"Gone with the Wind" – Assessing the Impact of Wind Generation on Electricity Prices in Great Britain

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Overview

Wind energy has experienced phenominal growth in recent years, changing the energy landscape around the world. In the UK, the installed capacity for on- and off-shore wind power generation has increased from 0.7 gigawatts (GW) in 2003 to 20 GW by the end of 2017.[1] In the first half of 2018, more than 15% of total electricity supply in the UK was generated from wind power. Because of its low marginal cost (zero fuel cost), wind power normally enters near the bottom of the supply curve, shifting the supply curve. It has been argued that the increased penetration of wind power would lead to lower electricity price (EWEA, 2010). However, most of the literature in this area is based on simulation studies (Green and Vasilakos, 2011; A. Gil and Lin, 2013; Brancucci Martinez-Anido et al, 2016). There is surprisingly little empirical evidence on how the wind power has affected the wholesale electricity price. In this paper we use monthly averages of volume-weighted wholesale price data in the UK from 2005 to 2018 to quantify the extent to which the wind power in the UK has influenced the wholesale electricity price.

Methods

Time-series model including structural vector autoregression (SVAR) and historical decomposition.

Results

From the preliminary estimation result, we find that the electrity price in the GB market is primarily affected by the price of natural gas, although wind is also found to have a negative effect on the price. In order to quantify the effect of wind power generation on wholesale prices, a historical decomposition based on a structural VAR will also be carried out. We will also assess the impact of wind generation on electricity price volatility (Woo et al, 2011).

References

A. Gil, Hugo & Lin, Jeremy. (2013). Wind Power and Electricity Prices at the PJM Market. Power Systems, *IEEE Transactions* on. 28. 3945-3953. 10.1109/TPWRS.2013.2260773.

Brancucci Martinez-Anido, Carlo & Brinkman, Greg & Hodge, Bri-Mathias. (2016). The impact of wind power on electricity prices. *Renewable Energy*. 94. 474-487. 10.1016/j.renene.2016.03.053.

European Wind Energy Association. (2010) "Wind Energy and Electricity Prices: Exploring the Merit Order Effect".

Green, R and N Vasalikos, (2011), "The long-term impact of wind power on electricity prices and generating capacity", 2011 IEEE Power and Energy Society General Meeting proceedings.

Woo, C.K.; I. Horowitz, J. Moore, A. Pacheco, (2011) "The impact of wind generation on the electricity spot-market price level and variance: The Texas experience," Energy Policy, Volume 39, Issue 7, Pages 3939-3944

[1] The Department of Energy and Climate Change, energy statistics.