Stress testing in a time of models

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Agenda

- **Why Stress Test?**
- **Users of Stress Tests**
- **Imagination vs. Expectation**
- **Robust Stress Testing Infrastructure**
- **Good / Bad Practice**
- **Recent Stress Testing Exercise**
- **The Regulatory Regime**

Key Messages

- **Good risk management tool**
- **Don't keep to yourselves**
- **Do it properly**
- **Talk to your board**
- **(& you have to do it anyway)**

Why Stress Test?

Why Stress Test

- **It is a good risk management tool**
- **It's easier to understand and simpler to apply than complex models, leading to:**
  - Lower risks in modelling error, and
  - Easier communication to stakeholders

And

- **You have to !** (current FSA handbook and future S2 directive requirements)

What do we mean by Stress Testing?

- **Stress Testing**
  - Stressing individual model parameters
  - Applying particular events to a portfolio
- **And Scenario Testing?**
  - Applying a set of parameter changes to a model
- **There is much overlap**
  - Today we will be discussing both approaches

Users of Stress Tests?

Users of Stress Tests

- **Useful to :**
  - Board members
  - Capital Modellers
  - Underwriters
- **And external parties :**
  - Regulators
  - Rating agencies
  - Analysts

Users of Stress Tests

- **Board Members**
  - Stochastic models are hard to understand
  - How can the board sign off on a model they do not fully understand?
  - How can the board effectively challenge the modelling work?
  - Stress Tests are a key method of communicating capital models to board members
  - A variety of well thought out stress tests provides common ground between the capital modellers and the board and enables constructive discussions
  - They demonstrate embedding of the models, which is an area that most insurers are currently not fully addressing

Imagination vs. Expectation

Scenarios to consider

- **'Back-testing' scenarios:**
  - Past events – what would their impact be, if repeated
  - Past events – what would their impact be had they occurred in the worst way for your portfolio
  - Could they occur with greater impact
- **'Prospective'**
  - How has environment changed
  - How have firm specific exposures changed
  - The (reasonably) unexpected (outside target probability range) – what impact, even if not likely

Risk appetite – Airline industry

- **Airline industry**
  - Shutting airspace for two weeks – who considered this to be a likely event?

- **Risk appetite / management in industry**
  - Civil aviation authorities – many robust responses throughout Europe

- **An event with a relatively low impact on insurance industry (by cost), but:**
  - How likely was the loss scenario considered (if at all) – by the airline or insurance industry?

- **And on piloting :**
  - "You only need one pilot. Lets take out the second pilot. Let the bloody computer fly it" – Michael O'leary – Ryanair CEO
  - "Experience matters. Sullenberger's experience appears to have prepared him for dangerous and unexpected situations. He has spent over 40 years flying planes, including seven years in the U.S. Air Force as a fighter pilot. He joined US Airways in 1980." – quote describing pilot of plane crash landed on Hudson River - everybody survived.
- **Which plane do you wish to be on (or insuring)?**

- **Feynman's observations:**
  - Failure probability range of between 1 in 100 (independent engineer) to 1 in 100,000 (NASA management)
  - The latter implies losing only one shuttle, assuming a shuttle was sent into space every day for 300 years!
- **Feynman contrasts robustness of risk management processes between:**
  - Engineering and Avionics (computer systems)

An insurance example

- **Recent FSA stress testing exercise - UK Earthquake Example**
  - 6.3 magnitude event hitting a major city
  - Some firms relied very heavily on their catastrophe models
    - With some estimating that such a loss would have a return period approaching 1 in 10,000 years
    - A recent report by the British Geological Survey suggests that the risk is higher than many people thought (survey considered 6.0 magnitude)

Robust Stress Testing Infrastructure

The Good …

Examples of good practice

- **Undersea Internet Cable Failure**
  - A ship attempting to anchor in a storm off the coast of Egypt (Feb 2008)
  - Severely affected internet traffic throughout the Middle East and India
  - Issues affecting firms:
    - Potential insurance loss
    - Communication delays
    - Problems with outsourced operations

… and the not so good…

Poor Infrastructure / Implementation

FSA

- **Stress Tests are often an afterthought to the ICA**
  - A significant number of ICA reviews conclude that firms have done insufficient stress tests
- **ICAs stress tests don't approach the 1 in 200 required figure – becomes pointless**
- **Lack of documentation**

Examples of bad practice

- **A firm applied flood scenarios to its model**
  - These were significantly less severe than the floods it had experienced only a year or two before
- **A firm stressed the length of the recent recession to a maximum of 3 years**
  - The depression lasted over 10 years
- **A firm applied insufficient stress to its intra-group reinsurance programme**
  - Regulatory challenge around group fungibility led to major changes

Examples of bad practice

- **A firm attempted to 'fit' a distribution around some data (5 data points...)**
  - Their 99.5th percentile was less than 2 of their observed points
- **During the current recession a firm assumed that unemployment would not deteriorate as it was already severe**
  - A quick Google showed that within the last 20 years it had been much worse

Examples from other industries

- **Deepwater Horizon oil spill**
- **BP was big enough to not need much insurance to protect its balance sheet**
- **Forced BP to sell assets in US, Canada and Egypt – realising illiquidity costs**
- **US government stepped in to suspend dividends and force the firm to set up a $20bn escrow account**
- **Reputational risk**

Recent Stress Testing Exercise

Stress Testing Exercise

- **We recently asked a sample of large firms to estimate their gross and net losses following a variety of events**

- **Mixed response**

  – Some firms simply read off values from their cat models or looked at their maximum line size

  – Some firms engaged a variety of internal experts, estimated secondary effects and identified credible management actions

Stress Testing Exercise

- **UK Earthquake Example**
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Stress Testing Exercise
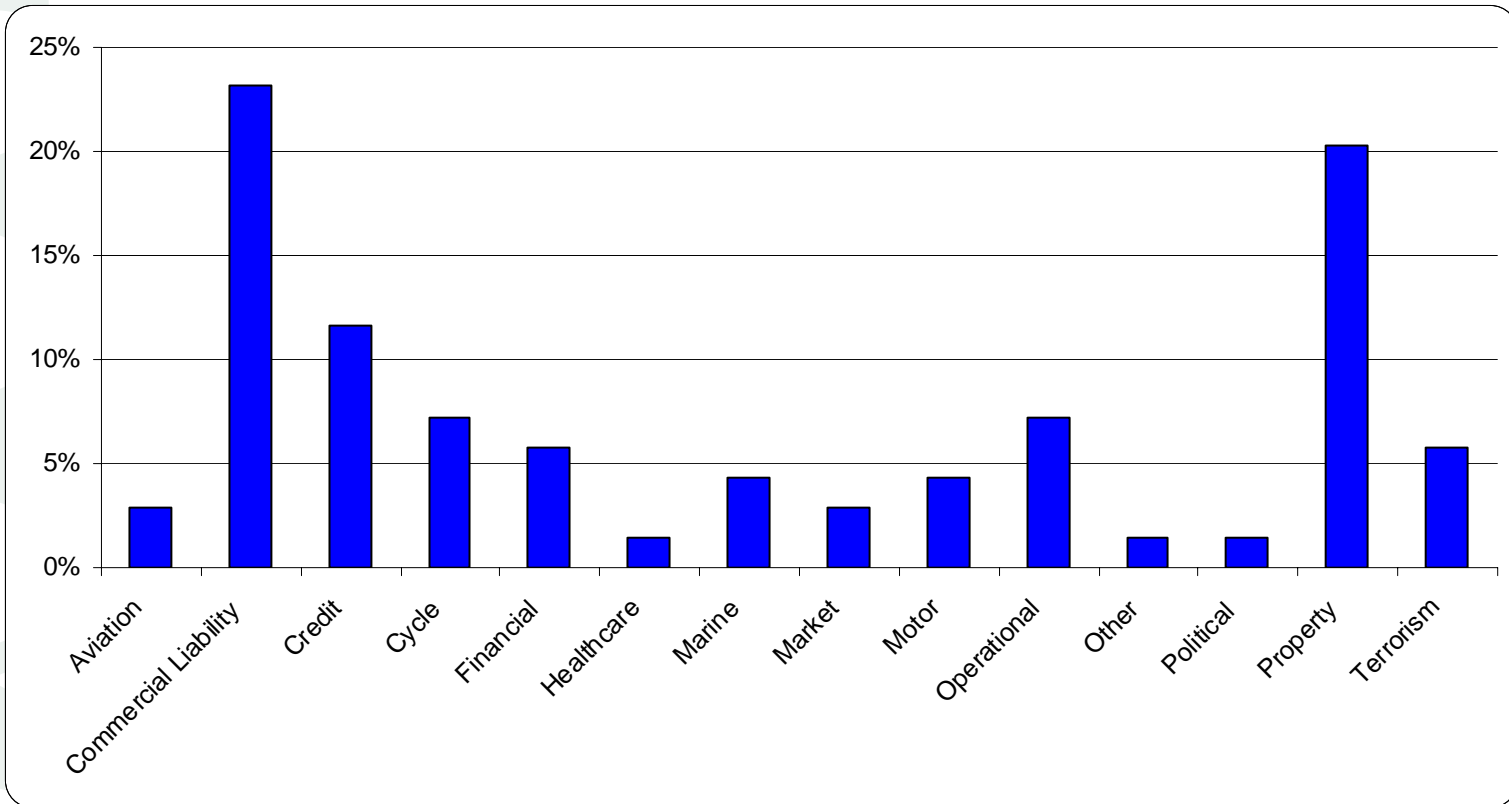
- **We also asked firms to identify 3 scenarios of their own**

The regulatory Regime

Regulatory Regime - Current

Don't intend to go into too much detail, just highlight that it has changed and most insurers are NOT doing this!

- **Handbook**
  - GENPRU 1.2.42
  - GENPRU 1.2.63 - GENPRU 1.2.78
    - in particular GENPRU 1.2.73A:

      ... a firm should project both its capital resources and its required capital resources over a time horizon of 3 to 5 years....
  - INSPRU 7.1.9A
- **Policy Statement – PS 09/20**
  - Reverse Stress Testing
- **FSA Stress Testing Website**
  - http://www.fsa.gov.uk/Pages/About/What/International/stress_testing/index.shtml

Regulatory Regime – the Future

- **Detail key high level requirements from S2 – used as key examples in implementing measures:**
  - Technical Provisions (CP39 and also CP26)
  - Tests and Standards for Internal Model Approval (CP 56)
  - Own Risk and Solvency Assessment – the ORSA (Issues paper)

Regulatory Regime - Impending changes

FSA

- **Reverse Stress Testing requirements**
  - "when business model becomes unviable"
  - What would it take to get to this point?
  - Should be within realms of usefulness
  - Expect NEDs to challenge complacency
  - Need to be ready to append to ICA submissions (requirements w.e.f. 13/12)
  - Not part of public disclosed material

To conclude …

Key Messages

- **Good risk management tool**
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Questions for Debate

- **What issues have firms identified when stress testing?**

- **Which people have been included in the stress testing process?**

- **How do firms generate scenarios when stressing their reserves?**

Appendix

Users of Stress Tests

- **Capital Modelling Team**
  - Stochastic modelling is hard
    - Get a result that you weren't expecting
    - Convince yourself of the reason for the result
    - When actually there is a problem with the model
  - Testing of the model
    - Checking individual aspects of the model
    - Sense Checking
  - Identifying model drivers
  - Calibration of correlations
  - Back testing

Users of Stress Tests

- **Underwriting Team**
  - Assisting with calibration of risk drivers
  - And correlations
  - Communication of model output

- **External parties – eg Regulator**
  - Demonstrate model use within the business
  - Reduces likelihood of errors
  - Provides increased confidence in quality of submissions (eg ICAs)
  - Communicate the strength of the calibration (eg ICAs)

Robust Infrastructure – key aspects

FSA

- **Importance of board and senior management engagement**

- **Forward looking hypothetical scenarios – we expect better capital-planning stress testing**

- **Suite of stress testing (scenarios) to include reverse stress test**

- **Judgements can be net of credible management actions**

- **Formal workshops with relevant business experts**

- **Stress Tests run alongside other processes (eg ICAs, and not as afterthought)**

- **Compared directly against stochastic model output**

And

- **Fully documented**

Examples of good practice

- **Holding workshops**
  - key directors, management, underwriting and claims personnel
- **Clear ownership of the stress testing process**
  - Evidence that the work has been approved by senior management / board
  - Fully documented
- **Learning from other firms' mistakes**
- **Considering second order effects**
  - Effects on the wider economy
  - Changes to the insurance cycle

Examples of good practice

- **Identifying trigger points and potential management actions**
- **Stressing intra-group relationships**
  - Reinsurance
  - Loans
  - Liquidity arrangements
  - Shared resources
- **Robust Infrastructure**
  - Quickly and efficiently estimate effects of particular stresses
  - Apply reinsurance programme and other mitigating factors
  - Compare directly with the firm's capital model