Frédéric Lantz and Lesya Nadzon

OIL PRICE VOLATILITY AND HEDGING STRATEGIES : APPLICATION TO THE EUROPEAN GAS OIL MARKET

Frédéric Lanz, Lesya Nadzon: IFP-School/228-232, avenue Napoléon Bonaparte F-92852 Rueil-Malmaison cedex,, Tel: 33 1 47 52 68 68 - Fax: 33 147 52 70 66, e-mail: frederic.lantz@ifp.fr

Overview

In this paper, we analyse the different hedging strategies (optimal hedge ratio, choice of derivatives) on the European gas oil market. The choice of derivatives as well as the optimal hedging ratio is based on the market volatility. We study the market volatility through an econometric modelling approach. We analyse the term structure of gas oil futures using a multivariate Markov-switching heteroskedastic framework where the variance of the disturbance term depends on the regime. Furthermore, we analyse the co-integration between the Rotterdam gas oil price and the French prices. We point out the influence of the rate of change of the Euro on the transmission of the volatility between the markets. Finally, we study the implications of the choice of hedging strategy (according to the market structure) for the companies.

Methods

First, we estimate the relationship between the spot and the future prices in a co-integration approach. We study the volatility of the residual with a autoregressive conditional heteroskedastic model.Then, the statistical analysis is carried out in the context of VAR's allowing for regime change in terms of a Markov process. We adopt a multivariate Markov switching model MS-VECM that allows for regime switching mean equation parameters and variance-covariance matrix. We first estimate the long-run relationship (if any).

Furthermore, we estimate the dynamic system that allows for two regimes, high and low volatility.

Finally, we estimate an other model (also based on a co-integration approach) to estimate the relationships between the gas oil spot price on the Rotterdam market, the domestic prices and the rate of change. From this model, we study the transmission of the volatility between the international and the domestic markets.
From this approach, we estimate an optimal hedging ratio and we study the derivatives on this market.

Results

We use monthly data from June 1992 to august 2006, concerning the gas oil spot price on the Rotterdam market, the future gas oil prices, the domestic French prices, and the rate of change between the Euro and the US dollar (starting in 2002).
On the international European market, we estimate an equilibrium relationship between the spot and the futures prices which exhibits an ARCH effect. From the MS-VECM (Markov Switching - Vector Error Correction Model) estimated coefficients, we give an interpretation of the regimes which are associated to different price's volatility. The high volatility periods are associated to the tensions on the oil markets.
The econometric equilibrium between the international gas oil price and the French retail price (before tax) point out the impact of the Euro rate of change.
Finally, we use some data from French firms which consume such middle distillates and we study their hedging strategies.

Conclusions

Three main issues raise from this study :

- The econometric estimation of the relationships between the spot and the future gas oil prices leads to distinguish some changes in the market volatility. These changes could be associated to the period of . From these results, we estimate an optimal hedging ratio which change according to the change of volatility.
- The volatility of the retail gas oil price is strongly reduced by the influence of the rate of change of the Euro.
- The choice of derivatives (options, swaps) could be associated to the market structure and the firm behaviour.

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