

Stochastic Modelling and Forecasting with Applications to Wind Derivatives: The Australian case

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Abstract

Wind electricity generation in Australia is accelerating, and South Australia has one of the highest penetration rates globally, so pricing and hedging risks associated with wind power generation are of critical importance. This paper proposes stochastic models for the dynamics and attributes of wind capacity utilisation, a typical underlying asset of wind derivatives. Using daily wind generation data from the five states of the Australian national electricity market (NEM), we identify the nature of wind capacity utilisation (generation/capacity) in terms of seasonality, mean reversion, and roughness. We employ rough and Lévy stochastic models to capture these dynamics and gauge their efficiency for calibration applications. Finally, we assess the forecasting performance of the proposed models, an application of practical relevance for wind derivative pricing and hedging. This research offers practical insights into the role of wind derivatives in the energy transition and the integration of wind energy into the electricity markets.
