Redesigning the balancing power market in Germany – a critical assessment

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Enerday 2008
Agenda

- Introduction
- Market Redesign
- Hypotheses
- Descriptive Statistics
- Structural Break Analysis
  - Event dummy
  - Breakpoint Test
- Market Integration
- Conclusion
Introduction

- TSOs main task is the maintenance of balance between supply and demand.

- Balancing management requires an efficient and appropriately designed balancing power market.

Market redesign in Germany

- In August 2006 a common tendering procedure was established.

- Since 1st December 2006 the TSOs operate a joint tendering procedure for tertiary reserves, based on a common platform.

Research issues:

- Analysis of redesign (structural change) on prices and volatility.

- Analysis of market efficiency before and after the structural change.
Market Redesign

- Major aims:
  - Facilitate market entry
  - Decrease price level

- Changes and key elements:
  - Reduction of minimum quantity
  - Increase of market transparency and supply:
    joint internet platform, common auction for minutes reserve
  - “Pay-as-bid” auction
  - Selection of suppliers by merit order of demand rate (kw)
  - Auction timing: bids submitted before opening of spot market
Hypotheses

• Reduction of minimum quantity and market transparency increase via common auction should facilitate competition.

Hypothesis I:

- Average prices decrease
- Price volatility increases

• Competition increases market efficiency. Efficient markets do not offer sustainable arbitrage potentials.

Hypothesis II:

- Balancing reserve prices and spot market prices become increasingly interdependent.
Descriptive Statistics

- Data: Daily spot prices for positive and negative minutes reserves for the timeperiod 01/01/06 to 08/13/07.
Descriptive Statistics

- Observable differences in prices and price volatility for pre- and post-market redesign periods.
Structural Break Analysis (I)

• Test for structural changes due to a certain event.

• Two different methods:
  - Eventdummy as additional explanatory variable in time series’ regression equation.
  - Chow Breakpoint test (Chow 1960).
### Results - Event dummy with exponential decay

#### Dependent Variable: Positive minutes reserve (log)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREAK_DUMMY</td>
<td>1.160674</td>
<td>0.182373</td>
<td>6.364279</td>
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<tr>
<td>R-squared</td>
<td>0.956423</td>
<td>Mean dependent var</td>
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</tr>
</tbody>
</table>

#### Dependent Variable: Negative minutes reserve (log)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
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<td>BREAK_DUMMY</td>
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<td>R-squared</td>
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Results – Breakpoint test

Positive minute reserves

<table>
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<th></th>
<th>Value</th>
<th>Probability</th>
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<tr>
<td>F-statistic</td>
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<tr>
<td>Log likelihood ratio</td>
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<td>0.754753</td>
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Negative minute reserves

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Probability</th>
<th>Probability</th>
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</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>0.307770</td>
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<td>0.735258</td>
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<tr>
<td>Log likelihood ratio</td>
<td>0.621188</td>
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<td>0.733011</td>
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</table>

Chow Breakpoint test rejects the existence of a structural break for positive as well as negative minutes reserves prices.
Market Integration (I)

- An efficient market is characterized by its degree of integration to adjacent markets.
- For balancing power in Germany, the electricity spot market (EEX) represents such a market.

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Dependent Variable: Positive minutes reserve (log), entire time series
Method: Least Squares
R-squared: 0.958702
Mean dependent var: 4.818876
Market Integration (II)

Positive minutes reserve (log)

- LOG_PHELIX PEAK
- LOG_PHELIX

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Market Integration (III)

• EEX prices have an impact on positive and negative minutes reserve prices

• Arising question: Does the interdependence between spot market and tertiary control market change due to the establishment of a new tendering procedure?

• The explanatory power of the model increases from 95 % before to 98 % after the structural change → the introduction of the new auction design increased the dependence between positive minutes reserve and spot market.
## Market Integration (IV)

### Before market redesign

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</table>

R-squared: 0.947488

### After market redesign

<table>
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R-squared: 0.977184
Conclusions

• On December 1 2006, the market design of the German reserve power markets has changed.

• The new auction design implies a reduction of the minimum quantity bids and common auction platform.

• Analysis focused on the impact of the new auction design on prices and price volatility of the German market for tertiary reserves.

• Structural Break analysis shows that there is no persistent increase in prices or price volatility.

• The dependence between prices for positive minutes reserve and spot prices increased after the establishment of the new market design.
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