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Scenario reduction in stochastic programming. (English) Zbl 1023.90043

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Summary: Given a convex stochastic programming problem with a discrete initial probability distribution, the problem of optimal scenario reduction is stated as follows: Determine a scenario subset of prescribed cardinality and a probability measure based on this set that is the closest to the initial distribution in terms of a natural (or canonical) probability metric. Arguments from stability analysis indicate that Fortet-Mourier type probability metrics may serve as such canonical metrics. Efficient algorithms are developed that determine optimal reduced measures approximately. Numerical experience is reported for reductions of electrical load scenario trees for power management under uncertainty. For instance, it turns out that after 50% reduction of the scenario tree the optimal reduced tree still has about 90% relative accuracy.

MSC:

90C15 Stochastic programming

90C31 Sensitivity, stability, parametric optimization

Cited in **1** Review
Cited in **102** Documents

Keywords:

stochastic programming; quantitative stability; Fortet-Mourier metrics; scenario reduction; transportation problem; electrical load scenario tree

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