Volatility Spillovers in Energy Markets

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Executive summary

The volatility spillover effect refers to the impact that events in one market may have on the volatility of other markets, being the information flow connected to volatility whenever observed price changes are used to infer valuable information from price changes in the related market. This research issue is thereby closely related to price discovery and can also provide evidence for market integration. In this paper, we use the methodology proposed by Diebold and Yilmaz (2009 and 2012) to uncover the links between a total of 17 forward price series, covering electricity (from Germany, the Netherlands, France, Italy, Spain and the Nordic market), natural gas (NBP from the UK, ZEE from Belgium, TTF from the Netherlands, NCG and GASPOOL from Germany and Henry Hub from the US), crude oil (WTI from the US and Brent from Europe), coal (API2 index from Europe and CAPP from the US) and emission allowances (EUA from Europe), for the period from November 2008 to June 2016.

The main conclusions can be summarized as follows: Firstly, own-sector volatility spillovers account for the highest share of forecast error variance. Pairwise directional spillovers are higher within than across sectors and the highest observed pairwise spillovers are observed between crude oil series. Secondly, Brent is shown to be the crude oil benchmark for European electricity, natural gas, coal and emission allowances, whereas WTI is so for US natural gas and coal. Furthermore, when comparing sectors, the linkages between natural gas volatility and the other commodity volatilities are shown to be the greatest. Interestingly, TTF is on the way to becoming the benchmark price for natural gas in Europe, after having overtaken NBP in trading volume. In addition, the results achieved indicate that spillovers are time-varying and seem to increase with economic growth as well as during periods of turmoil. Within sectors, the German electricity market is, in overall terms, the main volatility spillovers transmitter. Over time, NCG and TTF arise as the two reference price series, affecting the rest of the natural gas series. It is clear that GASPOOL changes its role, after 2014, from net volatility spillovers transmitter to net volatility spillovers receiver, in favor of TTF and NCG. There is also a role change shown in the crude oil series during the later years of the sample. In particular, Brent becomes a net receiver of volatility spillovers from WTI after 2013. Regarding the coal series, CAPP and API2 have a mutual impact upon one another without the former prevailing over the latter. Another relevant conclusion is that natural gas seems to be overtaking crude oil as a global benchmark for energy commodities.

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Political implications are derived in terms of the level of integration between energy markets in the UE. Thus, the most integrated markets appear to be Germany, France and the Netherlands, followed distantly by Italy, Spain and the Nordic market. Greater efforts, in terms of harmonizing rules, increasing interconnections and designing new coupling initiatives, should be made to further integrate the Nordic market, Italy and Spain.

These results are also of relevance to practitioners, as a correct valuation of the risks being assumed crucially depends on a proper knowledge of the shock-transmission mechanisms across markets and the way the information flows from one market to the others. If volatility is transmitted across markets in a quite systematic way when arriving new information, this should be taken into account when devising trading strategies and particularly for risk hedging purposes.

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