Uwe Gotzes

Decision Making with Dominance Constraints in Two-Stage Stochastic Integer Programming

VIEWEG+TEUBNER RESEARCH

Stochastic Programming

Editor:

Prof. Dr. Rüdiger Schultz

Uncertainty is a prevailing issue in a growing number of optimization problems in science, engineering, and economics. Stochastic programming offers a flexible methodology for mathematical optimization problems involving uncertain parameters for which probabilistic information is available. This covers model formulation, model analysis, numerical solution methods, and practical implementations. The series "Stochastic Programming" presents original research from this range of topics.

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With a foreword by Prof. Dr. Rüdiger Schultz

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Foreword

Stochastic dominance, an established concept in decision theory, has gained attention in stochastic programming only recently. The present monograph contributes to this line of research. It deals with stochastic programming models incorporating risk aversion via stochastic dominance constraints. The latter arise by comparing decision dependent random variables and pre-specified benchmarks. This induces some notion of acceptance: Only those decisions are feasible that lead to random entities, e. g., costs, returns, or revenues, which compare favorably to some random benchmark profile reflecting the user's desire.

This monograph addresses decision making with stochastic dominance constraints in the framework of two-stage mixed-integer linear stochastic programming. Its main results concern basic structural findings, novel decomposition algorithms for the numerical solution of the large-scale stochastic programs arising, and case studies on two exemplary industrial optimization problems under uncertainty, namely competitive selling price determination for electricity retailers and planning of a local network for heat supply. Thus, both readers interested in mathematical foundation or practical application of optimization under uncertainty may find this text interesting.

The monograph grew out of a doctoral dissertation prepared during 2005–2008 at the Chair of Discrete Mathematics and Optimization in the Department of Mathematics of the University of Duisburg-Essen. This research has been supported by the German Federal Ministry of Education and Research (BMBF) within the program "Netzwerke Grundlagenforschung erneuerbare Energien und rationelle Energieanwendung".

Rüdiger Schultz

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Uwe Gotzes

[1] German Federal Ministry of Education and Research

[2] Distributed renewable power generation: Innovative modeling and optimization

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