GUY CARPENTER

CATASTROPHE REINSURANCE

Understanding its Past, Present and Potential

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MARSH & McLENNAN COMPANIES

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**

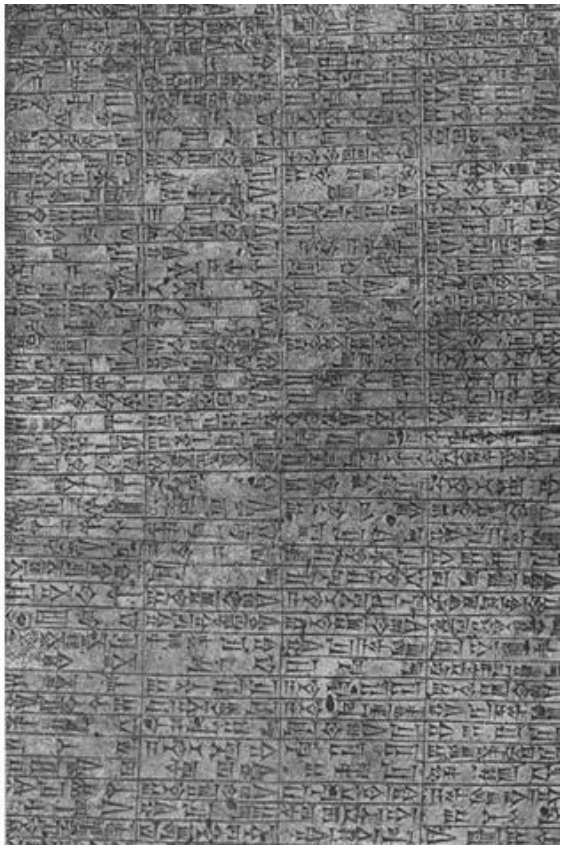
Reinsurance: a Brief History

(or How to Empty a Room Without Really Trying)

Catastrophe Reinsurance
History

- **In(surance) the Beginning …**

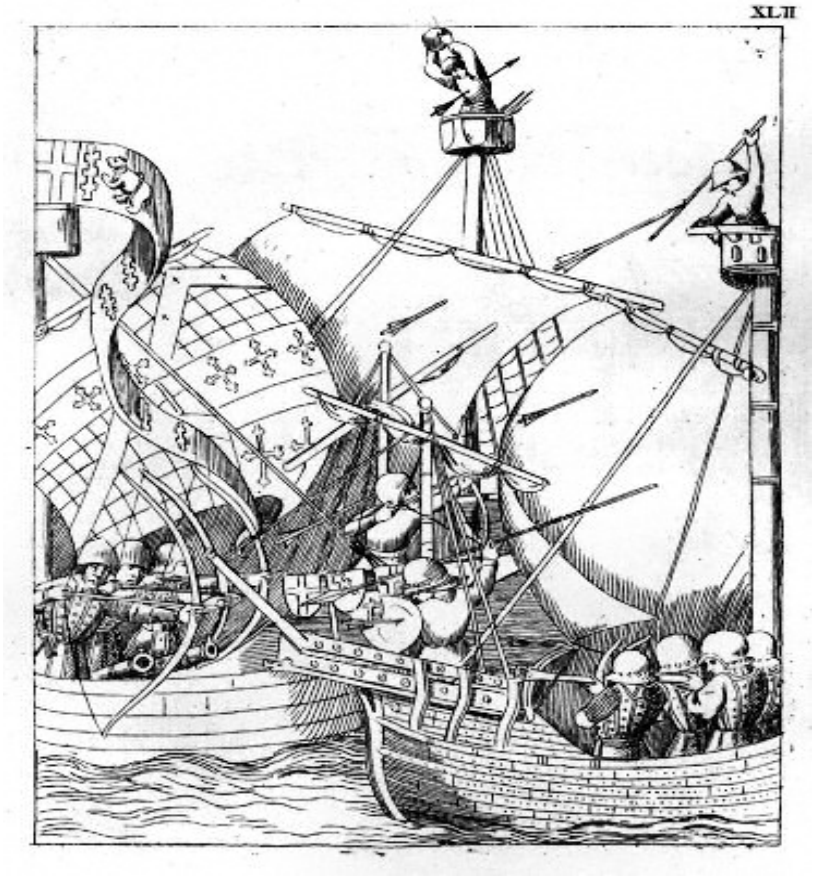
1800 BCE Babylon: The Code of Hammurabi



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 Cologne Re.

Oldest Reinsurance Company in the World – Established 1846

- **The Great Glarus, Switzerland Fire of 1861 – Swiss Re Est. 1863**

Swiss Re

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

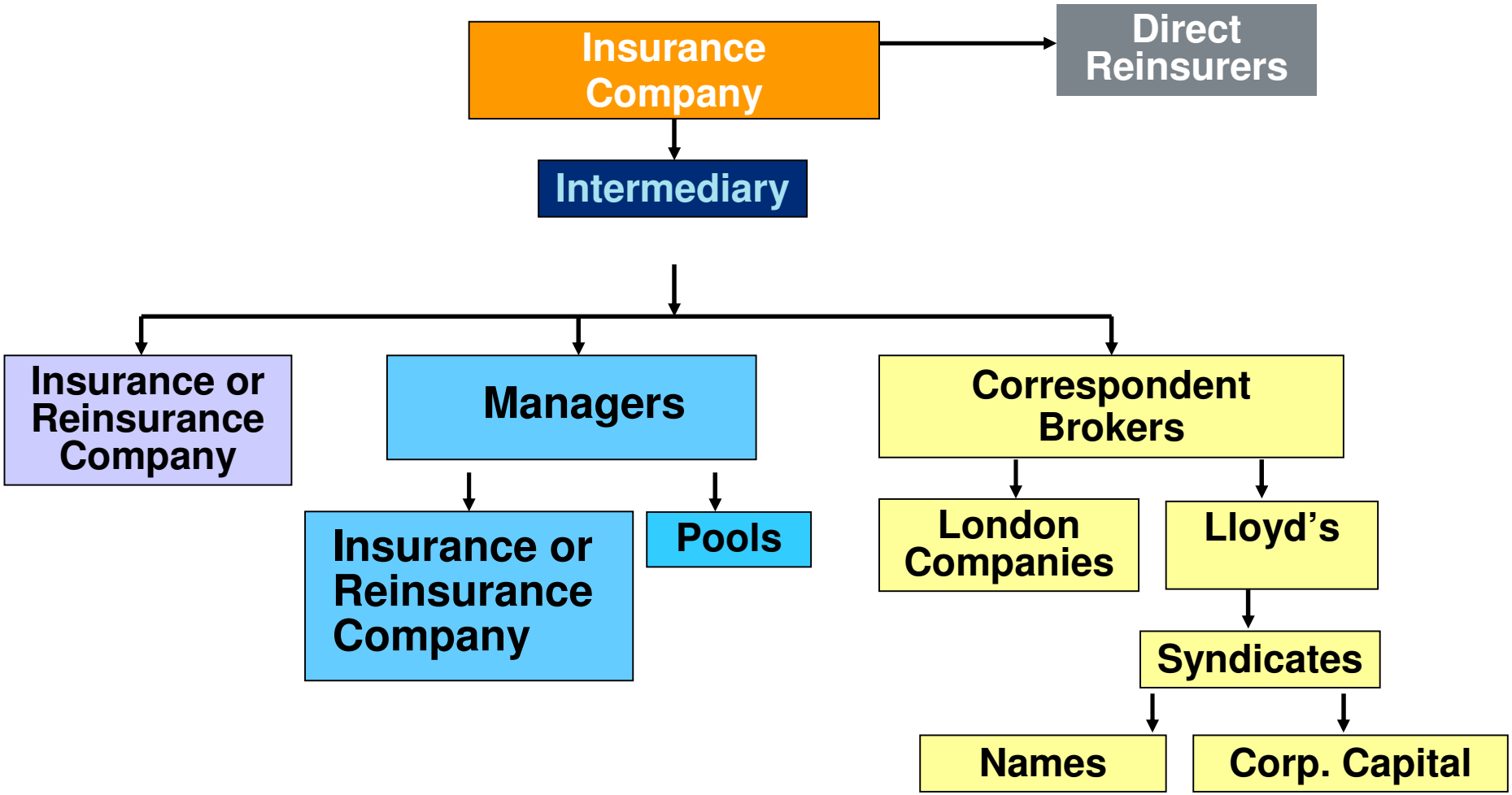
- **Capacity**

  The Company can write larger policies

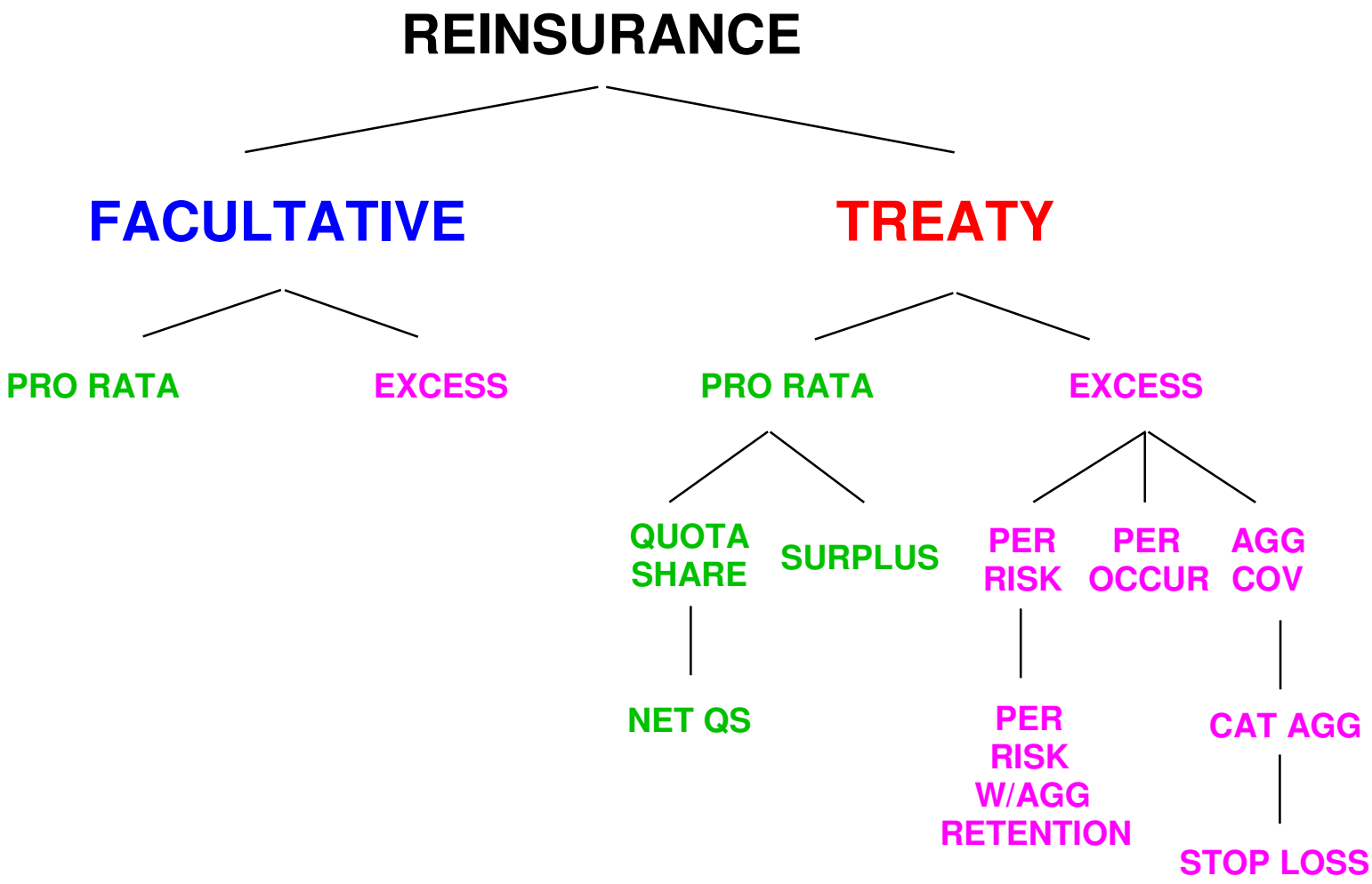
- **Catastrophe**

  The Company can protect itself from a major loss occurrence

Reinsurance Basics
The Reinsurance Family Tree



Reinsurance Basics
The Reinsurance Agreement Family Tree



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.

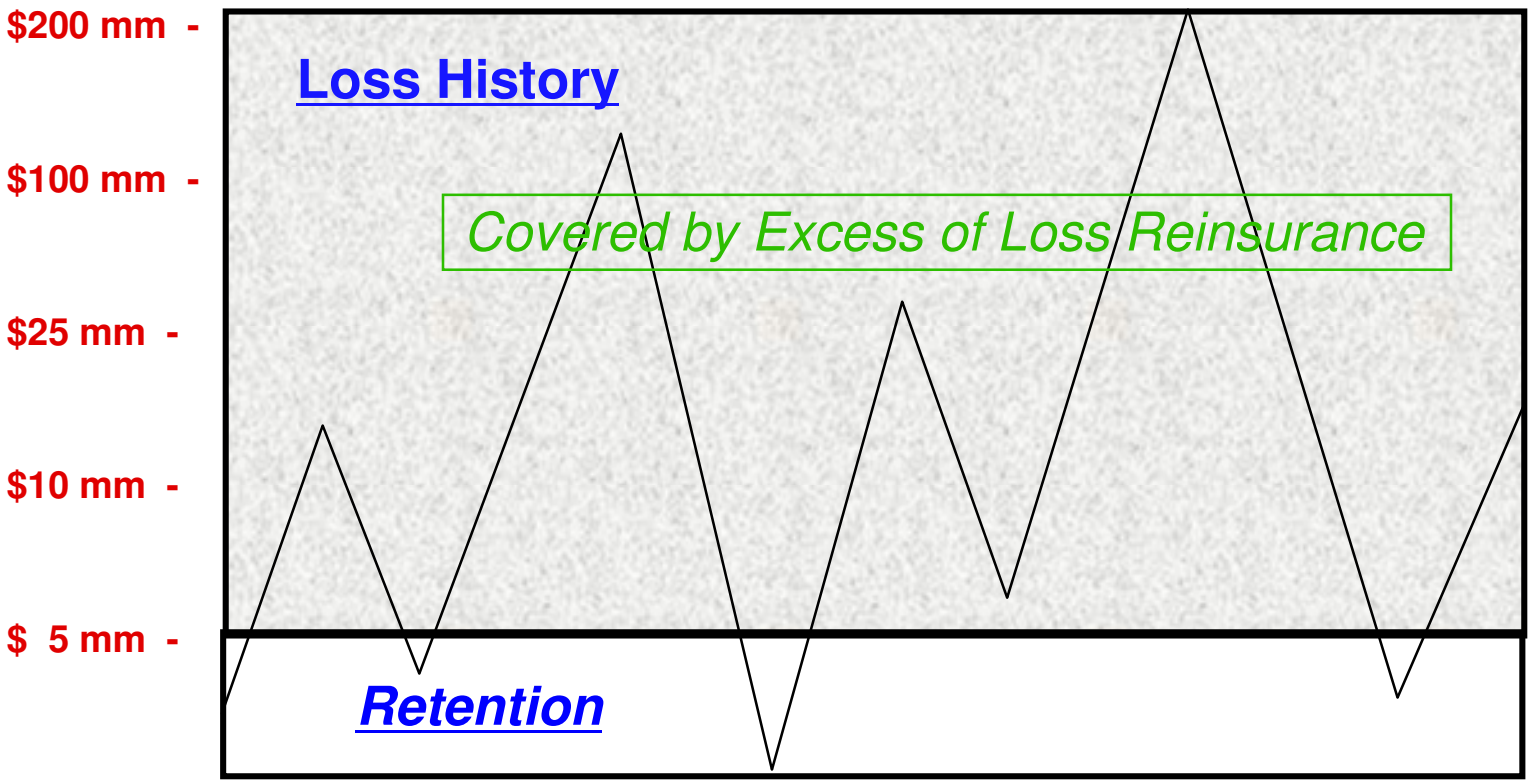
Reinsurance Basics
Layering Example

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



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:

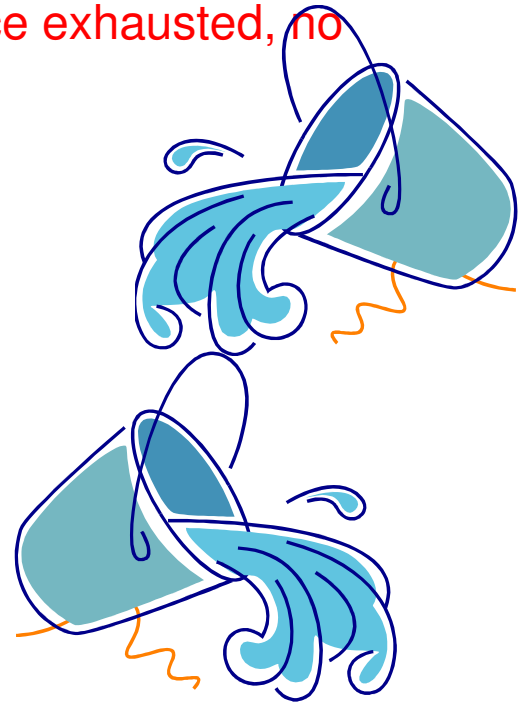
$$\frac{\text{Annual Reinsurance Premium}}{\text{Reinsurance Limit of Liability}} = \text{ROL}$$

$$\frac{250{,}000}{5{,}000{,}000} = 5\%$$

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.



Traditional Catastrophe Reinsurance
Reinstatement Premium Calculation

But Reinstatement requires additional Premium based upon 3 factors:

Amount		Time		Premium
Reinsurance Loss / Reinsurance Limit	X	**Number of days remaining in the period / Number of days in the period**	X	**Reins Premium**

Example:

5,000,000 / 20,000,000	X	**292 / 365** (Loss Date 3/15)	X	**400,000**

= 80,000 Reinstatement Premium

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:

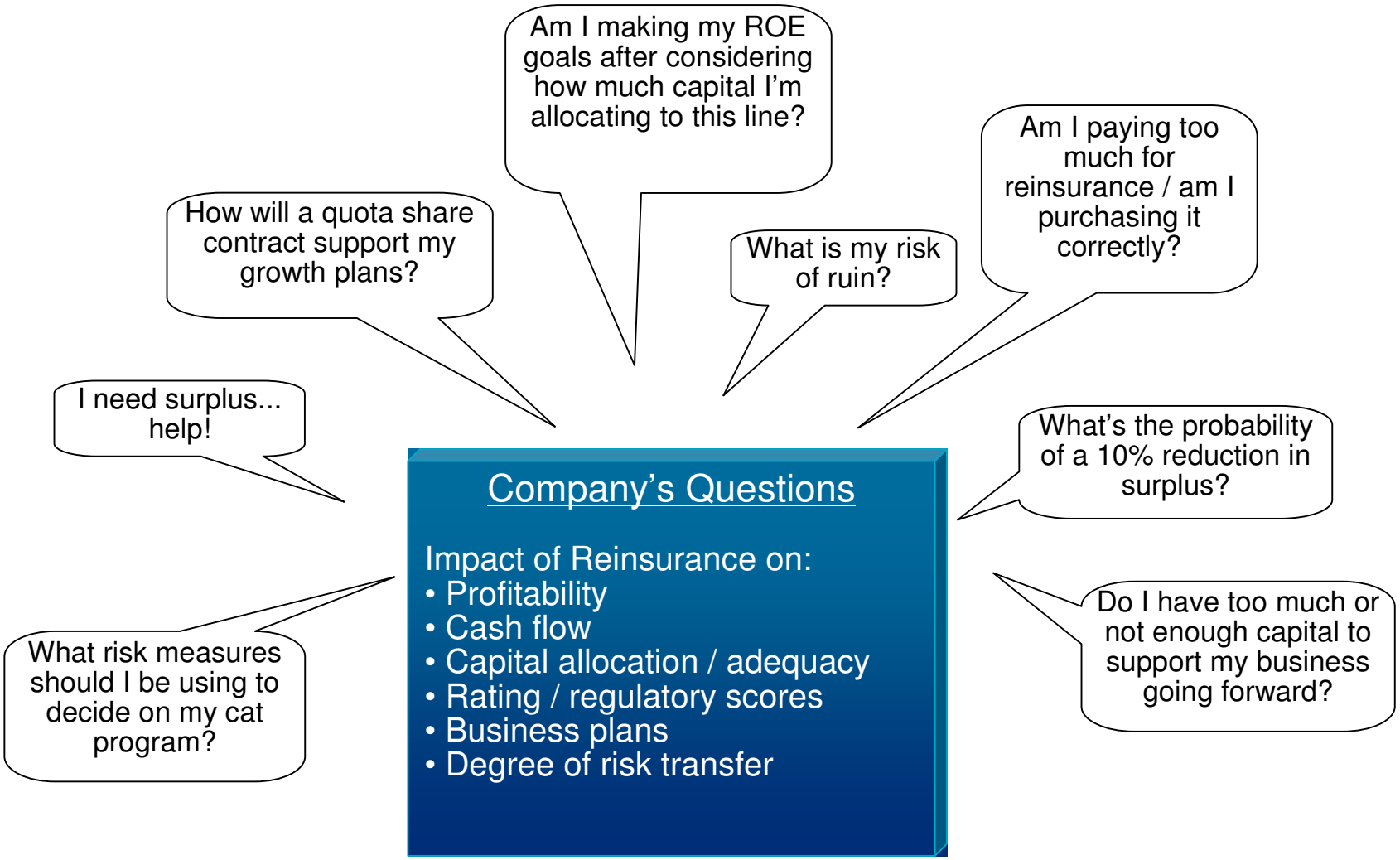
- **Catastrophe Aggregate Excess of Loss – to protect against an accumulation of retentions under multiple smaller loss occurrences.**
- **Second Event Excess Covers – to cover second and subsequent occurrences after an initial loss occurrence of sufficient size.**
- **Drop Down Excess Covers – cover 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

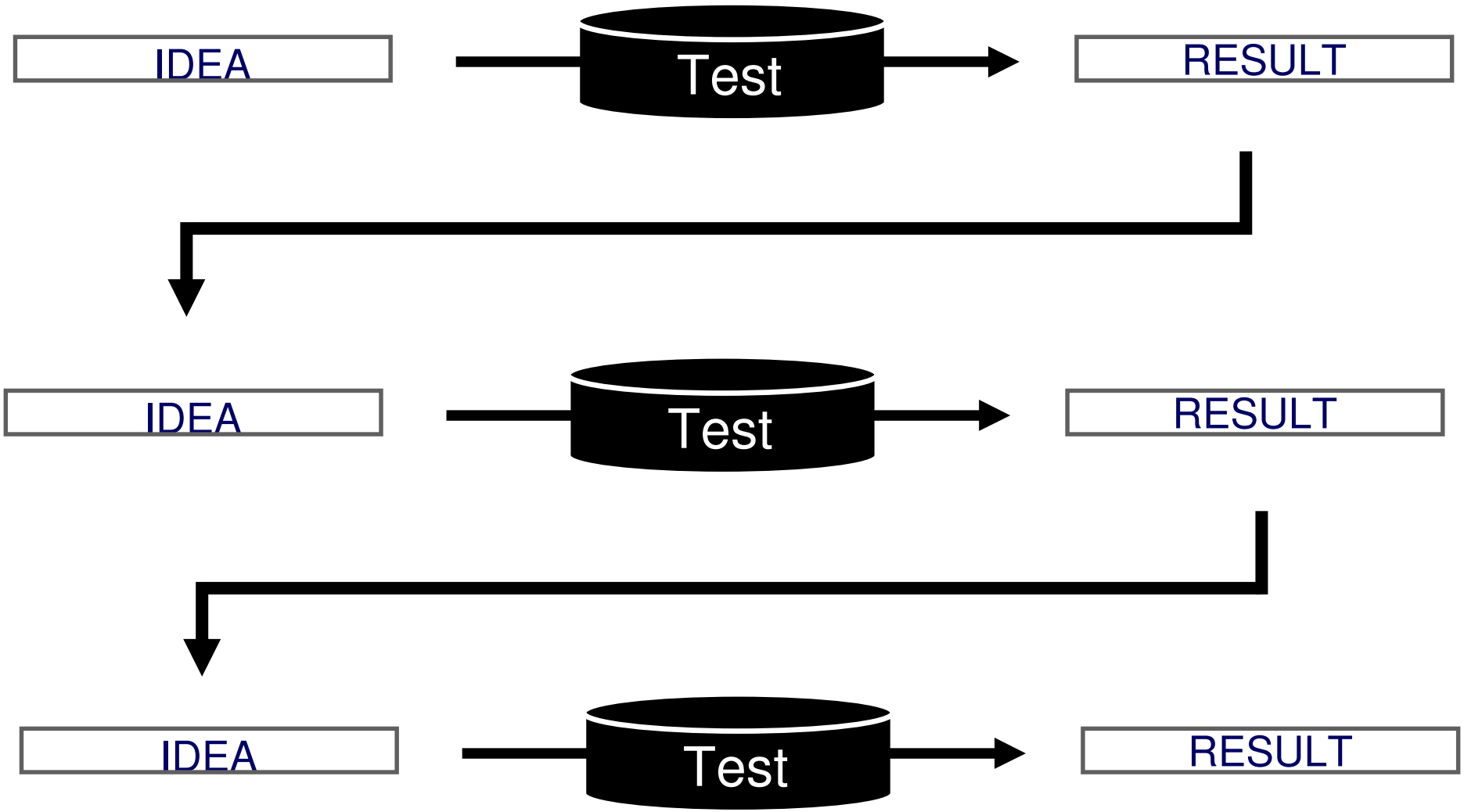
Catastrophe Program Design
Major Considerations

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

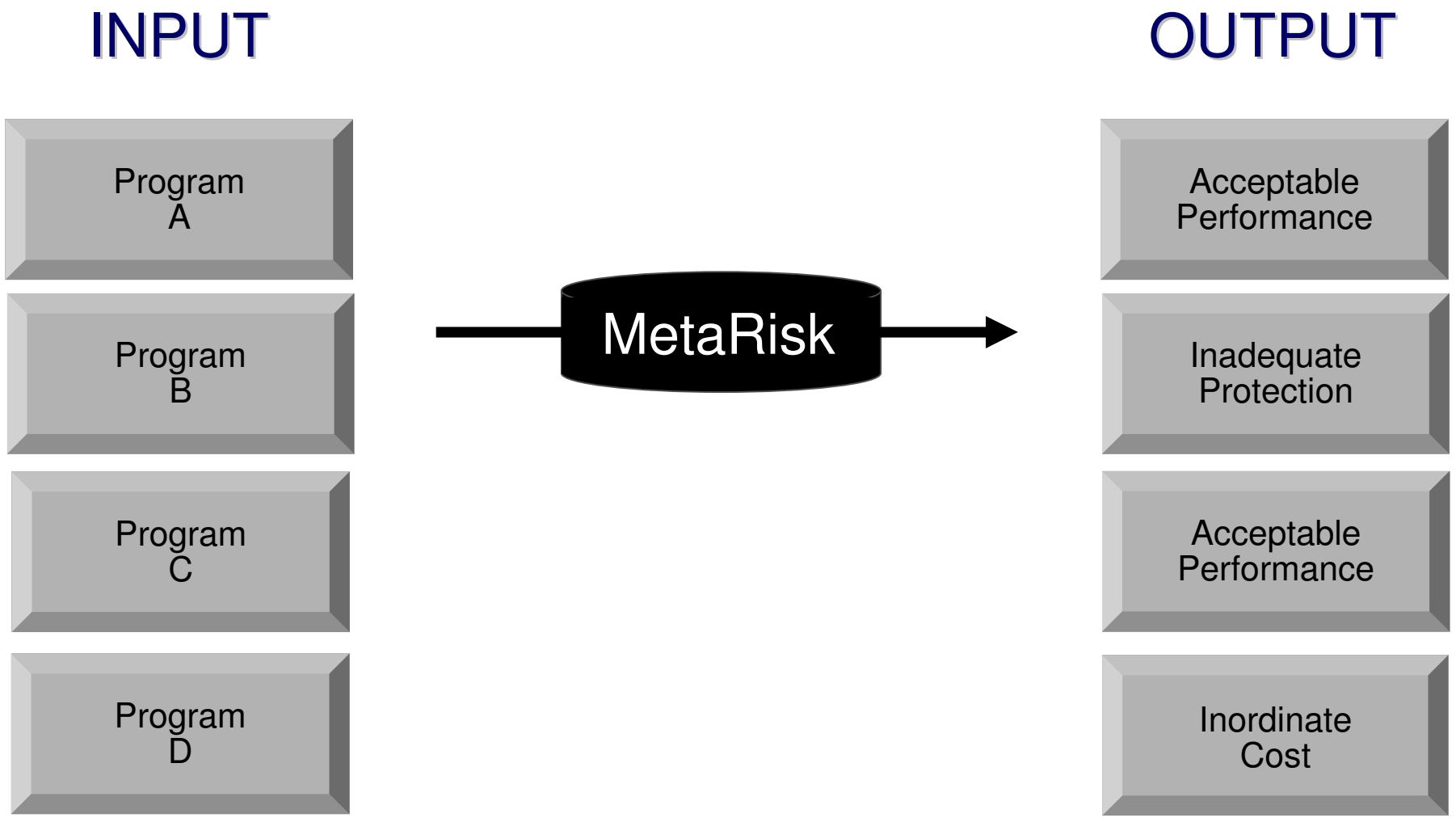
Meeting Firm Objectives
Reinsurance Effectiveness



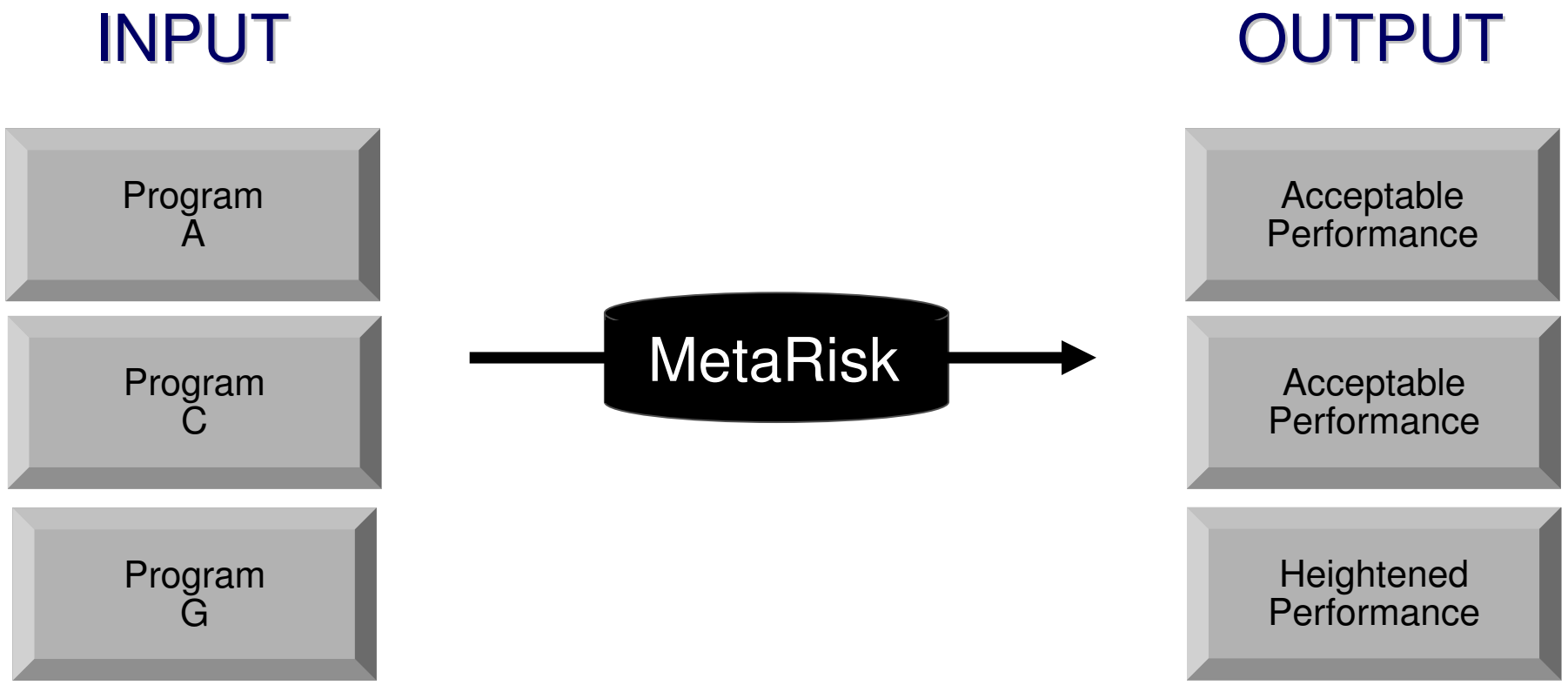
The Process



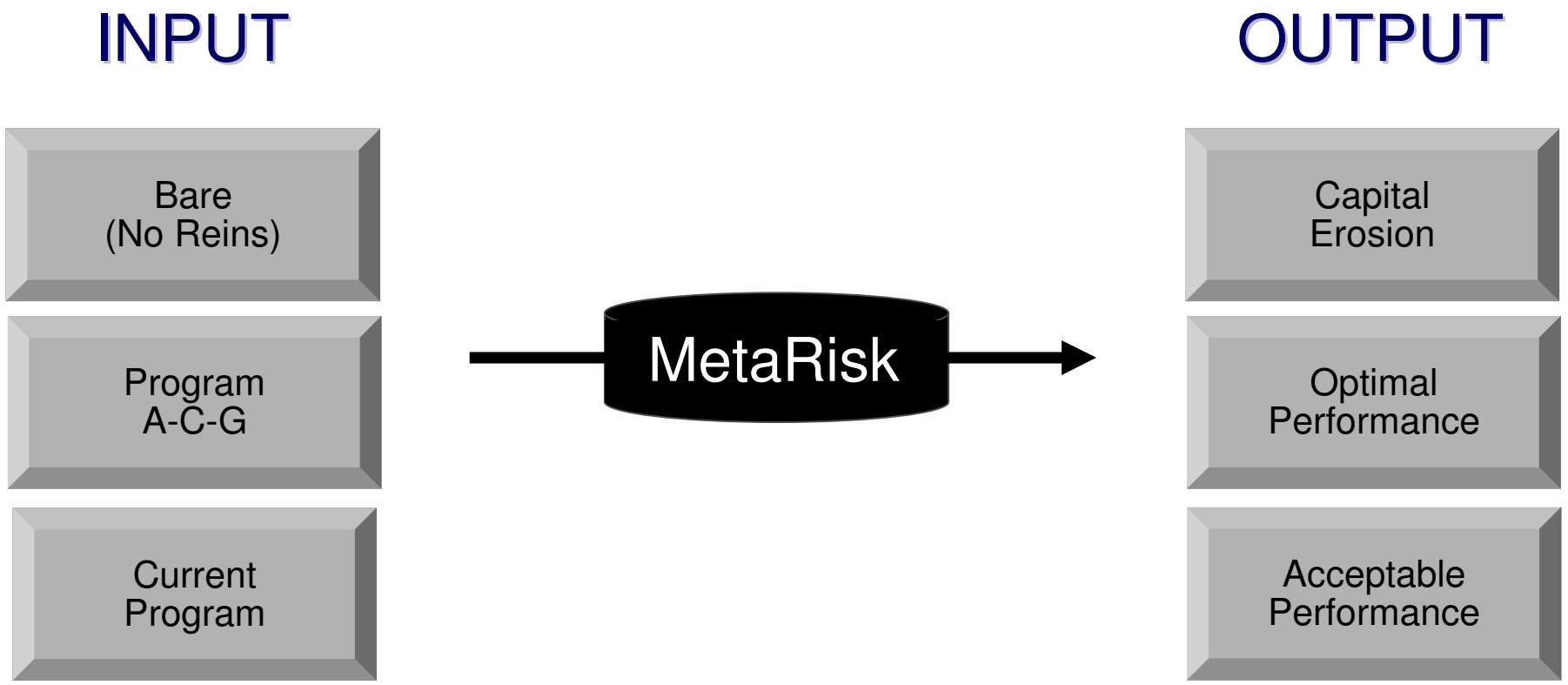
The Process


INPUT
Program A
Program B
Program C
Program D
MetaRisk
OUTPUT
Acceptable Performance
Inadequate Protection
Acceptable Performance
Inordinate Cost

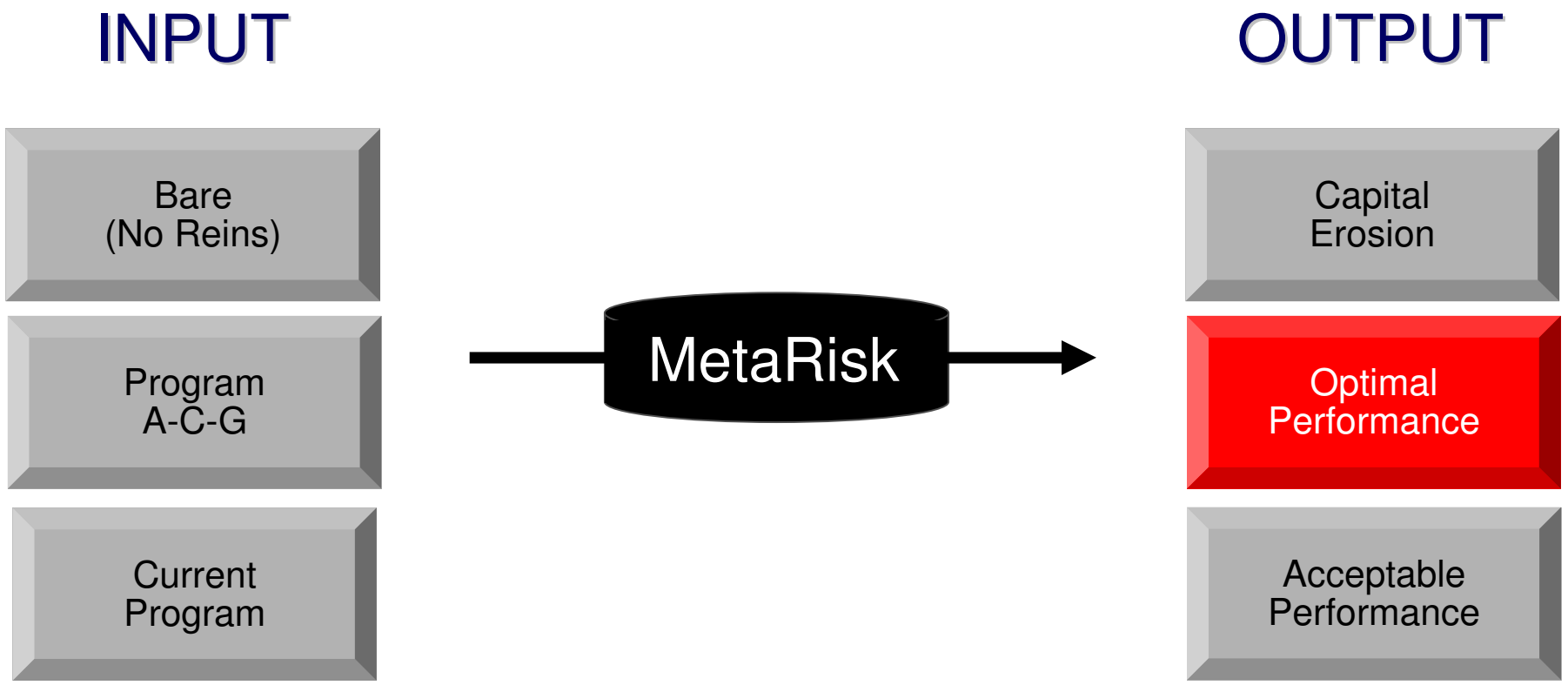
Again


INPUT
OUTPUT
Program A
Program C
Program G
MetaRisk
Acceptable Performance
Acceptable Performance
Heightened Performance

Again


INPUT
OUTPUT
Bare
(No Reins)
Program
A-C-G
Current
Program
MetaRisk
Capital
Erosion
Optimal
Performance
Acceptable
Performance

Again


INPUT
OUTPUT
Bare
(No Reins)
Program
A-C-G
Current
Program
MetaRisk
Capital
Erosion
Optimal
Performance
Acceptable
Performance

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

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

Source: Guy Carpenter & Company, LLC

Current Canadian Licensed Modeling Capabilities

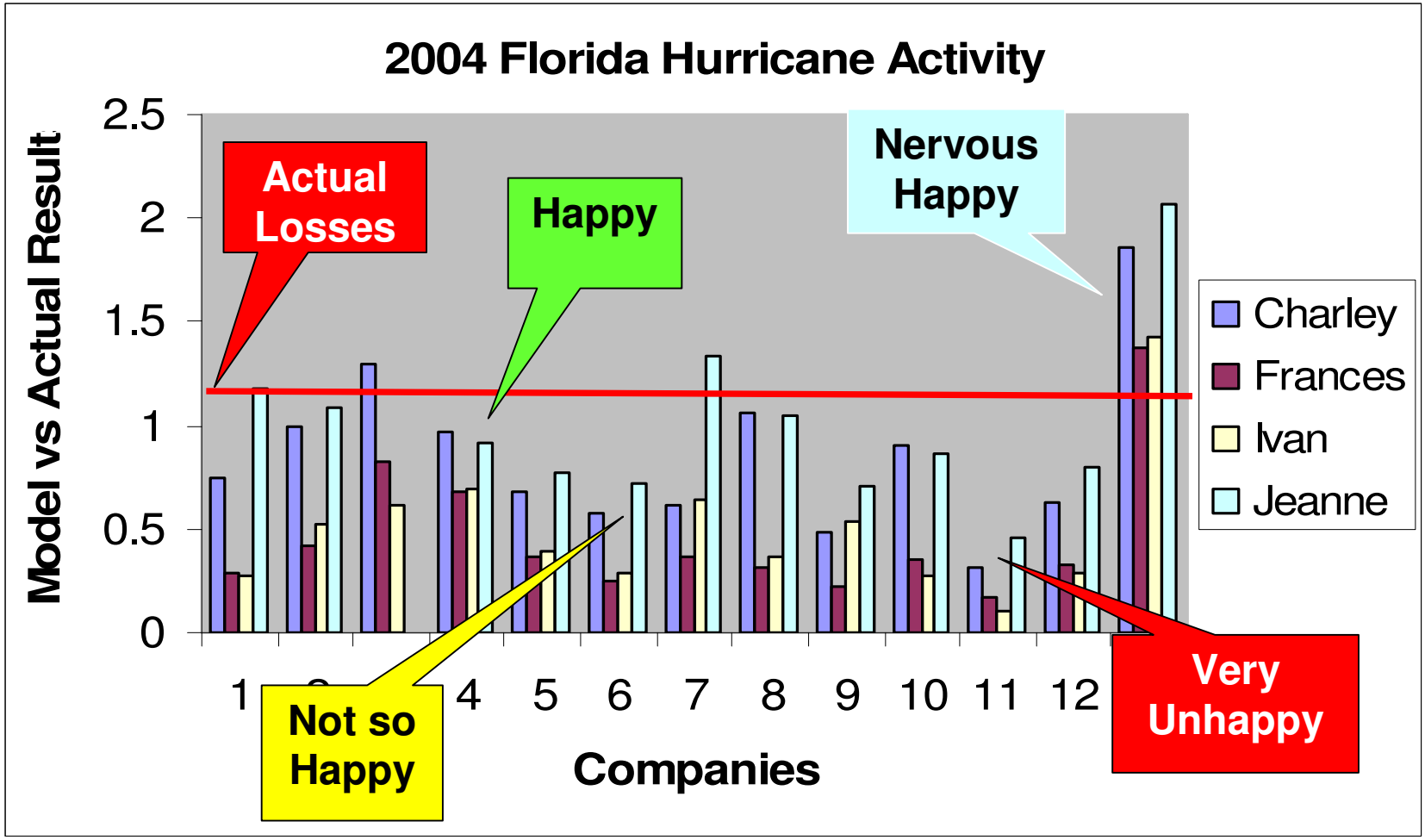
- **Model Perils Available in Canada:**
  - **RMS**
    - Earthquake
    - Fire-Following Earthquake
    - Severe Convection (Tornado, Hail, Lightening and Straight-Line Winds)
    - Winter storm (Freeze, Snow, Wind and Ice)
    - North Atlantic Hurricane (new to RMS v11.0)
  - **EQECAT**
    - Earthquake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

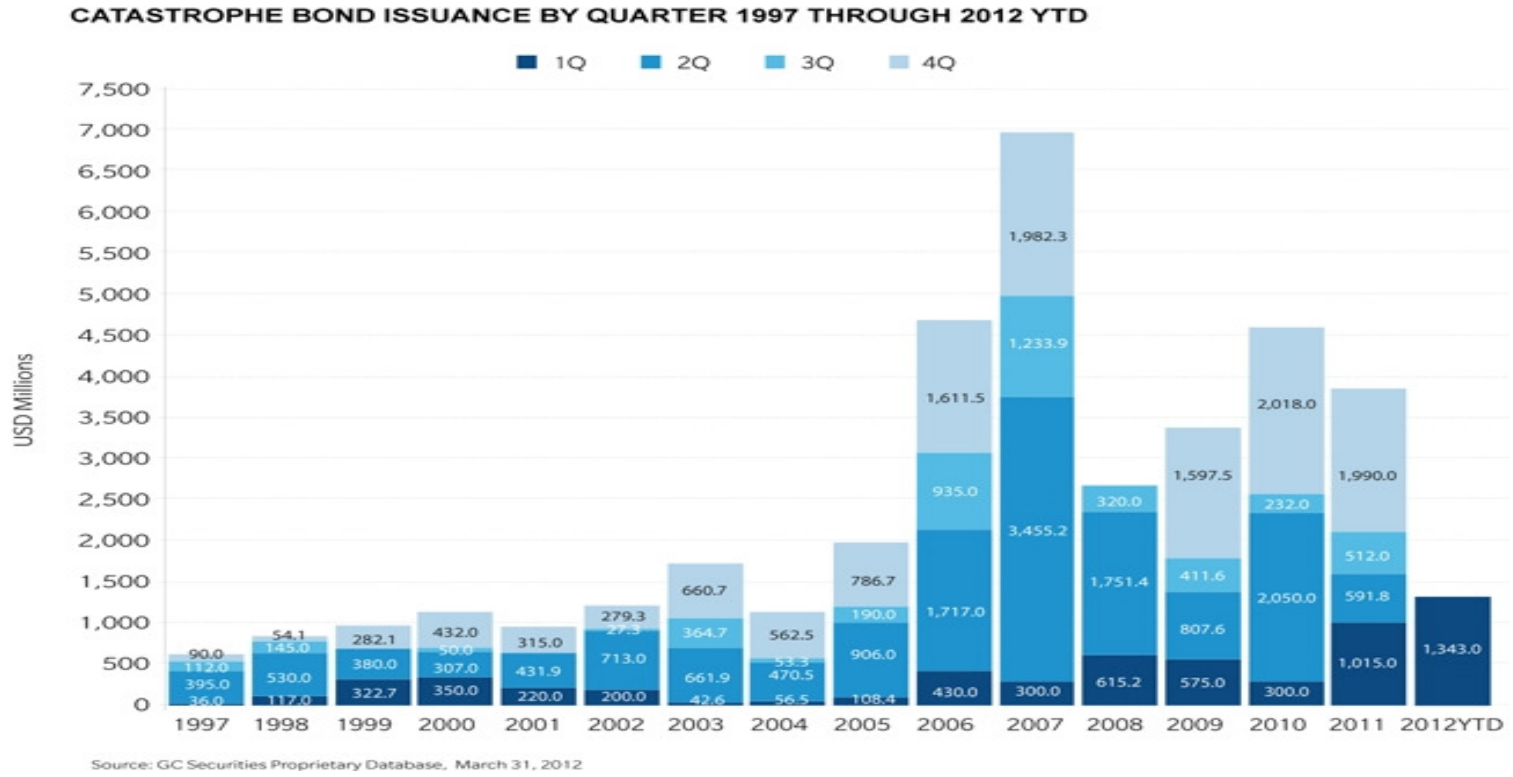
- Depends on who you ask!



Capital Market Solutions

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.



Capital Market Solutions
Insurance Linked Securities (ILS)

- 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 wither 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

Capital Market Solutions
Insurance Linked Securities (ILS)

- 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

Reinsurance	ILS
• Indemnity Based	• Index based
• Credit Risk	• No Credit Risk
• Capital Credit	• Reduced Capital Credit
• Customized Coverage	• Standardized Contract
• Partnership Driven	• Transactional
• No up-front Fees	• Up-front Fees Fixed


In closing, an optimistic note …

Thank you!

GUY CARPENTER