRIA coverage; rather, the Secretary of the Treasury is authorized to recoup some or all of the costs of providing financial assistance through taxes ("surcharges") on commercial property and casualty policyholders. Specifically, TRIA requires the Secretary to recoup financial assistance up to a fixed "retention amount" ($27.5 billion in 2007) minus the amount paid by insurers through deductibles and copayments. The losses that the federal government—and by extension, taxpayers—would initially pay after another significant loss would be very sensitive to how losses were distributed across insurers.[1] The process can be illustrated with two purely hypothetical examples.

1. For an analysis of who might pay under various scenarios, see Howard Kunreuther and Erwann Michel-Kerjan, *Looking Beyond TRIA: A Clinical Examination of Potential Terrorism Loss Sharing*, Working Paper No. 12069 (Cambridge, Mass.: National Bureau of Economic Research, February 2006), available at www.nber.org/papers/w12069.pdf.

insurance program.[42]) Premiums expressed as a percentage of total insured value have also either fallen or stabilized. The median rate for terrorism insurance fell from $56 per $1 million of total insured value in 2003 to $47 per $1 million in 2006. Terrorism insurance rates did increase in 2006 but not as much as those for the overall market.[43] The declining cost of coverage is particularly significant because insurers themselves faced rising deductibles under TRIA. That increase in program deductibles would not have raised costs for companies that held their terrorism exposure low (below their TRIA deductible). However, those insurers with higher levels of exposure would have experienced a reduction in the federal subsidy as deductibles rose. This suggests that competition has held down premium increases. Changes in expectations about the frequency of terrorist attacks and the size of potential losses could also have affected rates, as could have new transactions by firms determined to lower their average risk.

A significant but declining percentage of commercial policyholders continue to receive terrorism coverage without having to pay an explicit premium to their private insurers for that risk. In 2002, 70 percent of policyholders reported paying nothing extra for terrorism coverage. By

42. Ibid.

43. For purposes of estimating average rates, Marsh dropped quotes of nominal premiums of $1 or zero. See Marsh Inc., *Marketwatch*, pp. 5 and 8.

Box 2.

Continued

- Suppose that a $30 billion insured event occurred and that insurers' deductibles covered the first $10 billion in losses. Insurers' coinsurance payments would cover another $3 billion of the losses (15 percent of the losses between $10 billion and $30 billion). Thus, before federal assistance would be forthcoming, insurers would be responsible for $13 billion of the losses, which would leave the government initially paying $17 billion. The Treasury would then impose surcharges on policyholders to recover an additional $14.5 billion (the difference between insurers' aggregate retention of $27.5 billion and their $13 billion payments). Thus, the federal government and taxpayers in general ultimately would be left paying only $2.5 billion of the losses ($30 billion minus $27.5 billion insurers' aggregate retention). The Treasury also has the discretion to recoup all the payments made by the government, and thus taxes on policyholders could cover the $2.5 billion in claims above the $27.5 billion aggregate retention. In the long run, losses under $27.5 billion must be covered by insurers and commercial policyholders, including those who did not suffer any losses or purchase terrorism insurance.
- Under a highly stylized scenario in which insured losses worth $100 billion were distributed proportionately across all insurers in 2007, private insurers would collectively pay a deductible of approximately $36.4 billion, and then 15 percent of the losses above that amount, another $9.5 billion, for a total of $45.9 billion.[2] Federal taxpayers would be left paying $54.1 billion. In this case, the Treasury would not recoup any of the costs because the amount borne by insurers exceeded the aggregate retention amount of $27.5 billion. It is important to note, however, that losses from an actual event are unlikely to be evenly distributed across all insurers or to amount to precisely $100 billion.

2. Estimates of the aggregate insurer deductible can be found in *Terrorism Risk Insurance*, Report of the President's Working Group on Financial Markets (September 2006), available at www.ustreas.gov/offices/domestic-finance/ financial-institution/terrorism-insurance/pdf/report.pdf.

2004, the percentage had dropped to 37 percent.[44] More than half of all policyholders also report receiving coverage at no additional charge for domestic acts of terrorism, which is not provided by TRIA. Those policyholders are likely to be small firms in areas perceived to be "low risk." The decline in the percentage of policyholders receiving free coverage suggests an improved ability or willingness on the part of insurers to price terrorism risk.

Premium Collections. Estimates of terrorism insurance premiums, excluding those paid by firms for workers' compensation, were $700 million in 2002, $2.3 billion in 2003, and $2.7 billion in 2004.[45] Those increases are consistent with other indicators of a growing market for terrorism insurance.

Net Worth. Property and casualty insurers' net worth has grown from approximately $285 billion at the end of 2002 to $487 billion at the end of 2006. Property and casualty insurers experienced a $31 billion underwriting gain (the difference between premiums collected and claims incurred) in 2006. Underwriting gains, which

44. *Terrorism Risk Insurance*, Report of the President's Working Group, p. 51.

45. Based on data reported to CBO by the National Association of Insurance Commissioners. See Department of the Treasury, *Assessment*, p. 163.

Box 3.

Estimate of the Costs of the Terrorism Risk Insurance Extension Act of 2005

On January 4, 2006, the Congressional Budget Office (CBO) transmitted a cost estimate for S. 467—enacted as the Terrorism Risk Insurance Extension Act of 2005 (Public Law 109-144)—which extended the Terrorism Risk Insurance Act (TRIA) through calendar year 2007.[1] Under the extension, the government would continue its obligation to help property and casualty insurers cover losses in the event of certified terrorist attacks while changing certain coverage limits. CBO estimated that the two-year extension would increase federal spending by $1.7 billion, with most of the outlays occurring in the first five years following a loss. The TRIA Extension Act authorized the Secretary of the Treasury to recoup the government's losses by imposing taxes, or "surcharges," on policyholders. CBO estimated that if the federal government provided assistance to insurers in the aftermath of a terrorist attack, the Treasury ultimately would recover about $1.2 billion through taxes imposed on the insurance industry and policyholders.

Effect on Spending

On the basis of discussions with insurers and information provided by the insurance industry, CBO estimated that the expected or average annual loss subject to TRIA coverage would be about $2 billion (in 2006 dollars). This estimate assumed that, in most years, losses from terrorist attacks covered by TRIA would cost less than $2 billion, with a significant probability that no terrorist attack would occur in a given year—that is, at a cost of zero. (Similarly, there would be a small probability in each year of an event with costs far in excess of $2 billion.) Further, federal payments under the act would be lower than the total covered losses from terrorist attacks because of the limits TRIA placed on eligibility for federal assistance and the requirements that insurers pay a share of covered losses.

CBO estimated that extending TRIA for two additional years (calendar years 2006 and 2007) would increase direct (mandatory) spending by about $1.7 billion in total (before considering the revenues from taxes on policyholders). The estimate assumed that the federal government would incur claims of $850 million in both 2006 and 2007 on an expected-value basis. Actual spending would be spread over many years, and would be repaid, at least in part, by taxes imposed on policyholders.

Effect on Revenues

Rather than directing the government to charge premiums for federal terrorism reinsurance, the extension act specifically authorized the Secretary of the Treasury to recoup federal assistance up to a fixed "retention amount," minus the amount paid by insurers through the deductible and percentage share of losses over the deductibles assigned to insurance firms. (In 2007, insurers would pay 15 percent of losses above the deductible, and the federal government would pay 85 percent.)

Recoupment would be accomplished by assessing each insurer on the basis of its portion of aggregate property and casualty or group life insurance premiums for the preceding calendar year. Each company's assessment would be limited to 3 percent of its aggregate premiums. CBO estimated that total surcharges resulting from the two-year extension of TRIA would average about $800 million for each year of coverage and about $1.6 billion in total. CBO reduced the gross revenue impact of the insurance surcharges by 25 percent to reflect offsetting effects on income and payroll tax receipts. The net effect on revenues would total about $600 million per year and about $1.2 billion in total. Much of that revenue, however, would be collected outside the 10-year budget period.

1. Congressional Budget Office, *Cost Estimate for S.467, the Terrorism Risk Insurance Extension Act of 2005* (January 4, 2006), available at www.cbo.gov/ftpdocs/70xx/doc7011/s467pgo.pdf.

increase profits, had been a rarity for the industry.[46] As the financial strength of the insurance industry improves, so too does its ability to bear terrorism risk.

TRIA's enactment had little to do with the gains in insurers' net worth. Rising profits—which amounted to nearly $64 billion after taxes in 2006 and were attributable to increases in premium rates—as well as strong investment returns over the past few years have helped.[47] Further, the industry was able to grow despite losses from Hurricanes Charley, Frances, Ivan, and Jeanne in 2004 and Hurricanes Katrina and Wilma in 2005. The Insurance Information Institute estimates that about 20 percent of the 2004 hurricane losses and about 45 percent of the 2005 losses were paid by reinsurers, which helps explain why the industry could realize profits despite the catastrophic losses in those years.[48]

Not all of the entire net worth of property and casualty insurers is available to back terrorism losses. Some property and casualty insurers are primarily focused on residential and automobile policies, which are not covered by TRIA. The Insurance Information Institute estimates that the net worth of insurers writing coverage for commercial lines covered by TRIA is not quite 40 percent of the total market—about $187 billion.[49] That amount still handily exceeds the $100 billion total exposure allowed under TRIA.

Risk Models. Since the attacks of 9/11, several firms have developed terrorism risk models. Models of risk related to natural disasters are widely used by the industry to predict the frequency and severity of such events and to quantify potential losses. (It is common industry practice to add significant risk loads to the estimates of actuarially expected losses in order to further protect insurers from the uncertainty surrounding those estimates.) Because of the lack of historical data and the need to predict human behavior, terrorism risk models are subject to additional uncertainty.[50] Nonetheless, even though terrorism risk models are still in their infancy, they have been useful in measuring the concentration of insurance firms' exposure and the possible losses that might occur under several potential attack scenarios. In addition, the models allow insurers to measure the level of risk associated with a given property in terms of its proximity to other high-risk targets within major urban areas.[51] This information is not only useful to the insurer in managing its probable maximum losses but also is demanded by credit-rating agencies.[52] The data are also used in rate filings in most states.

Insurers distinguish risks on a relative basis and by location. For example, landmark or trophy properties are perceived to be at greater risk of attack because of their symbolic value. Moreover, the risks associated with operating a business in New York City, Washington, D.C., Chicago, or Los Angeles are also perceived to be much higher than elsewhere. Those differences are reflected both in the higher price of primary coverage and in the diminished availability of private reinsurance.

However, a key source of uncertainty in quantifying risk is predicting the frequency of attacks, which is affected by the effectiveness of counterterrorism measures and poli-

46. See Insurance Services Office, "Sharp Decline in Volatile Catastrophe Losses Drove Improvement in Property/Casualty Insurers' Full-Year 2006 Results" (press release, Jersey City, N.J., April 18, 2007), available at www.iso.com/index.php?option=com_content&task=view&id=2459.

47. Some investment gains are reported as earnings while others—including most unrealized capital gains—strengthen the balance sheet without flowing through earnings.

48. Those estimates exclude payments by the Florida Hurricane Catastrophe Fund, which paid out $3.95 billion for losses incurred in 2004 and $4.5 billion for 2005. Communication to CBO from Robert P. Hartwig.

49. Ibid.

50. For example, see American Academy of Actuaries, *Comments on "Terrorism Risk Insurance, Report of the President's Working Group on Financial Markets*."

51. For example, see Aon Corporation, "Response to U.S. Treasury and President's Working Group: Terrorism Insurance" (April 21, 2006), available at www.aon.com/us/busi/risk_management/risk_transfer/terrorism/AonFinalTreasuryReportResponseApril2006.pdf.

52. Insurers use the model's estimate of an "exceedance probability curve" to help determine how much terrorism coverage they can underwrite. The exceedance probability curve charts the probability that certain levels of losses will be exceeded either in a specific location or within a firm's portfolio of policies. If the probability of sustaining a loss that would threaten an insurer's solvency is too high, then the firm reduces its terrorism coverage in that location. The ambiguity surrounding the estimates of the probability and consequences of the events are factors that affect pricing. See Howard C. Kunreuther and Erwann O. Michel-Kerjan, *Climate Change, Insurability of Large-Scale Disasters and the Emerging Liability Challenge*, Working Paper No. 12821 (Cambridge, Mass.: National Bureau of Economic Research, January 2007), available at www.nber.org/papers/w12821.pdf.

cies and the changing strategies of terrorists. The uncertainty surrounding estimates of terrorism risk, particularly estimating events comparable in magnitude to or even more catastrophic than the attacks of 9/11, is one factor that could continue to limit the supply of private reinsurance. That uncertainty is likely to persist for the foreseeable future because the historical record is less predictive for terrorism events than it is for natural disasters.

Private Reinsurance. As insurers' assumption of risk under TRIA has grown, so too have purchases of private reinsurance. Estimates of reinsurance coverage, or "capacity," available in 2006 range from $6 billion to $8 billion. In addition, $900 million to $1.6 billion of reinsurance for NBCR risks was estimated to be available. That is up from the $4 billion to $6 billion available for conventional terrorism risks in 2005.[53] However, even with the growth in reinsurance coverage, existing capacity represents only about a quarter of the insurers' estimated aggregate deductible in 2007. Thus, insurers cannot currently assign to private reinsurers much of the terrorism risk they retain under TRIA—that is, the amount of claims for which they could be responsible.

To some extent, however, reinsurance purchases help offset insurers' retained risk under TRIA. Those purchases have risen as deductibles and coinsurance provisions have increased, as analysts expected. To help manage their exposure to concentrated losses, private reinsurers frequently write terrorism coverage with specific limits for individual properties rather than reinsuring a share of an insurance company's overall holdings. But, even with TRIA, some insurers have testified that they have been unable to purchase enough private reinsurance to cover their retained risks.[54] As long as the federal government provides reinsurance without charge under TRIA, demand for private reinsurance of terrorism risk will remain limited. Most industry analysts argue that the supply of reinsurance will remain constrained as long as estimates of expected losses from terrorism remain highly uncertain.

Effects of TRIA on Mitigation

An abundance of evidence suggests that commercial policyholders as a group are not taking significant steps to avoid or mitigate terrorism risks associated with their existing properties.[55] A sizable majority report that they have taken no steps to enhance the physical security of their buildings, according to surveys of policyholders. Moreover, fewer than 10 percent report decentralizing their operations in response to the threat of terrorism.[56] Similar data come from the Federal Reserve Bank of New York, which estimates that private-sector spending on homeland security remained constant as a share of gross domestic product (GDP)—at 0.46 percent—from 2001 to 2005 (increasing in dollar terms from $36 billion to $45 billion). The bank also reports that neither the private sector's share of labor inputs devoted to protective services, primarily the hiring of security guards, nor investment in security systems has increased significantly. Even in the commercial real estate sector, little evidence exists of a substantial shift in resources toward security.[57]

Policyholders generally do not receive explicit discounts on their terrorism insurance premiums for taking specific mitigation steps. Consequently, some analysts believe that TRIA may be undermining firms' financial incentives to take such action by reducing the premiums paid for terrorism risk coverage. However, other factors—such as the difficulty of knowing precisely which mitigation steps will be most effective and the realization that the benefits of mitigation may not show up in a company's bottom line—may also help explain the small levels of mitigation observed. In particular, because there is no baseline for comparison, it is hard to estimate what might have occurred in the absence of TRIA. Thus, it is not possible to quantify any effects that TRIA may be having on attempts at mitigation.

53. *Terrorism Risk Insurance*, Report of the President's Working Group on Financial Markets, p. 26.

54. For example, The Hartford was unable to purchase reinsurance coverage for its $1 billion of retention of property losses under TRIA in 2006. In contrast, the insurer was able to purchase $600 million worth of natural catastrophe reinsurance for losses above $175 million. See the Statement of Ramani Ayer, chairman, The Hartford Financial Services Group, before the Joint Subcommittees on Capital Markets, Insurance, and Government Sponsored Enterprises and Oversight and Investigation of the House Financial Services Committee, September 27, 2006, available at http://financialservices.house.gov/media/pdf/092706ra.pdf.

55. Congressional Budget Office, *Homeland Security and the Private Sector*.

56. See Department of the Treasury, *Assessment*, pp. 107–108 and p. 135.

57. See Bart Hobijn and Erick Sager, "What Has Homeland Security Cost? An Assessment: 2001–2005," *Current Issues in Economics and Finance*, Federal Reserve Bank of New York, vol. 13, no. 2 (February 2007), available at www.newyorkfed.org/research/current_issues/ci13-2.pdf.

Looking at mitigation responses in the aggregate may be misleading, however. Other surveys show that increased security measures are being undertaken in central business districts—a 12 percent increase from 2001 to 2003—with the biggest jumps observed in landmark or trophy buildings.[58] Other analysts point out that businesses have improved their contingency plans for post-event operations, which is important because business-interruption losses represented about one-third of total insured losses from 9/11.[59]

One factor contributing to a relatively low level of mitigation may be that TRIA's subsidies give insurers less reason to make their premiums sensitive to their policyholders' risk of incurring losses from an act of terrorism. For many hazards, risk-based insurance pricing provides signals that mitigation to reduce expected losses can have financial benefits. For example, an insurer charging a risk-based premium might be willing to lower a homeowner's annual premium by $100 if storm shutters costing $1,000 were installed to reduce future hurricane damage. Similarly, insurers generally lower automobile insurance premiums for drivers who purchase cars with antilock brakes and air bags. Such discounts increase policyholders' incentives to incur the cost of the mitigation measures. Some analysts argue that less mitigation of terrorism risk is occurring under TRIA because the subsidized terrorism premiums cannot be adjusted enough to reflect the benefits of mitigation. A similar phenomenon is observed in many states, including Florida, where insurers do not offer discounts because the regulated premiums limit risk rating.[60]

However, other analysts doubt that TRIA's subsidies are reducing firms' mitigation efforts on their existing properties, for three reasons.[61] First, firms have other incentives besides reductions in their insurance bills to mitigate losses and protect their employees. Second, even in the absence of TRIA, insurers may not offer mitigation discounts on terrorism insurance premiums if they are unable to measure and price the effectiveness of specific mitigation measures.[62] That difficulty arises not only because the available data are limited, but also because terrorists may change their strategies in response to mitigation measures, attacking the "next-weakest link in the chain." The fact that federal agencies have provided no clear guidance on which mitigation steps might be prudent supports that second argument. (The explicit link between terrorism insurance and mitigation is also missing in other developed countries with terrorism insurance programs.[63] However, those programs also tend to be subsidized by taxpayers.) Third, firms may not be optimally investing in mitigation because of security interdependencies between firms.[64] Some policyholders may believe that mitigation measures are likely to be ineffective in reducing losses, particularly if losses depend in part on other firms' taking similar steps. That is, when the effectiveness of Firm A's mitigation measures depends in part on whether Firm B takes similar steps, the incentive to mitigate is reduced because of the spillover. For example, to operate properly, retailers rely on supply chains; any disruption to those chains' activities will be costly not only to the retailer but also to the supplier. So the retailer's level of vulnerability is tied to the security efforts of its suppliers (for instance, whether they screen their workers or monitor their activities or whether they take steps to assure tamper-proof containers).[65]

Effects of TRIA on the Economy

Stabilization of the economy was a primary motivation for the initial passage of TRIA. Assessing TRIA's success

58. See Abadie and Dermisi, *Is Terrorism Eroding Agglomeration Economies in Central Business Districts?*

59. James W. Macdonald, "Terrorism, Insurance, and Preparedness: Connecting the Dots," in Philip Auerswald and others, eds., *Seeds of Disaster, Roots of Response: How Private Action Can Reduce Public Vulnerability* (New York: Cambridge University Press, 2006), pp. 305–337. Also see The Economist Intelligence Unit Ltd. and Lloyd's, *Under Attack? Global Business and the Threat of Political Violence* (April 2007), available at www.lloyds.com/NR/rdonlyres/0926E705-A16C-4432-B607-A4925A9EFEAB/0/360terrorismreport.pdf.

60. See Congressional Budget Office, *Federal Reinsurance for Disasters*.

61. *TRIA and Beyond: Terrorism Risk Financing in the U.S.*, Report prepared by the Wharton Risk Management and Decision Processes Center.

62. Ibid., p. 192.

63. Kunreuther and Michel-Kerjan, *Looking Beyond TRIA*.

64. If Firm A's investment in protection also benefits Firm B, then imposing deductibles on policyholders may improve welfare. The incentive to invest in protection may increase if the policyholder is not fully insured. See Alexander Muermann and Howard Kunreuther, *Self-Protection and Insurance with Interdependencies*, Working Paper No. 12827 (Cambridge, Mass.: National Bureau of Economic Research, January 2007), available at www.nber.org/papers/w12827.pdf.

65. For more examples, see *TRIA and Beyond*.

in offsetting the effects of terrorism on economic growth is difficult because it is hard to know how the economy would have performed in the absence of the law. Policymakers' immediate economic concern after the attacks on the World Trade Center and the Pentagon was that a shortage of terrorism insurance could reduce economic activity. In particular, it was feared that commercial construction might slow dramatically, causing an accompanying loss of jobs, and that the economy would weaken further as a result.

Some evidence exists that labor markets were adversely affected by the attacks. There was a drop in payroll employment in New York City after the attacks—a net loss of more than 225,000 private-sector jobs, a cumulative decline of 7 percent—and it was not until two years later that employment began to recover. However, statistical analysis suggests that the employment effects attributable to the events of 9/11 lasted just over a year, and there is little evidence of a lasting effect on the city's employment, according to a study conducted by the Federal Reserve Bank of New York.[66]

After TRIA's enactment, some recovery in commercial construction occurred. But the law appears to have had little measurable effect nationally on office construction, employment in the construction industry, or the volume of commercial construction loans made by large commercial banks.[67] Although a sharp drop in office construction occurred in 2001, much of it was under way before the attacks, and the bottom of that market was not reached until April 2003.[68] In any case, nonresidential construction represented only 3.1 percent of GDP in 2006, and commercial office construction made up only 12.2 percent of nonresidential construction.[69] By extrapolation, a decline in nonresidential construction is likely to have modest effects on the economy.

The disruption to the insurance markets appears to have had little effect on commercial lending, in part because firms have alternatives other than insurance for spreading risk. In retrospect, the immediate macroeconomic concerns may have been exaggerated.

Policy Options

As policymakers deliberate the future of the TRIA program, they could consider a broad array of options. Several options would, in varying degrees, maintain insurers' access to coverage, minimize total losses from acts of terrorism, and share the burden with taxpayers. Those options include extending TRIA but amending numerous provisions of the law; extending the law and amending one specific provision (that related to program premiums); and expanding program coverage. At the opposite end of the spectrum, one option would let TRIA expire as scheduled at the end of 2007. In addition, other, noninsurance options—such as creating a post-event loan program or providing direct subsidies to owners of at-risk enterprises—are available that could make the burden of bearing terrorism risk more transparent in the budget.

Extending the program raises the issue of duration. For example, continuing to increase risk-sharing provisions such as deductibles, coinsurance, and aggregate retention levels would be consistent with an eventual phaseout of TRIA. Another approach would allow a longer-term extension of TRIA but require a fixed set of parameters (including an explicit program termination date) combined with the requirement that insurers pay premiums for the reinsurance. Because of the effort involved in the government's setting premiums, this option would fit an

66. Jason Bram and James Orr, "Taking the Pulse of the New York City Economy," *Current Issues in Economics and Finance*, vol. 12, no. 4, Federal Reserve Bank of New York (May/June 2006), available at www.newyorkfed.org/research/current_issues/ci12-4.pdf.

67. For more details, see Congressional Budget Office, *Federal Terrorism Reinsurance*, and Statement of Douglas Holtz-Eakin, director, Congressional Budget Office, before the Senate Committee on Banking, Housing, and Urban Affairs, published as Congressional Budget Office, *Federal Terrorism Reinsurance* (April 14, 2005). Also see Department of the Treasury, *Assessment*, p. 135.

68. At an annual rate, office construction put in place declined from $57.6 billion in January 2001 to $47.0 billion in August of that year and then to $44.4 billion in September before bottoming out at $28.7 billion in April 2003. To get a better idea of how much of that decline was specific to office construction and how much was related to other developments in the economy that affected nonresidential construction in general, one could measure office construction as a share of total private nonresidential construction. By that measure, an even greater share of the decline occurred before September 2001. The share dropped from 20.7 percent in January 2001 to 17.1 percent in August and then to 16.4 percent in September. It hit a low of 12.5 percent in May 2003. Thus, the decline of office construction relative to other construction was already half complete in September 2001.

69. Those figures, which CBO updated, were reported in Department of the Treasury, *Assessment*, p. 135.

intermediate- or long-term extension of TRIA better than a temporary one.

Extend and Amend TRIA

One option is to extend TRIA on a temporary basis while raising program deductibles and copayments and increasing the size of losses that the government can recoup through post-event surcharges on policyholders. In addition, policymakers could further reduce the number of insurance lines covered by the federal backstop. For example, policymakers could eliminate many of the "other liability" lines that do not present concentrated risks, including directors' and officers' liability coverage.[70] Consequently, eliminating those lines from TRIA's coverage would be unlikely to pose solvency concerns for insurers. Extending TRIA would promote affordable and widespread coverage while giving insurers and reinsurers additional time to adjust to risks posed by terrorism. Ideally, raising the share of costs borne by the insurance industry and policyholders would correspond to gradual improvements in the industry's financial condition, thereby promoting the further development of private reinsurance and catastrophe bond markets for terrorism risks.

However, in the long term, extending TRIA could moderate the economy's adjustment to terrorism risk and potentially increase the size of losses from terrorism by subsidizing development in areas at the highest risk of loss. But slowing the economy's adjustment to terrorism risk might also have desirable effects if agglomeration economies are a consideration. Development of private-market solutions might also be slowed by the law's extension, unless insurers' cost-sharing provisions also continued to rise.

A variation on this option would be to limit the amount of federal reinsurance payments that goes to particular properties. The argument is that a great deal of risk-sharing already exists for the owners of large properties and corporations currently purchasing insurance. Limiting the payments would better target the subsidies to small businesses and property owners and potentially reduce costs to taxpayers. By the same logic, the limits would not apply to workers' compensation policies because risk-pooling opportunities are limited for workers. The major disadvantage of this change would be the increased administrative complexity of the coverage limits.

Some analysts who favor a temporary role for TRIA contend that it is not the most equitable and efficient program for the long run.[71] In particular, the lack of premiums for federal reinsurance means that the federal government would continue to bear most of the cost of terrorism risk above the aggregate retention level. In the long run, a stronger case exists for policyholders to use their own capital to bear terrorism risk rather than to purchase insurance. In particular, large firms may be able to take on more risk by substituting equity for debt or by relying more on contingent capital. For example, firms could issue debt that would be forgiven, in whole or in part, if a terrorist event occurred. The debt holders would then need to be compensated in the form of higher interest rates for bearing those risks. (For a more in-depth discussion of this issue, see the appendix.)

Another concern is that if TRIA was made permanent, it could lead to changes in underwriting practices that could, in turn, result in insurers' shifting more of the costs of a big event to the government.[72] Under current loss-sharing provisions, larger insurers with lower deductible-to-net-worth ratios might have an incentive to write more policies in high-risk areas. By taking on more concentrated risks, those insurers could collect more premium income. That practice, however, could effectively transfer more of the risk of losses from a large terrorism event to the government and, by extension, taxpayers. Raising insurers' 15 percent coinsurance rate would be one way of addressing this potential problem. However, as long as TRIA remained temporary, insurers would have little incentive to change their strategy because it would be too costly to underwrite new policies just on a short-term basis. Thus, insurers would probably continue

70. Liability insurance covers policyholders who may become legally obligated to pay for bodily injury or property damage to others. Other liability includes warranty insurance on automobiles and appliances and various forms of professional liability. Product liability is its own line. The 2005 TRIA extension removed professional liability (except for directors' and officers' liability).

71. See Kunreuther and Michel-Kerjan, *Looking Beyond TRIA*, pp. 29–35.

72. Howard Kunreuther and Erwann Michel-Kerjan, *Evaluating the Effectiveness of Terrorism Risk Financing Solutions*, Working Paper 2007-07-20 (Philadelphia: University of Pennsylvania, The Wharton School, Risk Management and Decision Processes Center, July 17, 2007).

to try to limit their concentrations of exposure, as long as TRIA was extended for only a short period.

Extend TRIA and Charge Premiums for Coverage

Setting premiums to cover expected losses would reduce costs to taxpayers while maintaining the availability of federal reinsurance. Further, the government might decide to set premiums above expected losses to cover all costs, which include the cost to taxpayers of supplying capital. That markup would also leave greater opportunity for competition among private suppliers whose rates must compensate shareholders for their cost of capital.[73] Eliminating or reducing subsidies could strengthen financial incentives to mitigate risks, including consideration of terrorism risks when choosing the location and design of new construction. Because post-event surcharges do not encourage mitigation, relying on premiums rather than taxing commercial policies after an event would be advantageous. The post-event surcharges are effectively a uniform tax on all commercial policyholders, even those with little or no exposure to terrorism risk. Imposition of taxes could lead some policyholders to drop their coverage.

Charging premiums, particularly risk-based premiums, presents one main disadvantage: Doing so may require more information than the government has access to or is able to obtain. The same factors that limit private insurers' ability to price terrorism risk, particularly estimating the probability of attacks, also could limit the government's ability to quantify that risk. While the government might have more information about terrorism risks than it releases to the public, for reasons of national security, that classified information probably would not be used to set prices. Moreover, experience with other government insurance programs suggests that the government has trouble setting premiums that protect taxpayers from losses even when information about sound actuarial rates is less problematic. Auctioning the reinsurance to insurers might reduce the burden to the government of accurately pricing coverage.[74] However, setting a reservation price, or minimum bid, would be difficult, so there is no guarantee that taxpayers would be fully protected against expected losses.

Expand the Provisions of TRIA

The coverage offered under TRIA could be expanded to close gaps that still exist in the market for terrorism insurance and to lower the price of all types of insurance. Specifically, insurers could be required to offer coverage against weapons of mass destruction, and TRIA's coverage ceiling could be raised or even removed, at least as applied to the federal government. Coverage could be further expanded to include domestic acts of terrorism and group life insurance. Expanding TRIA's coverage would have distinct disadvantages, however: A greater federal role would unquestionably increase the costs borne by taxpayers and, in addition, could further slow the economy's adjustment to the threat of terrorism and crowd out private-sector solutions.

Require Coverage of Losses from Weapons of Mass Destruction. Requiring that companies offer coverage against risks posed by weapons of mass destruction—nuclear, biological, chemical, and/or radiological risks—would fill a gap in the market. However, lower deductibles and copayments for this particular coverage might be needed to address insurers' very limited ability to price this risk. Otherwise, insurers might significantly reduce their exposure to terrorism risks in general. In addition, this coverage may have to be separately priced rather than bundled together with conventional terrorism coverage. If the coverage was not separately priced, it might result in significantly higher charges, which could result in far fewer firms' purchasing terrorism coverage.[75] (For instance, when the United Kingdom's Pool Re terrorism

73. See Cummins, "Should the Government Provide Insurance for Catastrophes?" pp. 337–379. Also see Dwight M. Jaffee and Thomas Russell, "Should Governments Provide Catastrophe Insurance?" *Economist's Voice*, vol. 3, issue 5, article 6 (Berkeley Electronic Press, April 2006), available at www.bepress.com/ev/vol3/iss5/art6.

74. For example, see Christopher M. Lewis and Kevin C. Murdock, "The Role of Government Contracts in Discretionary Reinsurance Markets for Natural Disasters," *Journal of Risk and Insurance*, vol. 63, no. 4 (December 1996), pp. 567–597.

75. See Lloyd Dixon and others, *Trade-Offs Among Alternative Government Interventions in the Market for Terrorism Insurance: Interim Results* (Santa Monica, Calif.: RAND Corporation, Center for Terrorism Risk Management Policy, June 2007), pp. 39–45, available at www.rand.org/pubs/documented_briefings/2007/RAND_DB525.pdf.

program eliminated the exclusions for NBCR coverage in 2003, prices increased significantly.)[76]

The inclusion of losses from NBCR hazards would reduce uncertainty about whether federal assistance would likely be provided following such attacks.[77] Expanding TRIA in this manner might add little cost to taxpayers if they were already implicitly exposed to NBCR risks, but it would probably increase the explicit costs of the program. Eliminating the cap on federal coverage would also reduce uncertainty about how those claims would be settled. Irrespective of where that cap is set, policymakers might also need to take additional steps to assure insurers that the cap is legally binding. A first step would be to establish rules governing the payment of claims when losses exceeded the cap. Insurers fear that they would most likely be sued in state courts if policyholders did not receive payments up to their full limits.[78] Thus, insurers face some uncertainty about the size of their retentions under TRIA.

In the case of NBCR coverage, limited supply is not an issue for most policyholders who are not seeking this coverage, in part because they do not see themselves at risk.[79] (Alternatively, they may assume that the government will cover most or all of the uninsured losses from an event involving weapons of mass destruction.) Some insurers and reinsurers have shown a willingness to offer NBCR coverage but in very limited amounts. For example, a Lloyds syndicate offers up to $25 million of NBCR coverage to policyholders. Risks can also be unbundled; AIG, the largest commercial insurer, offers up to $10 million in coverage to policyholders for biological and chemical risks but continues to exclude radiological and nuclear risks.[80]

Cover Losses Arising from Domestic Terrorism. TRIA also could be extended to cover acts of domestic terrorism. The June 2005 bombings in London illustrate the ambiguity of the exclusion. The bombings were carried out by British citizens acting in support of, but apparently not under the direction of, foreign terrorists. Similar acts in the United States might or might not be certified acts of terrorism under TRIA. Moreover, how the federal government would respond in the case of attacks by unidentified terrorists is uncertain. For example, investigators never determined the source of the anthrax attacks in the fall of 2001, which occurred prior to TRIA's enactment. Those attacks resulted in some fatalities and the disruption of business in several Congressional buildings as well as for some small businesses. The lack of clarity on this issue could mislead firms planning for those events.

However, the development of primary insurance and reinsurance markets for domestic terrorist events might be hampered if TRIA was expanded to include this coverage.[81] About 75 percent of firms purchasing terrorism coverage under TRIA also purchase separate coverage for domestic terrorism events, which is generally provided at little additional charge.[82]

Include Group Life Coverage. Inclusion of group life coverage was considered when TRIA was first debated in 2002 and again in 2005 when TRIA was reauthorized. Policymakers rejected that coverage both times. There has been little decrease in the availability and terms of group life insurance in the aftermath of 9/11.[83] Little has changed since then to strengthen the case for inclusion. Relative to the losses experienced by property and casualty insurers on 9/11, losses experienced by providers of life insurance were modest—amounting to approximately $1 billion to $2 billion of the total $40 billion in annual benefits the life insurance industry typically pays out.[84]

76. Other changes in the program were made at the same time; therefore, the increase in price cannot be attributed solely to the addition of NBCR coverage. Communication to the Congressional Budget Office from Steve Atkins, chief executive, Pool Reinsurance Company Limited (Pool Re), July 9, 2007.

77. Cummins, "Should the Government Provide Insurance for Catastrophes?" p. 374.

78. Reported to the Congressional Budget Office in a briefing by Christopher M. Lewis, vice president, The Hartford Financial Services Group, June 6, 2007.

79. Only 5 percent of policyholders cited lack of adequate NBCR terrorism coverage as a major factor in their decision not to purchase coverage. Another 21 percent cited high prices or the terms of coverage as factors. See Department of the Treasury, *Assessment*, pp. 105–106.

80. Marsh Inc., *Marketwatch*, pp. 16 and 20.

81. For data on the market for domestic terrorism insurance, see Department of the Treasury, *Assessment*, pp. 78–79 and p. 120.

82. Marsh Inc., *Marketwatch*, p. 5.

83. See Department of the Treasury, *Assessment*, p. 33.

84. See *Terrorism Risk Insurance*, Report of the President's Working Group on Financial Markets, pp. 4–5 and pp. 64–72.

Further, providers of group life insurance continue to cover terrorism risk and reduce prices even though no federal backstop exists for this insurance line.

Life insurers have been adept at accessing capital markets both to reduce their funding costs and to transfer some catastrophic risks. Life insurers have been able to monetize the expected future premium income on their policies by pooling and transforming the policies into tradable securities. The primary motivation for life insurers to securitize their assets is to reduce their capital requirements and lower their financing costs rather than to spread risks. The outstanding volume of insurance-linked securities in the United States is nearly $23 billion, about triple the amount recorded in 2002.[85] Mostly, those transactions involve securitization of relatively low-risk cash flow from the pooled policies over 20 to 30 years. However, some life insurers have been able to securitize the risk of excess mortality that might accompany terrorist risks by issuing catastrophe bonds.

Allow TRIA to Expire

If TRIA expired, insurers would lose access to premium-free reinsurance and, in response, would most likely raise prices for their policyholders. Owners of properties at risk would probably reduce coverage at higher prices and seek alternative means of reducing exposure, including relocation away from high-risk areas and retrofitting existing structures to better resist attack and facilitate evacuation. In fact, without the financial support offered under TRIA, losses from a terrorist event would probably be lower because efforts to mitigate risk could increase in the absence of subsidized insurance.

In addition, the development of global financial instruments for spreading risk, including catastrophe bonds, would probably be more rapid without TRIA. For example, catastrophe bonds have been issued to cover the mortality risks in group life insurance policies, which are not covered by TRIA, even though life insurers could face similar insurance risks. But if TRIA is allowed to expire, policymakers might need to take other measures to enhance the supply response. For example, policymakers might also consider removing tax and regulatory barriers to the development of the catastrophic bond market. Although catastrophe bonds and reinsurance are both means of spreading risk, they are not treated similarly by state regulators. The regulatory treatment of catastrophe bonds invariably raises their costs. (See the appendix for further discussion of catastrophe bonds.) Other policies, such as allowing insurers to set aside tax-free reserves, could also increase supply but would have costs to taxpayers.[86]

If TRIA expired, insurers could increase diversification of insured properties. In fact, trophy and landmark properties generally are not insured by a single insurer but rather by many insurers. Insurers could also manage their exposure by tightening the policy limits or maximum insurance payments on individual properties.

Eliminating the federal role could result in the supply of private workers' compensation insurance falling significantly. The downside risks are greater for workers' compensation markets because that line is exposed to risks from weapons of mass destruction and subject to rate controls at the state level. Moreover, state regulations make it much harder to diversify workers' compensation risk. (See Box 1 on page 8 for an analysis of workers' compensation insurance.) In particular, TRIA's $100 billion cap on total exposure helps insurers collectively deal with their insolvency risk. There are scenarios involving weapons of mass destruction under which insured losses could exceed that amount and exhaust industry capital. One study found that under certain scenarios governed by TRIA's provisions, the federal government would pay more for losses in workers' compensation lines than for property losses. Should TRIA expire, some analysts argue, a large terrorist attack could bankrupt the biggest workers' compensation funds in New York and California.[87] For all of those reasons, a continuing federal role may be necessary to avoid a sharp reduction in the supply of workers' compensation insurance.[88]

Even in property and casualty lines other than workers' compensation, a free market might not result from elimi-

85. See Rainer Helfenstein and Thomas Holzheu, "Securitization—New Opportunities for Insurers and Investors," *Sigma*, no. 7 (Zurich: Swiss Reinsurance Company, December 2006), p. 24, available at www.swissre.com/INTERNET/pwsfilpr.nsf/vwFilebyIDKEYLu/MPDL-6WAFA2/$File/sigma7_2006_e.pdf.

86. The tax treatment has been a big factor pushing both reinsurers and catastrophe bond issuers offshore. See Congressional Budget Office, *Federal Reinsurance for Disasters*, pp. 31–33.

87. See Kunreuther and Michel-Kerjan, *Looking Beyond TRIA*.

88. For example, see Macdonald, "Terrorism, Insurance, and Preparedness."

nating the federal reinsurance. State regulators might constrain insurers' ability to exit the market in the short run. For example, before the federal program began, some states, including New York, did not allow insurers to exclude terrorism risks. Others allowed the exclusion but required that losses from fires be covered regardless of cause, which effectively put some terrorism cost back on insurers. This situation could leave insurers bearing risks that they could not adequately reinsure in the limited private market.

The existing private reinsurance market for terrorism insurance is small relative to the federal backstop, and private reinsurers may not be willing to increase their role until they are more comfortable with the pricing of terrorism risk.[89] Letting TRIA abruptly expire rather than gradually phasing it out thus might expose property owners to onerous premiums. In the absence of TRIA, an unexpectedly large terrorist attack could lead to another episode of scarce coverage, rising prices, and uninsured losses. Declining terrorism insurance coverage might also increase the government's use of supplemental disaster assistance to the uninsured following an event.[90]

Create a Post-Event Loan Program

Another possibility would be for the government to replace TRIA with a policy of lending to insurers following a catastrophic terrorist event.[91] This would reduce the risk that the market would temporarily contract after an unexpectedly large act of terrorism. The argument is that insurers might face a liquidity shortage after a big loss and be unable to quickly access capital markets.

This option mimics the Federal Reserve's power to act as a lender of last resort to financial institutions. That is, the Federal Reserve is prepared to lend when other private lenders will not. The Federal Reserve protects itself from losses on its losses by placing itself ahead of all creditors of a bank, should the lending institution fail. Similarly, the federal government could preauthorize insurers for loans and give itself seniority over other lenders.

One drawback to the option is that prequalification requires the screening of applicants for creditworthiness. Another drawback is that firms already have the option to arrange for contingent financing—they can issue both contingent debt and contingent equity (new stock in the company) in private markets. Insurers have used both of those financial arrangements to raise funds after natural disasters.[92] Before an event, insurers agree to sell, and purchasers agree to buy, a debt issue at a fixed price. The arrangement for contingent financing allows insurers to issue debt at a specified rate following a disaster, when the insurer's financial condition might otherwise preclude such a sale. (If no disaster occurs, no debt is issued.) Investors receive a higher rate of return or an up-front fee to induce them to commit funds and to compensate them in the event that interest rates rise or in cases of only partial repayment. But high costs limit their use and that of contingent equity. No contingent transactions have yet been done for terrorism risk. The loans from the federal government might have to be subsidized to make the program an attractive alternative to insurers.

Provide Direct Subsidies to Owners of At-Risk Enterprises

Replacing TRIA with direct subsidies to at-risk property owners and commercial enterprises offers the advantages of distributing costs nationally, making the cost of the policy transparent in the budget, and allowing for the development of private insurance and capital-market solutions. The subsidies could be used for mitigation or to purchase insurance. For example, the government could pay a percentage of the itemized terrorism insurance premium charge for all properties. The success of the option would depend on the assumption that the

89. See *Terrorism Risk Insurance*, Report of the President's Working Group on Financial Markets, pp. 29–31. Most reinsurers have stated that they are unwilling to substantially increase their exposure to terrorism risks. For example, see Franklin W. Nutter, "Financing Catastrophe Risk with Public and Private (Re)insurance Resources," in Philip Auerswald and others, eds., *Seeds of Disaster, Roots of Response: How Private Action Can Reduce Public Vulnerability* (New York: Cambridge University Press, 2006), pp. 379–391. Also see Kurt Karl and David Laster, "The Economic Case for a Private-Public Terrorism Insurance Partnership," *Insights* (Zurich: Swiss Reinsurance Company, March 2007), available at www.house.gov/apps/list/hearing/financialsvcs_dem/htswissre030507.pdf.

90. Some analysts have argued that, under certain scenarios, taxpayers' costs could be higher without a federal program if the government chose to compensate some or all uninsured losses. See Dixon and others, *Trade-Offs Among Alternative Government Interventions in the Market for Terrorism Insurance: Interim Results*.

91. See Jaffee and Russell, "Terrorism Insurance."

92. Congressional Budget Office, *Federal Reinsurance for Disasters*, pp. 46–47.

government subsidy would increase the price of insurance and induce insurers to increase supply.

Many insurance industry participants, however, believe that the availability of coverage is constrained not by policyholders' willingness to pay; instead, they maintain that the uncertainty surrounding estimates of terrorism losses and insolvency risks leads firms to ration supply. Subsidizing the insurance could increase its availability but could also reduce the economy's adjustment to terrorism risk by encouraging businesses to locate in high-risk areas. By contrast, subsidizing mitigation could lead to excess or inefficient investments in safety, although, as many believe, there may be positive spillovers from those investments.

Appendix: Catastrophe Bonds and Other Risk-Transfer Mechanisms

Capital markets offer insurance providers several alternatives to traditional reinsurance markets, including catastrophe bonds and vehicles known as sidecars. Many times larger than primary insurance and reinsurance markets, global capital markets (in which debt and equities are traded) promote risk spreading in general and offer significant potential for spreading catastrophic risk in particular.[1] The catastrophe bond market allows insurers and reinsurers to spread some of their exposure to losses associated with catastrophic events to the debt market without exposing debt holders to their general business risks. Sidecars are another way in which reinsurers can access capital markets. Unlike traditional equity investments in reinsurance firms, sidecars allow outside investors to choose which specific insurance risks to assume in partnership with a reinsurance firm. The risk-spreading potential of capital markets is slowly being realized, especially in the case of natural disaster risk, and some analysts remain hopeful that terrorism risk can also be securitized in greater amounts.

Catastrophe Bonds

Purchasing natural catastrophe bonds is a way for investors to diversify their portfolio risk because returns on the bonds are not correlated with stock market returns. Natural disasters generally do not cause markets to fall. In part, that is because natural disasters have had their greatest impact on households rather than on businesses. Stock markets in the United States did fall, however, as a result of the attacks of September 11, 2001. Typically, investors have demanded a higher spread over comparably rated debt to offset the lack of perceived liquidity in the secondary market for debt—where the bonds can trade after they have been initially issued—and a novelty premium for the nontraditional nature of the securities.[2] Most catastrophe bonds cover risk estimated to have less than a 1 percent likelihood of resulting in actual losses. In the past, holders of catastrophe bonds were primarily insurers and reinsurers, but demand now is expanding as other investment vehicles, such as private equity funds and mutual funds, have become bigger players.

In the event of specified catastrophes, the interest paid and the principal amount owed by an issuer of catastrophe bonds would diminish, in part or in full. Those cancellation provisions increase the resources available to the issuer—typically an insurer or reinsurer—to pay catastrophe-related claims. Until a disaster occurred, bondholders would be compensated for such cancellation provisions by earning higher interest rates. The bonds generally have a three-year maturity, but some provide five years of coverage. About $4.7 billion worth of catastrophe bonds were issued in 2006, more than double the $2 billion worth issued in 2005 and more than triple the amount issued in 2004. Between 1997 and 2006, $15 billion worth of catastrophe bonds were issued in

1. See Phil Davies and Richard M. Todd, "Disaster Zone: Why Conventional Insurance Alone Isn't the Best Way to Cope with the Next Catastrophe," *The Region*, Federal Reserve Bank of Minneapolis, vol. 20, no. 4 (December 2006), pp. 6–9 and pp. 4–42.

2. See Rainer Helfenstein and Thomas Holzheu, "Securitization—New Opportunities for Insurers and Investors," *Sigma*, no. 7 (Zurich: Swiss Reinsurance Company, December 2006), available at www.swissre.com/INTERNET/pwsfilpr.nsf/vwFilebyIDKEYLu/MPDL-6WAFA2/$File/sigma7_2006_e.pdf.

89 transactions.[3] The market has continued to grow rapidly through the first half of 2007; one encouraging development has been the entry of more established insurers, including Allstate and Travelers. Interest rate premiums on catastrophe bonds are also coming down.[4] Big increases in reinsurance rates after the 2004 and 2005 hurricane seasons appear to have helped make catastrophe bonds more appealing to issuers. Despite their recent rapid growth, however, issues of natural catastrophe bonds remain small relative to reinsurance transactions and the size of the federal terrorism insurance backstop. This suggests that the catastrophe bond market is not mature enough to substitute for federal reinsurance under TRIA, but it may eventually supplement it.

While most issues of catastrophe bonds in recent years have covered risks related to natural disasters, extreme mortality risks posed by a variety of precipitating events, including terrorism, have been securitized since 2003. Those issues allow life insurers and reinsurers to reduce their exposure to unexpected increases in death rates and cover losses in several countries, including the United States. In those transactions, bondholders assume some of the financial risk posed by potential excess mortalities caused by pandemics and epidemics (including avian influenza), wars, natural disasters, and terrorist events (including those from nuclear, biological, chemical, and/or radiological risks). Those transactions—two totaling $600 million in 2006—provide coverage for events that are often excluded by traditional reinsurance policies.[5] In addition, a reinsurer based in Luxembourg issued a privately placed catastrophe bond linked to terrorism risk after September 11, 2001.

Several regulatory, accounting, and tax factors have slowed the growth of the market for catastrophe bonds.[6] However, recent developments—including improvements in the design of the bonds—may have reduced the importance of those factors.[7] In the past, the most important drawback to those bonds for issuers may have been the lack of an event trigger that matched the reduction in the bond value to the potential insurance company loss while still meeting the requirements of investors and regulators. That is, the extent of the reduction in the debt obligation after an event is typically tied to industrywide losses or to parametric measures of the event, which are based on a physical measure of the event (the size of an earthquake or the strength of a hurricane), rather than to the insurance company's losses. Investors prefer the payouts to be independent of the individual insurers' actual losses to eliminate moral hazard.[8] The fear is that if insurers' own losses were directly covered, then they would have weaker incentives to underwrite risks and keep claims down after an event. As a result of the weak link between the gain on the debt and the company's losses, some state regulators may not classify the catastrophe bond as reinsurance for regulatory accounting purposes. Recently developed, "dual-trigger" contracts are considered a solution to this problem. Payouts governed by these instruments would be made following an event only if an industrywide loss threshold was exceeded and an insurer's own loss exceeded a specified amount. Dual-trigger contracts satisfy regulatory requirements while reducing basis risk—the absence of a close match between loss claims and gain on value of the bond—for the issuer.

Although execution of such deals is improving, the high cost of issuing catastrophe bonds also limits their use. Most catastrophe bonds require the establishment of a "special-purpose reinsurer" that issues the bonds to investors and typically invests the proceeds in Treasury securities, which provide collateral and protect the catastrophe-bondholders from the general credit risk of the insurance

3. Guy Carpenter Company, *The Catastrophe Bond Market at Year-End 2006: Ripples into Waves* (2007), available at http://gcportal.guycarp.com/portal/extranet/pdf/GCPub/Cat%20Bond%202006.pdf?vid=1.

4. For an explanation of why spreads are high but declining, see J. David Cummins, "Should the Government Provide Insurance for Catastrophes?" *Review*, Federal Reserve Bank of St. Louis, vol. 88, no. 4 (July/August 2006), pp. 352–357.

5. Guy Carpenter Company, *The Catastrophe Bond Market at Year-End 2006*, pp. 40–41.

6. General Accounting Office, *Catastrophe Insurance Risks: The Role of Risk-Linked Securities and Factors Affecting Their Use*, GAO-02-941 (September 2002), available at www.gao.gov/new.items/d02941.pdf.

7. Cummins, "Should the Government Provide Insurance for Catastrophes?" pp. 356–357.

8. The presence of insurance may lead to moral hazard—changes in policyholders' action that potentially can increase insured losses. For example, when car owners possess automobile theft insurance they may be less likely to lock their car doors. Insurers typically use deductibles and copayments to reduce moral hazard.

company.[9] (In contrast, insurers purchasing reinsurance are exposed to "counterparty" risk—the risk that the reinsurer will become insolvent.) Because the assets that the issuer uses to collateralize the principal of the catastrophe bond will not be able to pay for other insured losses, the use of catastrophe bonds has some additional costs not associated with reinsurance.[10] For tax reasons, most special-purpose reinsurers are located offshore because they lack conduit status offered by other mortgage-backed and asset-backed securities. (Conduit status allows asset-backed securities to avoid double-taxation of income; only the income received by the investors holding the securities is taxed.)[11]

Several factors suggest that the market for catastrophe bonds tied to terrorism risk will be much smaller than the market for natural catastrophe risk. The possible correlation with stock market losses could limit the appeal of catastrophe bonds for terrorism risk for most investors.[12] If reinsurers, who have significant expertise in risk assessment, do not underwrite certain risks in large amounts, investors may reason that those risks represent bad investments unless they are accompanied by a very high interest rate. Credit-rating agencies and investors have also been unwilling to rely on the ability of analysts to assess terrorism risk. Without the rating agencies' stamp of approval, the market for catastrophe bonds linked to terrorism risk is likely to remain very limited.[13] While there have been some capital-market transactions involving terrorism risk, they have been small to date. One insurer, The Hartford, attempted to securitize some of its terrorism exposure but found that the capital markets were not interested in taking on those risks.[14]

Sidecars

In addition to taking advantage of the risk-spreading potential of catastrophe bonds, investors in hedge funds and other groups of investors have injected nearly $3 billion in capital into reinsurance companies through 2006 to help finance specific risks.[15] Those risks have included some exposure to terrorism. The financing mechanisms, known as sidecars, allow managers of hedge funds and other private equity funds to invest in specific underwriting transactions without having to purchase stock in a reinsurer or create a new reinsurance firm. The sidecar financings do not expose the hedge funds to the reinsurer's general credit risk but rather only to the profits or losses on specific reinsurance contracts or lines of business. However, that segregation of risk requires that sidecars be created as special-purpose entities, which are established for a limited duration, typically just two or three years. In that respect, sidecars are similar to special-purpose reinsurers. Investors in sidecars and reinsurers are partners in the sense that they are exposed to the same

9. Rather than issuing a catastrophe bond directly, insurers and reinsurers generally set up special-purpose entities (SPEs) with the assistance of investment banks to issue the bonds. The SPE issues the bond and invests the proceeds in Treasury securities or other high-quality collateral, receives payments from the sponsoring insurer (reinsurance premiums), and then passes those payments to the bondholders as interest, as long as the specified event does not occur. Generally, SPEs are kept off the sponsor's balance sheet by having independent investors hold a small minority equity share. Banks and other firms have also used, and sometimes abused, similar SPEs to fund their activities. See Government Accountability Office, *Catastrophe Insurance Risks*.

10. Darius Lakdawalla and George Zanjani, *Catastrophe Bonds, Reinsurance, and the Optimal Collateralization of Risk-Transfer*, Working Paper No. 12742 (Cambridge, Mass.: National Bureau of Economic Research, December 2006), available at www.nber.org/papers/w12742.pdf.

11. The cancellation provisions also raise the issue of whether the catastrophe bonds meet the definition of debt in the U.S. tax code. Thus, the issuer might not be able to deduct the periodic payments of "interest" to the bondholders. Those payments would instead be treated as dividends, which would make the deals uneconomic if originated in the United States. Offshore deals, however, have several disadvantages, a primary one being that they are less convenient.

12. Because rating agencies would most likely be reluctant to rate an issue, most transactions would probably have to be privately placed—that is, sold directly to a limited number of buyers without a public offering. Hedge funds would be possible purchasers. Investment bankers believe that terrorism risk offers a hedging opportunity because Treasury prices may rise after an attack as investors seek safe havens for their capital.

13. Howard Kunreuther and Erwann Michel-Kerjan, *Looking Beyond TRIA: A Clinical Examination of Potential Terrorism Loss Sharing*, Working Paper No. 12069 (Cambridge, Mass.: National Bureau of Economic Research, February 2006), available at www.nber.org/papers/w12069.pdf.

14. Statement of Christopher M. Lewis, vice president, The Hartford Financial Services Group, before the Subcommittee on Oversight and Investigations of the House Committee on Financial Services and the Subcommittee on Intelligence, Information Sharing, and Terrorism Risk Assessment of the House Committee on Homeland Security, July 25, 2006.

15. For more details, see Guy Carpenter Company, *The Catastrophe Bond Market at Year-End 2006*, pp. 36–39; and "Catastrophe Risk Insurance," *Economic Report of the President* (February 2007), pp. 105–123, especially Box 5-1, pp. 111–112.

risks on a shared quota basis—that is, they accept a certain percentage of the risk of loss. In contrast, catastrophe bonds spread risk differently; losses over a specified amount and up to a fixed cap are borne by others. Sidecars can also be beneficial to the reinsurers because they usually generate fees from outside investors who pay reinsurers for their underwriting expertise.