Mathematical Programming Methods for Stochastic Optimization Methods with a Class of Risk Measures

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Recently, stochastic programming and decision making under conditions of uncertainty have been receiving an increasing amount of attention in the literature. With the ongoing advances in the amount of computational power, it is now possible to successfully solve optimization problems in the presence of random parameters for many practical applications. In the present talk I will discuss two challenges associated with the introduction of randomness into optimization: how these uncertainties can be modeled, and then how the resulting mathematical programming problems can be solved. During the discussion of the modeling aspect of my work I will outline our efforts in designing appropriate “measures of risk”, which naturally lead to convex programming formulations. Special consideration in this work is given to the phenomena of heavy-tailed distributions of losses and catastrophic risk. This leads to the introduction of a new general framework for formulating convex and coherent measures of risk. In the second part of the talk I will concentrate on mathematical programming consequences of the proposed modeling approaches. This work includes design of novel solution procedures for both convex and mixed-integer programming problems of a special kind. Some of the advances in this area as well as results of numerical experiments will be presented.

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