German continuous intraday power market: Orders books' behavior over the trading session

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Overview

Following the liberalization of the power sector in Europe, organized market places have emerged. On the short term, the spot market can be divided between the day-ahead market (auction) and the intraday market (continuous). The intraday continuous power market (IDM) is a European specificity and the German market is unique due to its large liquidity as a result of the strong increase of the intermittent renewable energy sources (iRES) in the country. On top of the traditional uncertainty (demand/ temperature, unplanned outages), the evolution of the electricity mix brings a significant amount of uncertainty to the market relative to the intermittency and associated forecast errors. The IDM has also been growing significantly since its creation in 2009 accounting for more than 36.3 TWh in 2015 and is of a major importance for the balancing of the power system. We want to understand to what extend the bid-ask spread on the German continuous intraday power market is driven by liquidity and volatility.

The paper characterizes the quality of the intraday continuous power market. The quality is assessed in terms of liquidity and trading opportunities over the trading session using the bid-ask spread and the market depths. Based on German intraday orders books for the hourly products, we use a tool that reconstitutes at every moment of time the best order stream (best bid price, best ask price) and the market depths. Then, we analyze the output using statistics and panel data econometrics. To our knowledge, this is the first paper that uses a complete orders book information in the finest details of the intraday continuous electricity market to quantify the liquidity of the market and its evolution through the bid-ask spread and market depths of the orders book.

The paper is organized as follow: after the introduction, the second section is dedicated to the relevant literature, the third one is an overview of the current spot market in Germany, the fourth section presents the data and the methodology used. Then, the fifth section displays the empirical results. The last section is the conclusion.

Methods

We run a tool that reconstitutes at every moment of time the best order stream (best bid price, best ask price) and the market depths (sell depths, buy depth) from a complete orders books (first grade data). We then perform statistical analysis and panel data econometrics (fixed effects model) on the output.

Results

First, the daily average bid-ask spread can be explained by 4 components: risk (standard deviation of the trades' prices), re-balancing of portfolio (wind and solar error forecast), activity (market depths, dummy on week-ends), competition (number of active member on the market). The two first components are volatility drivers while the two last one are liquidity drivers.

Second, we observe a U-shaped pattern of the bid-ask spread along the trading session. A strong dispersion of the bid-ask spread on the German intraday hourly markets at the beginning of the trading session is observed which will then diminish as the end of the session approaches. The dispersion highlights the volatility due to the uncertainty away from the delivery time.

Third, we find that the correlation between the bid-ask spread with the buy and sell depths are strong and negative which is consistent with the findings on the financial markets.

Conclusions

We tested the hypothesis that the bid-ask spread on the German continuous intraday power market is driven by 2 components: the liquidity and the volatility. First, we highlight the 4 determinants of the bid-ask spread of the market (risk, activity, competition and re-balancing of portfolio). Second, we confirm the "U-shaped" of the bid-ask spread along the trading session and well as the strong relationship between the bid-ask spread and the market depths in the market.

The analysis can easily be extended to other markets and product segments (ie. 15 minutes or 30 minutes).

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