



Managing and Financing Extreme Events

A Research Program of Wharton Risk Center

Risk Management
and Decision
Processes Center

The Managing and Financing Extreme Events research program was initiated in 1996 as a joint activity between the Wharton Risk Management and Decision Processes Center and the Wharton Financial Institutions Center. Initially it was concerned with the role of mitigation, insurance and capital markets instruments in managing catastrophic risks arising from natural hazards. Given recent events, the project expanded its focus to deal with terrorism and other extreme events.

What follows is a “snapshot” summary of the most recent research activities undertaken at the Center on this program. It presents the scope and focus of this research program and summarizes the highpoints of the Wharton Risk Center “Managing and Financing Extreme Events” roundtable on January 30, 2004. Summaries of recent working papers, journal publications and books written by Faculty at the Center are also presented with links to the complete documents from the Wharton Risk Center Website.

The Wharton Risk Center looks forward to working on these issues with its industry sponsors, research partners, public sector agencies and international organizations as well as with other institutions interested in joining this program. More details on the Wharton Risk Center can be found at its website: <http://grace.wharton.upenn.edu/risk/>.

Howard Kunreuther

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The Wharton Risk Center
“Managing and Financing Extreme Events”
Research Project

The Extreme Events research program has been fortunate to have had considerable input from sponsoring member institutions from the insurance and reinsurance sectors as well as the banking, finance and defense industries. Research partners in the project are drawn from selected modeling and consulting firms.

Several important publications have resulted from the Extreme Events Project to date. These include the book, by Howard Kunreuther and Richard Roth, Sr. (ed) *Paying the Price: The Status and Role of Insurance Against Natural Disasters in the United States*, published in 1998; the book by Martin F. Grace, Robert W. Klein, Paul R. Kleindorfer and Michael M. Murray, *Catastrophe Insurance: Supply, Demand and Regulation* (2003). (See Section *Books* on page 10 in this Snapshot for a more detailed description of the latter book).

A new book edited by Howard Kunreuther, Patricia Grossi with Chandu Patel, *Catastrophe Modeling: A New Approach to Managing Risk*, will be published in the fall 2004 (see Section on *Books* on page 9 of this Snapshot for a more detailed description of the book).

The Managing Extreme Events Project has been an ambitious undertaking, with the following major activities undertaken to date:

1. Mitigation of hazards via building and other retrofits: This part of the project has been concerned with assessing the effects of mitigation on expected losses, and on insurer solvency and profitability. The project has also considered the implications of such mitigation for insurance industry practices and for homeowner decisions to invest in mitigation measures.

2. Insurance regulation and industry analysis: This research entailed a large-scale empirical analysis of the supply and demand determinants of market offerings of catastrophe insurance products, and the effects of regulation on solvency and pricing of such products.

3. Securitization of insurance risk: The possibility of securitizing catastrophe risks has been a centerpiece since the successful Act of God Bonds first offered by USAA in 1997. Such catastrophe bonds require the investor to provide money upfront that will be used by an insurer if some type of triggering event occurs, such as a severe earthquake in California. In exchange for a higher return than normal, the investor faces the possibility of losing either a portion of or its entire principal invested in the catastrophe bond. The project has studied the design and pricing of such securities and the determinants of their market acceptance.

4. Measuring the capacity of insurance and reinsurance markets to respond to catastrophic losses: The reason for such strong interest in catastrophic risks has been the occurrence of extreme events, such as Hurricane Andrew in 1992 or the Northridge Earthquake of 1994. The project has developed a number of conceptual and computational tools for assessing the capacity of the insurance and reinsurance industry to respond to such events.

5. Interdependent security risks: The project has recently expanded its scope to confront issues of insurability and risk management for *security risks*, especially those involving multiple parties whose actions may give rise to interdependencies in the mitigation or financing of such risks. The project has also been concerned with the insurance issues that arise from the ambiguity and strategic nature of the risks from terrorism and the appropriate roles for the government and private sector in managing and financing such risks.

INTERDEPENDENT SECURITY AND MANAGING EXTREME EVENTS January 30, 2004

The Wharton Risk Center "Managing and Financing Extreme Events" project held its Winter 2004 meeting on January 30, 2004.

Nearly 50 people from 25 organizations (Industry, Government and Academic) participated in this Roundtable at the Wharton School, University of Pennsylvania.

The Executive Summary of the Roundtable appears below.

EXECUTIVE SUMMARY

The interdependent nature of security risks presents a unique challenge in the age of global terrorism. Risk-management strategies, such as enhanced security measures or terrorist insurance policies, can only be effective if all entities in a given operating system are adequately protected. The decision by an airline, for example, to screen every item of luggage on every flight will be compromised if other airlines whose flights connect with it do not also follow the same rigorous procedure. Similarly, the collapse of the World Trade Center on Sept. 11, 2001 could be attributed in part to the failure of security at Logan airport in Boston to prevent some of the terrorists from boarding the planes that flew into the twin towers.

Recognition of the vulnerability of one part of a system to weaknesses elsewhere can act as a disincentive for individual components to improve their own operations.

Effective risk management strategies will require public-private partnerships tasked with improving data sharing, providing incentives, issuing regulations and providing adequate compensation thru insurance or reinsurance against extreme events such as a terrorist attack.

In this connection, the Terrorist Risk Insurance Act of November 2002 has guaranteed the availability of terrorism insurance to commercial enterprises, but there is currently limited interest in purchase. Rates in January 2004 were similar to those in April 2003, indicating there has been no increased in the perceived risk by insurers.

All parties seeking to manage terrorist risk continue to be hampered by the difficulty of estimating the likelihood and nature of an attack. Officials within the Department of Homeland Security (DHS) are operating on the basis of "not if but when" another terrorist attack occurs. The expectation that another attack will be catastrophic is increased by the belief that terrorists will seek to gain the maximum impact from their limited resources.

Modelers accumulate data and simulate the circumstances of possible terrorist attacks via the construction of scenarios for a range of institutions including the electric power generating industry, the U.S. navy, and for major ports. They are challenged by the need to obtain high-quality information, such as the number of people working in a particular building in the course of assessing risk. Insurers typically use the models to gauge their proximity to targets, identify large losses and aggregate their risk. There is a need for better information on indirect losses such as business interruption stemming from extreme events.

Though there has been increased interest since 9/11 in assessing and managing extreme events, there is a need for the private sector to be more proactive in the development and implementation of risk-management strategies, rather than waiting for government requirements or incentives. Strategies should integrate enhanced physical and cyber security as a core element of the corporate culture.

Future research needs include:

- Identifying sources of interdependence
- Shoring up the weakest link
- Modeling the risks
- Evaluating indirect losses such as business interruption
- Alternative risk-sharing mechanisms as well as international comparisons
- Behavioral research on decision processes and choice
- Understanding institutional arrangements for specific problem contexts
- Public-private cooperation in the United States and abroad

A full report on this Roundtable and the list of attendees can be downloaded at:

<http://grace.wharton.upenn.edu/risk/conf0304.html>

Recent Working Papers

- **"You Only Die Once: Managing Discrete Interdependent Risks"** by Geoffrey Heal and Howard Kunreuther, October, 2003.

Do firms have adequate incentives to invest in protection against a risk whose magnitude depends in the actions of others?

This paper extends our earlier analysis of *interdependent security (IDS)* issues (Kunreuther and Heal, 2002) to a general class of problems involving discrete interdependent risks with heterogeneous agents.

There is a threat of an event that can only happen once, and any agent's incentive to invest in managing the risk depends on the actions of others. Security problems at airlines and in computer networks come into this category, as do problems of risk management in organizations facing the possibility of bankruptcy, and individuals' choices about whether to be vaccinated against an infectious disease.

Here we characterize Nash equilibria with heterogeneous agents and give conditions for tipping and cascading of equilibria.

Downloadable at:

<http://grace.wharton.upenn.edu/risk/downloads/03-11-HK.pdf>

- **"Algorithms for Interdependent Security Games"** by Michael Kearns and Luis E. Ortiz, Autumn 2003.

Inspired by events ranging from 9/11 to the collapse of the accounting firm Arthur Andersen, economists Kunreuther and Heal recently introduced an interesting game-theoretic model for problems of *interdependent security (IDS)*. In this model a large number of players must make individual investment decisions related to security — whether physical, financial, medical, or some other type — but in which the ultimate safety of each participant may depend in a complex way on the actions of the entire population.

Kunreuther and Heal observe that a great variety of natural problems share this basic interdependent structure, including investment decisions in *airline baggage security* (in which investments in new screening procedures may reduce the risk of directly checking suspicious cargo, but nearly all airlines accept transferred bags with no additional screening); *risk management in corporations* (in which individual business units have an incentive to avoid high-risk or illegal activities only if enough other units are similarly well-behaved); *vaccination against infectious disease* (where the fraction of the population choosing vaccination determines the need for or effectiveness of vaccination); certain problems in *computer network security*; and many others.

All these problems share the following important properties:

- There is a “bad event” (condominium fire, airline explosion, corporate bankruptcy, infection, etc.) to be avoided, and the opportunity to reduce the risk of it via some kind of investment.
- The cost-effectiveness of the security investment for the individual is a function of the investment decisions made by the others in the population.

The original work by Kunreuther and Heal proposed a parametric game-theoretic model for such problems, but left the interesting question of *computing* the equilibria of model largely untouched. In this paper, we examine such computational issues.

Downloadable at:

<http://grace.wharton.upenn.edu/risk/downloads/03-33-MK.pdf>

- **"Assessing, Managing and Financing Extreme Events: Dealing with Terrorism"**
by Howard Kunreuther, Erwann Michel-Kerjan, and Beverly Porter - National Bureau of Economic Research *Working Paper 10179*, December 2003.

This paper discusses new challenges we face with terrorism as a catastrophic risk by focusing on risk assessment, risk management as well as risk financing issues.

The special characteristics of terrorism compared with major natural hazards call for the development of public-private partnerships, as recognized in November 2002 when the Terrorism Risk Insurance Act of 2002 (TRIA) was passed.

This paper shows, however, that the temporary insurance system established by TRIA is neither a complete answer nor a definitive one. It raises fundamental questions for U.S. insurers as to how they will estimate the risk in order to set premiums for terrorist coverage that they now must offer to their clients. We discuss some of the most recent developments of terrorism models for helping insurers and reinsurers assess the premiums they should charge and how much coverage they can assume as well as for firms to better understand their exposure.

Since the passage of TRIA, the current level of demand for insurance coverage has remained low and we discuss some factors that may contribute to it. After presenting alternative foreign public-private partnerships and discussing the potential role for terrorist catastrophe bonds, we provide some features of a more sustainable program for terrorism insurance in the U.S. after December 31, 2005.

Downloadable at:

<http://grace.wharton.upenn.edu/risk/downloads/03-12.pdf>

- **" Terrorism Risk Coverage after 9/11: A Comparison of the New Public-Private Partnerships in France, Germany and the United States"** - by Erwann Michel-Kerjan and Burkhard Pedell, February 2004.

The terrorist attacks on September 11, 2001 have raised, among others, the question of the responsibilities of the public and private sector in dealing with terrorism risk and as to how both sectors can provide adequate coverage for potential victims of new attacks should they occur.

Whereas the current debate is mainly focused on whether or not government should intervene in terrorism insurance markets, we argue that the nature of terrorism itself, as discussed in this paper, calls in any case for governmental responsibilities in supporting part of the risk.

The central question is thus as to how the public and private sectors can establish partnerships for covering against terrorism risk. We discuss the functioning of three public-private partnerships established post 9/11: the French *GAREAT* established in December 2001, the German *Extremus* established in September 2002 and the U.S. Terrorism Risk Insurance Act of 2002 (*TRIA*) that was passed in November 2002. Although it is still too early to conclude on their efficiency, these schemes are compared with respect to the economic effects of the design of the partnership, the pricing policy as well as the market penetration and the government exit strategy.

As these are considered temporary only, this paper could help a range of stakeholders (insured, insurers, reinsurers, policymakers) to better understand how well foreign solutions are working in practice and whether some features would be more appropriate for each country.

The complete list of working papers of the Center can be found at:

<http://grace.wharton.upenn.edu/risk/wp0104.html>

Recent Publications

➤ **"The Role of Insurance in Managing Extreme Events: Implications for Terrorism Coverage"**, by Howard Kunreuther, published in *Risk Analysis*, Vol. 22: 3, June 2002.

A key question raised since September 11th is the appropriate role of the private and public sectors in reducing losses and offering insurance protection against extreme risks such as natural disasters, technological accidents and terrorist activities.

This raises the following questions that this paper will address:

1. What factors determine whether the risk is insurable?
2. How much capital will AR require in order to provide protection against terrorism?
3. What role can and should the private and public sectors play in providing protection against terrorism?

The first section turns to Question 1 by showing that uncertainty and ambiguity regarding the risks is likely to raise the premiums considerably, particularly if the insurer is concerned with the potentially large losses, as is the case with the terrorism risk.

The paper then addresses Question 2 by showing why terrorism coverage is likely to be uninsurable if investors require large returns for providing funds to cover this risk.

Finally it then turn to Question 3 and contend that today there is a role for the federal government to play in conjunction with the private sector because of the large uncertainties associated with the terrorism risk. The paper concludes with a set of open questions for future research.

Downloadable at:

<http://grace.wharton.upenn.edu/risk/downloads/02-11-HK.pdf>

➤ **"Integrating Mitigation with Risk-Transfer Instruments"**, by Howard Kunreuther, George Deodatis and Andrew Smyth, published as the Chapter 8 for the book *Catastrophe Risk and Reinsurance: A Country Risk Management Perspective*, edited by Eugene N. Gurenko (London: Risk Books, 2004).

This paper explores the financial benefits to national governments by encouraging or requiring property owners to invest in cost-effective mitigation measures.

Studies on the rationale for mitigation have focused primarily on the benefits to the individual property owner of investing in loss reduction measures. Limited attention has been given to the added benefits to the public sector in reducing its financial vulnerability.

The paper focuses on how mitigation can be coupled with insurance, reinsurance and/or catastrophe bonds to aid individual property owners and national governments in their pre-disaster planning efforts.

This linkage between mitigation and risk transfer instruments is illustrated for the government of Turkey that established an insurance program following the 1999 earthquake and has purchased reinsurance to protect itself against the possibility of a catastrophic disaster in the near future.

The paper concludes by suggesting ways that international institutions, such as the World Bank, can promote the adoption of cost-effective mitigation in emerging economies by linking them with risk transfer instruments.

Downloadable at:

<http://grace.wharton.upenn.edu/risk/downloads/03-13-HK.pdf>

➤ **"New Challenges in Critical Infrastructures: A U.S. Perspective"**,
by Erwann Michel-Kerjan, published in *Journal of Contingencies and Crisis Management*,
vol.11: 3, pp.132-142, September 2003.

The emergence of a larger threat spectrum – terrorism, sabotage, local conflicts, political unrest, and natural disasters– combined with the growing globalization of economic activities, makes networks highly vulnerable. Rethinking national vulnerabilities requires the creation and the improvement of long-term public-private partnerships.

The article discusses the US Presidential initiative launched in 1996 – the first initiative worldwide to put these issues on the top-level agenda– as well as the national structure of developed partnerships. It might constitute a starting point for other countries to develop their own national strategy, adapting it of course to their own national characteristics.

Terrorists attacks in 2001 show, however, that such an initiative constitutes nothing but a first step in a general process to build preparedness nationwide; America still remains highly vulnerable. I conclude with a few myths that must be confronted to deal more efficiently with these new large-scale risks at an international level.

Downloadable at:
<http://grace.wharton.upenn.edu/risk/downloads/03-25-EMK.pdf>

➤ **"Neglecting Disaster: Why Don't People Insure Against Large Losses?"**,
by Howard Kunreuther and Mark Pauly,
published in *Journal of Risk and Uncertainty*,
vol. 28: 1, pp.5-21, February 2004.

This paper provides a theoretical explanation for the common observation that people often fail to purchase insurance against low-probability high-loss events even when it is offered at favorable premiums.

We hypothesize that individuals maximize expected utility but face an explicit or implicit cost to discovering the true probability of rare events. This cost constitutes a threshold that may inhibit purchase but may be offset in several ways by suppliers of insurers and state regulators.

Downloadable at:
<http://grace.wharton.upenn.edu/risk/downloads/03-08-HK.pdf>

The complete list of journal publications by the Center can be found at:

<http://grace.wharton.upenn.edu/risk/wp0104.html>

Other Recent Research Related to the Managing and Financing Extreme Events Project*

- **"Near-Miss: A Tool for Integrated Safety, Health, Environmental and Security Management"**, by Ulku Oktem, presented at 37th Annual AIChE Loss Prevention Symposium, March 30 - April 3, 2003. (WP)
- **"Actuarially Consistent Valuation of Catastrophe Derivatives"**, by Alexander Muermann, July 2003. (WP)
- **"The Effect of Air Pollution Related Human Health Risks on Firm Financial Performance"**, by Dinah A. Koehler, Bernell Stone, Deborah H. Bennett, Gregory Norris and John D. Spengler, Fall 2003. (WP)
- **"Critical Infrastructures under Threat: Learning from the Anthrax Scare"**, by Arjen Boin, Patrick Lagadec, Erwann Michel-Kerjan and Werner Overdijk, *Journal of Contingencies and Crisis Management*, Volume 11, Number 3, September 2003.
- **"The Role of Hazardousness and Regulatory Practice in the Accidental Release of Chemicals at U.S. Industrial Facilities"**, by Michael R. Elliott, Paul R. Kleindorfer and Robert A. Lowe, *Risk Analysis*, Oct, 2003, Vol. 23 Issue 5.
- **"Accident Epidemiology and the U.S. Chemical Industry: Accident History and Worst-Case Data from RMP*Info"**, by Paul R. Kleindorfer, James, C. Belke, Michael R. Elliott, Kiwan Lee, Robert A. Lowe, and Harold Feldman, *Risk Analysis*, Vol.23, No 4, 2003, pp 865-881.

- **"Probabilistic Benefit-Cost Analysis for Earthquake Damage Mitigation: Evaluating Measures for Apartment Houses in Turkey"**, by Howard Kunreuther with Andrew Smyth, Gulay Altay, George Deodatis, Mustafa Erdik, Guillermo Franco, Polat Gulkan, Hilmi Lus, Esra Mete, Nano Seeber and Ozal Yuzugullu, *Earthquake Spectra*, February 2004.

- **"Managing Risk in Global Supply Chains"**, by Paul R. Kleindorfer and Luk N. Van Wassenhove, to appear in H. Gatigon and J. Kimberly (eds.), *The Alliance on Globalization*, forthcoming, Cambridge University Press, 2004.

* To download these working papers (WP) and publications, please visit our website at:
<http://grace.wharton.upenn.edu/risk/wp0104.html>

Books

Forthcoming...

Catastrophe Modeling: A New Approach to Managing Risk –

Kluwer Academic Publisher, Boston, 2004

Patricia Grossi and Howard Kunreuther (eds.),
with Chandu Patel.

This book written with the three modeling firms (Applied Insurance Research, EQECAT and Risk Management Solutions) is designed to bring the reader up-to-date on how catastrophe models can be used to manage risk from natural disasters and other extreme events. The book focuses on natural disasters, but also discusses application of these models to man-made risk-management problems, such as those associated with the terrorist attack of the World Trade Center on September 11, 2001.

Part I of this book provides an introduction to risk management and catastrophe models. *Chapter 1* indicates the need to manage risk as well as the stakeholders and government's role in the process. *Chapter 2* introduces the components of a catastrophe model and how it aids insurers in assessing their portfolio risk..

Part II of the book delves more deeply into catastrophe modeling as a means of assessing natural hazard risk. *Chapter 3* discusses the components of catastrophe modeling in more detail, including the hazard, inventory, vulnerability, and loss modules. *Chapter 4* defines the types of uncertainty and the treatment of uncertainty in a catastrophe model. Using data from Charleston, SC, the chapter highlights the importance of understanding how uncertainty in modeling impacts estimates of future losses to key stakeholders.

Part III examines how catastrophe modeling currently aids insurers and other interested parties in managing the risks from natural hazards. *Chapter 5* focuses on the actuarial principles for insurance rate-making and the role of catastrophe modeling in risk classification and rate setting for residential structures in the states of Florida and California. *Chapter 6* focuses on insurance portfolio management and the role of catastrophe modeling in quantifying an insurer's portfolio risk. *Chapter 7* provides a comprehensive discussion of risk financing for an organization and the regulatory basis for the design of new risk transfer instruments.

Part IV illustrates how catastrophe models aid insurers in providing coverage to homeowners residing in hazard-prone areas in the United States. Utilizing data provided by the three leading modeling firms (Applied Insurance Research, EQECAT and Risk Management Solutions), it examines the role of mitigation and risk transfer instruments for dealing with hazards in three model cities: Oakland, California, Long Beach, California and Miami/Dade County, Florida. *Chapter 8* explores how the reduction of losses through mitigation measures will impact on pricing of an insurance policy and the amount of coverage insurers are willing to offer. *Chapter 9* builds on the analyses presented in Chapter 8 by examining the impact of reinsurance and catastrophe bonds on the profitability of an insurer and the return on assets to investors in the insurance company.

Chapter 10 discusses how catastrophe modeling can be utilized for dealing with terrorism and other extreme events by focusing on whether a risk is insurable when there is considerable uncertainty and ambiguity associated with either the probability and/or losses resulting from events such as terrorism. The chapter concludes with a discussion of the appropriate role of the public and private sectors for dealing with these types of catastrophic risks.

The audience for this book is a sophisticated risk manager or policy maker who has some appreciation for the role that modeling and quantitative analysis can play in improving the decision making process.

The September 11th terrorist attacks and ensuing activities makes this book of greater relevance than before this event given the increased interest by the private and public sectors in risk analysis and risk management for extreme events.

Catastrophe Insurance: Supply, Demand and Regulation –
Kluwer Academic Publishers, Boston, 2003- pp.140



**Martin F. Grace,
Robert W. Klein
Paul R. Kleindorfer
Michael Murray**

This book presents the results of the first significant attempt to examine empirically the nature of the supply of and demand for insurance against natural disasters at a detailed, microeconomic level. This study has been made possible with the unprecedented assembly of an extensive, detailed database on residential insurance transactions affected by catastrophe risk. These data are supplemented by public information on insurer financial and organizational characteristics and the demographics of residential households at a Zip code level.

After a general introduction to the subject, the study explores several significant aspects of residential insurance markets threatened by hurricanes. The focus is homeowners multiperil insurance that is used to cover residential property. The analysis seeks to identify factors that affect the supply of insurance and the determinants of consumer demand using a model that properly reflects their interaction. The analysis encompasses key variables and their effects on the quantity, quality and price of insurance purchased. Among the phenomena studied are the sensitivity of demand to prices, household income and other demographic characteristics, policy features and the bundling/unbundling of perils and coverages. Also examined are insurer and consumer decisions in different market and regulatory environments – Florida and New York – over a four-year period 1995-1998, with a further examination of developments in these markets and elsewhere since 1998.

A number of important findings arise from this analysis. Rates in high-risk coastal areas in Florida have risen 100-200 percent since Hurricane Andrew, reflecting the reassessment of catastrophe exposure.

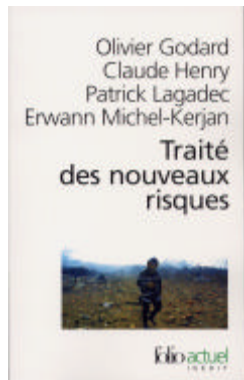
The availability of coverage has significantly improved since the mid-1990s, but government mechanisms still provide coverage for the wind peril for almost 500,000 homes and full coverage for more than a 100,000 dwellings. A number of homeowner insurers left the Florida market and others have entered to take their place. Insurers have adjusted the portfolios of properties they cover, but some carriers retain a high concentration of exposures in southeastern portions of the state. Deductibles, particularly for wind, have increased substantially. Insurers and insureds in New York have also experienced the effects of increased catastrophe risk, but to a much lesser degree than in Florida.

The econometric analysis focuses on factors affecting the demand for insurance, examining non-catastrophe and catastrophe coverages separately and combined. The analysis shows that the demand for catastrophe coverage is much more price-sensitive than the demand for non-catastrophe coverage. This implies that public policies that reduce insurers' costs of underwriting catastrophe risk could significantly enhance the adequacy of protection against disasters purchased by homeowners.

Further, the demand for catastrophe coverage increases with income in both states. The demand for non-catastrophe coverage tends to decrease with income in New York but not Florida. When both coverages are combined, the negative income elasticity of the demand for non-catastrophe coverage in New York dominates. Overall, the demand for homeowners insurance has a low-income elasticity. This supports the theoretical literature on the relationship between income, wealth and the demand for insurance.

As expected, policy options that expand coverage generally have a positive effect on the demand for insurance and vice versa. Neighborhood and housing characteristics associated with higher risk also tend to increase demand. Interestingly, in New York, as homeowners' equity increases, their demand for non-catastrophe insurance tends to fall. Finally, regulatory suppression and compression of rates induces homeowners to buy more coverage. This may sound desirable to some, but the ultimate effect is to reduce the supply of insurance and reduce homeowners' incentives for hazard mitigation.

Treatise on New Risks. Sustainability, Crisis Management and Insurance –
Edition Gallimard-Folio, Paris, 2002- pp. 621



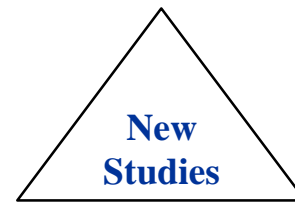
**Olivier Godard
Claude Henry
Patrick Lagadec
Erwann Michel-Kerjan**

This book builds on the most recent research developments in economics, finance and other social sciences in the field of emerging large-scale risks. It is innovative in that it analyzes not only strengths and interaction but also tensions between these disciplines as to how to adequately managing these new risks.

The authors recommend the implementation and the development of new Governance principles based upon three pillars that are rarely discussed jointly:

- *Precaution and Sustainability*; from established risk theory toward public policies and political regimes in a new non-probabilistic world;
- *Prevention and Crisis Management*; new trends are analyzed through three case studies: the criminal contamination of a pharmaceutical product; the destruction of the Quebecois electrical network in January 1998; the management of the mad cow epidemic in the United Kingdom.
- *Insurance of Large-scale Risks* (natural disasters, industrial catastrophes and mega-terrorism); how they have transformed the economy of insurance, reinsurance and risk financing and the need for innovative financing programs and public-private partnerships.

Why a *Treatise*? We argue that to avoid disarray within government and from industry as well as resistance to new risk management programs by the general citizenry, there needs to be a better understanding of the nature of new risks and the challenges in dealing with them in today's society.



International Comparison of Terrorism Insurance Programs – U.S./Europe

The Wharton Risk Center, in conjunction with the Munich Business School (Germany) and the Ecole Polytechnique in Paris (France), launched in 2003 an international comparison of terrorism insurance programs (see Section *Recent Working Papers* in this snapshot).

This study focuses on the new public-private partnerships established after 9/11 in France, Germany and the U.S. and analyzes how they are working in practice and whether some features of the European solutions could be instituted in developing a sustainable terrorist insurance program the U.S. after 2005. This study will be completed by Summer 2004.

OECD Task Force on Terrorism Insurance

The Organization for Economic Cooperation and Development (OCDE), composed of 30 member countries, established a task force on terrorism insurance at its annual meeting in 2002. This group, in conjunction with leading academic institutions worldwide, will provide policy recommendations on the question of terrorism risk coverage with a special focus on mega-terrorism.

Howard Kunreuther and Erwann Michel-Kerjan currently work with this Task Force. The final studies will be presented at a roundtable at the end of 2004 in Paris, OECD's headquarters.

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Agenda of Future Events at the Wharton Risk Center

- **April 22, 2004 - "Designing and Auditing Management Systems for Safety, Health and Environmental Risks Related to Chemical Processing"**
- **April 23, 2004 - Advisory Committee Meeting – "Information, Integration and Interdependency for Assessing and Managing Risks"**

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