An analysis of the bid-ask spread in the German power continuous intraday market

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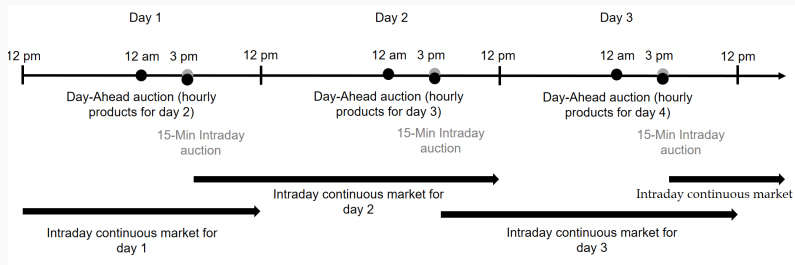
Universite Paris-Dauphine - EPEX SPOT

Table of contents

Context

The orders book

Ask		Bid	
Quantity	Price	Price	Quantity
20	35	32	4
5	36	31	15
12	39	29	7
3	42	28	9
		25	30

The bid-ask spread

Ask		Bid	
Quantity	Price	Price	Quantity
20	35	32	4
5	36	31	15
12	39	29	7
3	42	28	9
		25	30

The bid-ask spread is the difference in price between the lowest price for
which a seller is willing to sell a MWh of power and the highest price that
a buyer is willing to pay for it.

Ask		Bid	
Quantity	Price	Price	Quantity
20	35	32	4
5	36	31	15
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3	42	28	9
		25	30

Market depths are the total volume available in the orders book on the ask (sell depth) and the bid (buy depth) side.

- How are the bid-ask spread and the market depths behaving over the trading session?
- What are the determinants of the bid-ask spread on the market?

Dynamic analysis

How are the bid-ask spread and the market depths behaving over the trading session?

- Dynamic analysis
- Period: 1st of June to 15th of November 2015
- Data: German intraday continuous orders books (EPEX SPOT)
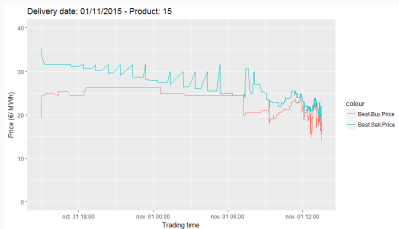- Granularity: microseconds

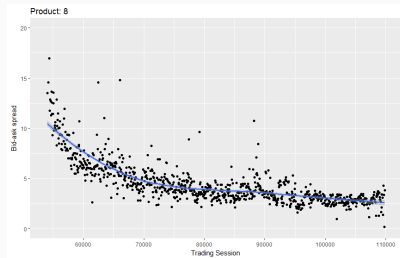**Figure 1:** Evolution of the best buy and best sell prices over a trading session

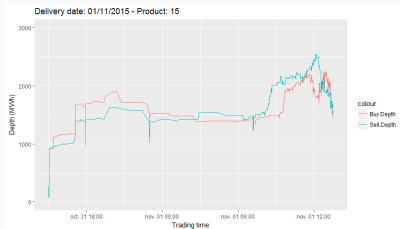**Figure 2:** Bid-ask spread over an average trading session

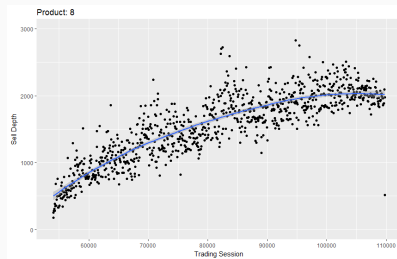**Figure 3:** Evolution of the best buy and sell depths over a trading session

Figure 4: Sell depth over an average trading session

Econometric analysis

What are the determinants of the bid-ask spread on the market?

- Panel data econometrics / FGLS estimator
- Period: 1st of June to 15th of November 2015
- Data: German intraday continuous orders books + trades books + aggregate curves of the German Day-Ahead Market (EPEX SPOT) + load (EEX) + fundamentals forecasts and generation (EEX, EuroWind)
- Granularity: trading session

Empirical strategy

$$BAS = \beta_1 \mathbb{1}_{wkd} + \beta_2 L + \beta_3 WAP + \beta_4 AM + \beta_5 V$$
$$+\beta_6 \Delta_{W+} + \beta_7 \Delta_{S+} + \beta_8 \Delta_{W-} + \beta_9 \Delta_{S-} + \beta_{10} ES + \beta_{11} EP$$

$\mathbb{1}_{wkd}$: dummy variable for week-end
L: load (MWh)
WAP: weighted average price ($€/$ MWh)
AM: number of active members
V: volume of the market (GWh)
Δ_{W+}: Positive solar forecast error (GWh)
Δ_{S+}: Positive solar forecast error (GWh)
Δ_{W-}: Negative wind forecast error (GWh)
Δ_{S-}: Negative solar forecast error (GWh)
ES: Elasticity of the supply curve of the DAM
EP: Elasticity of the purchase curve of the DAM

Empirical strategy

$$BAS = \beta_1 \mathbb{1}_{wkd} + \beta_2 L + \beta_3 WAP + \beta_4 AM + \beta_5 V$$
$$+ \beta_6 \Delta_{W+} + \beta_7 \Delta_{S+} + \beta_8 \Delta_{W-} + \beta_9 \Delta_{S-} + \beta_{10} ES + \beta_{11} EP$$

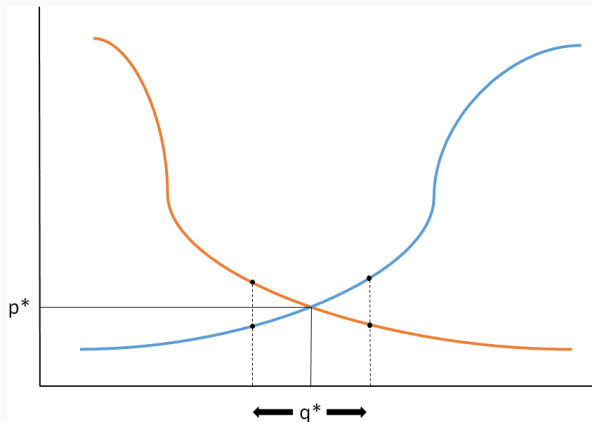$$\Delta_W = W - \hat{W}$$
$$\Delta_{W+} = max\{\Delta_W, 0\}$$
$$\Delta_{W-} = min\{\Delta_W, 0\}$$

W: wind generation (GWh)
$\hat{W}$: wind forecast (GWh)

12

$$BAS = \beta_1 \mathbb{1}_{wkd} + \beta_2 L + \beta_3 WAP + \beta_4 AM + \beta_5 V$$
$$+\beta_6 \Delta_{W+} + \beta_7 \Delta_{S+} + \beta_8 \Delta_{W-} + \beta_9 \Delta_{S-} + \beta_{10} ES + \beta_{11} EP$$

Results

	Estimate	Std. Deviation
Dummy week-end	0.074***	0.004
Load (GWh)	-0.007***	0.0002
WAP (€/ MWh)	0.005***	0.0001
IDM volume (GWh)	0.087***	0.001
Number of active members	-0.008***	0.0001
Positive solar FE (GWh)	0.0247***	0.001
Positive wind FE (GWh)	0.004***	0.001
Negative solar FE (GWh)	-0.005***	0.001
Negative wind FE (GWh)	0.022***	0.001
Elasticity sell side	6.546***	0.110
Elasticity buy side	1.765***	0.048
Observations	3,713	
R^2	0.233	

Conclusion

Key take aways

- The bid-ask spread has a "U-shape" over the trading session
- The spread is negatively correlation with the liquidity and positively with the volatility
- The liquidity is the main driver of the German intraday power market's spread

Thank you!

Please, feel free to share your comments or suggestions.

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