Institute and Faculty of Actuaries

Reverse Stress Testing: A Case Study

Lucy Currie, PPF
Fred Vosvenieks, Milliman

Pension Protection Fund

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Agenda

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1. The PPF - An Overview
2. Rationale for Exercise
3. Process Overview
4. Cognitive Mapping
5. Scenario Generation
6. Results
7. Conclusions

The PPF – An Overview (1)

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Who are we?

- Public corporation with an independent Board
- Unique organisation within the UK (analogous to Pension Benefit Guaranty Corporation)
- Established in 2005
- A pension fund – or an insurer?

What do we do?

- Pay compensation to members where the corporate sponsor has failed and the defined benefit pension scheme has insufficient assets
- Some reductions apply to scheme benefits:
  - 90% of scheme benefits if under normal pension age
  - Cap of around $55,000
  - Possible loss of pension increases
- Over 150,000 existing members
- Around 12 million people protected by us within DB schemes in the UK

The PPF – An Overview (2)

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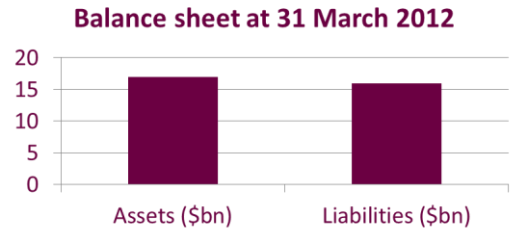
How are we Funded?

- Scheme assets
- Investment income
- Levy paid by solvent sponsors
- Recoveries from insolvent sponsors



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The PPF – An Overview (3)

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The PPF's Risk Framework

The PPF aims to apply ERM principles and techniques where appropriate for example:

- Developing a funding objective with clear risk measures
- Adopting robust governance structures
- Applying "Use test" principles to our internal model

The Board has identified 7 risk areas:

- Funding and Investment Strategy
- Investment Operations
- Strategy/Environmental
- Legal
- Operational
- Reputational
- Organisational Design/Culture

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Rationale for Exercise (1)

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Legislative Requirements

Requirements for PPF much less stringent than for insurers

- No requirement to hold capital
- Ability to cut compensation in extreme circumstances
- Not regulated by the UK Financial Services Authority
- Not subject to EU Solvency II Directive

…so why conduct a reverse stress test exercise?

Rationale for Exercise (2)

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Why Conduct a Reverse Stress Test Exercise?

- Aim to learn from best practice; UK Financial Services Authority strongly advises as part of Own Risk and Solvency Requirement (ORSA)
- Complements existing stress testing
- Ensures holistic view of risks is maintained

Rationale for Exercise (3)

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PPF's Objectives for the Exercise

- Completeness and relevance – test existing risk framework
- Comprehensiveness and inclusivity – importance of our stakeholders
- Objectivity
- Connectivity – avoiding risk silos
- Accessibility – bringing risk to life for the Board

Process Overview

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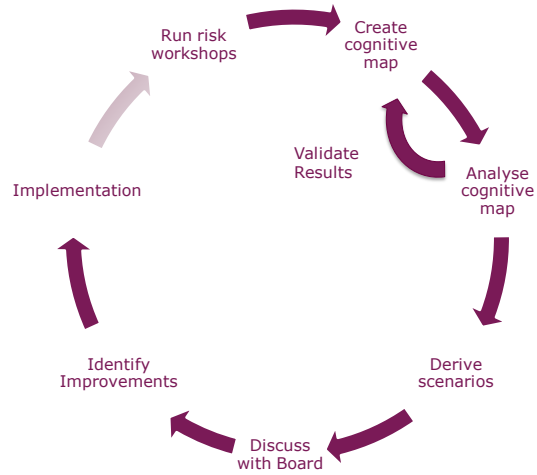

Cognitive Mapping (1)

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Describing Complex Systems

- Cognitive mapping breaks accounts of a problem into its constituent elements
- Map illustrates complex interconnected factors in simplified diagrammatic form
- Process should give robust, repeatable results
- Particularly useful for identifying and analysing strategic issues
- Combining individuals' views helps to remove bias and produce a comprehensive picture
- Recognises importance of both strategic and operational "layers"

Cognitive Mapping (2)

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Key Concepts

- Nodes represent individual concepts mentioned in discussions
- Edges are the links between nodes, connecting different concepts based on how they were represented in discussions
- Critical nodes are highly connected nodes
- Potent nodes influence the most critical nodes
- Loops are connected subsets of the map which represent processes or systems which could spiral out of control or quickly reach an extreme state
- Focusing on critical and potent nodes helps identify most important dynamics of the system

Cognitive Mapping (3)

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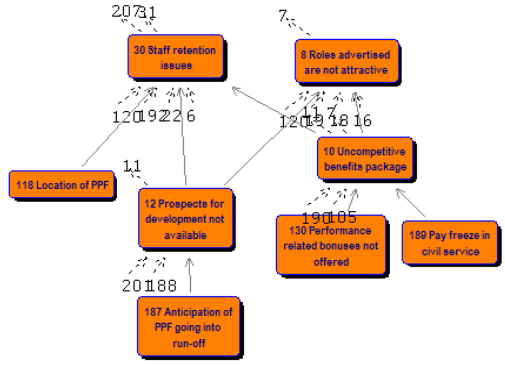
Mapping Example



Cognitive Mapping (4)

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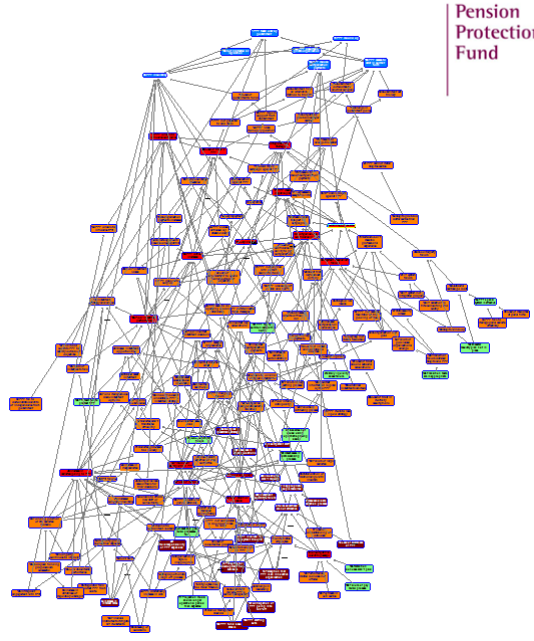
The PPF's Cognitive Map

- Concepts within the cognitive map are structured so that causal relationships flow upwards
- Structure allows tracing of different potential scenarios from beginning to end



Cognitive Mapping (5)

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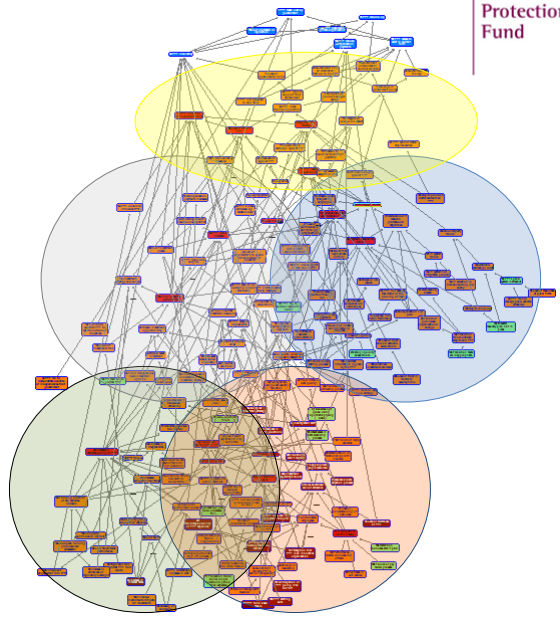
Theme Grouping

- The map is further structured such that concepts with common themes are grouped together



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Cognitive Mapping (5)

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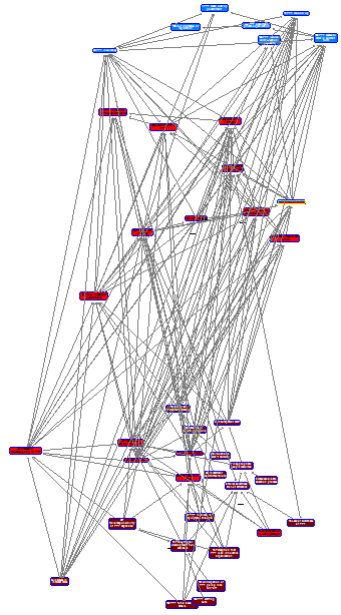
The Collapsed Map

- The cognitive map can be collapsed to show only the 'critical', 'potent' and 'impact' nodes i.e. the key components of the PPF's risk profile



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Scenario Generation (1)

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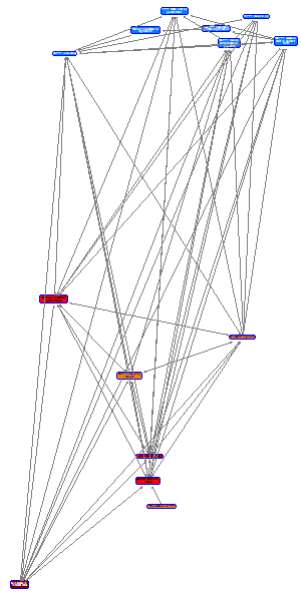
Process

- The collapsed cognitive map was analysed to identify inter-linking critical and potent nodes
- Nodes linking between themes were chosen to create novel and interesting dynamics
- Additional nodes from the full cognitive map were included to provide additional context to the scenario



Scenario Generation (2)

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Example Scenario: Operational Failure Spiralling Out of Control

'The PPF has become the subject of a concerted media campaign against it by its members, following repeated systemic errors in compensation payments on a particular type of scheme. The largest affected scheme is based in the Parliamentary constituency of the Minister of State for pensions.

A system failure at the PPF's payroll provider means that all PPF members go unpaid for 3 months in a row. The Government Department for Work and Pensions (DWP) has recently successfully taken back managing another pension compensation scheme for which the PPF had been responsible.

The Minister decides that "enough is enough" and, after commissioning a critical independent report, decides to dissolve the PPF and take payment management and levy collection into DWP.'

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Results

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Board Review

- Finalised RST scenarios were then explored by members of the Board
- Board members were asked to consider how each of the scenarios may impact on the PPF's strategic objectives
- Scenarios produced rich discussions and identified:
  - Areas in which the PPF was doing well
  - Areas for potential future improvements

Conclusions (1)

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Why Reverse Stress Test?

- Failure is about more than financials
- Complex scenarios are improbable but not impossible – risk management processes should be able to withstand them
- Avoidance of "groupthink"

Why Use a Complexity Science Approach?

- Provides a comprehensive view of the system
- Identifies both obvious routes to failure, and more subtle ones
- Allows detail to be considered without sacrificing coverage of wider system
- Incorporating both operational and strategic issues develops realistic and meaningful scenarios

Conclusions (2)

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Specific Learnings

- Did gain new insights – not just play back existing knowledge
- Including external stakeholders really valuable
- Openness of participants vital

Questions

Comments

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenter.

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