Global Optimization over the Efficient Set

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Abstract: One of the most interesting and important concepts in multicriteria decision making is to optimize some given function over the set of all efficient solutions. As the efficient set is in general nonconvex, even for the case of linear multicriteria programming problems, optimizing over the efficient set belongs to a typical problem class of multiextremal optimization problems, which can have local optima different from global optima.

In this article, we consider the case where the multicriteria programming problem is linear, whose feasible set is given by a system of linear equations. Characterizing the set of efficient solutions by some constraint of complementarity type, we formulate the problem of minimizing a continuous function f over the efficient set as a global optimization problem with a special structure. A lift-and-project method is then proposed to convexify the resulting problem successively within a branch and bound scheme. Convergence properties of the general algorithm are discussed, and a detailed implementation is given for some special cases of f including linear, convex, concave, and d.c. (difference of two convex) functions.

Key words: Multicriteria optimization, optimization over the efficient set, global optimization, branch and bound.

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