Book Review

Roger M. Cooke, *Experts in Uncertainty*, Oxford University Press, New York, NY, 1991, $65.00, cloth.

This book is about expert opinion: how it is being used today, how the associated uncertainty is or should be represented, how people do or should treat this uncertainty, how the quality and usefulness of expert opinion can be assessed, and how the views of several experts might be combined. The approach is rigorous and thorough. The exhaustive coverage of methods and practices makes the book a valuable reference, particularly as enhanced by Cooke's critique and recommendations.

The work is divided into three parts. Part I, "Experts and Opinions," addresses the various ways in which expert opinion is being used today; how the scientific and engineering community is dealing with it. This is the most easily readable part of the book. It makes light use of mathematical formulations, and points out philosophical dilemmas such as the contradiction in the notion of expert opinion when *expert* designates certainty while *opinion* implies uncertainty. The goal of Part 1 is presented as to identify "better" or "worse" ways of using the uncertain opinion of experts. In a review of think-tank activities, scenario analyses, the Delphi method, military intelligence, artificial intelligence, and policy analysis in general, the author identifies pitfalls and guides the reader on how to reason with uncertainty. Logical and probabilistic thinking is also discussed in this part with many surprising elucidations of everyday-type of problems.

Part II, "Subjective Probability," features a fair amount of probability theory formulations even though the author assures us that advanced probability knowledge is not a prerequisite. Such theories as Savage's representation of rational preference and De Finetti's notion of learning from experience are treated with rigor and a critical viewpoint in order to "distill" the essence. Two chapters on scoring — the process of assigning a numerical value to a subjective probability — include practical guidelines for eliciting opinions from experts as well as a quantitative treatment of proper rules and weights.

Part III, "Combining Expert Opinions," draws on the first two parts to develop models for combining expert opinion assuming that the combination results in a probability distribution for the decision maker. Three classes of models are discussed. The "classical," the "Bayesian," and the "psychological scaling" models. The classical model constructs a weighted combination of expert probability assessment according to proper scoring rules described earlier. Its application depends on the availability of seed variables. A fundamental assumption of the classical (as well as the Bayesian) model is that the future performance of experts can be judged on the basis of past performance. The experts are required to have some notions of probability theory and some familiarity in estimating numerical values. Bayesian models require assessment of probability distributions via Baye's theorem. A Bayesian model has a stronger mathematical foundation, and it is less flexible than a classical model as it admits only quantile assessment and requires that all experts assess the same variables. Both types of models require resourcefulness on the part of the analyst and sympathetic cooperation from the experts themselves. If the experts have little training or feeling about the model and about assessing quantitatively values to relevant variables, the psychological scaling model may be more appropriate.

The psychological scaling models are quite different from the other two. These models are user-friendly and are characterized as consensus builders, but the transformation to absolute values remains problematic. Strong assumptions and the difficulty in choosing between a variety of models are considered as disadvantages. Applications of the three types of models are described in Chapter 15 and the conclusions drawn highlight strengths and weaknesses of the method as well as some feedback from users and experts.

Experts in Uncertainty is written in an academic style. A thesis and its antithesis are sometimes both presented as valid points of view, if at different chronological periods. For example, the culminating popularity of the Delphi method is shown to erode because of people like Sackman who concludes that "experts and nonexperts generally produce comparable results in Delphi exercises." This conclusion resonates with an older one by Spyros Makridakis — a Time Series old-timer — that "simple statistical methods in Time Series analyses perform at least as well as complicated ones." Cooke's encounter with the phenomenon of methods coming in and out of fashion does not draw him into a discussion of life cycles and substitutions of techniques. He contends himself with evaluating all methods and confronting them with real-life applications, adhering to certain pragmatism: "The proof of the pudding is in the eating."

lt is unfortunate that this book is too technical to be read by people like the young American who recently committed suicide on learning he had tested positive for HIV. The test had a 49o rate of false positives and he believed his chance of carrying the virus was 96%. Had he read this book, he would have been able to reason that the true chance that he carried the virus was only 109c!

Could Roger Cooke be convinced to put together a simplified version of his book for the general reader?

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