

University of Cambridge  
Centre for Science and Policy  
8<sup>th</sup> March, 2011

## Resilience in Insurance

Stress test business plans for extreme events – hope for the best; plan for the worst

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The Lighthill Risk Network is a consortium of insurance companies and brokers working to build bridges between the insurance market and the research community.

## Useful URLs

- Blackett Review on High Impact/Low Probability Risks
  - [www.bis.gov.uk/assets/bispartners/goscience/docs/b/12-519-blackett-review-high-impact-low-probability-risks.pdf](http://www.bis.gov.uk/assets/bispartners/goscience/docs/b/12-519-blackett-review-high-impact-low-probability-risks.pdf)
- The Foundation for Science and Technology
  - [www.foundation.org.uk](http://www.foundation.org.uk)
- The Risk Centre, Cranfield University
  - [www.cranfield.ac.uk/sas/risk](http://www.cranfield.ac.uk/sas/risk)
- Professor Richard Smith
  - [www.stat.unc.edu/faculty/rsmith.html](http://www.stat.unc.edu/faculty/rsmith.html)
- Professor Paul Embrechts
  - [www.math.ethz.ch/~embrechts/](http://www.math.ethz.ch/~embrechts/)
- Cambridge Centre for Risk Studies
  - [www.risk.jps.cam.ac.uk](http://www.risk.jps.cam.ac.uk)

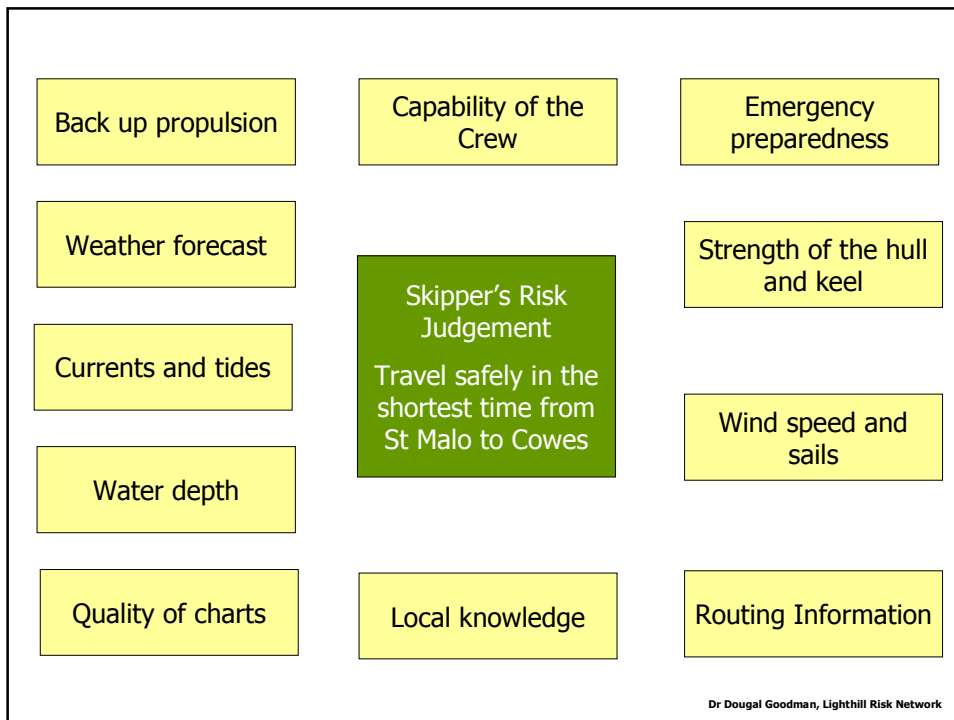
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Paul Thompson



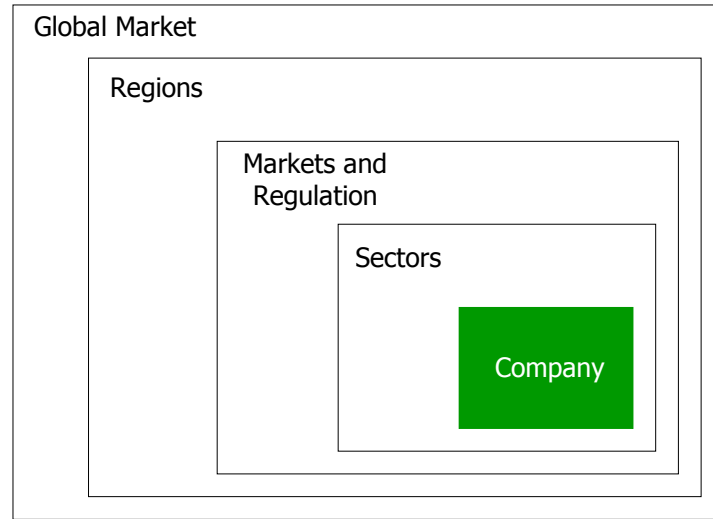
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**Risks to a Company**

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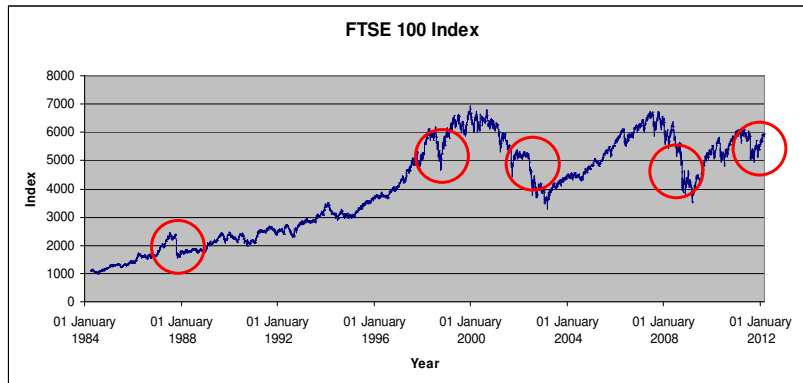
## System of Systems



Threat of contagion

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## Events do happen...



2007 Floods

Banking Crisis

Japanese Tsunami

Eurozone Crisis

What next?

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## Deep downsides – only some can be quantified

- Sudden product price or margin fall
- Customers do not pay for goods or services
- Liability claim
- Loss of trust of employees
- Outrage of the public
- Projects fail to complete on time and within budget
- Cyber attack
- Business interruption from natural catastrophes
- Fire or explosion at a facility
- Fraud, accounting or trading failure
- Collapse of a supplier
- Regulatory or tax step change
- Loss of utilities
- and so on...

**Risk level controlled by elimination, management or transfer**

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## What is acceptable?

### A board decision

As Low As Reasonably Practicable

Risk = Consequences \* Vulnerability \* Likelihood

Risk = How big? \* How vulnerable? \* How often?

Impact per unit time

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What could destroy 5%  
or more of UK GDP or  
5% or more of the  
value of a company?

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## Macondo Well Failure

- Damage to BP brand in US and elsewhere
- Combination of events led to low probability, high severity event
- Challenge to client contractor relationships
- Significant loss of value to the company

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## Macondo Insurance Exposure

Total economic loss: \$40 billion plus

	<b>Working interest</b>	<b>Maximum insurance coverage</b>
BP	65%	Self-insured
Anadarko	25%	\$163 million
Mitsui	10%	\$175 million
Transocean	Contractor	\$950 million

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Since merchants first met to insure their ships at Edward Lloyd's coffee shop over 300 years ago, nearly every aspect of the way we do business has changed. But one constant is the bold confidence proclaimed by our motto, reflected in both our unique appetite for risk and our worldwide reputation for settling valid claims.

Lloyd's of London commitment to insureds is to "settle all valid claims"

Market made up of underwriting syndicates regulated by Lloyd's corporate structure

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# Risks to an insurance syndicate

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## Solvency II – Regulation of Insurers

New regime for the regulation of insurers from January, 2014

- Pillar I - Companies will have to show regulators that they have appropriate internal models for evaluating their capital requirements or use a standardised approach
- Pillar II – Demonstrate that they have an **effective risk management process and a risk identification process**
- Pillar III – Public disclosure and reporting requirements

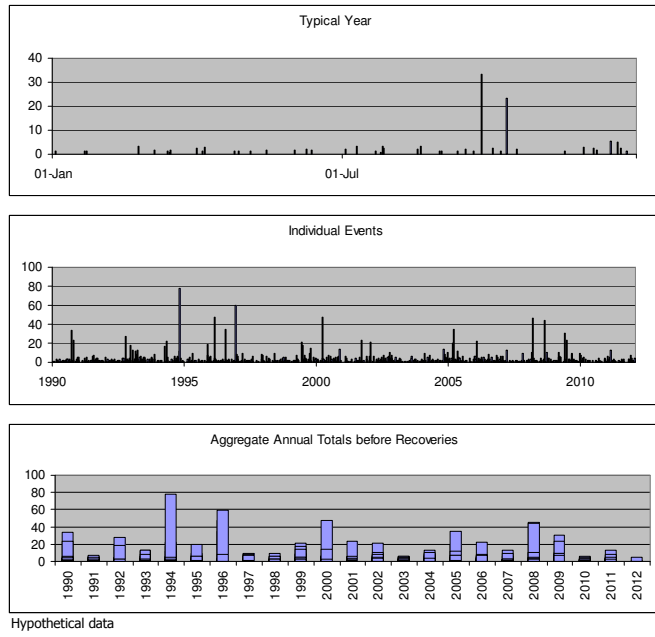
Test of the ability of an insurance entity to survive a 1 in 200 event.

Regulators wish to be reassured that if premiums are collected the insurer will be able to pay valid claims for future losses.

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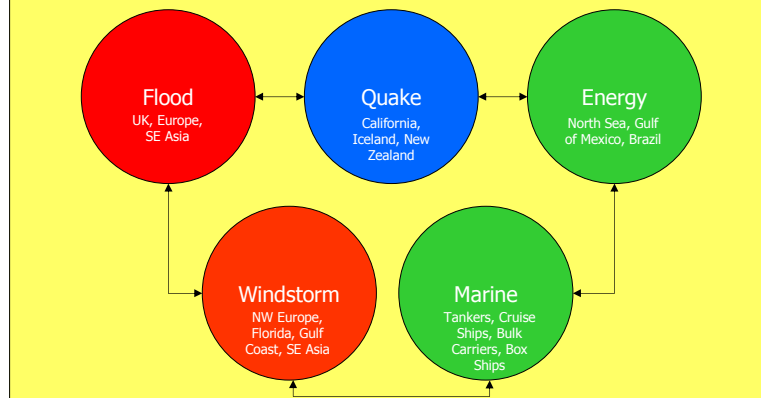


### Typical time series of losses for a catastrophe line of business



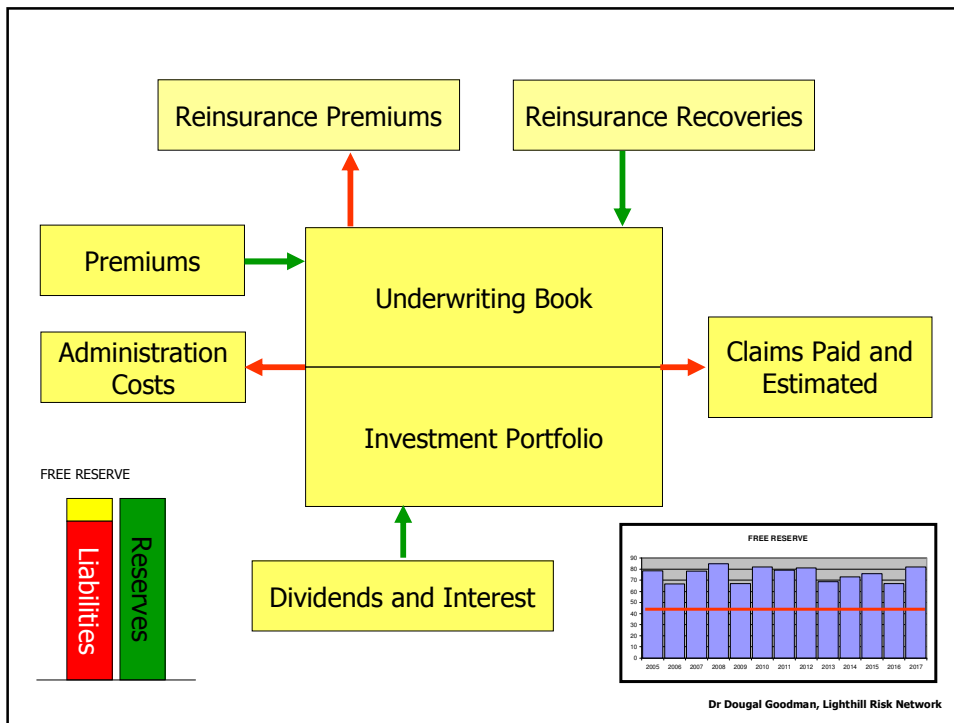
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### Partial Correlation



### Typical Underwriting Book of Business

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# Extreme Value Analysis



- Compulsory Scenarios
  - Two Events
  - Florida Windstorm
  - Gulf of Mexico Windstorm
  - European Windstorm
  - Japanese Windstorm
  - Californian Earthquake
  - New Madrid Earthquake
  - Japanese Earthquake
  - UK Flood
  - Terrorism
- Optional Scenarios
  - Marine P&I Risks
  - Loss of Major Complex
  - Aviation Collision
  - Satellite Risks
  - Liability Risks
  - Political Risks
  - Alternative RDS

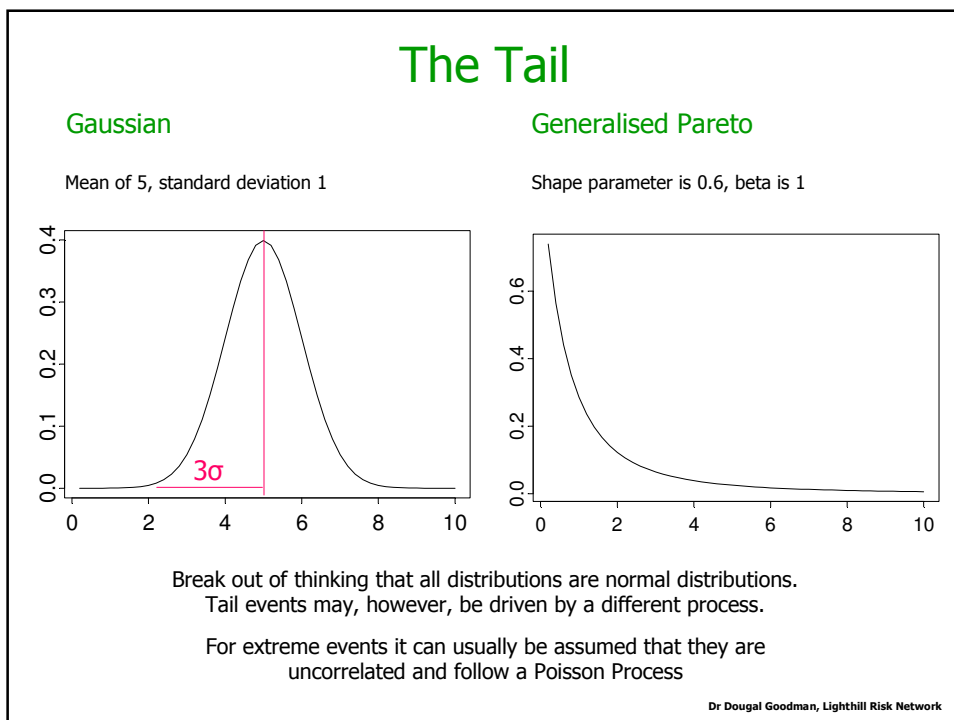
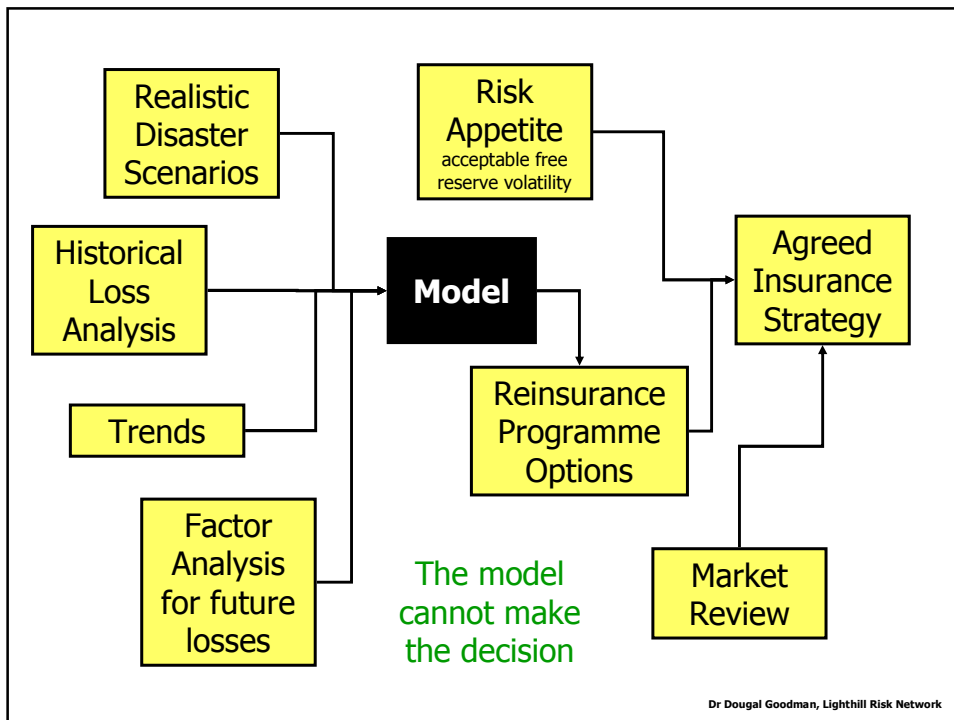
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## UK Flood Event – Lloyd’s RDS Scenario 9

Residential	£4.5 bn
Commercial/industrial	£1.6 bn
Agriculture	£0.05 bn
Motor	£0.05 bn
<b>TOTAL</b>	<b>£6.2 bn</b>

To estimate the loss a knowledge of precipitation, surface flooding, river flow, terrain heights, land use and the social aspects of how people react to flood warnings is required.

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# Communication of Risk

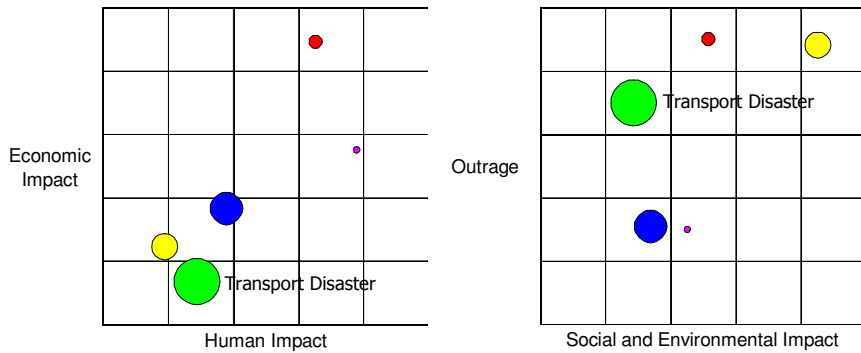
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## Dimensions for Communication

- Economic Impact
  - Impact on the economy or business return
- Human Impact
  - Fatalities and serious injuries
- Outrage
  - Lost of trust in government or business management
- Social and Environmental Disruption
  - Social breakdown or severe environmental damage
- Likelihood
  - Return period for an event – large uncertainty
  - Depends on scenario description

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## Unbundling Risk



The area of the circle is a measure of likelihood

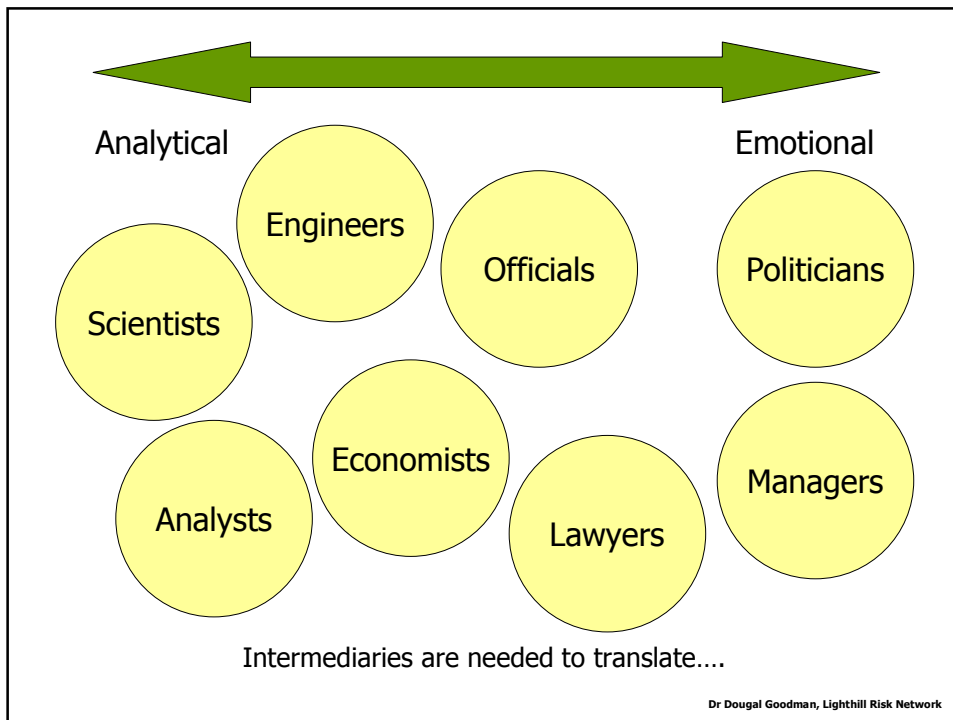
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## Risk Framework of Macro-Threats

Dr Andrew Coburn, Cambridge Risk Studies Centre

 1 Financial Shock	 5 Natural Catastrophe	 9 Disease Outbreak
 2 Trade Dispute	 6 Climatic Catastrophe	 10 Humanitarian Crisis
 3 Geopolitical Conflicts	 7 Environmental Catastrophe	 11 Externality
 4 Political Violence	 8 Technological Catastrophe	 12 Other Shock

Community peer review being conducted at <http://systemshock.org.uk>



## Summary

- Every organisation should have systems in place to test the impact of deep downsides on future performance
- Senior managers should stand back from day to day operations and think about the events that could destroy the company or organisation
- Communication of extreme value analysis is not straightforward – a new language for communicating risk in business is required

Hope for the best; plan for the worst

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Thank You

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