

# Efficient Solution of Problems with Probabilistic Constraints Arising in the Finance and Energy sectors

Claudia Sagastizabal - IMPA

In many real life problems from finance and engineering, constraints involve random parameters due to (market, weather, etc) uncertainty. In such a setting it is often the case that a decision, say  $x$ , has to be taken "here and now", before the uncertainty is observed. No matter how carefully  $x$  is chosen, there is no guarantee that the random constraint will be satisfied for all possible realizations of the uncertain parameters.

One possibility to deal with this issue is to use probabilistic constraints.

Specifically, when the probability distribution of the random variable is known, for each  $x$  the probability of constraint satisfaction can be computed and, hence, it is possible to solve a problem in which  $x$  is feasible if such a probability is higher than certain safety level, deemed satisfactory for the application (for instance, with 90% confidence).

We discuss an efficient solution method that makes use of  $p$ -efficient points and solves a dual problem by an inexact bundle algorithm.

The interest of the approach is assessed on a cash-matching problem and on the optimal management of a hydro-valley, with several hydro power plants cascaded along the same basin.

Joint work with Wim van Ackooij (EdF-France), Violette Berge (Ensta-ParisTech), and Welington Oliveira (Impa)