

## Book reviews

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## Cost–Benefit Analysis and the Theory of Fuzzy Decisions

Springer–Verlag, Heidelberg 2004.

xviii + 400 pages.

ISBN 3–540–22154–9.

The fuzzy set theory and fuzzy numbers theory is recently applied in rapidly growing area of economic and human sciences. Namely, the optimization methods and the fuzzy-based decision-making under uncertainty are in the focus of interest. In general, this development is logical and natural. The optimal decisions depend on a wide class of vague input data reaching from the expectations of the uncertain costs to the subjectively estimated benefits, and covering individual preferences and frequently not exactly known mechanism transforming the accepted decisions into real consequences. The referred book contributes to this topic by a relatively detailed analysis of the decision-making based on the vaguely formulated costs and profits. Such topic can be inspirational and fruitful, and its presentation can be supported by well elaborated theory of both – the decision-making models and fuzzy set analysis. The main task of this review is to evaluate how successfully the referred book copes with the challenge of so wide subject.

The text of the book is, after a preface, divided into six chapters. The first one, “*Decision, Cost and Benefit*” presents the introductory information on concepts and methodologies investigated in the rest of the book. This first chapter is mostly heuristic with minimum of mathematics limited rather to symbols than to some statements.

The second chapter “*The Theory of Computable Cost-Benefit Identification Matrices*” introduces the logical structure and significant properties of the concept of identification matrices representing the basic formal tool for the analysis of cost-benefit decision-making. Chapter 3, “*Theory of Social Cost and Costing*” presents the fuzzy-decision theory of social cost in the relation to the theory of computable cost-benefit identification matrices. The next Chapter 4 “*The Theory of Social Benefits and Benefit Accounting*” deals with the second component of the cost-benefit model and its fuzzification, namely the fuzzy decision theory of social benefits and benefit accounting. The cost and benefit accounting is presented as soft computing with subjectivity and vagueness included in the computation.

These three chapters are characterized by heuristic discussions combined with isolated mathematical symbols, a few tables, some identification matrices and several graphical schemes of the interrelations among the investigated phenomena. Only Chapter 4 includes formal definitions – there are 17 of them – and several statements.

Chapter 5, “*Essential Mathematics for Fuzzy Decision Processes*” aims to summarize the essential mathematics for the fuzzy decision investigation. It is presented in almost sixty definitions combined with some mostly simple statements (most of them are “observations” and “statements” without proofs) and numerous examples with illustrative figures. Finally, Chapter 6, “*The Basic Theory of Fuzzy Decisions*” is devoted to the fundamentals of the fuzzy decision-making being in the background of the main Chapter 3.

It is typical for the referred book that the main theoretical (i. e., mathematical) parts useful for the understanding of the conceptual analysis of the input concepts of cost, benefit and decision are organized after their presentation. The main stress is put on the fluent and illustrative explanation with necessary symbols and formulas, supported by many examples, figures and numerical data. The unavoidable mathematics includes much more definitions than effective mathematical theorems with not-trivial proofs.

It is to be mentioned that the volume is completed by a well prepared index and very rich list of references (1 277 items) organized into nine groups due to their main subjects.

The previous characteristics means that the referred book will not fully satisfy (at least by my opinion) a theoretically oriented mathematician but it can be very attractive for an economist or sociologist which is able to percept the not very complicated mathematical terminology and formulas, who is used to read graphical representation of relations existing in the cost-benefit decision situations in economics, welfare models and related fields.

*Milan Mareš*