Interaction of Spot and Future Prices of Electricity

Tobias Federico
Introduction

The most common expression regarding power price forecast in the market is “the best forecast of future electricity prices is the today’s future derivative price”.

This sentence is referring to the potential development of the yearly average spot price in the future in comparison to the today’s traded derivative prices of a yearly delivery of electricity for the same period.

But how good has the forecast been and what type of models can be used in the electricity market to describe these interactions?
Forward Prices: What do they mean?

- The market price for Cal 09 Base on the 11.02.2008, is the average spot price (Phelix Base) on this day on the market for the year 2009.
- The same applies for Cal 09 Peak…
What is HPFC?

The Hourly Price Forward Curve is the present expectation for how the electricity prices will develop over a period of time in the future.
Future Prices as Forecast

Granularity

Day Ahead Spot

Future contracts

Month
Quarter
Year

Time

Future Prices as Forecast

Granularity

Day Ahead Spot

Future contracts

Month
Quarter
Year

Time

PFC Pricing

Synthetical prices

n.a.
hPFC Procedure Summary

Forward prices
Month/quarter/year

Quarter Prices

Month Prices

Day Prices

Hour Prices

e.g. EEX historical prices

Calendar

HPFC (Bid-Ask)

Profile

Bid-Ask-Spread
Retail Price Calculation

Combination of demand curve and current future prices.
Usually used for Back-to-Back procurement, deviations still possible.
Modelling power plant dispatch

**Merit Order**
- availability renewables
- power plant DB
- efficiencies according to year of construction
- STMGC according to commodity prices

**Power Demand**
- regression analysis of daily average demand
- parameters: calendar and temperature data
- hourly load profile according to monthly day type

**Power Plant Dispatch**
- hourly power plant dispatch with according market clearing price
Expected Spot Market Prices as Evaluation for Power Plants

Fundamental Merit Order Model
for Spot Prices until 2040

Power Plant Hedging is done on the Future Market

Source: RWe Investor and Analyst H1 2010 Conference Call 12.08.2010

Source: Energy Brainpool
F1BY 2009 in 2008 Trading

Spot Price 2009
38.85 [EUR/MWh]

F1BY Jan 2009

Price [EUR/MWh]

Source: EEX F!BY JAN 09 data

No. of Observation

Source: EEX F!BY JAN 09 data
Hourly power price vs. wind power forecast

Aug 2007 - Aug 2008, working days only
EEG-residuals (e. g.: wind power)

Lack of wind power generation in regard to EEG’s wind forecast

Surplus of wind power generation in regard to EEG’s wind forecast

Surplus
Shortfall
Wind power generation
EEG’s wind power generation forecast
### Three legislative steps to bring power from renewables into the commercial market

<table>
<thead>
<tr>
<th>Allocation of EEG electricity</th>
<th>Allocation of EEG electricity physically to …</th>
<th>Trading residuals</th>
<th>Refinancing the EEG feed-in-tariff</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>municipalities as monthly constant base load EEG-band</td>
<td>OTC/EPEX (not regulated, approx. 1/3 of residuals on EEX spot auction)</td>
<td>Ø EEG tariff and power grid charge per kWh of consumption</td>
</tr>
<tr>
<td>until July 31st, 2009</td>
<td></td>
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<tr>
<td>2</td>
<td>municipalities as monthly constant base load EEG-band</td>
<td>EPEX spot market only (price independent offers based on forecast of EEG power generation \±3,000.00 EUR/MWh Spot Auction \±9,999.99 EUR/MWh Intraday)</td>
<td>Ø EEG tariff and power grid charge per kWh of consumption</td>
</tr>
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<td>since August 1st, 2009</td>
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<tr>
<td>3</td>
<td>EPEX spot market only (price independent offers based on forecast of EEG power generation -3,000.00 EUR/MWh Spot Auction -9,999.99 EUR/MWh Intraday)</td>
<td>EEG residuals</td>
<td>EEG share 2.047 ctEUR/kWh of consumption (2010) and power grid charge (for EEG-balancing energy only)</td>
</tr>
<tr>
<td>from January 1st, 2010</td>
<td>total EEG generation</td>
<td></td>
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</tbody>
</table>

- Bringing EEG-electricity into the market offers economical stimuli to prepare the market for competitive electricity from renewables.
October 4th, 2009: Extreme negative spot market prices

Minimum: -500.02 EUR/MWh from 2:00 to 3:00 am

Minimum: -1,499.00 EUR/MWh from 0:00 to 1:00 am

Source: eex.com
Unlimited Bid of Renewable Energy on the EPEX Spot

18.03.2010, Stunde 1: 34.93 EUR/MWh

Source: eex.com
F1BY 2010 in 2009 Trading

Spot price ytd
42,19 [EUR/MWh]

F1BY Jan 2010

Source: EEX F1BY JAN 10 data

No. of Observations

Price [EUR/MWh]

Tobias Federico

Interaction spot and future prices
Forecasting Quality of F1BM two Month Ahead

 Ø Terminmarktpreis für Monat t (in t - 2 Monate) [EUR/MWh]
 Ø Spotmarktpreis in Monat t (PHELIX) [EUR/MWh]
 Abweichung (Spot-Termin) [EUR/MWh]
 Abweichung (Spot/Termin) [%]
Is Everything Fundamental?

F1BY Jan 11 Price Development in 2010
Modelling Needs

- Future price do show a strongly deviation from the spot prices
- Future prices are the expectation value of spot prices in the delivery period
- Beside of risk premium of weather risks, supply risks, convenience yield or security yields (for hedging purposes) legal changes in the spot market regime do affect the „forecasting“ potential of future prices
- The market needs a much better understanding in the interaction of future and spot prices
- Scientific models should be applied soon in the standard procedure in evaluating supply contracts and power plant dispatching
Ihr Ansprechpartner: Herr Lenck
Telefon: +49 (0)30 76 76 54

www.energybrainpool.com