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Optimal mass transportation relaxations of stochastic dominance relations in optimization

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Optimization problem with stochastic dominance constraints provide a possibility to shape risk by selecting a benchmark random outcome with a desired distribution. A difficulty arises when no feasible decision results in a distribution that dominates the benchmark. In this talk, we address the problem of choosing a tight relaxation of the stochastic dominance constraint by selecting a feasible distribution, which is closest to the benchmark in terms of a mass transportation distance. For the second-order stochastic dominance, we present new formulae for the Monge-Kantorovich distance of first order of a given distribution to the set of distributions dominating the benchmark. Under an additional assumption, we also construct the associated projection. The results allow us to construct numerical methods for solving the optimization problem with automatic relaxation should the benchmark cause infeasibility. We present also numerical results illustrating the proposed approach.

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