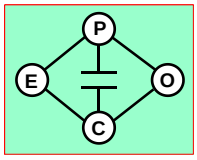


# DOASA

DOASA (Dynamic Outer Approximation Sampling Algorithm) is a sampling-based optimization package for solving multi-stage stochastic linear programming problems. DOASA can be applied to any multi-stage stochastic linear program with the following specific features:

1) All problems exhibit relatively complete recourse;
2) All the uncertain parameters appear in the right-hand side of the constraints;
3) Uncertain parameters are stagewise independent.

DOASA was developed by researchers at the Electric Power Optimization Centre at the University of Auckland. A standard version that models the New Zealand electricity system and runs in the cloud is being made available from the EMI site at the New Zealand Electricity Authority. Details of this standard version are in Philpott and Pritchard (2018).

DOASA follows a similar solution approach to methods using SDDP. The main difference is its use of a single sample path (forward pass), and its termination criterion. Unlike SDDP, DOASA does not test the candidate policy for optimality while iterating. It runs for a fixed number of iterations (chosen by the user). The policy is stored and can be tested by simulation at the completion of the iterations.

The mathematics underlying DOASA is described in more depth in the papers by Philpott and Guan (2008), and Girardeau et al (2015). These can be downloaded from www.epoc.org.nz/publications. In these papers, DOASA is shown to converge almost surely to an optimal solution.

Bespoke versions of the DOASA code for commercial clients can be obtained from Stochastic Optimization Limited (www.sol.co.nz). Interested parties should contact software@sol.co.nz for more details.

References:

Philpott, A.B. and Guan, Z., On the convergence of stochastic dual dynamic programming and related methods, *Operations Research Letters*, 36, 450-455, 2008.

Philpott, A.B. and Pritchard, G. EMI-DOASA, downloadable from www.epoc.org.nz, 2018.

Girardeau, P., Leclere, V. and Philpott, A.B., On the convergence of decomposition methods for multi-stage stochastic convex programs, *Mathematics of Operations Research*, 40(1):130-145, 2015.