Catastrophe Reinsurance Agenda

- A Brief History of Reinsurance
- Reinsurance Basics: Functions and Forms
- Catastrophe Reinsurance Concepts
- Catastrophe Modeling Concepts and Issues
- Catastrophe Program Design: A Case Study
- Capital Market Solutions
Reinsurance: a Brief History
(or How to Empty a Room Without Really Trying)
Catastrophe Reinsurance History

• In(surance) the Beginning …

1800 BCE Babylon: The Code of Hammurabi
Catastrophe Reinsurance History

• The First Reinsurance – 1370 CE

Genoa-Cadiz-Sluys Voyage: True Risk Transfer
Catastrophe Reinsurance

History

• Catastrophes accelerate change:

  The Great Fire of London, 1666

• Led to the establishment of the “Fire Office” the 1st Insurance Company in England.

• 1681 -- Louis the 14th enacts the “Ordonnances de la Marine” specifically authorizing re-assurance of risk “incautiously bound.”
Catastrophe Reinsurance History

• The Power of Caffeine:

Edward Lloyd’s Coffee House - 1688
Catastrophe Reinsurance
History

Once again, catastrophic fire became the agent of change:

The First Professional Reinsurance Companies

• The Great Hamburg Fire of 1842 -- Cologne Re Est. 1846

• The Great Glarus, Switzerland Fire of 1861 – Swiss Re Est. 1863
Catastrophe Reinsurance

History

1921-- Mr. Guy Carpenter devises a new form of reinsurance to cover cotton crop losses over multi-year periods. Known as “The Carpenter Plan,” it revolutionized the way excess of loss coverage was provided.

Guy Carpenter
Reinsurance Basics
Reinsurance Basics
A Definition:

What is Reinsurance?

• **Simple:** Insurance for insurance companies.

• **Robert Park (1799):** “RE-ASSURANCE … may be said to be a contract, which the first insurer enters into, in order to relieve himself from those risks which he has incautiously undertaken, by throwing them upon other underwriters, who are called ‘re-assurers.’”

• **Robert Strain:** “A form of insurance whereby the reinsurer, for a consideration, agrees to indemnify the ceding company against all or part of the loss which the latter may sustain under the policy or policies which it has issued.”

• **Essentially,** Reinsurance is a contract of loss indemnification between insuring entities, which does not involve the original insured.
Reinsurance Basics
The Functions of Reinsurance

- **Finance**
  The Company can write more business

- **Stabilization**
  The Company can stabilize results from year to year

- **Capacity**
  The Company can write larger policies

- **Catastrophe**
  The Company can protect itself from a major loss occurrence
Reinsurance Basics
The Reinsurance Family Tree

- Insurance or Reinsurance Company
- Intermediary
  - Managers
    - Insurance or Reinsurance Company
    - Pools
  - Correspondent Brokers
    - London Companies
    - Lloyd’s Syndicates
      - Names
      - Corp. Capital

Direct Reinsurers
Reinsurance Basics
Key Terminology for Excess of Loss Treaties

- **Retention** - In Excess treaties retention refers to that portion “of the loss” that the Ceding Company keeps.

- **Ultimate Net Loss (UNL)** - the amount of the net loss and expenses to which the Agreement applies.

- **Loss Occurrence** - Any disaster, accident or loss or series of disasters, accidents or losses arising out of one event, as defined in the contract.

- **Layering** – The segmentation of reinsurer liability into easily marketable bands of limits.
### Reinsurance Basics

**Layering Example**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Retention</th>
<th>Excess of Loss</th>
<th>Company Retention</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Excess of Loss</td>
<td>$3,000,000 XS $2,000,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd Excess of Loss</td>
<td>$5,000,000 XS $5,000,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd Excess of Loss</td>
<td>$15,000,000 XS $10,000,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Company Retention</td>
<td></td>
<td></td>
<td>$2,000,000</td>
</tr>
</tbody>
</table>
Traditional Catastrophe Reinsurance
Traditional Catastrophe Reinsurance
Functions of Catastrophe Reinsurance

- **Catastrophe** -- Preservation of policyholders’ surplus in the event of major loss occurrence

- **Stabilization** -- The Company can stabilize results from year to year

![Graph showing Loss History and Retention covered by Excess of Loss Reinsurance](image-url)
Traditional Catastrophe Reinsurance
Basic Concepts

• Cat Reinsurance is typically written on an “Excess of Loss” basis whereby the Ceding Company is covered for the amount of loss in excess of a specified retention with respect to the accumulation of losses resulting from an event or series of events.

• Coverage applies to the Company’s net retention (UNL) after reduction by recoveries from all other reinsurances (except Net Quota Share).

• Umbrella Theory – Cat Reinsurance provides a kind of “umbrella” protection because it pays a loss only after the Company has collected from its other reinsurance agreements, and covers what is left over.
  – It is designed for the infrequent severe loss and applies primarily to property coverages.
Traditional Catastrophe Reinsurance
Key Terminology

• Loss Occurrence
  – Catastrophe Excess of Loss Treaties carefully define a “Loss Occurrence”.

  – There are hourly and geographic limitations in the contract for specific perils (wind, riot, earthquake, brushfire, freeze, etc.).

  – The loss is composed of that portion of individual losses from one occurrence that are not covered by other reinsurance agreements.

  – The Cat Agreement will sometimes cover only a percentage (e.g. 95%) of those losses that exceed the Company’s retention. It is usually warranted that the Company will retain the remaining percentage net and unreinsured.
Traditional Catastrophe Reinsurance Payback

**Payback Formula:**

\[
\frac{\text{Reinsurance Limit of Liability}}{\text{Annual Reinsurance Premium}} = \text{Number of years of pay back}
\]

\[
\frac{5,000,000}{250,000} = 20 \text{ Years}
\]
Traditional Catastrophe Reinsurance
Rate on Line (ROL)

Rate on Line Formula:

\[
\frac{\text{Annual Reinsurance Premium}}{\text{Reinsurance Limit of Liability}} = \text{ROL}
\]

\[
\frac{250,000}{5,000,000} = 5\%
\]
Traditional Catastrophe Reinsurance
Reinstatement of Cover after Loss

A Cat Treaty Limit of Liability is available only once, and once exhausted, no coverage remains…

…But, Reinstatement restores the limit during loss.
But Reinstatement requires additional Premium based upon 3 factors:

<table>
<thead>
<tr>
<th>Amount</th>
<th>Time</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinsurance Loss</td>
<td>Number of days remaining in the period</td>
<td>Reinsurance Limit</td>
</tr>
</tbody>
</table>

Example:

\[
\frac{5,000,000}{20,000,000} \times 292 \times 365 \times 400,000 = 80,000 \text{ Reinstatement Premium}
\]

(Loss Date 3/15)
Traditional Catastrophe Reinsurance
Reinstatement Premium Calculation

Reinstatement Premium Issues:

Number of Reinstatements available varies based upon type of treaty:

- Property Per Risk – multiple or unlimited
- Casualty Excess -- negotiated
- Catastrophe Excess – usually one

Premium is always proportionate to the amount of limit used.

Proration by time is a variable:

- Prorated as to time (from 1st day of loss)
- 50% as to time
- 100% as to time (most common)
Traditional Catastrophe Reinsurance
Unique Forms of Catastrophe Excess of Loss Agreements

Catastrophe Treaties with a twist:

- **Catastrophe Aggregate Excess of Loss** – to protect against an accumulation of retentions under multiple smaller loss occurrences.

- **Second Event Excess Covers** – to cover second and subsequent occurrences after an initial loss occurrence of sufficient size.

- **Drop Down Excess Covers** – cover second and subsequent loss events at a reduced retention level.

- **Reinstatement Premium Protection (RPP) Covers** – to cover expense of reinstatement premium paid under the main cat program in the event of large loss.
Catastrophe Program Design
Catastrophe Program Design
Major Considerations

- Management goals – financial, emotional
- Risk profiles – policies, limits and exposures
- Loss studies – severity, frequency, development
- Catastrophe modeling
- Peer comparisons
Meeting Firm Objectives
Reinsurance Effectiveness

Company’s Questions

Impact of Reinsurance on:
• Profitability
• Cash flow
• Capital allocation / adequacy
• Rating / regulatory scores
• Business plans
• Degree of risk transfer

Am I making my ROE goals after considering how much capital I’m allocating to this line?

Am I paying too much for reinsurance / am I purchasing it correctly?

I need surplus... help!

What’s the probability of a 10% reduction in surplus?

What is my risk of ruin?

How will a quota share contract support my growth plans?

Do I have too much or not enough capital to support my business going forward?

What risk measures should I be using to decide on my cat program?
The Process

IDEA → Test → RESULT

IDEA → Test → RESULT

IDEA → Test → RESULT

GUY CARPENTER
The Process

**INPUT**

- Program A
- Program B
- Program C
- Program D

**OUTPUT**

- Acceptable Performance
- Inadequate Protection
- Acceptable Performance
- Inordinate Cost

MetaRisk

GUY CARPENTER
Again

INPUT

Program A
Program C
Program G

OUTPUT

Acceptable Performance
Acceptable Performance
Heightened Performance

MetaRisk
Again

INPUT

- Bare (No Reins)
- Program A-C-G
- Current Program

OUTPUT

- Capital Erosion
- Optimal Performance
- Acceptable Performance

MetaRisk
Cat Modeling Concepts
Models
Background

• Traditionally, catastrophic loss impact was developed on a retrospective basis (payback plus expenses and profit)

• Introduction of the Applied Insurance Research (AIR) loss simulation technology in 1987 began a transition to a prospective view

• Since 1987, catastrophe models have been embraced by the insurance industry
  – Quantify risk at generally accepted benchmarks to help design and implement risk transfer programs
  – Annualized losses used in insurance rate promulgation
  – Integral part of underwriting decision making process
Models
Advantages

• **Minimizes reliance on historical data**
  – Adding an additional historical event to a small historical database can provide broad fluctuations in results
  – Historical results are not representative of future events in many areas
  – Exposures change over time (property values, population movement, building codes and construction techniques, topography, etc.)

• **Uses probabilistic distributions to properly address**
  – Low frequency but high severity events
  – Geographical distributions of events

• **Probabilistic distributions provide for robustness in the tail**
  – Compensate for little historical data
  – Should this be influenced by future activity?

• **Process large volumes of data and complex calculations quickly**
Models
Disadvantages

• Model output is heavily influenced by three critical areas
  – Quality of the source data (availability, completeness, accuracy)
  – Model methodology (difficult to quantify and changes over time)
  – Model application (added complexity in decision process)

SIGNIFICANT WIND MODEL CHANGES IN 2010 AND 2011

<table>
<thead>
<tr>
<th>Model</th>
<th>Change Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIR CLASIC/2 v.12 US Hurricane</td>
<td>July 2010</td>
</tr>
<tr>
<td>AIR CLASIC/2 v.12 Europe Windstorm</td>
<td>July 2010</td>
</tr>
<tr>
<td>AIR CLASIC/2 v12.5 Asia Typhoon</td>
<td>November 2010</td>
</tr>
<tr>
<td>RMS RiskLink v.11 US Hurricane</td>
<td>February 2011</td>
</tr>
<tr>
<td>RMS RiskLink v11.0 (SP2) European Windstorm</td>
<td>July 2011</td>
</tr>
<tr>
<td>RMS RiskLink v11.0 (SP2) Asia Typhoon</td>
<td>July 2011</td>
</tr>
<tr>
<td>EQECAT WorldCat Enterprise v.3.15 Asia Typhoon</td>
<td>July 2010</td>
</tr>
<tr>
<td>EQECAT WorldCat Enterprise v.3.15 North America Hurricane</td>
<td>July 2011</td>
</tr>
</tbody>
</table>

Source: Guy Carpenter & Company, LLC
Current Canadian Licensed Modeling Capabilities

• **Model Perils Available in Canada:**
  
  – **RMS**
  - Earthquake
  - Fire-Following Earthquake
  - Severe Convection (Tornado, Hail, Lightening and Straight-Line Winds)
  - Winter storm (Freeze, Snow, Wind and Ice)
  - North Atlantic Hurricane *(new to RMS v11.0)*

  – **EQECAT**
  - Earthquake
  - Fire-Following Earthquake

  – **AIR**
  - Earthquake
  - Fire-Following Earthquake *(not for automobiles)*
  - Severe Thunderstorm
Catastrophe Modeling
What is right?

• No one model is “right”

• All can claim to be, but none can substantiate that they are “better”
  – Models are proprietary
  – None is consistently more accurate in estimating actual event losses
  – No independent study has been definitive
How Reliable are Models?

- Depends on who you ask!

![2004 Florida Hurricane Activity](image-url)

- Actual Losses
- Happy
- Nervous Happy
- Very Unhappy
- Not so Happy

Companies

Model vs Actual Result

- Charley
- Frances
- Ivan
- Jeanne

May 25, 2012
Supply and Demand

• In the wake of large Cat losses in 2001, 2005 and now 2011, diminished capacity and increasing reinsurance rates caused a surge of interest in the ILS sector.
What are Insurance Linked Securities (ILS)?
- Financial instruments by which risk is transferred via the capital markets.

Characteristics of ILS:
- Typically of multi year duration.
- Generally higher ROL than similar traditional reinsurance coverages.
- Transacted in the financial markets either publicly or privately.

Common forms of ILS:
- Cat Bonds
- Industry Loss Warranties
- Cat Futures
Capital Market Solutions
Insurance Linked Securities (ILS)

• Cat Bond characteristics:
  – Transfers specific segment of risk
  – Involves “Special Purpose Vehicle” (SPV) which issues bonds
  – Principal pays losses if trigger conditions met
  – Used as alternative to high-layer Cat Reinsurance
• Industry Loss Warranty (ILW) characteristics:
  – Responds when the industry as a whole sustains sufficient loss to trigger payoff.
  – Relies on PCS or other claims service for Industry loss estimates.
  – May be written as reinsurance or as a derivative.
Capital Market Solutions
Insurance Linked Securities (ILS)

- Cat Futures characteristics:
  - Responds similarly to ILWs.
  - Contracts traded on commodity exchanges such as NYMEX or Chicago Climate Futures Exchange.
  - May be written as reinsurance or as a derivative.
Comparison of Traditional Reinsurance to Capital Market Solutions

<table>
<thead>
<tr>
<th>Reinsurance</th>
<th>ILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Indemnity Based</td>
<td>• Index based</td>
</tr>
<tr>
<td>• Credit Risk</td>
<td>• No Credit Risk</td>
</tr>
<tr>
<td>• Capital Credit</td>
<td>• Reduced Capital Credit</td>
</tr>
<tr>
<td>• Customized Coverage</td>
<td>• Standardized Contract</td>
</tr>
<tr>
<td>• Partnership Driven</td>
<td>• Transactional</td>
</tr>
<tr>
<td>• No up-front Fees</td>
<td>• Up-front Fees Fixed</td>
</tr>
</tbody>
</table>
In closing, an optimistic note …
Thank you!