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
- The Foundation for Science and Technology
  - www.foundation.org.uk
- The Risk Centre, Cranfield University
  - www.cranfield.ac.uk/sas/risk
- Professor Richard Smith
  - www.stat.unc.edu/faculty/rsmith.html
- Professor Paul Embrechts
  - www.math.ethz.ch/~embrechts/
- Cambridge Centre for Risk Studies
  - www.risk.jps.cam.ac.uk
Risks to a Company
System of Systems

Global Market

Regions

Markets and Regulation

Sectors

Company

Threat of contagion

Events do happen...

FTSE 100 Index


Index

2007 Floods  Banking Crisis  Japanese Tsunami  Eurozone Crisis

What next?
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

What is acceptable?

A board decision

As Low As Reasonably Practicable

Risk = Consequences * Vulnerability * Likelihood


Impact per unit time
What could destroy 5% or more of UK GDP or 5% or more of the value of a company?

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
Macondo Insurance Exposure

Total economic loss: $40 billion plus

<table>
<thead>
<tr>
<th>Working interest</th>
<th>Maximum insurance coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP 65%</td>
<td>Self-insured</td>
</tr>
<tr>
<td>Anadarko 25%</td>
<td>$163 million</td>
</tr>
<tr>
<td>Mitsui 10%</td>
<td>$175 million</td>
</tr>
<tr>
<td>Transocean</td>
<td>Contractor $950 million</td>
</tr>
</tbody>
</table>

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
Risks to an insurance syndicate

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

Partial Correlation

Flood
UK, Europe, SE Asia

Quake
California, Russia, New Zealand

Energy
North Sea, Gulf of Mexico, Brazil

Windstorm
NW Europe, Florida, Gulf Coast, SE Asia

Marine
Tankers, Cruise Ships, Bulk Carriers, Box Ships

Typical Underwriting Book of Business
Extreme Value Analysis
UK Flood Event – Lloyds RDS Scenario 9

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

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.
Realistic Disaster Scenarios

Historical Loss Analysis

Trends

Factor Analysis for future losses

The model cannot make the decision

Risk Appetite acceptable free reserve volatility

Agreed Insurance Strategy

Reinsurance Programme Options

Market Review

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The Tail

Gaussian

Mean of 5, standard deviation 1

3σ

Generalised Pareto

Shape parameter is 0.6, beta is 1

Break out of thinking that all distributions are normal distributions. Tail events may, however, be driven by a different process. For extreme events it can usually be assumed that they are uncorrelated and follow a Poisson Process.
Communication of Risk

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
Unbundling Risk

The area of the circle is a measure of likelihood

Risk Framework of Macro-Threats
Dr Andrew Coburn, Cambridge Risk Studies Centre

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

Community peer review being conducted at http://systemshock.org.uk
Intermediaries are needed to translate....

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
Thank You