Scenario Modelling & Stress Testing

AA Forum 3-4 Dec 2014

Reference Materials

- CRO_Council_-_Stress_and_Scenario_Testing_Paper_FINAL

- International Actuarial Association (IAA) - http://www.actuaries.org/CTTEES_SOLV/Documents/StressTestingPaper.pdf

"The banking system's reported financial indicators are above minimum regulatory requirements and stress tests suggest that the system is resilient" (IMF, *Iceland: Financial Stability Assessment – update*, 19 August 2008, p 5)

The above simply echoed the message of stress tests carried out by authorities and banks around the globe ahead of what turned out to be one of the worst financial crises in world history and with that the collapse of the Icelandic economy.

Indeed, had Winston Churchill been still alive, he might well have said: "Never in the history of mankind have so many got it so wrong for so long."

(BIS Working Papers No. 369, Jan 2012)

Agenda

- Background and introduction
- Principles and governance
- Scenario Building
- Modelling Scenarios - Approaches
- Presentation of Results
- Conclusion

Background (1)

- Global economic crisis
- Volatile equity market returns
- Competitive pressures
- Ongoing regulatory and accounting developments
- Social, economic and environment changes

Background (2)

- The new economic environment has increased the focus on risk and capital management

   By the Board of Directors

   By the regulators

   By the rating agencies (S&P, A.M. Best)

- Global shift towards a more dynamic, forward-looking and comprehensive regulatory framework

- The current trend will continue and accelerate over the coming years

Background (3)

1. Articles 41, 44, 45 and 246 of Solvency II Directive

2. Guidelines on Forward Looking assessment of own risks (based on the ORSA principles)

3. FCR guidelines: Section 9.1 scenario testing, Section 14.2 stress testing

Table No. 9.1: Risk Management

Key Risk/Scenario		Value of Asstes	Value of Liabilities	ASM	RSM	SM
Key Risk1*:	Base Scenario*:					
	Pessimistic Scenario1*:					
	Pessimistic Scenario2*:					
Key Risk 2*:	Base Scenario*:					
	Pessimistic Scenario1*:					
	Pessimistic Scenario2*:					

* Define Key Risk, base scenario and pessimistic scenarios

Table No. 14.2: Stress Tests

Financial Year	Scenario 1			Scenario 2		
	FY ending 31-March-X+1	FY ending 31-March-X+2	FY ending 31-March-X+3	FY ending 31-March-X+1	FY ending 31-March-X+2	FY ending 31-March-X+3
Projected ASM						
Projected RSM						
Projected Solvency Ratios						

X = Current Calender Year

Benefits (1)

- An effective scenario modelling and stress testing program should serve the following main objectives:
  - ➢ Identification of possible threats to the financial condition of an insurer
  - ➢ Defining appropriate risk management actions to address those threats
  - ➢ Providing a complementary risk perspective to other risk management tools
  - ➢ Supporting capital management
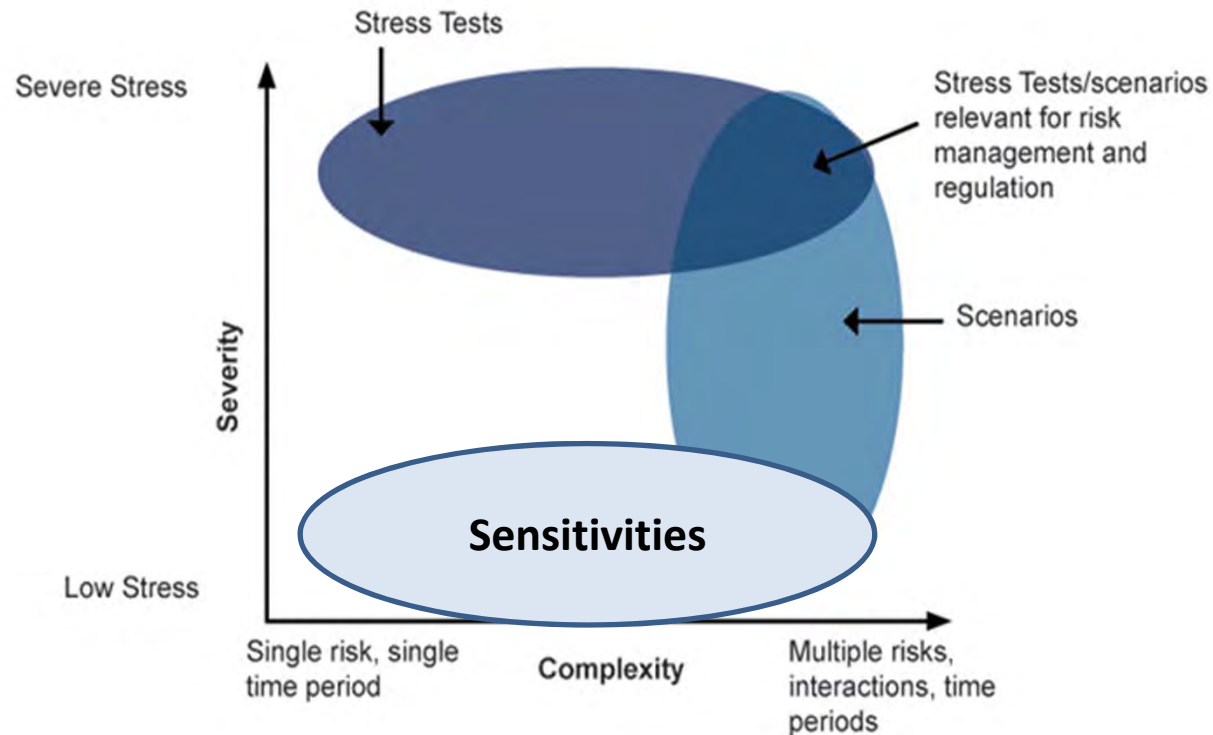 - ➢ Improving liquidity management

Benefits (2)

Stress and scenario testing is one of the core components of a strong ERM program.
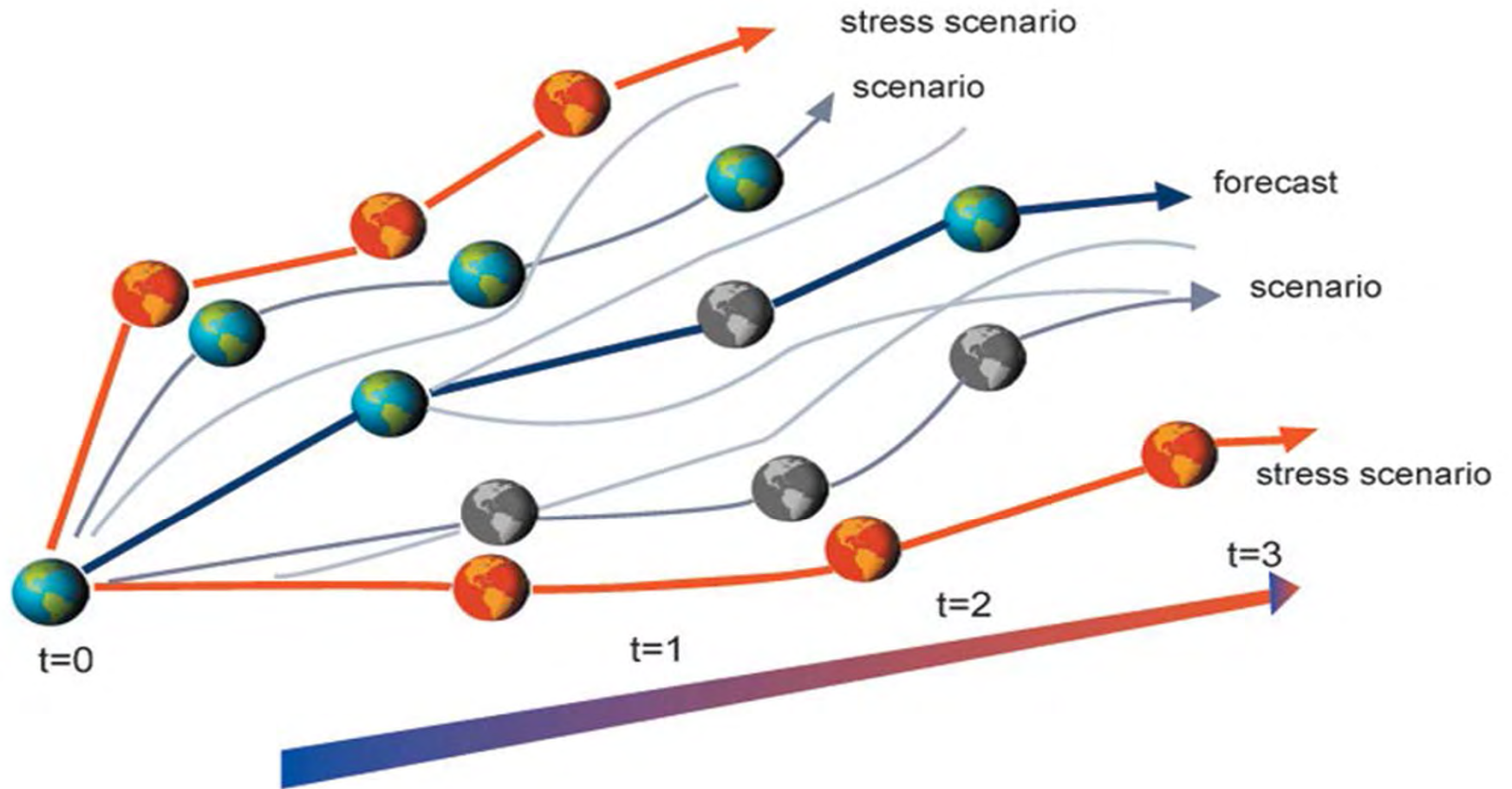
Definitions (1)

Figure 1

1. Sensitivity: Movement in single risk at a time
2. Scenario Analysis: An event which may trigger a series of dependent events leading to a variety of outcomes
3. Stress Test: A sensitivity of scenario test which leads to severly adverse outcome. Extreme but plausible scenario.

Definitions (2)

Figure 2

SCENARIO ANALYSIS PRINCIPLES AND GOVERNANCE

North American CRO Council, December 2013 - Scenario Analysis Principles and Practices in the Insurance Industry

Scenario Analysis (1)

Governance and Process

- Reflect the scale and complexity of the insurer.
- Understood and actively supported by senior management with Board oversight.
- Supplement other risk management tools.
- A flexible, fluid process rather than a mechanical exercise.
- Allow for timely analysis – enabled infrastructure and process
- Documented and peer reviewed
- Communicated effectively to encourage discussion and debate

Scenario Analysis (2)

Objective Function

- Linked with and tailored to clear objective functions
- Actionable, with links to key risk and strategy decisions
- Consider qualitative and quantitative impacts
- Used to challenge existing assumptions and calibrations

Scenario Analysis (3)

Design & Analysis should:

- consider multiple time horizons.

- consider impacts on all appropriate accounting or valuation bases.

- consider the frequency and severity of core risks, recognizing both historical and prospective relationships.

- include all appropriate aggregation levels.

- account for management action.

- account for single events as well as concurrent scenarios.

Types of Scenarios

- Reverse scenarios
- Historical scenarios
- Synthetic scenarios
- Company-specific scenarios
- Single-event scenarios
- Multi-event scenarios
- Global scenarios

Business Planning Modules

Modules of the business planning file:

1. Revenue
   - LOBs, products
   - New business vs renewal business
   - Branches
   - Channels
   - Investment income

2. Costs
   - Commission
   - Operating Costs, departments, branches
   - Claims – by LOBs, attritional and large claims, catastrophes

Key outputs

1. Profit / loss
2. Solvency ratio
3. Capital required
4. Return on capital

Example parameters for scenario building

Baseline (= "Plan")

Standard Sensitivities – Run each year

- Discounting on base premium rates
- Sales up/down
- Interest Rates up/down
- Cost inflations
- Catastrophe events / pandemics

Environment-specific scenarios – May change each year

- Catastrophe events / pandemics
- Acts of terrorism
- Reinsurer default
- Significant movements in interest rates
- Regulatory changes
- Court decisions
- Rotating cycle or bespoke
- Include non-economic scenarios (e.g. operational risk)
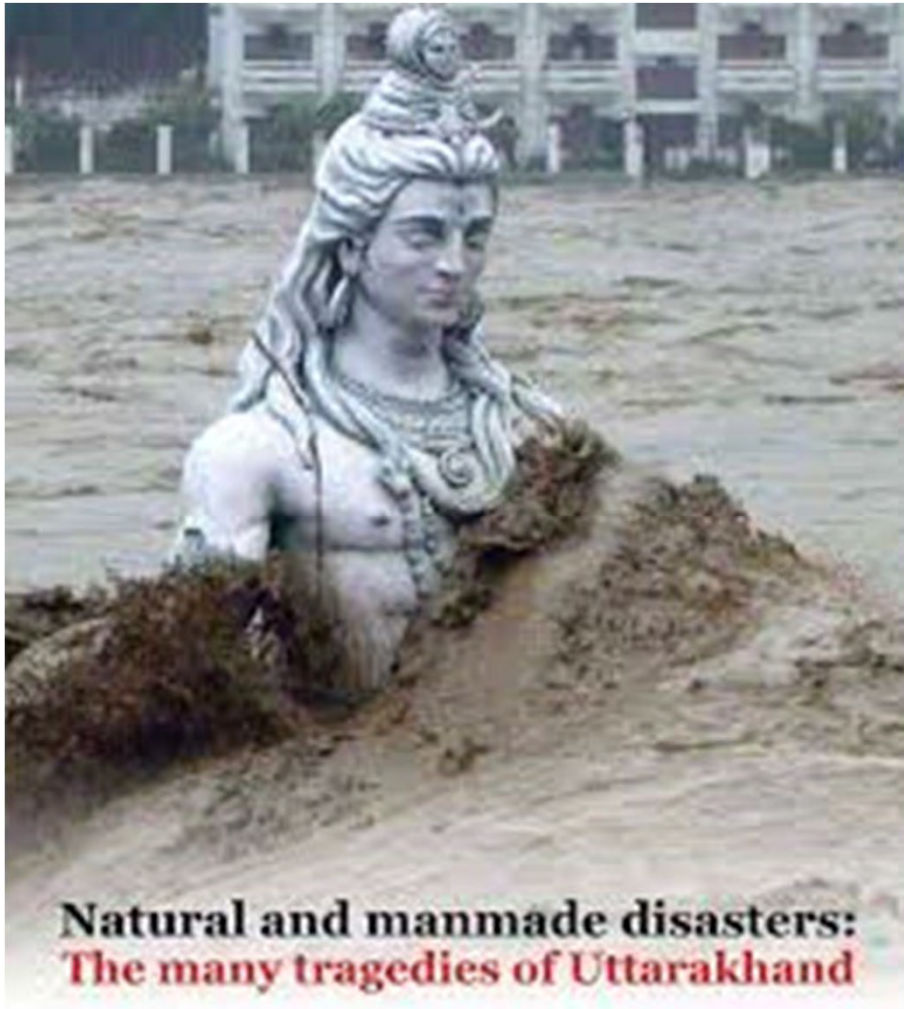
Example Scenario

Higher than planned discount on an LOB

Possible impacts:

1. The loss ratio will go up in short term.

2. Revenue will go up.

3. COR may move up or down.

Natural Catastrophe Events

Uttarakhand Floods 2013

Natural and manmade disasters:
The many tragedies of Uttarakhand

General insurance companies have also begun to engage loss surveyors and loss assessors to get information on the claim amounts. With several hydropower projects situated in the region, industry sources estimate the losses to touch Rs 1,500-2,000 crore.

"Not just property and motor vehicles, large-scale projects have also been impacted. We are assessing those claims and helping them to restore operations as soon as possible.

http://www.business-standard.com/article/finance/natural-calamity-in-uttarakhand-insurers-peg-losses-up-to-rs-3-000-cr-113072200848_1.html

Hudhud 2014

The [Hudhud cyclone](#) that hit Andhra Pradesh and Odisha has led to Rs 3,000-3,200 crore of claims for property and crop damage.

Boats damaged by strong winds caused by Cyclone Hudhud in Visakhapatnam
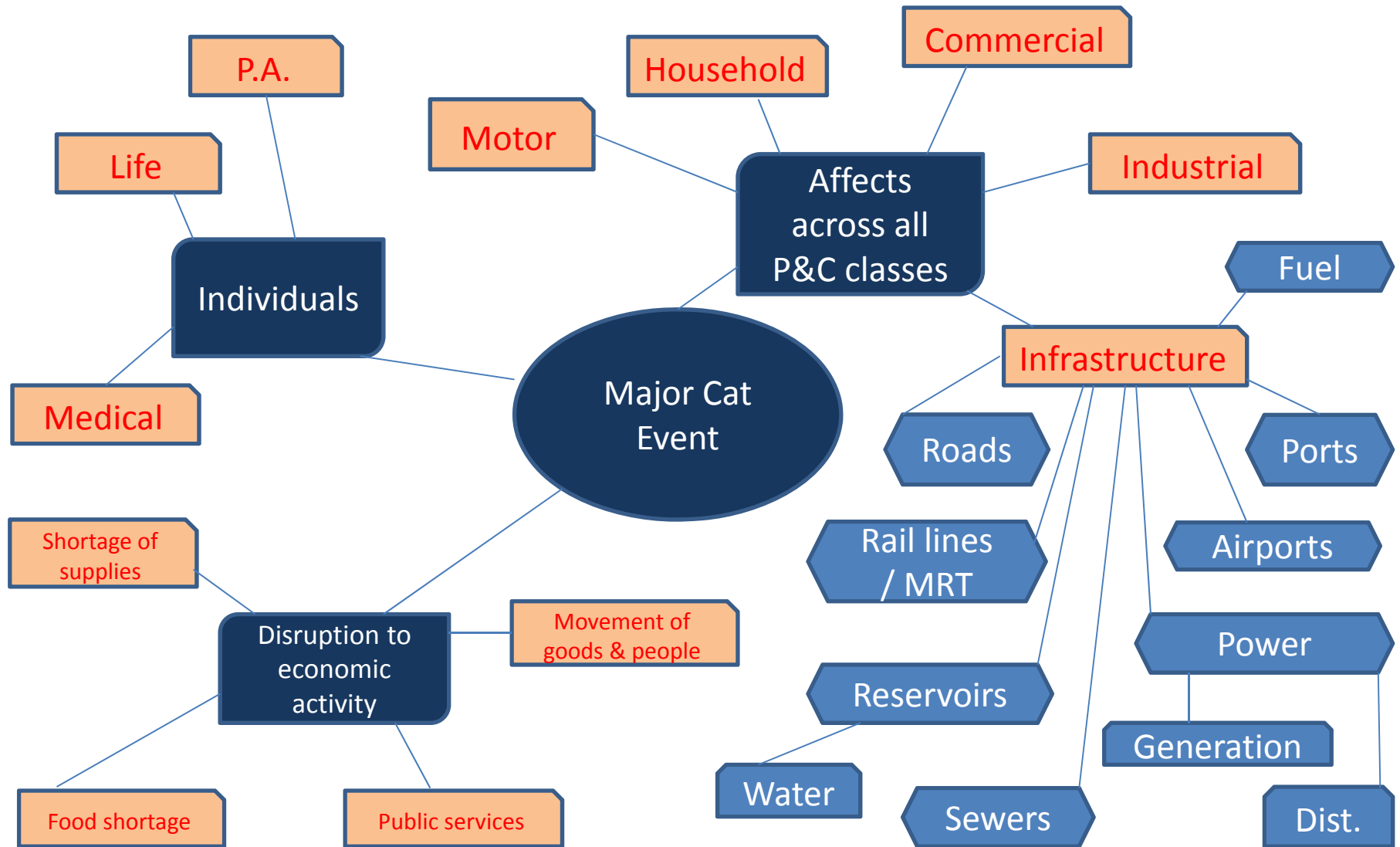
Jammu & Kashmir Floods 2014

Floods in Jammu & Kashmir saw insurers taking a hit of Rs 3,000 crore.
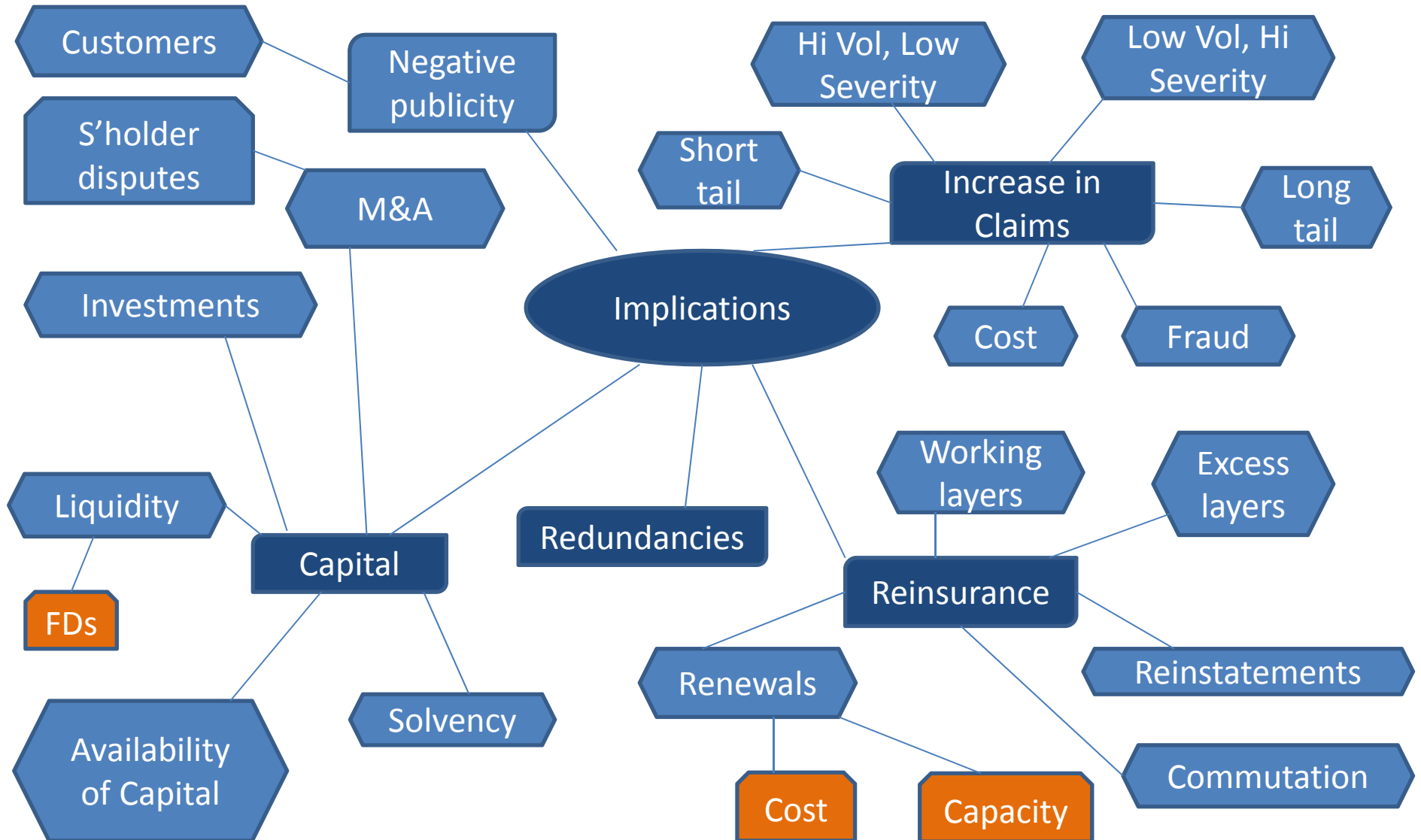
Modelling Scenarios

Simple Approach

- Event definition
- Exposures – Major ports, airports, properties, etc.
- Projected industry loss levels split by LOB
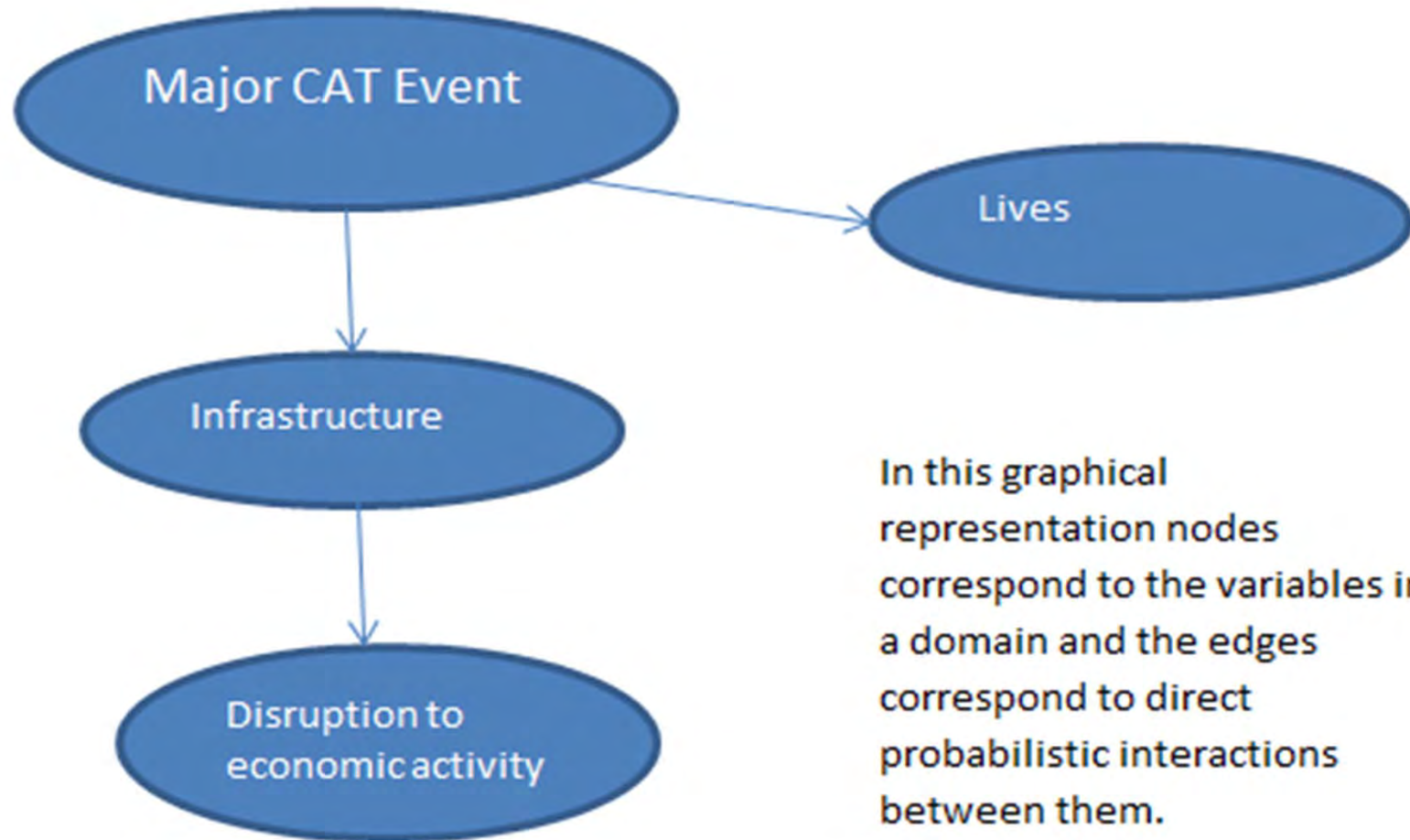- Company projected loss levels based on underwriting data and market share

Extent of losses following a CAT event

CAT Event: Implications on an Insurer

Modelling Dependencies

In this graphical representation nodes correspond to the variables in a domain and the edges correspond to direct probabilistic interactions between them.

Operational Risk

IT system fails

- Policy details become completely unavailable
- Loss of reputation – customers and intermediaries walk away
- Claims leakages
- Less or no revenue
- Regulatory intervention
- Associated businesses may be affected

Aggregation

- Events and their impact must be aggregated using correlations and dependencies
- Assumptions must be validated with senior management teams

Presentation of Results

- Enhance the understanding of if and when a firm is vulnerable to highly uncertain tail risks.
- May enable management actions resulting in
  - ➢ Change in Mix of Business
  - ➢ Change in Risk Appetite
  - ➢ Change in Reinsurance

Implementation (1)

- Key Success Factors
  - Board and senior management involvement is essential
  - Convey meaningful information in a manner that is understandable to the Board and senior management
- Find the right trade-off between "precision" and "approximation"
  - Do not need to be as accurate as DCAT modeling
  - Clearly define the materiality level used
  - Approximations must be validated

Implementation (2)

- Be able to accommodate short production time and high frequency testing

- Focus on the material and plausible risks

- Does it pass the "smell" test?
  - ➢Reasonability check
  - ➢Validation against historical data

Conclusion

Scenario modelling and stress testing:

- is a very important risk management tool

- it should be embedded in the company's internal risk management processes

- Capitalize on its process and make it more than just a "regulatory" requirement

Thank You