Hedging the Risk of Renewable Energy Sources in Electricity Production

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Renewable Energy Sources (RES) have become a significant part of electricity production in Europe due to the 20-20-20 targets. The low operating costs of RES plants with respect to conventional plants represent a positive feature of RES, but, unfortunately, come with an increased intermittence of energy supplied to the grid. This trade-off between costs and volatility of energy production has required the introduction of more sophisticated risk management tools by energy producers.

In this paper, we propose an equilibrium model of the electricity market, which allows for capacity expansion of both conventional and wind plants, and investigate the effects of wind energy penetration. The agents are assumed to be either risk-neutral or risk-averse. Besides, they hedge the intermittence of wind by buying option contracts written on a suitable index.

The model is formulated as a complementarity problem and is implemented in GAMS, while the option contracts are priced through Monte Carlo methods. Intermittence of wind is accounted for through scenario generation.

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