

Making Hard Decisions, An Introduction to Decision Analysis. by Robert T. Clemen, Boston: PWS-Kent, 1991, xviii + 557 pp.

This is an exceptionally well-written textbook about decision making as a science and an art. The intended audiences are advanced undergraduate and Master's degree students who have little mathematical background.

This book consists of three major sections. The first section is "Modeling Decisions," the second section is "Modeling Uncertainty," and the last section is "Modeling Preferences." Chapter 1 gives a well-rounded introduction to decision analysis. The author emphasizes that decision analysis of a problem is a critical learning process that helps the decision maker gain a better understanding of the situation at hand and provides a mechanism to structure the problem, thus helping the decision maker to develop beliefs and rationales for better decision making.

Section 1 comprises Chapters 2–6. Chapter 2, "Elements of Decision Problems," describes basic decision problems consisting of (a) decisions to make, (b) uncertain events, and (c) the value of a specific outcome. This can be summarized as the problem definition. Chapter 3 introduces techniques of using influence diagrams and decision trees as tools to provide a structure for a decision problem. Chapter 4, "Making Choices," concerns using decision trees and expected monetary value (EMV) to make a choice. It also provided currently available computer software that will help perform these types of decision analysis. Chapter 5, "Sensitivity Analysis," tells how sensitivity analysis can be used to reexamine the decision model to determine which components of the decision model are critical and how it affects the decision making. The result of the sensitivity analysis can be used to structure a better decision model. Chapter 6, "Creativity and Decision Structure," provides the characteristics of creativity and elements that inhibit it. Techniques that enhance the creativity are also provided. The importance of creativity in decision analysis, I believe, is not only in the formatting and structuring of the decision problems but also is enabling the decision maker to look at the problem with new perspectives and providing ingenious alternatives and solutions to the decision problems at hand.

Section 2 consists of Chapters 7–12. Chapter 7, "Probability Basics," provides the basic law and definitions of probability, including a description of the Bayes theorem. Chapter 8, "Subjective Probability," describes how an individual's degree of belief can be assessed and utilized and also its potential pitfalls in the assessing and application of subjective probability. Chapter 9, "Theoretical Probability Models," provides almost cookbook-like descriptions of binomial, Poisson, exponential, normal, and beta distributions. Chapter 10, "Using Data," describes how the data can be used to estimate a distribution. Chapter 11, "Monte Carlo Simulation," describes how a computer spreadsheet can be used to do the work of simulation, an important part of modeling the uncertainty. Chapter 12, "Value of Information," gives a brief treatment of how the value of information can be estimated based on the certainty of the information and its monetary values.

Section 3 consists of Chapters 13–17. Chapter 13, "Risk Attitudes," describes how a decision can be affected by a decision maker's risk attitudes. This decision maker's risk attitudes are described by a utility function. Chapter 14, "Utility Axioms, Paradoxes, and Implications," discusses various desirable characteristics of a utility function and the paradoxes and implications of known human behaviors on the valuation of the risks. Chapter 15, "Conflicting Objectives I: Some Basic Techniques," highlights several techniques that can be used to make a decision that contains conflicting objectives. Chapter 16, "Conflicting Objectives II: Multiattribute Utility Models," describes how to estimate multiattribute utility functions. Chapter 17 is "Conclusion and Further Reading."

Decision analysis is a difficult subject. It is difficult in terms of the modeling of human decision-making behaviors. It is difficult in terms of the assessment of human risk attitudes. In the prevailing decision-analysis methods, the heuristic of framing a defined decision problem in terms of a decision tree or influence diagram is perhaps the most scientific part of the decision analysis. The art of decision analysis resides in problem analysis and the creation of solution alternatives. The real art of decision analysis is the prevention of committing the error of the third kind in terms of providing irrelevant problem settings or decision alternatives.

Clemen's book very clearly stated all of these relevant issues to decision-analysis beginners, in spite of the abovementioned difficulties. This book also provides a wealth of examples, case studies, questions, and problems. These examples, case studies, questions, and problems provided further opportunity for students to familiarize themselves with the concepts and techniques in the main text.

The book is well edited and illustrated, and very few typos are found (one on p. 413, inside the Allais Paradox box, Decision 1, alternative B: "Win \$2 million," which should be "Win \$2.5 million").

I highly recommend this book as a textbook for the first course in decision analysis, provided that the instructor and students are also equipped with and familiar with some of the personal computer decision software that Clemen used to illustrate his examples and problems.

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