October 17, 1997
MCR Advisory Group Meeting

SNAPSHOT

Managing Catastrophic Risks

A Research Program of Wharton's
Financial Institutions Center
and
Decision Processes and Risk Management Center

On October 17, the Advisory Group of industry sponsors and research associates met with project researchers to review progress on Wharton's "Managing Catastrophic Risks" program. This was the second scheduled Advisory Group meeting held during this first year of the research program. What follows is a brief "snapshot" of the discussions.

During our last meeting in May, discussion focused on the several projects and initiatives related to the "model city" developments and related research in the areas of mitigation and industry structure. At this October meeting, the emphasis was purposely shifted to discussion of research efforts more directly related to industry risk sharing and funding. Specifically, the topics of industry capacity and the impact of capital markets served as the primary discussion themes.

During the afternoon, attention turned to a summary of Wharton's role as Co-Sponsor for one of a series of forums being held in Washington over the coming year on national disaster reduction. The Wharton session will be held on December 11 and members of our Advisory Group will be invited to attend.

The final session of the day served as an update on the model cities and mitigation projects, including discussion of the technical advisory committee. This group of scientists and scholars recently met with Wharton researchers and representatives of the modeling firms to discuss the structure and direction of this effort.

Prior to the meeting, a series of papers were distributed which served as the basis for much of the discussion. The referenced papers, in several of the cases preliminary in their analysis are:

"Capital Market Instruments for Financing Catastrophic Risk: New Directions?"
by Christopher Lewis

"Financial Risk Management for Natural Catastrophes"
by Neil Doherty

"Can Insurers Pay For the "Big One"? Measuring Capacity of An Insurance Market to Respond to Catastrophic Losses"

by David Cummins and Neil Doherty
"The Regulation of Catastrophic Insurance: One Initial Overview"
by Robert Klein

"Managing Catastrophic Risks Through Insurance and Mitigation"
by Howard Kunreuther

Additional copies of the above cases are available from Steve Levy, Project Manager. Steve can be reached at 215-898-2323. We hope you find this "snapshot" helpful and we will continually work to keep you informed of our progress. We welcome your calls and visits.

Please call Steve or any of us with your thoughts and questions.

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TEXT:

Industry Capacity: Discussions on this topic were led by David Cummins, Neil Doherty and Bob Klein. David and Neil addressed the early stages of their work in estimating the capacity of the insurance industry in response to catastrophic risks. Bob Klein followed with his observations on the impact of regulation on market capacity.

The issue of industry capacity took on new relevance following the Northridge Earthquake and Hurricane Andrew. While most insured losses were paid, the events did lead to some insurer insolvencies. The potential for future stress on the insurance markets becomes more real when consideration is given to some catastrophe scenarios that suggest the feasibility of $75 billion and $100 billion events. At the same time, even a growing industry surplus available to meet such claims would be substantially less than the industry total depending on how the liabilities and surplus are distributed across insurers.

The fundamental question being examined in this project, is how do the many structural and market dynamics impact the true capacity of the industry. The research is also intended to add insights into the relationships between industry capacity and the demand for additional risk sharing and funding sources from the reinsurance industry and/or the capital markets.

The approach, as outlined in the presentation, is not to examine the impact of a single event but rather the sum of all losses that might impact the P&C business in a given time period. The resulting "shock" loss than becomes the total of all losses above the expected loss level. Once calibrated, the model will allow for testing the impact of different levels of "shock loss" on increases in insolvencies and

resulting decrease in industry capacity. The very early estimates indicate, for example, that insolvencies begin at "shock loss" levels of around $45 billion and accelerate substantially at around $70 billion.

As the analysis continues and methodologies are refined, the intent is to incorporate the impact of reinsurance and the various state solvency schemes. Over the next months, efforts will be made to improve the quality of data and methodologies. Among those issues discussed were, incorporating a risked base capital definition for insolvency and taking into account group vs. single firm effects. During the project discussion, the Advisory Group provided a number of additional suggestions that will be incorporated in the research. As an example, a discussion on the timing for reserve recognition and claim settlements of CAT events, suggests that additional premiums from future periods would be available to the industry and, in effect, add to capacity.

Impact of Regulation: In the context of his work on industry structure and regulation, Bob Klein made some brief remarks on the impact of regulatory structure on the markets for catastrophic risk coverage. The ramifications are broad and complex. Regulation influences the supply and purchase of coverage by its impact on insurer entry and exit decisions, capitalization, pricing, product offering and underwriting selection. Government financing of catastrophe risk through residual market mechanisms, special CAT funds and other devices adds additional elements to the ultimate capacity equation.

This segment of the program's research agenda seeks to shed new light on how regulation can promote efficient catastrophe insurance markets and satisfy public policy requirements. The analysis will include a conceptual framework for insurance regulation and specifically, catastrophe insurance. In assessing the impact of regulation on market efficiency, the research will examine how regulation has responded to natural catastrophes and the resulting issues raised.

A fuller discussion of regulation and industry structure is planned for the next meeting. In the group discussion the complexity of these issues was highlighted by one participant who, in responding to a description of the current Florida structure, noted "It is difficult to assess what my true exposure is in the state and understand how this differs from what I thought I underwrote."

HIGHLIGHTED COMMENTS FOR EACH OF TWO PAGES

1. Capacity and ability of the market to respond to unexpected losses depends on how the industry liabilities and surplus are distributed across insurers.

2. How do the various regulatory mechanisms work to "socialize" cat risk and what is the impact on private incentives and markets?

Securitization and the Capital Markets: Discussion of this aspect of the research agenda began with Christopher Lewis, who discussed the evolution of cat-related instruments and markets, followed by

Neil Doherty who added comments from his on-going research on the issues of indexing and basis risk.

Chris began his remarks by outlining the forces that led to the initial attempts to link cat insurance and the capital markets. Firstly, is the well documented rise in natural disaster costs and exposures. Secondly, the rise in losses and the recognition of the industry's overexposure created serious disruptions in the primary and secondary insurance markets. As a result, in the early 1990's insurers started looking for alternative forms of inexpensive capital and the natural place to look was the $19 trillion in capital markets.

Chris's outline focused on the three basic securities structures, and the several derivative products that have emerged. The three structural models that have emerged are contingent surplus notes, catastrophe bonds and contingent equity transactions.

Focusing primarily on the cat bond structures, Chris noted that recent experiences provide some sense of direction for the continual evolution of these transactions. In the December 1996 failed attempt by St. Paul Reinsurance to place $204 million of pro rata capital bonds, it became clear that one of the principal failings of the transaction was its sheer complexity. The clear message was that investors become more concerned about hidden risks when deals are as complex as the St. Paul transaction. On the positive side though, the success of the more recent Winterhur, Reliance, USAA and Swiss Re transactions demonstrated investor interest in more straightforward transactions and an appetite for diversification among cat risks. The USAA deal in particular revealed strong investor interest in the principal at-risk tranche.

Looking forward, Chris suspects that even with softness in the reinsurance markets, capital market transactions will continue to grow in both number and value. Most of the activity will likely be seen in cat bonds and over-the-counter contingent equity instruments. Over time, returns to insurers from securitization will continue to improve.

Closing discussion centered on the challenges of assessing pricing for the various instruments and transactions. It was suggested that a comparative pricing approach be developed as part of the on-going research effort.

Securitization: Neil Doherty concluded this section of the research discussion with remarks on the structured composition of the new instruments. He noted that it is through greater understanding of the design choices that insights into risk-adjusted pricing comparisons can be made.

These choices relate to how one addresses moral hazard-basis risk, credit risk and the choice between hedging and financing. The various instruments developed to date (cat bonds, cat options, cateputs and reinsurance) accept different trade-offs in their design and address different insurer needs. For example, suppose one firm decided that it can live with some basis risk, but wishes to have an instrument that lowers the costs associated with moral hazard and has lower credit risk than reinsurance. As described, the indexed cat bonds come closest to meeting these requirements.

The research will continue to examine the issues related to these trade-offs, especially those related to the moral hazard - basis risk trade off. Advisory Committee members encouraged deeper investigation into the true cost and associated trade-offs inherent in reinsurance. One such effort will be to look at how insurance companies with different levels of reinsurance might differ as a means of

testing some of the underlying theory.

- Insurers can be expected to divide bonds into larger number of tranches reflecting different investor needs. This is the same pattern seen in the evolution of the mortgage market and other securitized asset classes.

- The most successful innovation to emerge in addressing moral hazard has been the development of index based hedges.

HIGHLIGHTED COMMENTS FOR EACH OF TWO PAGES

Mitigation and Model Cities: Howard Kunreuther and Paul Kleindorfer concluded the day's discussion with a brief update on the mitigation and model cities initiatives. A broader discussion of these and the other related projects will be scheduled for our next meeting and this update served primarily to provide information on the formation of a supporting technical advisory committee.

The technical advisory committee is made up of recognized experts in the fields of engineering, seismology, statistics, meteorology, decision analysis and public policy and who also bring a demonstrated interest in our research. A day long meeting was recently held in Chicago bringing together our researchers, the modeling firms and the technical advisory committee.

Discussion at the meeting centered on a number of technical issues including, the nature and reliability of hazard data, the role of engineering judgement in model building and the mathematical design of the models themselves. On a broader level, several important themes emerged from the discussion:

- the sources and consequences of bias

- the impact of the "megacity" environments on current disaster estimates

- the importance of addressing mitigation from the perspectives of different stakeholder categories, eg. renters vs. developers

- defining the degree of uncertainty inherent in the models as well as the uncertainty associated with the actual events

Recommendations on these and other areas were made and documented. The group will meet formally again in about a year's time. At the urging of the Advisory Group, Paul and Howard agreed to work to increase the frequency of contact with the technical advisory committee between formal meetings. As a substitute for the expense and complexity of physical meetings, conference calls and

video conferencing alternatives will be explored.

A technical advisory committee has been structured to provide input and technical counsel to the model city and related mitigation research initiatives.