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An Equilibrium Pricing Model for Wind Power Futures

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Abstract

Generation from wind power plants is intermittent and affects profits of wind power generators and conventional generators alike. Currently, generators have limited options for transferring the resulting wind-related volume risks. The European Energy Exchange (EEX) recently introduced exchange-traded wind power futures to address this market imperfection. We propose a stylized equilibrium pricing model featuring two representative agents and analyze equilibrium prices as well as the mechanics behind risk premia for wind power futures. We calibrate and simulate stochastic models for wind power generation, power prices, electricity demand, as well as other relevant sources of uncertainty and use the resulting scenarios to conduct a case study for the German market; analyzing prices, hedging effectiveness, and risk premia. Our main result suggests that wind generators are willing to pay an insurance premium to conventional generators to reduce their risks. We conduct a thorough sensitivity analysis to test the influence of model parameters and find that our results on risk premia hold for a broad range of reasonable inputs.

\textit{JEL Classification:} G130; L940; Q410; Q420; Q470

\textit{Keywords:} Weather derivatives, Power futures, Market integration of renewables, Variable renewables, Wind power, Intermittency

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