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The overnight risk premium in electricity forward contracts

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ABSTRACT

We analyze the risk premium on electricity forward contracts traded for the Nordic and German/Austrian electricity markets. We argue that finding risk premiums by analyzing overnight returns is more relevant than the frequently used ex post approach. The derivatives in these markets can be characterized as trading products and hedging products. Each contract shows a clear increase in trading volume and liquidity when approaching maturity. We link this to a testable hypothesis where financial traders are compensated for holding price risk, and where the sign and magnitude of the risk premium changes depending on the hedging pattern of producers and retailers. Incorporating this in regressions we find that there are higher risk premiums in the period before the forwards become front products, compared to the risk premiums in the front period. Quarterly and monthly contracts show the most significant results.

1. Introduction

We analyze the risk premium in electricity forward markets, specifically the Nordic and German/Austrian market. The risk premium formation in these markets has attracted much attention in the academic community, and much of the focus has been on the ex post risk premium. The ex post risk premium is the difference between the settlement price of the forward contract and the realized average spot price over the corresponding settlement period. The ex post risk premium is investigated in Geman and Vasicek (2001), Shawky et al. (2003), Longstaff and Wang (2004), Redl et al. (2009), Bunn and Chen (2013), Veka (2013), Cartea and Villaplana, (2014) and Haugom et al. (2014) amongst others. Botterud et al. (2010) regress the log return of the ex post payoff with respect to explanatory variables following Fama and French (1987). We investigate the risk premium by analyzing the forward contracts directly. Let the price of a forward contract be denoted by F, and the volatility of the forward contract σ. Then a simple model for the dynamics of the forward contract is

$$\frac{dF}{F} = \mu dt + \sigma dW. \tag{1}$$

A forward contract does not require an investment.[1] However, the forward contract has the risk associated with electricity prices, hence μ in Eq. (1) should will reflect the risk premium.

We distinguish between three types of players; producers, retailers and traders. Due to highly volatile electricity prices and the unique non-storable nature of electricity, producers of power will typically want to hedge their physical production a few years ahead (Sanda et al., 2013). If there are no natural buyers in the marketplace, such as retail companies, a financial trader may be the

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[1] Forward contracts do require a margin paid to the clearing house or as collateral for credit risk in bilateral agreements. The margin account typically pays the risk free interest rate. If the borrowing cost of the investor is the risk free rate, the forward contract will effectively not require an investment. While this is typically not the case, we assume that entering the forward contract is costless for the investor. This is a standard assumption made in financial theory.

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counterpart of the producer. To take on the price risk, the trader may command a risk premium from the producer. That is, to be long in the market, the trader will require a positive risk premium and $\mu > 0$ in Eq. (1). Retailers may want to hedge their physical delivery commitments. However, they do not enter the market before they know their sales obligations to end users. When these enter the market, their counterparts are the financial traders that offloaded the price risk from the producers. Financial traders have no incentive to hold contracts over settlement periods since they have no purchase or sales commitments in the spot market. When retailers meet the traders in the marketplace, the risk premium is likely to vanish, and $\mu = 0$ in Eq. (1). Another scenario is that retailers will want to offload more of their price risk than the producers. This means that financial traders will be net short after selling to retailers. To hold this price risk the trader will again command a risk premium. In this case, the trader must be compensated for holding a short position, and $\mu < 0$ in Eq. (1).

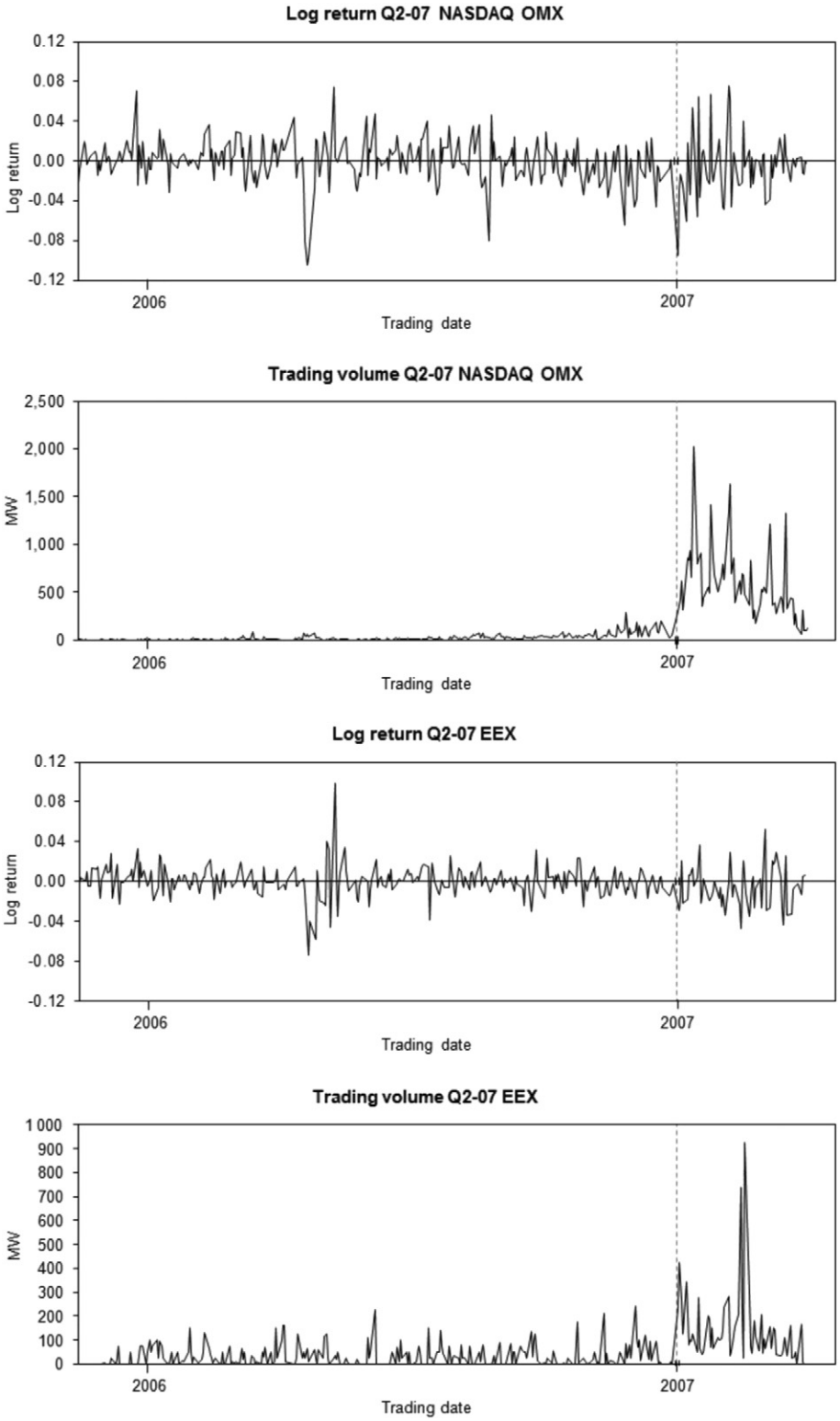

Fig. 1. Log return and trading volume for the Q2-07 contracts on NASDAQ OMX and EEX. The dotted line shows when the contract becomes the front product at the exchange.