

## Special issue on risk management

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The notion of risk is one with which we are all intimately familiar: all personal activities carry risk, from the most trivial (crossing the road to see a friend, breaking an egg to make an omelette) to most consequential (buying a house, entering into a partnership, changing job). Indeed, it is the nature of the human condition that we are all constantly exposed to risk, of death, of illness, and of personal or financial loss. World literature, from the Book of Job to Kafka's *Metamorphosis* testifies to our fascination as a species with the inexplicable ills which may befall us, and the shadow of risk falls in the most lighthearted of our cultural creations (even Asterix' chief, the brave Vitalstatistix, fears that one day the sky may fall on his head).

While risk has always been with us, however, nowadays organisations and governmental agencies are expected to actively *manage* the risks which they face (Power 2004). Yet while it is easy to demand that organisations manage risks, it is harder to identify “good practice”. One can determine whether one is managing money well by whether one remains solvent, and whether one manages staff well by whether one's employees are happy. However, since the risks which one faces are by their nature amorphous, uncertain or even unknown, the most that can be said is often “nothing bad has happened so far”—and whether this is attributable to good risk management or just to luck may be impossible to determine. Moreover, when a potential disaster does not occur, organisations can be pilloried for the money spent in preparing for the non-event. Back in the late 1990s the world spent a fortune in

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guarding against the ‘Millenium Bug’. Yet no catastrophe occurred at midnight on December 31st, 1999. So was the expenditure well made? Did it avert disaster or simply give employment to the IT industry?

The *EURO Journal on Decision Processes* has a unique remit: to show how operational research, modelling, and logical thought can help improve decision processes in organisations. Surely there are few areas besides risk management in which this is more urgently required or more challenging? Fortunately there is a long tradition of thinking about risk in the decision sciences. The classical model of risk is that.

$$\text{risk} = \text{probability} \times \text{consequence}$$

This notion of risk—which we will refer to as  $R = P \times C$ —has been enormously and widely influential. We might be wiser to use the symbol  $\otimes$  thus: ‘ $R = P \otimes C$ ’. This would indicate that the interaction between probability and consequence in defining risk is complex and far from multiplicative, but we follow idiom, however naïve that may be, and let the papers in the following bring a more sophisticated perspective. We also note that heavy intellectual machinery of decision theory has much of its focus on unpacking the risk concept (French and Rios Insua 2000; Aven 2003); yet at the same time in practice risk is often assessed and operationalised through simplistic risk management tools such as risk matrices (Cox 2008).

However, there are major conceptual and practical problems with the operationalization of the two main components: probability and consequence (Morgan 1990). First, consequences may be positive, negative or neutral depending on the special interests and values of the affected actors. The extent of utility gains or losses depend on subjective preferences and individual scales of desirability (Keeney 1992; French et al. 2009). Probability can be conceptualized as fixed aleatory chance (like throwing a dice), as an observation of relative frequencies deduced from past behaviour, or as a strength of belief in the realization of certain consequences (Renn 2008). One of the first authors to distinguish risk from uncertainty was Frank H. Knight who introduced a differentiation between ‘risks’ and ‘uncertainties’. According to Knight, risks are ‘measurable uncertainties’ [Knight 1965 (1921), p. 197 ff.]. Probabilities represent statistically proven distributions of events over time, while uncertainties represent unknown developments into the future (Bonß 2013). With the advent of Bayesian statistics and other mathematical tools, the border between a realist version of empirically observable and statistically calculated distributions over time and the constructivist version of personal beliefs in distinct distribution patterns have blurred. Issues of reliability, validity and predictability plague the scientific attempts to characterise and quantify the probability of future events. The recent failures of mathematical modeling for coping with financial risks are a good example of inadequate use of mathematical tools and the pitfalls of using normal distribution algorithms for events that follow a different distribution pattern (Taleb et al. 2009).

So, as simple as the risk algorithm appears at first glance, applying this decision theoretic notion of risk in practice is far from simple. The papers in this volume, the first of two special issues on risk management, variously unpack and challenge the

model of risk as probability  $\otimes$  consequence, underscoring the richness and complexity of the risk concept and the range of perspectives which can be brought to bear on the task of risk management.

Oliver (2013) mounts a critique of traditional methods of credit scoring in bank and other lending. His paper is located firmly within the  $R = P \times C$  tradition: he argues that traditional approaches to credit scoring which are purely statistical in nature underserve decision makers by neglecting economic consequences. He proposes and argues for a mode of analysis based around two economic concepts, Return on Equity and market share, as being more relevant to the goals of decision makers.

Ray et al. (2013) also explicitly relies on  $R = P \times C$ —indeed, the formula appears explicitly as Eq. (6) in their paper, which deals with the development of a decision support system for financial risks at IBM. Yet  $R = P \times C$  is far from easy or unambiguous in this context: considerable ingenuity has to go into the assessment of the probabilities in particular, through formally defining and quantifying a notion of similarity between the pairs of contracts.

Similarly, Karvetski et al. (2013) explore how to unpack the probability (as opposed to the consequence) part of the risk equation. Their interest is in how to improve intelligence work in a military context, in particular how to improve a process for the exploration of an evidence base called the analysis of competing hypotheses, or ACH. They argue for a structured modelling approach using Bayesian networks within the framework of what Franco and Montibeller have called “facilitated decision modelling”. They illustrate their approach with an analysis of a salmonella bioterror outbreak.

Ranger et al. (2013) describe a case of planning flood infrastructure in the face of uncertainty of future climate. As future climate depends on uncertainty both about human action around carbon emissions, and the response of the climate to these carbon emissions, it is very hard to quantify probabilities associated with particular climate outcomes. Ranger et al. propose an approach which sidesteps the assessment of probabilities in favour of a scenario-based approach. They show how contemplation of these scenarios helped the responsible agency to develop a ‘dynamic adaptive strategy’ based around contingency actions and a strong monitoring system.

Horlick-Jones and Rosenhead (2013), on the other hand, explore another way in which a focus on probability can fail to completely capture the concept of risk. Their interest is on risks where there are multiple competing meanings and interpretations at play: they illustrate their discussion with an intervention in the planning of a major cultural event, the Notting Hill Carnival. They advocate the use of problem structuring methods (PSMs) as a way of helping stakeholders negotiate shared meaning and suggest a “therapeutic” metaphor for problem helping in the risk management context.

Our contention in developing the special issue has been that risk is both a pervasive phenomenon that requires systematic assessment and management efforts and, at the same time, a slippery concept that evades attempts to achieve precise quantification. The pervasiveness is demonstrated by the range of application areas which are represented in this special issue (military, corporate, environment,

community, and financial). The conceptual slipperiness is illustrated by the variety of viewpoints and perspectives which our authors bring to the forefront. Nevertheless, the papers illustrate the resourcefulness of the authors and heterogeneity of the topic, describing better concepts, frameworks and models for getting a handle on risk and offering useful tools to decision makers. Moreover, and in keeping with the spirit and mission of the *EURO Journal on Decision Processes*, the authors show how the challenge of addressing these eminently practical problems brings deep theoretic insight in the nature of risk itself.

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