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UNIVERSITY OF CAMBRIDGE
Electricity Policy Research Group

Properties of Electricity Prices and the Drivers of Interconnector Revenue

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Deregulated electricity markets are characterised by very considerable price volatility. This is mainly due to the fact that electricity is not an easily storable commodity and is likely to increase as the penetration of wind power in the overall generation mix increases. Such volatility, unless perfectly correlated in any two markets, creates arbitrage opportunities for owners of transmission capacity between those markets and becomes a significant component of the economic rationale for interconnection investment. However, the bulk of existing academic literature on the economics of electricity transmission is theoretical and largely ignores market price volatility to concentrate on consistent price differences between markets.

This paper attempts to fill this gap by taking an empirical approach and explicitly modelling volatility in electricity markets in a way that closely mimics its actual observed characteristics. It sets out a widely applicable procedure that generates an unbiased long-run estimate of revenues of a proposed interconnector on the basis of limited historic price data. By proposing a simple algorithm that mimics market coupling, it also models the effect of interconnectors on price levels and volatility in the connected markets and the feedback of that effect into interconnector revenues.

The proposed simulation methodology allows the stochastic and deterministic properties of prices, as well as most model parameters, to be varied freely. This flexibility is used to ask a number of questions of the model, such as what is the relative importance of the various drivers of interconnector revenues, is it possible for price volatility to be exported through an interconnector and does arbitrage over one interconnector have a significant effect on the arbitrage opportunities over another interconnector?

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It is found that, generally, stochastic properties of prices play a more important role in determining interconnector revenues than consistent deterministic differences and that it is possible for interconnectors to generate considerable revenues without any consistent price differences between the connected markets. This shows that interconnectors between seemingly very similar electricity markets can be an attractive proposition for a profit-seeking investor.

Since one of the algorithms put forward in this paper permits the simulation of three markets being connected in line, as expected, it is found that, generally, different interconnectors have a negative effect on each other's revenues, though given the capacities of the interconnectors relative to the sizes of the connected markets considered here, this effect is found to be small.

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