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From the Editor...

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All of the papers in this issue focus on the value of obtaining information about uncertainties. We begin with an article by J. Eric Bickel on "The Relationship Between Perfect and Imperfect Information in a Two-Action Risk-Sensitive Problem." Next, is an article by Philippe Delquié on "The Value of Information and Intensity of Preference." Our third article, which uses an example of an oilfield decision to demonstrate an approach to "Valuing Future Information Under Uncertainty Using Polynomial Chaos," is by Michael Prange, William J. Bailey, Benoit Couët, Hugues Djikpesse, Margaret Armstrong, Alain Galli, and David Wilkinson. In the final article, Thomas Eppel and Detlof von Winterfeldt describe the calculation of value of information about the contents of waste storage tanks in "Value-of-Information Analysis For Nuclear Waste Storage Tanks." Since information is the topic of this issue, our trivia question is about the late Jacob Marschak, from whom I learned about the economics of information and about clarity of thought.

Key words: decision analysis; applications: energy; decision trees; expected utility; intensity of preference; Monte Carlo simulation; polynomial chaos; probability; uncertainty; value of information, two-action problem; editorial

The social object of skilled investment should be to defeat the dark forces of time and ignorance which envelope our future. John Maynard Keynes (1936)

If Keynes had been a decision analyst rather than an economist, he might have written that the object of a skilled *decision analysis* is to defeat the dark forces of time and ignorance. All of the papers in this issue focus on the value of obtaining perfect or imperfect information about future probabilistic uncertainties.[1] I have learned to ask doctors what treatment would be recommended after each possible medical test outcome. If the same treatment decision would be chosen no matter what the test outcome (and also chosen without even doing the test), then the information about the outcome of the test is of no extra value for the treatment decision. The basic ideas of the expected value of perfect information and the expected value of imperfect, or sample, information are often taught in management science and decision analysis classes, using examples with the goal of maximizing expected monetary value for a risk-neutral decision maker. In both the case of perfect and imperfect information about the outcome of an uncertain event, the expected value of the information is the excess that would be received, on average, if the outcome is known prior to decision making, compared with the base case when the decision is made before the outcome is known. This issue shows how these basic concepts of value of information can be extended and applied. Prior articles in *Decision Analysis* discussing value of information include Keisler (2004) and Matheson and Matheson (2005). Felli and Hazen (2004) describe a novel way to conduct sensitivity analysis and represent value of information using their javelin diagrams.

In our first article, J. Eric Bickel (2008) assumes a person has an exponential utility function and the goal to maximize this expected utility when choosing between two possible actions. When this person has normally distributed priors, he finds the value of imperfect information *divided* by the value of perfect information is maximal when the decision maker is indifferent between the two actions. He also examines

[1] While they may appear to be part of a special issue, the papers in this issue were reviewed as regular papers and happened to all be ready for publication in the same issue.

a risk neutral case. Bickel's prior publications in *Decision Analysis* include Bickel (2006) on corporate risk aversion, Bickel and Smith (2006) on sequential exploration, and Bickel (2007) on probability scoring rules.

Next, Delquié (2008b) calls the differences in utilities for the choice alternatives (before any information is resolved) the "intensity of preference." He shows that the intensity of preference is a determinant of the value of information (measured in utilities). In particular, if the person is indifferent among alternatives, the value of information (the *difference* between the expected utility with information and the expected utility without information) is maximal. He then shows how the value drops off as the preference intensity increases by one alternative getting better than the others, and considers specifically the linear (risk neutral) and exponential utility cases. In his prior paper in *Decision Analysis,* Philippe Delquié (2008a) shows how to interpret the risk tolerance coefficient (in an exponential utility function) in terms of maximum acceptable loss.

The next article is "Valuing Future Information under Uncertainty using Polynomial Chaos," by Michael Prange, William J. Bailey, Benoit Couët, Hugues Djikpesse, Margaret Armstrong, Alain Galli, and David Wilkinson. For the case of highly uncertain projects whose decisions have long-term impacts, Prange et al. (2008) present a framework using decision trees, Bayesian updating and Monte Carlo simulation to value future information, in terms of expected net present monetary value. They illustrate their approach for an oilfield example with a decision on where to place a new injection well, given a known faultline, when there is the option to make a measurement in the future that reveals the degree of reservoir compartmentalization caused by the fault.

In the final article, Thomas Eppel and Detlof von Winterfeldt (2008) describe a value-of-information analysis to determine whether to do further testing to gain information on the chemical and radiological composition in different nuclear waste storage tanks at the Hanford Site facility site in the southeastern part of Washington State. This analysis assumes risk neutrality and computes the expected monetary value of perfect or imperfect information. A prior publication in *Decision Analysis* by von Winterfeldt and O'Sullivan (2006) examined whether commercial airplanes should be protected against surface-to-air missile attacks by terrorists.

Since information is the topic of this issue, our trivia question is about the late Jacob Marschak, who was at the University of California, Los Angeles at the end of his career, and from whom I learned about the economics of information and about clarity of thought. (*Trivia question:* Which of the following is true about Jacob Marschak?[2] He a) was president of the American Economic Association, b) received the Ramsey award, c) is the Marschak in the Becker-deGroot-Marschak (1964) mechanism, d) is the namesake of the UCLA Marschak Colloquium, or e) is cited by one of the research papers in this issue.)

Jacob Marschak helped introduce information theory into economics. He was the director of the Cowles Commission (which was at the University of Chicago and later at Yale), where his colleagues who also worked on information included Kenneth J. Arrow, Roy Radner, and Franco Modigliani. In my opinion, he could have received the Nobel prize in economics if he had not died suddenly just over thirty years ago.

We will end with another quotation, which I leave to the reader to interpret:

> *"At sixty, I would like to give my future back its vistas of uncertainty."* Mason Cooley (1991)

[2] Trivia answers: a) False: he was elected, but died in 1977 right before he assumed the role: Marschak memorial text http://www.anderson.ucla.edu/x1094.xml; b) False: The first Ramsey Medal was awarded to Howard Raiffa in 1985, http://decision-analysis.society.informs.org/; Marschak bio http://www.anderson.ucla.edu/x1073.xml, http://en.wikipedia.org/wiki/Jacob_Marschak; c) True. This is a procedure used in experimental economics to measure willingness to pay (see also Keller et al. 1993). His co-author Morris de Groot (1970) is also cited by papers in this issue (http://en.wikipedia.org/wiki/Morris_H._DeGroot). d) True. At UCLA Marschak ran the Interdisciplinary Colloquium on Mathematics in the Behavioral Sciences. Upon his death, it was renamed the Jacob Marschak Interdisciplinary Colloquium on Mathematics in the Behavioral Sciences http://www.anderson.ucla.edu/x681.xml. (A career choice I regret is saying no to Marschak's offer to me to be the "secretary" of his colloquium. Young David Hirshleifer said yes; he is now a distinguished professor of behavioral finance at UC Irvine!); e) True.

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