

Computational Methods in Decision-Making, Economics and Finance

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Computational Methods in Decision-Making, Economics and Finance

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This book is dedicated to our families.

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Preface

Computing has become essential for the modeling, analysis and optimization of systems. This book is devoted to algorithms, computational analysis and decision models. The chapters are organized in two parts: optimization models of decisions and models of pricing and equilibria.

Optimization is at the core of rational decision making. Even when the decision maker has more than one goal or there is significant uncertainty in the system, optimization provides a rational framework for efficient decisions. The Markowitz mean-variance formulation is a classical example. The first part of the book is on recent developments in optimization decision models for finance and economics. The first four chapters of this part focus directly on multi-stage problems in finance. Chapters 5-8 involve the use of worst-case robust analysis. Chapters 9-11 are devoted to portfolio optimization. The last four chapters of this part are on transportation-inventory with stochastic demand; optimal investment with CRRA utility; hedging financial contracts; and, automatic differentiation for computational finance.

The uncertainty associated with prediction and modeling constantly requires the development of improved methods and models. Similarly, as systems strive towards equilibria, the characterization and computation of equilibria assists analysis and prediction. The second part of the book is devoted to recent research in computational tools and models of equilibria, prediction and pricing. The first three chapters of this part consider hedging issues in finance. Chapters 19-22 consider prediction and modeling methodologies. Chapters 23-26 focus on auctions and equilibria. Volatility models are investigated in chapters 27-28. The final two chapters investigate risk assessment and product pricing.

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