Masterarbeit am Center for Energy Markets

11.06.2014

Title

An ex-post study of scenario tree based stochastic optimization for electricity production and trading in

hydropower and pumped storage systems.

Motivation

- Managers of big hydro power plants face considerable dispatch problems due to the uncertainty of prices on the electricity markets and on reservoir water inflows.
- The dispatch problem can be cast as a scenario tree based stochastic optimization problem.
- The added value of stochastic optimization over deterministic optimization in dispatch planning is not well documented in the literature and potentially dependent on the parameters of the problem.
- Decision Trees is a Munich based company that offers energy suppliers customized software and consulting services for the development and implementation of new valuation, modelling, and optimization approaches.

Tasks

- Perform an ex-post analysis in order to evaluate the performance of scenario tree based stochastic optimization against the deterministic method on real data.
- Develop and evaluate different stochastic processes (e.g. Brownian motion, Poisson processes) for water inflows into reservoirs and implement parameter estimation routines in MATLAB.
- Sensitivity analyses for parameters of price and inflow processes, analyses of different scenario tree configurations with regard to computing times.
- The analyses will be performed using the Decision Trees software DT.HYDRO, a MILP-model for hydro power optimization, and a pre-existing scenario tree generation code.

Organization

- Advisors: Prof. Dr. David Wozabal, Ömer Kuzugüden (Decision Trees)
- Language: English
- Start: as soon as possible

Literature

- John R. Birge, François Louveaux. *Introduction to Stochastic Programming.* Springer, 2011.
- Stein-Erik Fleten, Trine Krogh Kristoffersen. *Stochastic programming for optimizing bidding strategies of a Nordic hydropower producer.* European Journal of Operational Research, 181:2(1), p. 916-928.
- Karl Frauendorfer, Jens Güssow, Gido Haarbrücker, Daniel Kuhn & Georg Ostermaier. *Umsetzung stochastischer Optimierungsmethoden in der Energiewirtschaft.* In VDI-Berichte Nr. 1688: IT-Lösungen für die Energiewirtschaft in liberalisierten Märkten, pp.141-151.
- Peter Kall, Stein W. Wallace. *Stochastic Programming.* Wiley, 1994.

Interested students should send their resume and their transcript of records to Prof. Dr. David Wozabal.