

Stochastic storage systems valuation, with application to wind power generation

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Abstract

We study the valuation of storage systems where the availability and spot price of the underlying generated are both subject to stochasticity. In particular, application to the storage of electricity from a wind farm with an attached back-up battery is explored; this system comprises two diffusive-type (stochastic) variables, namely the energy production and the electricity spot price, and two time-like variables, specifically the battery state and time itself. The solution of the related partial differential equation (PDE) model is approached numerically using an efficient algorithm to treat mixed advection and diffusion problems in four dimensions; a semi-Lagrangian based alternating-direction implicit (SLADI) methodology is implemented. Extensive numerical experimentation confirms the method to be robust and yields highly accurate solutions.