

## Multilevel optimization modeling for stochastic programming with coherent risk measures

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Coherent risk measures are a generally accepted way to introduce risk aversion into stochastic programming problems. If uncertainty is resolved at more than one point in time, however, their use appears to present an uncomfortable choice between time inconsistency and complicated, nonintuitive objective functions that can violate law invariance, assigning different objective values to outcomes with exactly the same distribution of outcomes. This talk proposes a multilevel optimization modeling scheme that avoids this difficulty and allows a straightforward risk measure to be used as the objective function of any multistage model. Unfortunately, it also shows that the resulting models are  $\mathcal{NP}$ -hard even in the simplest cases. On the other hand, it also presents empirical evidence that some nontrivial practical instances may not be difficult to solve.