

Cambridge Centre for Risk Studies
In collaboration with RMS and Praedicat

Workshop 6 September 2017

BEST PRACTICES IN SCENARIO DEVELOPMENT AND USAGE: PRESENT AND FUTURE

Centre for
Risk Studies



UNIVERSITY OF
CAMBRIDGE
Judge Business School

Praedicat®



Workshop Wednesday 6 September 2017

Best Practices in Scenario Development and Usage

Present and Future

Date: Wednesday 6 September 2017; 9.30 am to 6 pm.

Venue: Judge Business School, Trumpington Street, Cambridge CB2 1QA, United Kingdom

Organized by Cambridge Centre for Risk Studies, in collaboration with Risk Management Solutions, Inc.; and Praedicat, Inc.

Workshop attendance is by invitation only.

Dress code: Business casual.

Workshop will be followed by drinks and private dinner at Corpus Christi College, Cambridge.

As part of an insurance industry project on Global Exposure, Accumulation and Clash (GEAC), the Cambridge Centre for Risk Studies, in collaboration with Risk Management Solutions, Inc.; and Praedicat, Inc., is hosting a workshop on scenario development and usage. This is intended to focus on methodologies for developing and applying scenarios for classes of insurance beyond property catastrophe lines, and particularly for scenarios that address clash – i.e. losses across multiple lines of insurance business. A number of multiline clash scenarios will be developed as part of the GEAC initiative, to be made available through the RMS(one) Exposure Manager platform, as well as empowering participants to develop their own scenarios.

The workshop brings together stakeholders across the insurance and reinsurance industry to advance best practices in the development and application of scenarios in insurance decision-making. The workshop is for companies that develop their own multiline clash scenarios, that apply scenarios produced by others, or who report mandated scenario losses to regulators or rating agencies.

Scope of the Workshop

Insurance and reinsurance companies typically run deterministic scenarios in areas where they do not have probabilistic models for certain classes of insurance lines, emerging risks, and less-well understood and modelled perils. Deterministic scenarios typically use historical precedents, realistic disaster scenarios, and evidence-based imagination to create illustrative hypothetical examples. Extending scenario modeling to additional classes is becoming increasingly important as companies look to apply capital management consistently across broader classes of their exposure, and estimate their exposures to multi-line clash.

This invitation-only workshop will address the role of scenarios in this developing context, with attention to the frontiers of scenario development and identifying best practice usage of these scenarios as a complementary tool for capital management of multi-line clash.

The workshop will address three themes:

- *Identification of scenarios:* Which are the most important multi-line scenarios to develop and test portfolios against? How many should be developed and run? How can we get confidence that selected deterministic scenarios represent the event universe?
- *Severity of scenarios:* What levels of severity make sense to analyse in a multi-line scenario? What return periods are implied by the severities of a deterministic scenario if a probabilistic model is not available?
- *Sensitivity analysis for scenarios:* What are the best ways to provide meaningful sensitivity analysis for users of these scenarios so that they can understand the drivers of losses both within and across lines?

The invited stakeholders at this workshop will bring multiple perspectives to these questions to advance the frontiers of scenario development and deployment. Participants will be invited to reconvene periodically to continue to push the leading edge of scenario-thinking.

Program

08:30 Registration & Coffee

Part 1: Scenario Development

Plenary Session: **Lecture Theatre 2**

09:30 Welcome

Dr. Michelle Tuveson
Executive Director, Cambridge Centre for Risk Studies

09:40 **Beyond NatCat: Developing Scenarios for Use in Insurance Risk Management**

Dr. Andrew Coburn
Director of Advisory Board of Cambridge Centre for Risk Studies, and Senior Vice President, RMS

The Global Exposure Accumulation and Clash initiative is developing an insurance exposure data schema for multiple classes of insurance beyond property catastrophe, so that insurers can monitor and manage accumulations across their entire book, particularly to explore clash potential. The data schema is intended to facilitate the development of scenarios. Most insurers develop their own scenarios and each have their own approaches and methodologies. The workshop continues a dialog around best practices in developing scenarios for use in insurance decision-support.

10:00 **Developing Casualty and Multiline Business Accumulation: Scenarios**

Salomon Billeter
Head of Casualty Model Development, Swiss Re

Casualty and multiline business subject to diverse and changing drivers of relevant risk accumulation: scenarios to systematically capture, quantify, and standardize the obvious and the inconceivable alike

10:20 **Developing Scenarios to Influence Insurance Decisions**

Paul Kaye
Head of Actuarial, Aon Benfield London.

Aon Benfield use scenarios with clients to help understand risk accumulation potential and review business and financial objectives. We will give an overview of the role scenarios have in insurance business decision making, highlighting some best practice suggestions in scenario development and utilisation. This includes specific consideration around decision maker engagement and dealing with uncertainty.

10:40 **Chlorinated Organophosphate Flame Retardants: What if the “next asbestos” were literally the next asbestos?**

R.J. Briggs, *Senior Economist, Praedicat*
Adam Grossman, *Senior Scientist, Praedicat*

This session will focus on the development of a scenario for chlorinated organophosphate fire retardants (CLOPFRs), a class of chemicals used as in a wide array of structural materials and consumer goods. Exposure to CLOPFRs is ubiquitous and growing, and the scientific community is concerned that they may cause an array of latent injuries. Although Praedicat's analytics suggest that science has no practical chance of finding substantial support for these hypotheses in the next seven years, public concern over exposure to these chemicals has reached sufficient levels to warrant investigation of the potential severity of this event. In this scenario, producers of these chemicals and manufacturers that incorporate them across a spectrum of seemingly unrelated injuries face losses related to liability for bodily injury and the removal and replacement of property contaminated with these CLOPFRs. This presentation will highlight Praedicat's methodology for scenario identification, loss estimation, allocation of losses, and potential for sensitivity analyses.

11:00 Decisionmaking under Conditions of Deep Uncertainty

Professor Robert J. Lempert

Director, Frederick S. Pardee Center for Longer Range Global Policy and the Future Human Condition; Professor, Pardee RAND Graduate School; RAND Corporation

Developing scenarios and applying new tools for managing deep uncertainty and surprise, with an emphasis on climate change, energy, and the environment. Lempert and his research team assist a number of natural resource agencies in their efforts to include climate change in their long-range plans. He has also led studies on national security strategies and science and technology investment strategies for clients such as the White House Office of Science and Technology Policy.

11:20 Coffee/Tea Break

11:50 Group Exercise: Scenario Identification and Prioritization

Facilitator: Pooya Sarabandi

Vice President - Global Head of Data Analytics and Exposure Modeling, RMS, Inc.

A group exercise using interactive voting pads to explore the needs for different types of scenarios to monitor accumulations of different classes of insurance and the potential clash between them. The session will explore issues of selecting and prioritizing scenarios for development for multiline clash accumulation management.

12:15 Panel Discussion: Best Practice in Scenario Development

Moderator: Dr Robert Muir-Wood, *Chief Research Officer, RMS, Inc.*

Panelists:

- Neil Bodoff, *Executive Vice President, Willis Re*
- Ralf Roesch, *Practice Leader Casualty, SCOR*
- Satyan Sawhney, *Chief Risk Officer, Sompo International UK*
- Anthony Shapella, *Managing Director, Risk Officer, Liability and Financial Lines, AIG*

Panel discussion about the challenges of scenario development and what insurance companies need in the development of scenarios for their use.

1:00 Lunch

Common Room Refectory on 2nd floor, Judge Business School

Part 2: Using Scenarios in Decision-Making**2:00 Using Scenarios in Decision-Making: Applying Research for Business Impact**

Professor Danny Ralph

Academic Director, Cambridge Centre for Risk Studies

Scenarios play a large part in business management, from operational and contingency planning through to challenging embedded management assumptions, and exploring emerging risks for an organization. Management science research at Judge Business School, University of Cambridge, has involved deep engagement with companies that use scenarios in their business. The presentation covers the uses of scenarios in the decision-making of companies who have worked with and commissioned scenarios from, the Cambridge Centre for Risk Studies.

2:20 Practical (Re)Insurance Company Utilization of Multi-line Clash Scenarios

David D. Brooks, CPCU, ARM

Managing Director and ERM Global Head of Man-Made Perils, XL Catlin

Incorporating multi-line stress scenarios in capital model development, underwriting control and aggregation management...opportunities and challenges.

2:40 Are Scenario Libraries the Next Evolution of Models? Use of Scenario Library, Platforms & Relationship to Models

Dr. Bob Reville

Chief Executive Officer, Praedicat, Inc.

With the advent of new technology and the creation of casualty catastrophe models, scenarios can now be developed at scale, providing access to a wide library of potential casualty events. What platforms are needed to enable the use of these libraries? What new tools can be built on top scenarios to improve decision-making? This presentation will consider visionary ideas for the evolution of scenarios for liability catastrophe and beyond.

3:00 Evaluating Loss Scenarios and Stress Tests to Determine Insurer Financial Strength Ratings

Stefan Holzberger

Chief Rating Officer, AM Best

Insurers are exposed to a myriad of severe losses that have the potential to impair their financial strength. Losses can stem from a catastrophic event (natural or man-made), a sudden financial market dislocation, political or social unrest, a cyber attack, or a casualty clash event that rises to class action status -- just to name a few. This session will focus on how A.M. Best incorporates these risks into its rating methodology, and will illustrate how leading companies protect their balance sheets against such events through robust enterprise risk management frameworks

3:20 The Evolution of Disaster Scenarios at Lloyd's

Trevor Maynard

Head of Innovation, Lloyd's

Historically Lloyd's has required its members to submit their accumulations for a series of deterministic scenarios to assess market-wide exposures. These realistic disaster scenarios have been extremely influential in educating the market about potential catastrophes and emerging risks in multiple classes of insurance business. Scenario development requires balancing severity and plausibility. As the market grows increasingly sophisticated, scenarios need to embrace uncertainty, help the market appreciate sensitivity to underlying assumptions, and enable market participants to understand and manage their own risks to these concepts. Lloyd's is encouraging scenario developers to explore uncertainties and sensitivities in the creation of scenarios to improve methodologies of scenario development and usage.

3:40 Coffee/Tea Break and**Breakout session: Developing Best Practice Recommendations**Introduced by: Andrew Coburn, *RMS*

The workshop attendees will break into three groups. Each group will go to a separate meeting room and discuss a different theme around best practice for scenario development and usage. The discussion group is asked to identify and prioritize a number of key issues, related to their theme, and to propose three (or more) recommendations for best practice to report back to the plenary session. Each breakout group should identify someone from their team to be the reporter to summarize recommendations to the plenary.

The breakout groups will propose recommendations for best practice around the following themes. When developing the best practice recommendations, each group should consider what scenarios should be used for and how that relates to the question at hand, as they may vary for each different use (for example, first step for model development vs capital stress testing vs discussions with rating agencies vs underwriting).

Group A: Identifying Scenarios: Which are the most important multi-line scenarios to develop and test portfolios against? How many should be developed and run? How can we get confidence that selected deterministic scenarios represent the event universe?

Identify issues and propose three recommendations for best practice for scenario identification.

Meeting room: Lecture Theatre 2

Chair: Jessica Schuler, *Director of Client Services & Senior Actuary, Praedicat, Inc.*

Group B: Severity of Scenarios: What levels of severity make sense to analyse in a multi-line scenario? What return periods are implied by the severities of a deterministic scenario if a probabilistic model is not available?

Identify issues and propose three recommendations for best practice for setting the severities of scenarios.

Meeting room: Castle Teaching Rooms

Chair: Simon Ruffle, *Director of Research and Innovation, Cambridge Centre for Risk Studies*

Group C: Sensitivity Analysis for Scenarios: What are the best ways to provide meaningful sensitivity analysis for users of these scenarios so that they can understand the drivers of losses both within and across lines?

Identify issues and propose three recommendations for understanding sensitivities of assumptions in scenarios.

Meeting room: W2.01

Chair: Pooya Sarabandi, *RMS*

4:30 Breakout groups report back to plenary session

The reporter from each of the breakout groups summarises their discussions and recommendations to the plenary team, five minutes per breakout group, followed by discussion.

5:00 Panel Discussion: **Future of Analytics in the Insurance Industry**

Moderator: Professor Rob J. Lempert, *RAND*

Panelists:

- Nancy Bewlay, *Global Chief Underwriting Officer, Casualty, XL Catlin*
- Robin Lang, *Senior Vice President & Chief Risk Officer, European Operations, RenaissanceRe*
- Hjörtur Thráinsson, *Modeling Expert, Munich Re*
- Matt Harrison, *Group Head of Casualty Exposure Management, Hiscox*

Panel discussion about the changing nature of the insurance industry and the types of decisions it needs to support through the use of analytics in the future. A list of questions will be developed for the panel. Suggestions for questions are welcomed from the organizing committee.

5:30 Closing Remarks

Dr. Bob Reville

CEO, Praedicat, Inc.

5:45 Closing Remarks

Peter Ulrich

Senior Vice President, RMS

6:15 Convene in lobby of Judge Business School to walk over to Corpus Christi College

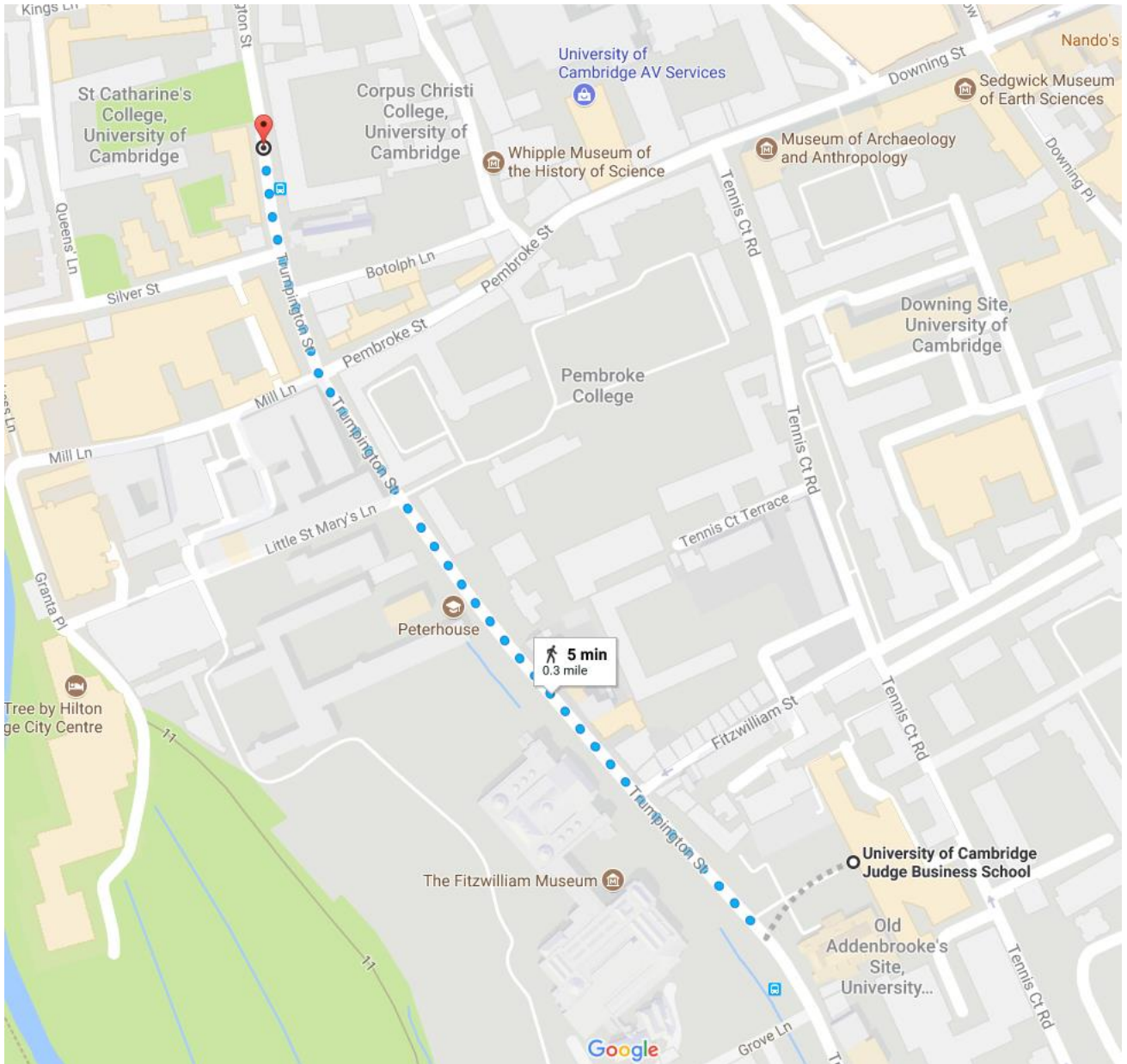
6:30 Networking and drinks reception, Corpus Christi College

7:15 Dinner, hosted by Praedicat, Corpus Christi College

Dinner at Corpus Christi College

The reception drinks and workshop dinner are at:

Main Dining Hall
Corpus Christi College
Trumpington Street, Cambridge CB2 1RH



Workshop Pre-Read Material

This workshop addresses scenarios that cause loss to classes of insurance beyond property catastrophe. We are reviewing scenario development methodologies for classes of insurance that include:

Casualty liability; Marine; Energy; Aviation; Specialty; Political and Security Risk; Credit & Surety; Agriculture; Cyber; Auto; Personal Lines; Life & Health.

The scenarios currently being considered for development will assist the management of accumulation for clash across multiple of these lines, and also commercial property and workers' compensation.

Scenarios are intended to be plausible but severe causes of insurance loss.

1.1 Global Exposure, Accumulation and Clash Initiative

The following documents describe the Global Exposure, Accumulation and Clash (GEAC) initiative being managed by Cambridge Centre for Risk Studies, in collaboration with Risk Management Solutions, Inc.:

- Overview document on the scope and principles of the GEAC initiative: [Multi-Line Insurance Exposure Data Schema, Consultation Document v0.1](http://cambridgeriskframework.com/getdocument/69) (<http://cambridgeriskframework.com/getdocument/69>)
- Version 0.5 of the [Consultation Document on Multiline Insurance Exposure Data Schema](#), proposing the structure and principles of data schema development, for use in accumulation scenario development.

1.2 Current Market Practice

We are currently reviewing the state-of-the-art of scenario development through literature review, industry dialog, and structured interviews with industry specialists. This workshop is intended to help us identify key open-source resources that document examples, scenario development methodologies, and industry practice.

Our focus is on the insurance industry, and developing scenarios for loss stress tests, however we are also reviewing methodologies deployed in operational and contingency business planning, financial stress tests, management science, military planning, policy making, and other areas of scenario development.

We welcome suggestions and contributions to the literature review and current practice survey,

1.3 Bibliography

Scenario Development Methodology

Publications on the methodology of developing scenarios.

Allianz.com. (2017). Today's Crystal Ball.

Kosow and Gaßner; 2008. Methods of future and scenario analysis: Overview, assessment, and selection criteria; DIE Research Project "Development Policy: Questions for the Future".

OECD, 2015; Overview of Methodologies; Futures Thinking; Schooling for Tomorrow: Knowledge Bank.

OECD, 2007; Scenario development: a typology of approaches; van Notten, Philip; Chapter 4.

Raconteur, 2017; Emerging risk can finally be measured.

Rebonato, Riccardo; 2010; Coherent Stress Testing: A Bayesian Approach to the Analysis of Financial Stress; Wiley; ISBN: 978-0-470-66601-2

Wilkinson and Kupers, 2013; Living in the Futures; *Harvard Business Review*; Managing Uncertainty

Published Multi-Line Clash Insurance Scenarios

Examples of published scenarios of multiline insurance loss analysis:

Centre for Risk Studies; 2014. Stress Test Scenario: China-Japan Conflict; Cambridge Risk Framework series; Centre for Risk Studies, University of Cambridge.

Centre for Risk Studies; 2014. Stress Test Scenario: São Paulo Virus Pandemic; Cambridge Risk Framework series; Centre for Risk Studies, University of Cambridge.

Centre for Risk Studies; 2014. Stress Test Scenario: Millennial Uprising Social Unrest Scenario; Cambridge Risk Framework series; Centre for Risk Studies, University of Cambridge.

Centre for Risk Studies; 2015. Stress Test Scenario: Global Property Crash; Cambridge Risk Framework series; Centre for Risk Studies, University of Cambridge.

Centre for Risk Studies; 2015. Stress Test Scenario: Eurozone Meltdown Financial Catastrophe Stress Test; Cambridge Risk Framework series; Centre for Risk Studies, University of Cambridge.

Centre for Risk Studies; 2016. Stress Test Scenario: Helios Solar Storm Scenario. Cambridge Risk Framework series; Centre for Risk Studies, University of Cambridge.

Lloyd's, 2015, Business Blackout: The insurance implications of a cyber attack on the US power grid; Cambridge Centre for Risk Studies; Lloyd's Emerging Risk Report; Innovation Series; Society and Security.

Lloyd's & Praedicat; 2017. Harnessing Big Data Analytics. Emerging Liability Risks; Lloyd's.

RMS, 2014; Loma Prieta: [25 Years After Loma Prieta: Preparing the Bay Area for "the Big One"](#). Risk Management Solutions, Inc.

RMS, 2004; Catastrophe, Injury, and Insurance: The Impact of Catastrophes on Workers Compensation, Life, and Health Insurance; Risk Management Solutions, Inc.

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List of Attendees

Name	Company	Title	Group
Nancy Bewlay	XL Catlin	Global Chief Underwriting Officer, Casualty	A
Salomon Billeter	Swiss Re	Head Casualty Model Development	B
Neil Bodoff	Willis Re	Executive Vice President	C
Melissa Boudreau	Praedicat	Vice President of Modeling and Chief Actuary	B
Stephen Bray	Aspen	Senior Insurance Risk Analyst	A
R.J. Briggs	Praedicat	Senior Economist	B
David Brooks	XL Catlin	Managing Director and Chief Risk Officer	B
Stephen Burr	Pool Re	Head of Actuarial Services	B
Katerina Christopoulou	Risk Management Solutions	Principal Modeler	B
Andrew Coburn	Risk Management Solutions	Senior Vice President	A
Jennifer Daffron	Cambridge Centre for Risk Studies	Research Associate	A
Andrew Donaldson	Pool Re	Deputy Head of Risk Analysis	C
Nina Everding	Allianz Global Corporate & Specialty	Global Head of Business Analysis - CUO Liability	A
Adam Grossman	Praedicat	Senior Scientist	C
Matt Harrison	Hiscox	Group Head of Casualty Exposure Management	B
Shanawaz Hirani	Tokio Millennium Re	Actuary	B
Stefan Holzberger	AM Best	Chief Rating Officer	C
Lars Huber	Swiss Re	Casualty Modeller	A
Paul Kaye	Aon Benfield	Head of Actuarial & Enterprise Risk Management	B
Sue Keaveny	AIG	Insurance Risk Officer for EMEA	C
Scott Kelly	Cambridge Centre for Risk Studies	Senior Risk Researcher	C
Monika Komarova	Zurich Insurance Company	Reserving Actuary, Group Reinsurance	A
Robin Lang	RenaissanceRe	Senior Vice President and Chief Risk Officer, European Operations	A
Rob Lempert	RAND	Principal Researcher, RAND; Director, Frederick S. Pardee Center for Longer Range Global Policy and the Future Human Condition; Professor, Pardee RAND Graduate School	C
Arjun Mahalingam	Cambridge Centre for Risk Studies	Research Assistant	C
Trevor Maynard	Lloyd's	Head of Innovation	B
Christos Mitas	Risk Management Solutions	Vice President, Model Development	A
Harriet Morris-Sloane	HSBC	Manager, Group Risk Governance & Appetite	A
Robert Muir Wood	Risk Management Solutions	Chief Research Officer	B
Nam Nguyen	STARR Companies	Lead Capital Actuary	B
Axit Patel	A.N.N. Consulting	Senior Actuary	B
Devki Patel	Sompo Canopius	Catastrophe Risk Manager	C
Danny Ralph	Cambridge Centre for Risk Studies	Professor, Academic Director	A
Robert Reville	Praedicat	Chief Executive Officer	A
Ralf Roesch	SCOR	Practice Leader Casualty	C
Simon Ruffle	Cambridge Centre for Risk Studies	Director of Research and Innovation	Chair B
Rainer Sachs	Munich Re	Head of Group Accumulation Control and Emerging Risks	A
Pooya Sarabandi	Risk Management Solutions	Vice President, Model Development	Chair C
Satyan Sawhney	Sompo International	London Market CRO and Global Head of P&C Risk	A
Jessica Schuler	Praedicat	Director of Client Services & Senior Actuary	Chair A
Ali Shahkarami	Allianz Global Corporate & Specialty	Head of CAT Risk Research	C
Anthony Shapella	AIG	Managing Director, Risk Officer	A
Andrew Skelton	Cambridge Centre for Risk Studies	Research Associate	C
Andrew Smith	Cambridge Centre for Risk Studies	Research Assistant	B
Kayla Strong	Cambridge Centre for Risk Studies	Research Assistant	B
Hjörtur Thráinsson	Munich Re	Modeling Expert	C
Richard Todd	STARR Companies	Senior Exposure Management Analyst	C
Jessica Tsang	Cambridge Centre for Risk Studies	Research Assistant	A
Michelle Tuveson	Cambridge Centre for Risk Studies	Executive Director	C
Peter Ulrich	Risk Management Solutions	Senior Vice President	B
Lois Winchester	SCOR	Practice Leader, Professional Liability	A