ABSTRACT OF THESIS

Portfolio Optimisation for Energy Markets

Roland Vincze, Applied Mathematics MSc
Supervisor: Gergely Mádi-Nagy

The liberalisation of the power sector split the different roles between the market participants. The trader's role became to collect the energy demand of his consumers, and cover it by purchasing energy products from the power producers. On one hand he takes over the price risk and the uncertainty of the consumption from his customers, on the other hand he realises profit from the trading activity.

During our work, we assume that the total energy consumption of the trader's customers is known in advance, as a demand curve. We also have information about the prices of the standard forward energy products, however, we do not know the spot prices. We model this uncertainty by using a number of spot price scenarios during the optimisation.

Our work is based on the paper *Price and volume risk management for power producers (2004)* by Paravan et al. However, in our model the trader has no impact on the power production, his only options are buying or selling energy products. These products, as a whole are called the trader's portfolio, hence the problem is called the trader's portfolio optimisation problem.

For risk measuring, we use the Conditional Value-at-Risk (CVaR), presented by Rockafellar and Uryasev (*Optimization of conditional value-at-risk, 2000*). We model the market liquidity with a quadratic function, which leads to a quadratically constrained linear programming (QCLP) problem.

We constructed the optimisation problem using Pyomo, which is a Python-based modelling package. We then solved the problem using the solver Xpress. We also implemented an Excel interface, which makes our algorithm easy to use. Finally, we generated price scenarios and performed a brief analysis of our method, using test instances based on real data.

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