Frank Asche[1], Atle Oglend[2], Petter Osmundsen[3], Marius Sikveland[4]

VOLATILITY AND RISK SHARING IN EUROPEAN GAS MARKETS

[1]University of Stavanger, Norway, (47)51832286, Frank.Asche@uis.no
[2]University of Stavanger, Norway, (47)51832747, Atle.Oglend@uis.no
[3]University of Stavanger, Norway, (47)51831568, Petter.Osmundsen@uis.no
[4]University of Stavanger, Norway, (47)51831448, Marius.Sikveland@uis.no

OVERVIEW

We investigate volatility of natural gas spot prices in UK, the Netherlands, and Belgium compared to long-term supply contract prices. During the last decade, we have observed several changes in the ways natural gas is traded in Europe. Although long term contracts still dominate, we have in recent years observed the emergence and growth of several types of spot markets. Recently, spot trading has also increased in continental Europe. Zeebrugge (ZEE) in Belgium is the arrival point for the Interconnector. The Title Transfer Facility (TTF) hub in the Netherlands is one of the most recently developed gas hubs in Europe. This hub, operational since 2003, is rapidly maturing into an important trading point for gas market participants in Northwest Europe. Due to these major market developments, price relationships between energy products might have changed, and the individual volatility processes might also have been altered. In this paper we use daily prices from September 1996 to March 2006 for spot NBP-gas and Brent to investigate the relationship between the NBP-gas and Brent volatility processes.

There have been several studies on the link between different gas prices, and between gas and oil prices. One study of the UK gas market in the period after deregulation (1995) and before the opening of the Interconnector (1998) finds indications of a highly integrated market where wholesale demand seemed to be for energy rather than a specific energy source [1]. Another study of the same markets over the period 1996–2003 finds that a cointegrating relationship was present throughout the sample period [2]. A third study also showed a high degree of market integration within Europe, using monthly prices of pipeline gas in Europe and LNG import prices to Europe in the period 1993–2004 [3]. A study of volatility in gas and oil prices finds that a statistically significant and positive time trend is found for natural gas, but it is too small to have any economic importance [4].

METHOD

We use daily prices from September 1996 to March 2006 for spot NBP-gas and Brent.

In the initial empirical analysis we calculate the correlation coefficient between pairs of prices, and the standard deviation of individual price series. This is done to get an initial overview of price connections. We then use the Lee-Strazicich Unit Root Test to look for structural breaks. We find evidence for a trend break in the NBP-gas price in 2003, consistent with the structural development in the continental gas spot market. Following this we divide the data sample into two sub-samples, before and after the suggested trend break. We then estimate a multivariate GARCH model with a BEKK parameterization [5] to capture the dynamics of the volatility process before and after this point of time. We do this for the two longest price series available at a daily frequency; the NBP gas spot price in the UK and the Brent blend crude oil price. This approach allows us to capture how shocks to either price series transmit to the other price series.

RESULTS AND CONCLUSIONS

From the initial correlation analysis we observe that the more liquid the spot gas market, the more independently it is priced from Brent blend. Seasonal variations at NBP result in spot gas becoming more expensive than contract gas in the winter. Although NBP has been cheaper than the Continental gas contract on average, NBP also has a higher probability of high gas prices over long time intervals because of extreme seasonal variations and volatility.

The Multivariate GARCH analysis indicates that in the second subsample (1996-2003) shocks to the oil price create volatility in the gas price. Before 2003, this was not the case. Shocks in either market did not create volatility transmissions in the other market. The increased liquidity and maturity of the spot market might have contributed to this result. When the spot markets are no longer used mainly for balancing purposes of the long term contracts, a richer set of short- and long term expectations might be incorporated in the current gas price and hence influence might also come from other sources of risk.

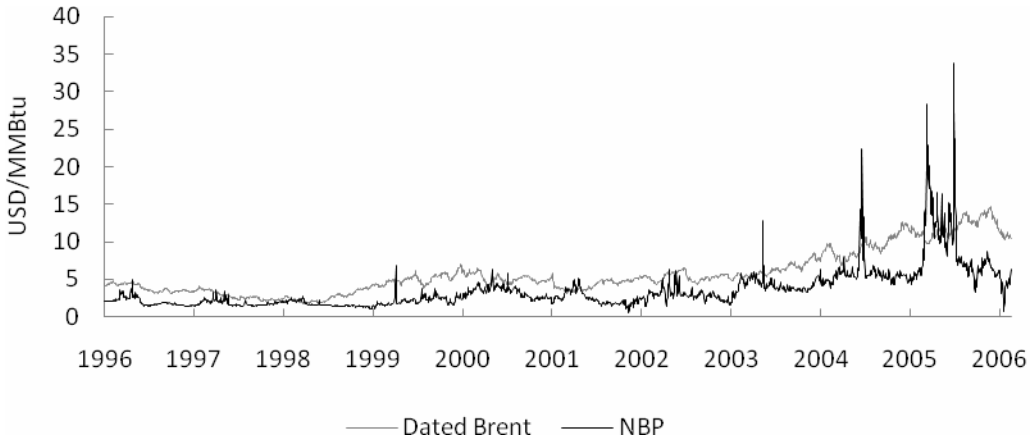

Fig. 1. Natural gas and oil prices.

REFERENCES

1. Asche F., Osmundsen. P. and M. Sandsmark (2006). The UK Market for Natural Gas, Oil and Electricity: Are the Prices Decoupled? *The Energy Journal* vol. 27, No. 2.
2. Panagiotidis, T., E. Rutledge (2007). Oil and gas markets in the UK: Evidence from a cointegrating approach. *Energy Economics* 29: 329–347
3. Silverstovs, B., G. L'Hegaret, A. Neumann, and C. Hirschhausen. (2005). International Market Integration for Natural Gas? A Cointegration Analysis of Prices in Europe, North America, and Japan. *Energy Economics* 27: 603–615.
4. Pindyck, R., (2004). Volatility in natural gas and oil markets. *Journal of Energy and Development* 30 (1), 1–19.
5. Engle, R. F. and Kroner, K. F. (1995). Multivariate simultaneous GARCH. *Econometric Theory*, 11:122-150.