

## CHANCE-CONSTRAINED METHODS FOR OPTIMIZATION PROBLEMS WITH RANDOM AND FUZZY PARAMETERS

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Received October 2007; revised March 2008

**ABSTRACT.** *On the basis of the possibility measure, necessity measure, credibility measure and probability measure, chance-constrained programming models are designed to treat optimization problems with stochastic and fuzzy parameters. Then, mathematical properties of different models, for instance, crisp equivalents of uncertain functions and constraints, are discussed on condition that parameters are uniformly distributed random variables and trapezoidal fuzzy variables. To solve the models, a genetic algorithm based on the simulation is designed to seek the approximate optimal solution. Finally, numerical examples are given to show the performance of models and algorithm.*

**Keywords:** Possibility measure, Credibility measure, Simulation technique, Genetic algorithm

**1. Introduction.** As we know, random programming and fuzzy programming are two important branches of operations research, the aims of which are to study the behaviors of optimal problems with randomness and fuzziness, respectively (We can refer to Lin and Lee [8], Liu & Zhu [13], Liu [10], Luhandjula [15], Ghazanfari et.al [3] and Yang & Liu [16]). Due to the complexity of the real system, randomness and fuzziness may appear simultaneously in the process of decision-making. In this case, optimization problems turn more complicated and decision-makers need to integrate probability theory with fuzzy set theory to deal with them. In literature, many researchers presented different methods for optimization problems with randomness and fuzziness. For instance, Iskander [5-7] presented several models to deal with stochastic fuzzy linear programming on the basis of probability measure, possibility measure and necessity measure. Liu [9], Liu and Liu [11,12] investigated fuzzy random programming and random fuzzy programming based on the chance measure, and some mathematical models with respect to different criteria were presented. Luhandjula [14] investigated the linear programming with fuzzy random coefficients. For other applications of fuzzy random systems, we may refer to Egawa and Fukuda [1], Fukuda [2] and Guo et.al [4].

In this paper, we shall discuss optimization problems with random and fuzzy parameters from other point of view. The main idea of this paper is similar to that of Iskander's works [5-7]. Iskander only discussed this kind of problems for linear programming. We generalize the models into more general cases. That is, the models in this paper are not only suitable for linear programming but also suitable for nonlinear programming and other cases. In addition, credibility measure is employed to construct mathematical models, which is also a new idea.

This paper is organized as follows. Section 2 introduces some preliminaries of fuzzy set theory. In Section 3, several chance-constrained programming models are designed on