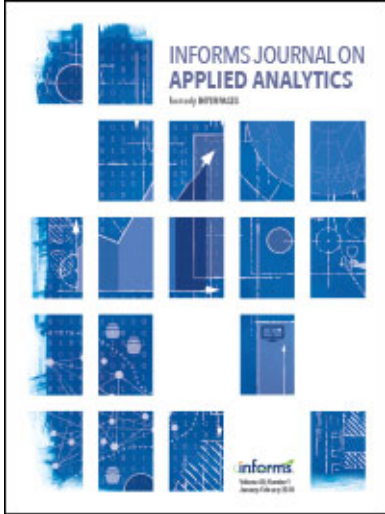




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Book Reviews

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Book Reviews

BENJAMIN LEV

School of Management
The University of Michigan-Dearborn
4901 Evergreen Road
Dearborn, Michigan 48128-1491
BLev@FOB-F1.umd.umich.edu

$$\beta \sum (\alpha \div \lambda \pi^e)^\sigma \leq \lambda \approx + \circ \lambda \$ \sum \lambda \Gamma_{\%}^{\alpha} \text{L T O } \cup \text{ } \omega \text{ } \phi \Delta \text{ } \beta \mu \div \text{ } \cap \text{ } \phi \text{ } \pi \text{ } \rho$$

The range of books reviewed is wide, covering theory and applications in operations research, statistics, econometrics, mathematics, computers, and information systems (no software is reviewed). In addition, we include books in other fields that emphasize technical applications. Publishers who wish to have their books and proceedings reviewed should send them to Professor Benjamin Lev. We list the books and proceedings received; not all books received can be reviewed because space and time are limited. Those who would like to review books are urged to send me their names, addresses, and specific areas of expertise. We commission all reviews and do not accept unsolicited book reviews. Readers are encouraged to suggest books that might be reviewed or to ask publishers to send me copies of such books.

SHIMIZU, K.; ISHIZUKA, Y.; AND
BARD, J. F. 1997, *Nondifferentiable and
Two-Level Mathematical Programming*,
Kluwer Academic Publishers, Dordrecht,
The Netherlands, 448 pp., \$132.00.

As the title suggests, this book concerns nondifferentiable mathematical programming and two-level optimization problems. The authors' emphasis is on presenting basic theoretical principles and on developing optimality conditions, rather than on discussing algorithms, although they address a few computational approaches briefly. The authors first discuss nondifferentiable nonlinear programming

problems and characterize directional derivatives and optimality conditions. They then use this theory to study two-level mathematical programs where the presence of optimal value functions within the model renders them nondifferentiable.

The book contains 16 chapters. In chapter 1, the authors introduce the different problems and applications and in chapter 2, they provide basic background material for differentiable and nondifferentiable nonlinear programming problems. They also present standard supporting and separating hyperplane results, the characterization of subdifferentials and general-

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ized directional derivatives, and various theorems of the alternative.

Chapter 3 concerns differentiable nonlinear programming problems. The authors describe the Karush-Kuhn-Tucker (KKT) theory for unconstrained and constrained problems, along with saddle-point duality theorems. They briefly address algorithmic approaches for both unconstrained and constrained problems, including Newton, quasi-Newton, conjugate gradient, penalty, and feasible directions methods. A nice addition here is a discussion of multi-objective programs, including the concept of efficient solutions and related necessary and sufficient optimality conditions. In chapter 4, they discuss the extension of these concepts to nondifferentiable optimization problems. They characterize directional derivatives and develop KKT-type optimality conditions for locally Lipschitz and quasi-differentiable cases. They include a very brief outline of subgradient optimization and bundle methods.

In chapter 5, the authors deal with a specialization of these results to linear-programming problems, focusing mainly on the simplex method, and duality and sensitivity analysis results.

In chapter 6, they begin to lay the groundwork for connecting the two parts of the book. They introduce optimal-value functions that are parameterized by some variable set, and for these functions, continuity properties, KKT multiplier maps under suitable constraint qualifications, directional derivatives, and generalized gradients. They also treat a special case in which the constraint map does not depend on the parameters (the “nonparametric” case).

Chapter 7 is an introduction to two-level mathematical-programming problems and Stackelberg leader-follower problems. For two-level nonlinear programming problems, the authors develop optimality conditions for the nonparametric case where the lower-level constraints do not depend on the upper-level decisions, and for the parametric case where they do. For Stackelberg problems, they develop optimality conditions for both cases where the lower-level optimal solution map is differentiable or nondifferentiable. They describe an application of bundle methods to solve this problem and present several applications to other problems, such as minmax, satisfaction, two-level design, resource allocation, and approximation theory.

Chapter 8 concerns decomposition methods for large-scale nonlinear programming problems that exhibit a block diagonal structure. The authors describe both primal decomposition and Lagrangian duality-based decomposition methods.

Chapters 9 through 14 focus on the aforementioned applications, addressing, in turn, minmax problems, satisfaction optimization problems, two-level design problems, general resource-allocation problems for decentralized systems, min-max multiobjective problems, and best approximation methods via Chebyshev norms. In each case, the authors develop optimality conditions for both the parametric and nonparametric cases, depending on whether or not the second-level constraints are governed by decisions made in the first stage. Finally, in chapter 15, they discuss the general Stackelberg leader-follower problem and in chapter 16,

specialize this discussion to the case of linear and convex function structures. For this latter instance, they develop detailed algorithms for linear and convex bilevel programming problems, including situations where the model incorporates certain discrete decision variables. The book concludes with a selected set of few references that highlight the vast breadth of topics addressed in this book.

Overall, Shimizu, Ishizuka, and Bard present a nice basic, fundamental introduction to nondifferentiable and two-level optimization problems, along with related applications and possible solution approaches. They do not intend the book to be used as a textbook. It contains no exercises and only a few illustrative examples. They address the book mainly to post-graduate students and researchers, who will find useful information here in beginning to study this vast and interesting topic.

Hanif D. Sherali

*Industrial and Systems Engineering
Department, 302 Whittemore Hall, Virginia
Polytechnic Institute and State University,
Blacksburg, Virginia 24061-0118*

LI, FENG 1995, *The Geography of Business Information*, John Wiley and Sons, Chichester, United Kingdom, 245 pp., \$54.95.

Although the title may suggest that this is a book about the distribution of business information, in fact, its main focus is on the interaction between corporate networks and the changes in business organizations and structures. More specifically, the author looked at the spatial and functional corporate restructuring in large

firms caused by the IT revolution. The author covers a wide range of topics. The first theme the author discusses is how organizational and contextual factors would affect the development and evolution of corporate networks.

The second theme explored is the impact of computer networks on business organization and structure. The author suggests that the corporate network can empower organizations with enormous spatial flexibility in the location and organization of business operations and enable corporations to use geographical differentiation as a resource in competition rather than as an impediment to managing and coordinating business operations. He proposes a functional approach based on information needs and information flow as a framework for analyzing the impact of computer networks on businesses. Li moves on to illustrate whether and how IT has contributed to the emergence of flexible production in the UK and suggests that flexibility in production systems and in labor practices are closely interrelated.

In the next two chapters, he examines the relationship between the development of a corporate network and business reorganization. Also discussed are the key elements and dimensions of corporate reorganization. Then he goes on to the relationship between interorganization computer systems and the changing relationship between business organizations.

Finally Li discusses the key factors supporting and limiting the proliferation of tele-work and presents an integrated-communication-infrastructure concept as a basis for studying business communication strategy and government policy is-

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sues. With so many topics floating around, the author sometimes loses the stated focus (spatial and functional corporate restructuring enabled by corporate network), and the jump in perspective in discussing different topics is sometimes confusing. Nevertheless, Li provides very detailed coverage and literature support for each of the topics covered, and the central idea about the interaction between the corporate network and business restructuring is very interesting, as are the cases used for illustration. The book will be a good reference for researchers interested in the topics covered, as well as a nice addition to the innovation and diffusion literature.

Haidong Song

Department of Information Systems,
University of Southern Queensland,
Toowoomba, QLD 4350, Australia

BERTSEKAS, D.P. AND TSITSIKLIS, J.N. 1996, *Neuro-Dynamic Programming*, Athena Scientific, Belmont, Massachusetts, 491 + xiii pp., \$79.00.

The text of the book jacket announces that the book "illustrates through case studies the practical application of NDP to complex problems." The cases concern a parking problem, a version of American football, a computer game (Tetris), and backgammon; the most practical cases, however, are a maintenance and repair problem: for a repair shop that has a number of spare parts for maintaining machines; and a dynamic channel allocation in cellular systems, an essential problem in mobile communication systems.

The solution methodology is a recently developed methodology that can be used

to solve very large and complex stochastic decision and control problems. It combines simulation, learning, neural networks and other approximation architectures, and the central ideas in dynamic programming.

Whereas dynamic programming is not the most-used technique for practitioners, Bertsekas and Tsitsiklis have tried to popularize their combined approach by writing a marvelous book that carefully treats the necessary theory for understanding their interesting approach. The book is nearly self-supporting, as it contains elementary material in two appendices. Each chapter in the book ends with a section containing notes and sources that refers to the literature in the reference list.

In spite of the authors' efforts, there remains the practical obstacle that the methodology they promote requires a wide knowledge of a difficult part of optimization theory. Furthermore, computer implementation of this technique is time consuming because no commercial software is available.

I hope and wish that the book will be the basis for more case studies, illustrating some beautiful and ingenious methods of OR.

Ton Volgenant

Faculty of Economics and Econometrics,
Operations Research Group, University of
Amsterdam, 1018 WB Amsterdam, The
Netherlands

SAKURAI, MICHIHARU 1996, *Integrated Cost Management: A Company-Wide Prescription for Higher Profits and Lower Costs*, Productivity Press, Portland, Oregon, 319 pp., \$50.00.

Increasingly managers are asking accountants to become integral players in team efforts to make their firms more responsive and flexible. McKinnon and Bruns [1992] noted that managers often used accountants and accounting systems for corroboration rather than as a primary source of information. To become better contributors, accountants must identify ways to bring cost-management techniques to bear on issues of concern to a broad range of managers. These issues include such concerns as marketing cost control [Foster and Gupta 1994] in addition to the more typical concerns about overhead allocations and budgeting. As firms demand greater cross-functional skills in the accounting members of their management teams, the need for integrated cost-management systems increases. Sakurai, writing in collaboration with D. Paul Scarbrough, provides an interesting perspective on the development and use of these systems.

Sakurai has been a management-accounting professor and an accounting-systems consultant to firms and governmental units. He brings his expertise and experience to bear in this work. The book has three distinguishing features. First, Sakurai analyzes management accounting's response to such trends as factory automation and computer-integrated manufacturing. Second, he provides an extended study of cost management for software development as an example of cost-management integration. Third, he includes a running commentary on the differences in US and Japanese management-accounting practices. This commentary is especially informative, since it appears in

the context of each managerial-accounting practice he discusses. For example, in the chapter on target costing, he clearly explains Japanese approaches to target costing and includes guidelines for identifying candidate firms. He then contrasts these approaches and guidelines to US practices.

The book begins with an outline of current management-accounting practices in Japan. After identifying three key trends—globalization, factory automation, and improved information technology—the author describes how the 1990s differ from the 1960s and what these differences mean for management-accounting-system design. Sakurai then presents a short history of target costing in Japan and describes Japanese overhead-management practices. These discussions culminate in a chapter in which he compares US and Japanese approaches to overhead management. In this chapter, the author contrasts activity-based costing (ABC) and target costing with activity-based management (ABM). The presentation of ABC and ABM in this chapter is an excellent example of how the author compares US and Japanese approaches clearly and in context.

Sakurai then discusses quality costing and life-cycle costing. Sakurai's discussion of quality costing provides yet more intriguing insights into US-Japan differences. The author then tackles the difficult issue of how firms might justify an investment in computer-integrated manufacturing facilities. This is one of the classic problems of management accounting, and the author does an excellent job with it.

The remainder of the book contains an extended examination of software cost accounting, which includes comparisons of

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US and Japanese charge-back practices, and an interesting summary of performance evaluation issues that arise in high technology firms. The book concludes with a chapter that examines current issues in global management accounting.

The book is well written and extremely well referenced. Each chapter contains references to both the US and the Japanese cost-management literatures. The book even has an English/Japanese glossary of journals, newspapers, and organizations for the reader who wants to pursue the references further. I recommend this book to accountants and managers who want to understand better the role that integrated cost management will play in their future.

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Gary P. Schneider

School of Business, 5998 Alcalá Park,
University of San Diego, San Diego,
California 92110-2492

BRANDIMARTE, PAOLO AND VILLA, AGOSTINO, eds. 1995, *Optimization Models and Concepts in Production Management*, Gordon and Breach Publishers, Basel, Switzerland, 339 pp., \$80.00.

The editors of this book invited a number of multidisciplinary academics from Europe and America to write 10 chapters on optimization models within the field of production management. The major topics they deal with could be summarized as

job scheduling, flow management in flexible manufacturing systems (FMS), aggregate scheduling, material requirements planning (MRP), simulation, and computer integrated manufacturing (CIM). An initial chapter is a general introduction to the problems of optimization and computational complexity.

The authors do more than focus on aspects of optimization; rather they present models for the problems they put forward; that is, they focus more on the operative aspects of production than on the mathematical methodology for resolving the problems.

It is obvious that the editors have made a special effort to try to make the book appear to be a textbook rather than the proceedings of a conference. In each chapter—they call them just that as opposed to papers in order to underline the idea that they want to present a totally interrelated body of work—the authors begin by establishing that chapter's relationship with another. However, it is not easy to achieve this aim when many of the chapters are, to a large extent, presentations of individual studies carried out by the different authors rather than exhaustive state-of-the-art studies of particular topics and when the topics dealt with are so wide in scope that they are difficult to cover in only a few studies. At the same time, the authors skip over very important topics related to optimization in production management (such as inventory management and maintenance) and methodologies that are employed more and more in this field (such as metaheuristics).

Possibly, to achieve homogeneity in the studies, the editors could have included a

"chapter O" to act as a general introduction to the function of production, the different types of productive systems, and the types of problems that this discipline has to deal with. They could then have situated all the other chapters within this theoretical introduction. Though chapter 1 is a sound introductory summary of the problem of machine scheduling and complexity theory, it is not as wide in scope as I would suggest and that is needed to fulfil the editors' goal.

One goal they do achieve is that of making the book appropriate for both post-graduate students and practitioners. The chapters are written in a quite clear and instructive way, which those who are new to these topics will surely appreciate.

Belarmino Adenso-Díaz

*Escuela Superior Ingenieros Industriales,
Campus Viesques, 33204-Gijón, Spain*

MUNIER, BERTRAND and MACHINA, MARK J. 1994, *Models and Experiments in Risk and Rationality*, Kluwer Academic Publishers, Dordrecht, The Netherlands, 438 pp., \$ 118.50.

This book contains 20 papers selected from those presented at the Foundations and Applications of Utility, Risk and Decision Theory (FUR) conference held at the Ecole Normale Supérieure de Cachan, Paris, June 1992. Organized under six sections, these papers cover the full range of topics that are actively researched today. The editors, two of the best-known scholars in the field, have done a remarkable job of compiling the papers into sections and providing expert introductions at the beginning of each section.

Out of the 20 papers, I comment below

on 10 that, to me, have the most appeal.

The book's first section on psychological aspects of risk bearing starts with an article by Jean-Pascal Assailly, which, in the editors' words, begins at the beginning. It provides a summary of research findings on the ontogenesis of risk perception and risk attitude. Assailly discusses the evolution of human risk-taking behavior from childhood to adolescence in different cultures in detail. Researchers can find in that discussion several leads to yet-unexplored topics as well as topics worthy of further research.

In the second section, on the theory of risk aversion, the first paper is by Adolfo Montesano, who proposes a way of measuring uncertainty aversion and risk aversion in the case of expected utility with nonadditive probabilities. Analogous to the (additive) Shapley value of players in cooperative games, Montesano calculates additive probabilities of discrete events from nonadditive ones and uses them to calculate the expected value of a gamble. Let us denote this expected value by EVAP. Let EVNP denote the expected value calculated with nonadditive probabilities, as a Choquet integral. Let CE represent the certainty equivalent. Montesano's proposal is to use (EVAP-EVNP) as the measure of uncertainty aversion and (EVNP-CE) as the measure of risk aversion. He points out some desirable properties of the proposed measures.

In the next paper in the section, Louis Eeckhoudt and Harris Schlesinger extend Kimball's results on precautionary premium and prudence. They show that even though more prudence does not imply more risk aversion, the structures of risk

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aversion and prudence are not independent. They provide interesting proofs and examples.

The next section contains four interesting articles on nonexpected utility models and tests. Enrica Carbone and John Hey describe the test they performed on 24 subjects by asking them to completely rank 44 gambles at once, rather than two at a time. From the ranking data, they estimated the preference functionals of the subjects using an ordered logit specification. They conclude that only half the subjects conformed to EU models.

In the next paper, Mohammed Abdellaoui and Bertrand Munier describe an approach they call the "closing-in" method for estimating preference patterns within the Marschak-Machina triangle. As opposed to fixed lotteries and single-index models of the past, their method uses lotteries that are dynamically designed based on the subjects' responses. They used a specially designed software called MacLabEx. If multiple zones exist within the Marschak-Machina triangle, each with its own pattern, then the closing-in method can identify them.

Those who wish to compare the Choquet Expected Utility (CEU) theory and the Cumulative Prospect Theory (CPT) will find the next paper by Rakesh Sarin and Peter Wakker quite useful. They present an axiomatic derivation of the CEU model and then explain in detail how it compares with CPT.

A highlight of the FUR VI conference was the presentation by Maurice Allais, in a plenary session, about his contributions to risk and utility theory. His speech in French was simultaneously translated into

English and broadcast to the audience. The gist of his presentation is included in this volume; he summarizes his contribution to the field from 1952 to 1988.

In the next section are two interesting papers about financial markets. It is usual in finance theory to equate the value of an asset to the sum of the values of suitably selected other assets that together replicate the original asset's returns. The put-call parity theorem is a good example. But if we were to follow the Choquet expected utility theory, we cannot simply add the values of assets whose returns are not comonotonic. A call option and a short position on an asset are not comonotonic, and therefore their values are not additive. It is empirically observed that the traditional, additive valuations are violated in the market. Even after allowing for transaction costs, violations persist. Alain Chateauneuf, Robert Kast, and Alain Lapied present these facts in their paper and describe a valuation method in which the value of an asset is the Choquet integral of its payments with respect to a capacity.

Those who wish to apply the theory of stochastic processes to evaluate an asset, especially a derivative, will find the article by François Quitard-Pinon and Jacques Sikorav very useful. The authors calculate certain functionals of Brownian motion using the reflection principle, optimal stopping theorem, and Girsanov's theorem. Then they make use of these functionals to evaluate two contingent claims. The first is a claim contingent on the underlying asset price reaching a predetermined value within a given time and the second is a guaranteed warrant.

The final section contains four papers on games and social choice, of which the one by Colin Camerer and Risto Karjalainen relates most closely to decision theory. They describe four noncooperative game experiments that they conducted to test the ambiguity aversion of their subjects. Since the motives and rationality of other players are a kind of knowable missing information, other players' moves could be considered ambiguous states and thus the test could be considered an ambiguity aversion test. Across the four experiments, the authors report that 40 to 65 percent of the subjects expressed some degree of ambiguity aversion.

The next FUR conference was held at Oslo in July 1994, and Kluwer Academic Publishers will bring out the next volume containing selected papers from that conference soon.

Jayavel Sounderperandian

Department of Business, University of Wisconsin-Parkside, Kenosha, Wisconsin

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