Cyclical gas demand and volatility transmission in European oil and gas markets

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(1) Overview

This paper investigates how price volatility is transmitted in the European oil and gas markets depending on seasonal changes of demand for natural gas. To identify the effects of capacity utilization on volatility spillover we follow industry practise and divide the year into a winter and summer half. Since natural gas is used for both heating and electricity generation capacity utilization in the pipeline system is much higher during the winter. We separate our data along these lines as the capacity restriction may influence to what extent volatility is transmitted between the markets. We investigate whether there is a significant difference in volatility spill-over between natural gas and Brent oil conditional on the natural gas capacity utilization. This is relevant to the question of market deregulation effect since independent natural gas pricing suggests less volatility spill-over between oil and natural gas markets. If the oil price is less informative on natural gas prices then less of the volatility in natural gas will be accounted for by oil price variation.

(2) Methods

In order to compare the natural gas spot market in the UK with the Brent oil price - in terms of price volatility - we estimate a bivariate GARCH model with a BEKK parameterization (Engle and Kroner 1995) to capture the dynamics of the volatility process. This approach allows us to show how volatility in either price series is transmitted to the other price series.

(3) Results

The figure shows NBP winter and summer returns. We can see that there is larger variability in the NBP returns during the gas winter compared to the gas summer. Our econometric analysis indicates that volatility is transmitted from the oil market to the gas market only in the low demand natural gas season (April through September). Capacity constraints and therefore limits to arbitrage in the natural gas market during the high demand season (October through March) may provide an explanation.

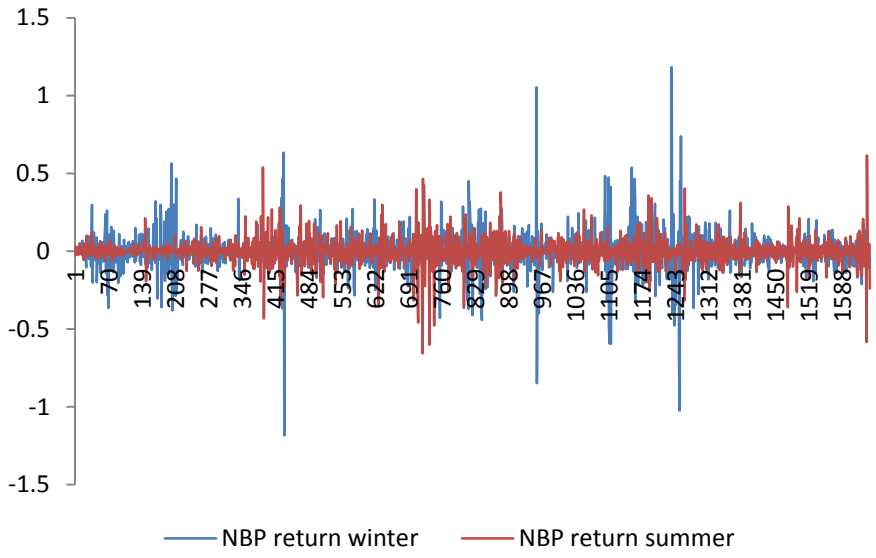

Figure: NBP winter returns compared to summer returns

(4) Conclusions

During the winter season no evidence is found for any volatility spill-over between the UK natural gas market and Brent oil. Capacity constraints and therefore limits to arbitrage in the natural gas market during the high demand season may explain this difference. These findings have implications for valuation of options on natural gas: today's volatility in the oil price has explanatory power for the volatility of natural gas the following day if the natural gas market is in a state of low demand. Moreover, it indicates that substitutability between oil and natural gas is more limited during the winter months than in the rest of the year, and as such, is evidence that one are closer to independent natural gas pricing during winter.

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