



A two-level (three-stage) binary scenario tree

Numbers are demand(probability)

Stochastic Programming

Alan J. King, Stein W. Wallace



Stochastic Programming:

Introduction to Stochastic Programming John R. Birge, François Louveaux, 2011-06-15 The aim of stochastic programming is to find optimal decisions in problems which involve uncertain data This field is currently developing rapidly with contributions from many disciplines including operations research mathematics and probability At the same time it is now being applied in a wide variety of subjects ranging from agriculture to financial planning and from industrial engineering to computer networks This textbook provides a first course in stochastic programming suitable for students with a basic knowledge of linear programming elementary analysis and probability The authors aim to present a broad overview of the main themes and methods of the subject Its prime goal is to help students develop an intuition on how to model uncertainty into mathematical problems what uncertainty changes bring to the decision process and what techniques help to manage uncertainty in solving the problems In this extensively updated new edition there is more material on methods and examples including several new approaches for discrete variables new results on risk measures in modeling and Monte Carlo sampling methods a new chapter on relationships to other methods including approximate dynamic programming robust optimization and online methods The book is highly illustrated with chapter summaries and many examples and exercises Students researchers and practitioners in operations research and the optimization area will find it particularly of interest Review of First Edition The discussion on modeling issues the large number of examples used to illustrate the material and the breadth of the coverage make Introduction to Stochastic Programming an ideal textbook for the area Interfaces 1998

Stochastic Programming András Prékopa, 2013-03-09 Stochastic programming the science that provides us with tools to design and control stochastic systems with the aid of mathematical programming techniques lies at the intersection of statistics and mathematical programming The book Stochastic Programming is a comprehensive introduction to the field and its basic mathematical tools While the mathematics is of a high level the developed models offer powerful applications as revealed by the large number of examples presented The material ranges from basic linear programming to algorithmic solutions of sophisticated systems problems and applications in water resources and power systems shipbuilding inventory control etc Audience Students and researchers who need to solve practical and theoretical problems in operations research mathematics statistics engineering economics insurance finance biology and environmental protection **Applications of**

Stochastic Programming Stein W. Wallace, William T. Ziemba, 2005-06-01 Consisting of two parts this book presents papers describing publicly available stochastic programming systems that are operational It presents a diverse collection of application papers in areas such as production supply chain and scheduling gaming environmental and pollution control financial modeling telecommunications and electricity **Stochastic Programming** Kurt Marti, Peter Kall, 2013-12-14 In order to obtain more reliable optimal solutions of concrete technical economic problems e g optimal design problems the often known stochastic variations of many technical economic parameters have to be taken into account already in the

planning phase Hence ordinary mathematical programs have to be replaced by appropriate stochastic programs New theoretical insight into several branches of reliability oriented optimization of stochastic systems new computational approaches and technical economic applications of stochastic programming methods can be found in this volume

Stochastic Programming Francesco Archetti, G. Di Pillo, Mario Lucertini, 1986 Stochastic Programming: Applications In Finance, Energy, Planning And Logistics Horand I Gassmann, William T Ziemba, 2012-11-28 This book shows the breadth and depth of stochastic programming applications All the papers presented here involve optimization over the scenarios that represent possible future outcomes of the uncertainty problems The applications which were presented at the 12th International Conference on Stochastic Programming held in Halifax Nova Scotia in August 2010 span the rich field of uses of these models The finance papers discuss such diverse problems as longevity risk management of individual investors personal financial planning intertemporal surplus management asset management with benchmarks dynamic portfolio management fixed income immunization and racetrack betting The production and logistics papers discuss natural gas infrastructure design farming Atlantic salmon prevention of nuclear smuggling and sawmill planning The energy papers involve electricity production planning hydroelectric reservoir operations and power generation planning for liquid natural gas plants Finally two telecommunication papers discuss mobile network design and frequency assignment problems a

Stochastic Linear Programming Algorithms Janos Mayer, 1998-02-25 A computationally oriented comparison of solution algorithms for two stage and jointly chance constrained stochastic linear programming problems this is the first book to present comparative computational results with several major stochastic programming solution approaches The following methods are considered regularized decomposition stochastic decomposition and successive discrete approximation methods for two stage problems cutting plane methods and a reduced gradient method for jointly chance constrained problems The first part of the book introduces the algorithms including a unified approach to decomposition methods and their regularized counterparts The second part addresses computer implementation of the methods describes a testing environment based on a model management system and presents comparative computational results with the various algorithms Emphasis is on the computational behavior of the algorithms **Applications of Stochastic Programming** Stein W. Wallace, William T. Ziemba, 2005-01-01 Consisting of two parts this book presents papers describing publicly available stochastic programming systems that are operational It presents a diverse collection of application papers in areas such as production supply chain and scheduling gaming environmental and pollution control financial modeling telecommunications and electricity

Encyclopedia of Optimization Christodoulos A. Floudas, Panos M. Pardalos, 2008-09-04 The goal of the Encyclopedia of Optimization is to introduce the reader to a complete set of topics that show the spectrum of research the richness of ideas and the breadth of applications that has come from this field The second edition builds on the success of the former edition with more than 150 completely new entries designed to ensure that the reference addresses recent areas where optimization

theories and techniques have advanced Particularly heavy attention resulted in health science and transportation with entries such as Algorithms for Genomics Optimization and Radiotherapy Treatment Design and Crew Scheduling

Modeling with Stochastic Programming Alan J. King, Stein W. Wallace, 2012-06-19 While there are several texts on how to solve and analyze stochastic programs this is the first text to address basic questions about how to model uncertainty and how to reformulate a deterministic model so that it can be analyzed in a stochastic setting This text would be suitable as a stand alone or supplement for a second course in OR MS or in optimization oriented engineering disciplines where the instructor wants to explain where models come from and what the fundamental issues are The book is easy to read highly illustrated with lots of examples and discussions It will be suitable for graduate students and researchers working in operations research mathematics engineering and related departments where there is interest in learning how to model uncertainty Alan King is a Research Staff Member at IBM's Thomas J Watson Research Center in New York Stein W Wallace is a Professor of Operational Research at Lancaster University Management School in England

Stochastic Programming, Algorithms and Models Julia L. Hingle, S. Sen, 1996 Lectures on Stochastic Programming Alexander Shapiro, Darinka Dentcheva, Andrzej P. Ruszczyński, 2014-07-09 Optimization problems involving stochastic models occur in almost all areas of science and engineering such as telecommunications medicine and finance Their existence compels a need for rigorous ways of formulating analyzing and solving such problems This book focuses on optimization problems involving uncertain parameters and covers the theoretical foundations and recent advances in areas where stochastic models are available In *Lectures on Stochastic Programming Modeling and Theory* Second Edition the authors introduce new material to reflect recent developments in stochastic programming including an analytical description of the tangent and normal cones of chance constrained sets analysis of optimality conditions applied to nonconvex problems a discussion of the stochastic dual dynamic programming method an extended discussion of law invariant coherent risk measures and their Kusuoka representations and in depth analysis of dynamic risk measures and concepts of time consistency including several new results

Stochastic Programming V.V. Kolbin, 1977-06-30 This book is devoted to the problems of stochastic or probabilistic programming The author took as his basis the specialized lectures which he delivered to the graduates from the economic cybernetics department of Leningrad University beginning in 1967 Since 1971 the author has delivered a specialized course on Stochastic Programming to the graduates from the faculty of applied mathematics management processes at Leningrad University The present monograph consists of seven chapters In Chapter I which is of an introductory character consideration is given to the problems of uncertainty and probability used for modelling complicated systems Fundamental indications for the classification of stochastic programming problems are given Chapter II is devoted to the analysis of various models of chance constrained stochastic programming problems Examples of technological and applied economic problems of management with chance constraints are given In Chapter III two stage stochastic programming

problems are investigated various models are given and these models are qualitatively analyzed In the conclusion of the chapter consideration is given to the transport problem with random data the problem of the determination of production volume and the problem of planning the flights of aircraft as two stage stochastic programming problems Multi stage stochastic programming problems are investigated in Chapter IV The dependencies between prior and posterior decision rules and decision distributions are given Dual problems are investigated Stochastic Programming Kurt Marti, Peter Kall, 1995-04-06 Proceedings of the 2nd GAMM IFIP Workshop on Stochastic Optimization Numerical Methods and Technical Applications held at the Federal Armed Forces University Munich Neubiberg München Germany June 15 17 1993

Stochastic Programming Gerd Infanger, 2010-11-10 From the Preface The preparation of this book started in 2004 when George B Dantzig and I following a long standing invitation by Fred Hillier to contribute a volume to his International Series in Operations Research and Management Science decided finally to go ahead with editing a volume on stochastic programming The field of stochastic programming also referred to as optimization under uncertainty or planning under uncertainty had advanced significantly in the last two decades both theoretically and in practice George Dantzig and I felt that it would be valuable to showcase some of these advances and to present what one might call the state of the art of the field to a broader audience We invited researchers whom we considered to be leading experts in various specialties of the field including a few representatives of promising developments in the making to write a chapter for the volume Unfortunately to the great loss of all of us George Dantzig passed away on May 13 2005 Encouraged by many colleagues I decided to continue with the book and edit it as a volume dedicated to George Dantzig Management Science published in 2005 a special volume featuring the Ten most Influential Papers of the first 50 Years of Management Science George Dantzig's original 1955 stochastic programming paper Linear Programming under Uncertainty was featured among these ten Hearing about this George Dantzig suggested that his 1955 paper be the first chapter of this book The vision expressed in that paper gives an important scientific and historical perspective to the book Gerd Infanger *Risk Management in Stochastic Integer Programming* Frederike Neise, 2008-09-25 The author presents two concepts to handle the classic linear mixed integer two stage stochastic optimization problem She describes mean risk modeling and stochastic programming with first order dominance constraints Both approaches are applied to optimize the operation of a dispersed generation system

Stochastic Programming Willem K. Klein Haneveld, Maarten H. van der Vlerk, Ward Romeijnnders, 2019-10-24 This book provides an essential introduction to Stochastic Programming especially intended for graduate students The book begins by exploring a linear programming problem with random parameters representing a decision problem under uncertainty Several models for this problem are presented including the main ones used in Stochastic Programming recourse models and chance constraint models The book not only discusses the theoretical properties of these models and algorithms for solving them but also explains the intrinsic differences between the models In the book's closing section several case studies are presented

helping students apply the theory covered to practical problems The book is based on lecture notes developed for an Econometrics and Operations Research course for master students at the University of Groningen the Netherlands the longest standing Stochastic Programming course worldwide **Stochastic Decomposition** Julia L. Hingle,S. Sen,2013-11-27

Motivation Stochastic Linear Programming with recourse represents one of the more widely applicable models for incorporating uncertainty within in which the SLP optimization models There are several arenas model is appropriate and such models have found applications in air line yield management capacity planning electric power generation planning financial planning logistics telecommunications network planning and many more In some of these applications modelers represent uncertainty in terms of only a few seenarios and formulate a large scale linear program which is then solved using LP software However there are many applications such as the telecommunications planning problem discussed in this book where a handful of seenarios do not capture variability well enough to provide a reasonable model of the actual decision making problem Problems of this type easily exceed the capabilities of LP software by several orders of magnitude Their solution requires the use of algorithmic methods that exploit the structure of the SLP model in a manner that will accommodate large scale applications Stochastic Linear Programming Peter Kall,János Mayer,2005-07-25 Peter Kall and J nos Mayer are distinguished scholars and professors of Operations Research and their research interest is particularly devoted to the area of stochastic optimization Stochastic Linear Programming Models Theory and Computation is a definitive presentation and discussion of the theoretical properties of the models the conceptual algorithmic approaches and the computational issues relating to the implementation of these methods to solve problems that are stochastic in nature The application area of stochastic programming includes portfolio analysis financial optimization energy problems random yields in manufacturing risk analysis etc In this book models in financial optimization and risk analysis are discussed as examples including solution methods and their implementation Stochastic programming is a fast developing area of optimization and mathematical programming Numerous papers and conference volumes and several monographs have been published in the area however the Kall and Mayer book will be particularly useful in presenting solution methods including their solid theoretical basis and their computational issues based in many cases on implementations by the authors The book is also suitable for advanced courses in stochastic optimization **Stochastic Programming 84** András Prékopa,Roger J.-B. Wets,1986

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