ON VOLATILITY TRANSMISSION IN EUROPEAN ELECTRICITY MARKETS

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Overview

This paper investigates the dynamics of price volatility transmission between major electricity markets in Europe. Electricity markets differ from conventional commodities market in the sense that electric-ity cannot be stored in a traditional way. This means that electricity has to be produced and consumedinstantly, requiring the balance between supply and demand being constantly balanced in real time. With limitations on transmission capacity (Figure 1), surplus supply or demand in one regional market may cause spikes in electricity prices. Recent innovations in the European market has increased transmission capacity, although with increasing demand, there is still vulnerability in the market. We study a set of electricity hubs in EU between 2000 and 2016 and assess how price volatility transmits from one market to another. Table 1 lists the countries included in the paper, the number of electricity hubs per country and the period considered. We utilize the cross-sectional volatility to estimate volatility per country (Garcia et al., 2011), and apply this series to the method in Diebold and Yilmaz (2014, 2016), which allows us to evaluate both the size and direction of volatility spillover. Our results indicate considerable time-varying and increasing volatility spillover between the European electricity markets.

Figure 1. Transmission capacity. Indicative transport constraints, computed by extrapolation from standard situations. Winter 2010/2011standard peak hours. Transport constraints in GWh.

Methods

In this study we use daily price series gathered from Thomson Reauters. We first estimate the cross-sectional volatility which aggregates the product's dispersion from the index mean and provides an instantaneous estimate with no need to evaluate other parameters. Further, we evaluate volatility spillover between market by utilizing the generalized version of the spillover index developed in Diebold and Yilmaz (2014), which allow us to identify directional and net volatility spillover, in addition to total volatility spillover. Consequently, we are able to identify the main receivers and transmitters of price uncertainty and shocks to the price.

Table 1. Summary of electricity regions considered in paper

Country	Observations	Period	Price series
Netherland	4235	2000-2016	4
Belgium	4235	2000-2016	8
Norway	4235	2000-2016	4
Spain	4235	2000-2016	2
Switzerland	2530	2006-2016	9
Italy	3246	2004-2016	11
France	3187	2004-2016	3
Germany	4235	2000-2016	4

Results

We find considerable volatility spillover between the European markets considered. Firstly, we show that volatility spillover between markets has increased during the period considered. Although, the spillover volatility is time-varying, the trend is strong as we experience more spillover in the final years of our data sample. Morover, we find that a few regional maretks are transmitters to a larger degree than others, and vice versa. In particular, the Duth and Belgium electricity hubs receive relatively more spillover compared to other European electricity markets. France, on the other hand, seems to be a net transmitter to other European markets.

Conclusions

In general, we find time-varying volatility throughout our sample period. From our results connectivity varies in Europe, although we find suggestions of peaks in spillover that may coincide with surplus in supply or demand. Our test for seasonality also indicates a vulnerability during winter. The impact on electricity markets is substantial and warrents further studies on volatility spillover in electricity markets. The increasing share of renewables may also alter the dynamics between markets, and perhaps cause increased integration as supply and demand will vary according to power source variability. Our results therefore has impact for regulators as well as for the industry trying to balance supply and demand for stable prices in electricity markets throughout Europe.

References

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