

**Insurance World: A process for understanding risk flows due to
catastrophes in the Insurance/Reinsurance Industry**

by

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WHAT IS INSURANCE WORLD?

Insurance World is a consortium of Reinsurance/Insurance Companies banded together with scientists associated with the Santa Fe Institute to try and understand the effects of natural catastrophes on the Insurance Industry.

MOTIVATION

The modern business environment has become global and interconnected. An earthquake in Japan can lead to the failure of a major bank in Britain. Just-in-Time inventory control in manufacturing processes increases supply chain risks. A dip in foreign exchange rates can flip the advantage between two competitors. So it is no longer possible to manage different risks independently. Risk can no longer be divided into risks that can be insured, like interruptions due to fire or supply interruption, and risks that can be financed, such as price uncertainty. The interconnectedness of the global economy forces enterprises to manage uncertainty and volatility as a portfolio of risks, not as independent events. The science of complex adaptive systems is the science of interconnectedness. As such it is well suited to address the issues of risk management at the portfolio level. The purpose of Insurance World is to develop a set of complexity-based intellectual and software tools to help today's manager make sense of enterprise and industry-wide risk.

HISTORY

The Insurance World simulator grew out of the wish on the part of several firms in the catastrophe insurance industry to create a kind of "laboratory" with which to experiment with various risk scenarios. For instance, suppose a force 5 hurricane drops on Miami Beach. Who are the winners and who are the losers in the aftermath of such a major catastrophe? And what kinds of firms spring up to fill the niches left behind by those firms that disappear after such an event? These are the type of questions that are of vital concern to catastrophe insurance firms---but for which no experimentation is possible. The Insurance World simulator is designed to be a platform for performing such experiments *in silico*, rather than in the wild, so to speak.

The first phase of the Insurance World project, Insurance World 1, began in the fall of 1997 and ran for one year. It consisted of a series of five meetings at roughly two-month intervals between the eight representatives of the Insurance World consortium and the modeling group based at the Santa Fe Institute. The end result of these meetings and discussions was a software package termed the Insurance World simulator. It represents a "toy model" of the real world of catastrophe insurance, incorporating only two types of catastrophes---hurricanes and earthquakes---occurring in three geographic regions: Japan, California and the Gulf Coast. In this world, there are five primary insurance firms and five reinsurers. A run of the simulation extends over a ten-year period, in steps of one quarter each. At the outset, the user sets parameters for the external economic climate, estimates of the climate and earthquake conditions and the various factors distinguishing one firm from another. The simulation then traces out the implications of the decisions each firm makes in regard to developing market share, repayment of loans, attitudes toward risk, amount of risk assigned to reinsurers and so forth. In this way, various management strategies can be tried in an attempt to find those that lead to prosperity, or at least avoidance of extinction.

The second phase of the consortium, Insurance World 2, began in February of 2000. This consortium will last six months. In Insurance World 2, the Insurance World Simulator has been enhanced to include:

- Any type of catastrophe in any market (up to 10 markets).
- Any number of primary or reinsurance companies.
- Detailed financial accounting.
- Enhanced interaction with the capital markets, investments in stock markets, real estate, short-term bonds, long-term bonds, Cat bonds. Purchase of Cat bonds.
- Enhanced gaming capabilities.
- Anti-trust modeling.

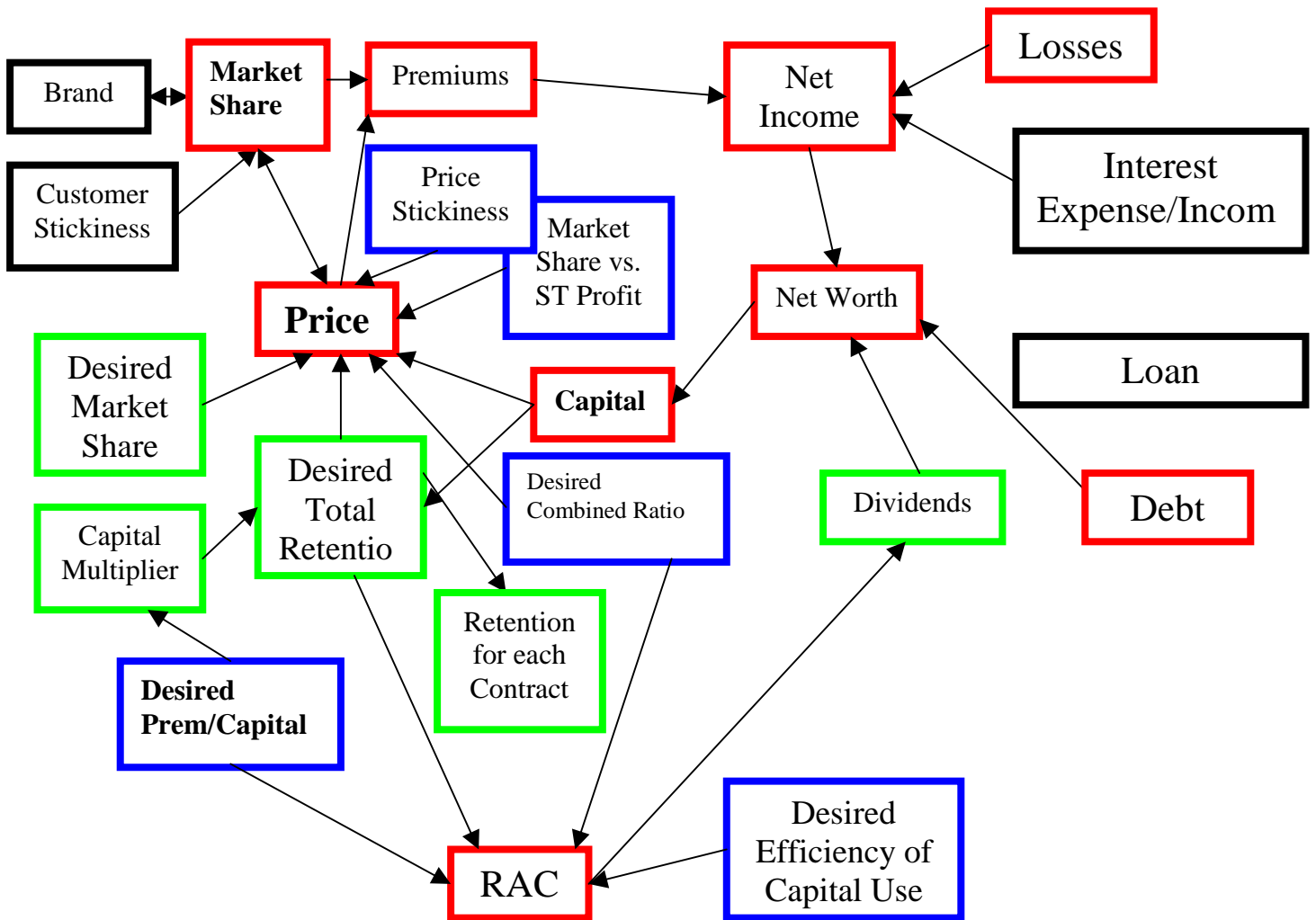
The members of the consortia since 1997 have been:

- **-ERNST AND YOUNG**
- **-SWISS RE**
- **-ZURICH / CENTRE RE**
- **-ITALRE / VICTORIA RE**
- **-CALIFORNIA HOUSING LOAN ADMINISTRATION**
- **-AMERICAN MANAGEMENT ASSOCIATION**
- **-BENFIELD GREIG**
- **-EMPLOYERS RE**
- **-ACE**
- **-CAT LTD**
- **-WINTERTHUR**
- **-Santa Fe Institute**
- **-Marsh and McLennan**
- **-Los Alamos National Laboratory**
- **-Wrigley Environmental Institute**
- **-Complexica**

To what questions does the Insurance World Consortium want answers?

- How do frequency, magnitude, and geographical distribution of natural catastrophes affect the profitability of Insurance/Reinsurance companies?
- How is risk spread among the companies?
- What is the effect of various pricing strategies on the industry as a whole and on individual companies?
- How do the consumers affect the risk of the companies?
- What affect does the availability of capital have on risk?
- What are the conditions for the formation of new companies?
- What are the conditions for bankruptcy?
- What is the effect of marketing strategies?
- What is the effect of the structure of Insurance/Reinsurance contracts?
- And many other questions

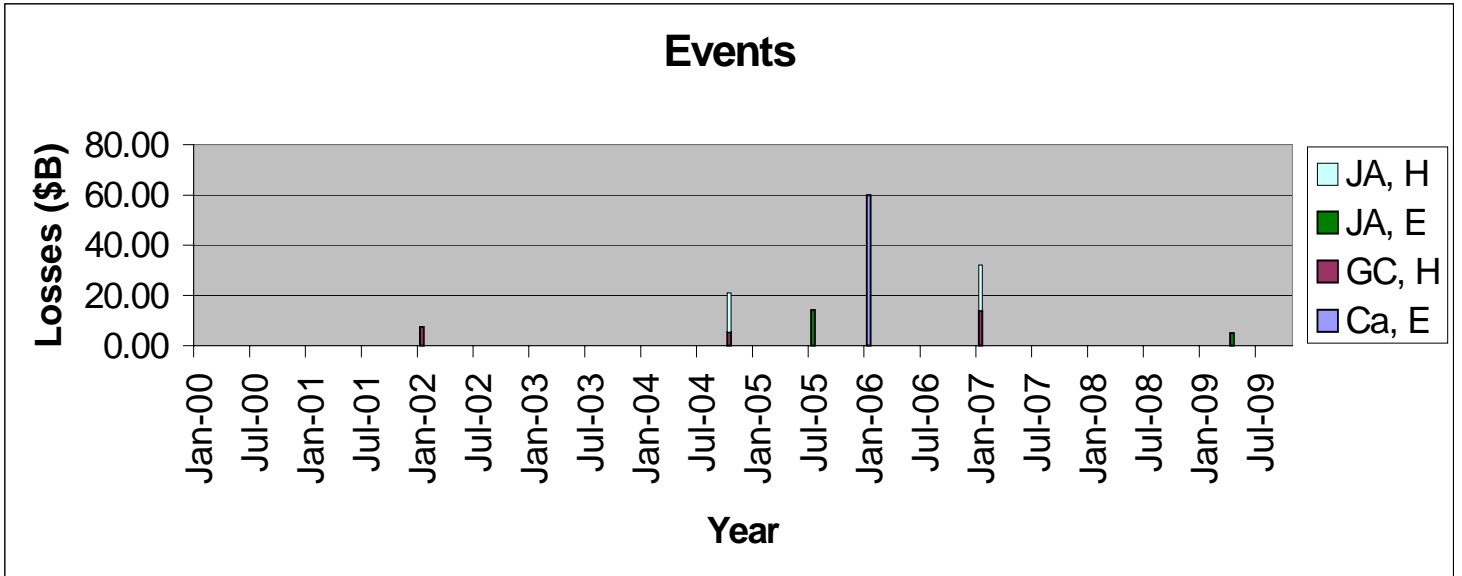
Processes Modeled in the Insurance World Simulator



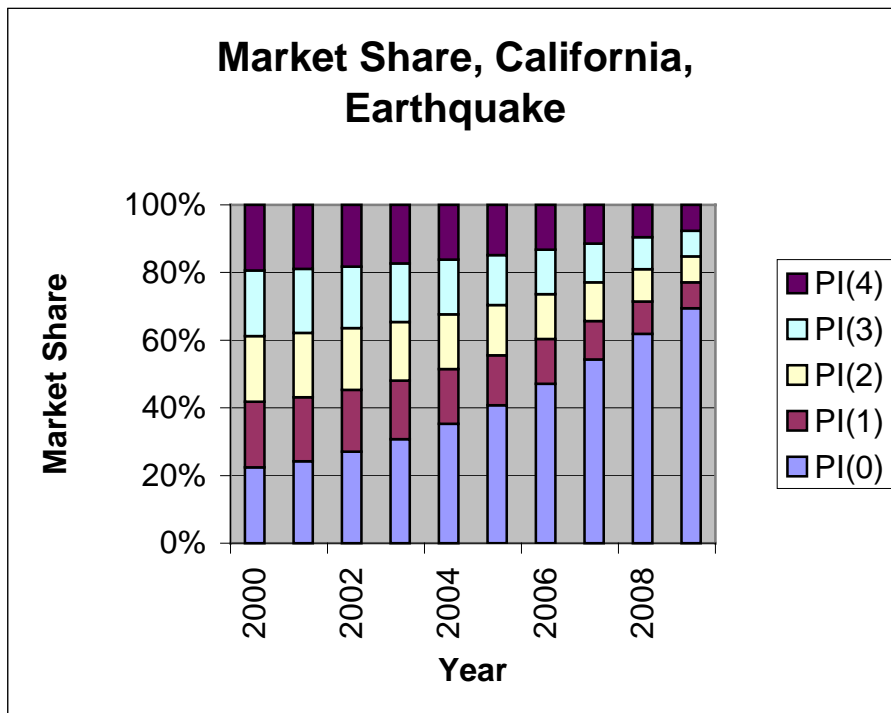
AN EXAMPLE: AN AGGRESSIVE PRIMARY INSURER AMONG CONSERVATIVE INSURERS

THE SCENARIO

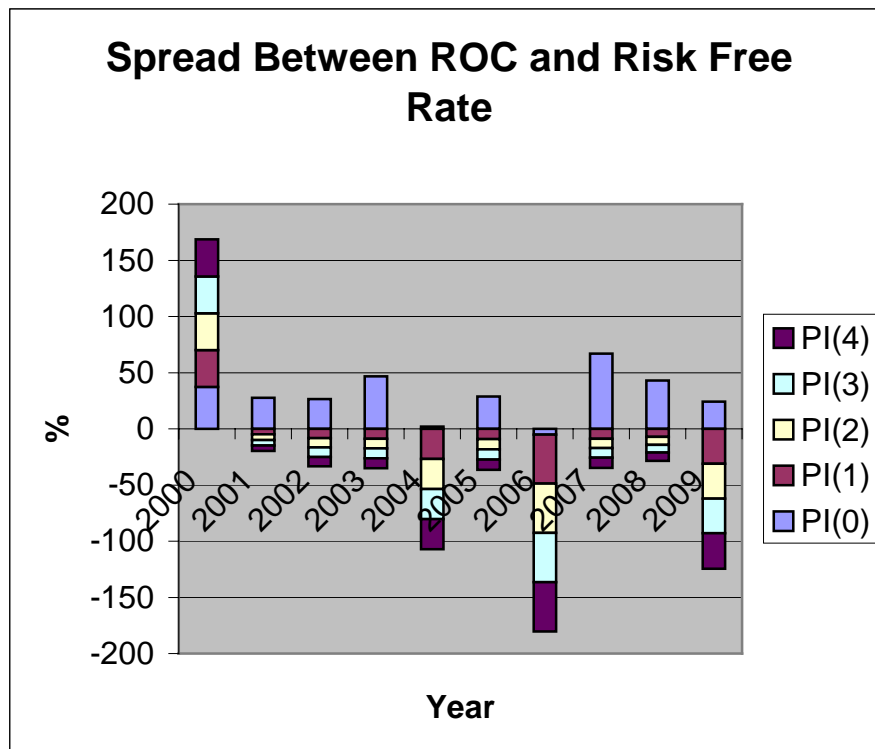
- Five Primary Insurers, one aggressive, four conservative
- Two Reinsurers
- Four Markets - California Earthquake, Gulf Coast Hurricane, Japan Earthquake and Hurricane



The “Blue” Company aggressively seeks market share in the California Earthquake Market. It also aggressively seeks high Return on Capital.



Despite the fact that there is a large earthquake in the California market in 2006, the aggressive “Blue” company succeeds. The conservative companies are too conservative, ceding too much of their risk to reinsurers and maintaining too much capital on-hand.



There is an optimum amount of risk to retain.

- If an insurer retains too little risk, its return on capital is too low - the company fails.
- If an insurer retains too much risk, its capital volatility is too high - the company fails.
- There is a “Goldilocks” regime in which the risk is “just right” based on the risk exposure and the behavior of the competition and market.

CONCLUSION: Insurance World is a paradigm for World Class business innovation.

- Client driven technology development.
- Clients come to understand possibilities in available technologies.
- Consultants receive an education in internal workings of clients and their industries.
- Trust is developed among participants.
- Proprietary projects follow.
- Consultants and Clients gain reputation as World Class Innovators.