Distributionally robust trading strategies for renewable energy producers

Professor Pierre Pinson

Imperial College London

Monday 13 February 2023
2.00pm
MR4, IEB

Abstract:

Renewable energy generation is to be offered through electricity markets, quite some time in advance. This then leads to a problem of decision-making under uncertainty, which may be seen as a newsvendor problem. Contrarily to the conventional case for which underage and overage penalties are known, such penalties in the case of electricity markets are unknown, and difficult to estimate. In addition, one is actually only penalized for either overage or underage, not both. Consequently, we look at a slightly different form of a newsvendor problem, for a price-taker participant offering in electricity markets, which we refer to as Bernoulli newsvendor problem. After showing that its solution is consistent with that for the classical newsvendor problem, we then introduce distributionally robust versions, with ambiguity possibly about both the probabilistic forecasts for power generation and the chance of success of the Bernoulli variable. All these distributionally robust Bernoulli newsvendor problems admit closed-form solutions. We finally use simulation studies, as well as a real-world case-study application, to illustrate the workings and benefits from the approach.