

Real Time Price Forward Curve & Valuation

Munich, September 2016

Arbitrage free „live“ Prices and „live“ Price-Forward-Curve

live

Broker-Screen

	Bid	Ask
Apr 13	26,2	26,25
May-13	26,03	26,18
Jun 13		
Jul 13	25,68	
Aug 13		
Sep 13		
Oct-13		
Nov 13		
Dec-13		
Jan 14		
Q213	26,1	26,25
Q313	25,95	26,03
Q413	27,1	27,4
Q114	27,68	27,83
Q214		
Q314		
Q414		
Q115		
Q215		
Sum 13	26,05	26,1
Win 13	27,43	27,5
Sum 14	25,78	25,85
Win 14		
Sum 15		
Win 15	26,8	27,2
Sum 16		
Win 16		
Sum 17		
2014	26,58	26,68
2015	26,23	26,33
2016		
2017		
Gas Yr 13		
Gas Yr 14		
Gas Yr 15		
Gas Yr 16		

live

Arbitrage free interpolated prices for customers

	Bid	Mid	Ask
Apr 13	26,2	26,25	26,25
May-13	26,03	26,14	26,18
Jun 13	25,97	26,01	26,07
Jul 13	25,68	25,89	25,96
Aug 13	25,75	25,93	25,99
Sep 13	26,13	26,19	26,25
Oct-13	26,53	26,68	26,74
Nov 13	27,13	27,27	27,33
Dec-13	27,64	27,79	27,84
Jan 14	27,97	28,01	28,07
Q213	26,1	26,13	26,25
Q313	25,95	26	26,03
Q413	27,1	27,25	27,4
Q114	27,68	27,69	27,83
Q214	25,91	25,96	26,01
Q314	25,64	25,7	25,73
Q414	27,09	27,14	27,18
Q115	27,68	27,74	27,79
Q215	25,47	25,53	25,6
Sum 13	26,05	26,07	26,1
Win 13	27,43	27,47	27,5
Sum 14	25,78	25,83	25,85
Win 14	27,39	27,44	27,48
Sum 15	25,25	25,31	25,4
Win 15	26,8	26,92	27,2
Sum 16	24,45	24,67	24,93
Win 16	25,74	25,96	26,25
Sum 17	24,18	24,4	24,69
2014	26,58	26,62	26,68
2015	26,23	26,29	26,33
2016	25,35	25,55	25,8
2017	24,88	25,1	25,38
Gas Yr 13	26,57	26,65	26,7
Gas Yr 14	26,32	26,38	26,44
Gas Yr 15	25,62	25,79	26,02
Gas Yr 16	24,96	25,18	25,47

red = arbitrage free interpolated Prices

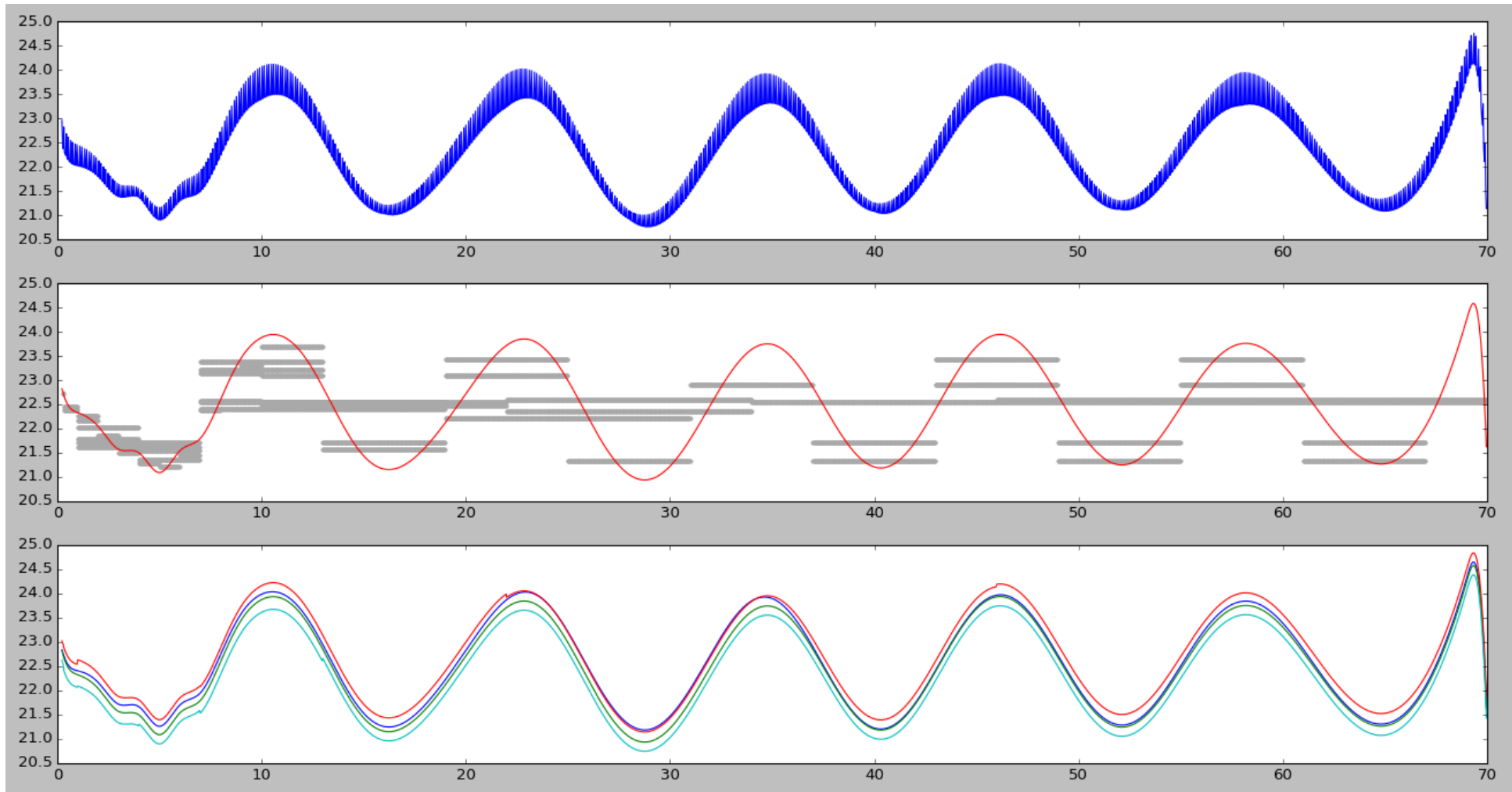
- „live“ (real-time) Prices / Price-Forward-Curve (e.g. from Trayport)

Potential uses

- Customer portals: Transparency for customers, possibility to lock in prices directly (increasing customer loyalty)
- Interface trading / sales: transparent transfer prices
- Risk Management: lower risk in the valuation of certain delivery profiles
- Clearing: OTC-Clearing of structured products possible
- Exchange trading / Clearing: Introduction into procedures to establish settlement prices assures arbitrage free settlement prices
- Upgrade from h-PFC zu 15min-PFC (power) or daily PFC to hourly PFC (gas)

Example shown for natural gas (arbitrage free interpolated „live“ Prices can also be created for Power or other Commodities)

Arbitrage free „live“ Prices and „live“ Price-Forward-Curve



Prototype: Operational mathematical optimization, graphical expression not optimized, time scale in months

Example shown for natural gas (Arbitrage free interpolated „live“ Price-Forward-Curves can also be created for Power)

Live-Curve vs. EEX-Settlement-Curve

- EEX-Settlement Prices for Futures may not be based on actually traded deals because they are designed to enable Cash-Settlement of cleared products. For later deliveries this may lead to differences of 0,10 €/MWh to 0,40 €/MWh between Settlement Price and actual market price. Settlement prices are not necessarily arbitrage free. They do not show the Bid-Offer Spread but are a synthetic mid price.
- Broker screens are showing the full forward curve with bid-offer spread during the core trading times. Tradeable products include outright products and time spreads.
- Time spreads are directly tradable (simultaneous buy and sell) and they are put in the market as spread bid and offer. It is assumed that spread products are less volatile (relative price differences are moving slower than absolute prices), and that counterparty positions are within a certain range so that credit risk is manageable.
- Both outright products and time spreads are included in a simultaneous optimization to show arbitrage free prices with the Bid-Offer-Spread (mathematical optimization) in a live price forward curve.
- Relatively usual in the market is the „methods of the smallest granules“ that sequentially weights current prices on the basis of the settlement curve on the day before. However the method has disadvantages at critical joints (e.g. March – April or September – October on the gas market) that may lead to price distortions and to higher commodity costs. The assumption of the method is that market spread changes only to a very limited degree, and that products are coupled to each other basically constantly. This assumption cannot be easily upheld.
- A Live-Price-Forward-Curve may be used for trading anytime (market access assumed), a Price-Forward-Curve on the basis of settlement prices from the day before usually not.
- A Price-Forward-Curve on the basis of settlement prices is not including information on spreads for later deliveries and is suggesting market liquidity that may not actually be there. However for structured trading the information on the fair value on the relevant price side (bid or offer) at every point in time is decisive. Live prices can be used to calculate prices for screen trading.
- Such an evaluation shows if a trader shows a fair price or a discussion might be held what components a trader may have priced in. Margins of 0.10 €/MWh to 0.20 €/MWh are possible when trading with smaller utilities („Stadtwerke“).

DEVnet Competence and References

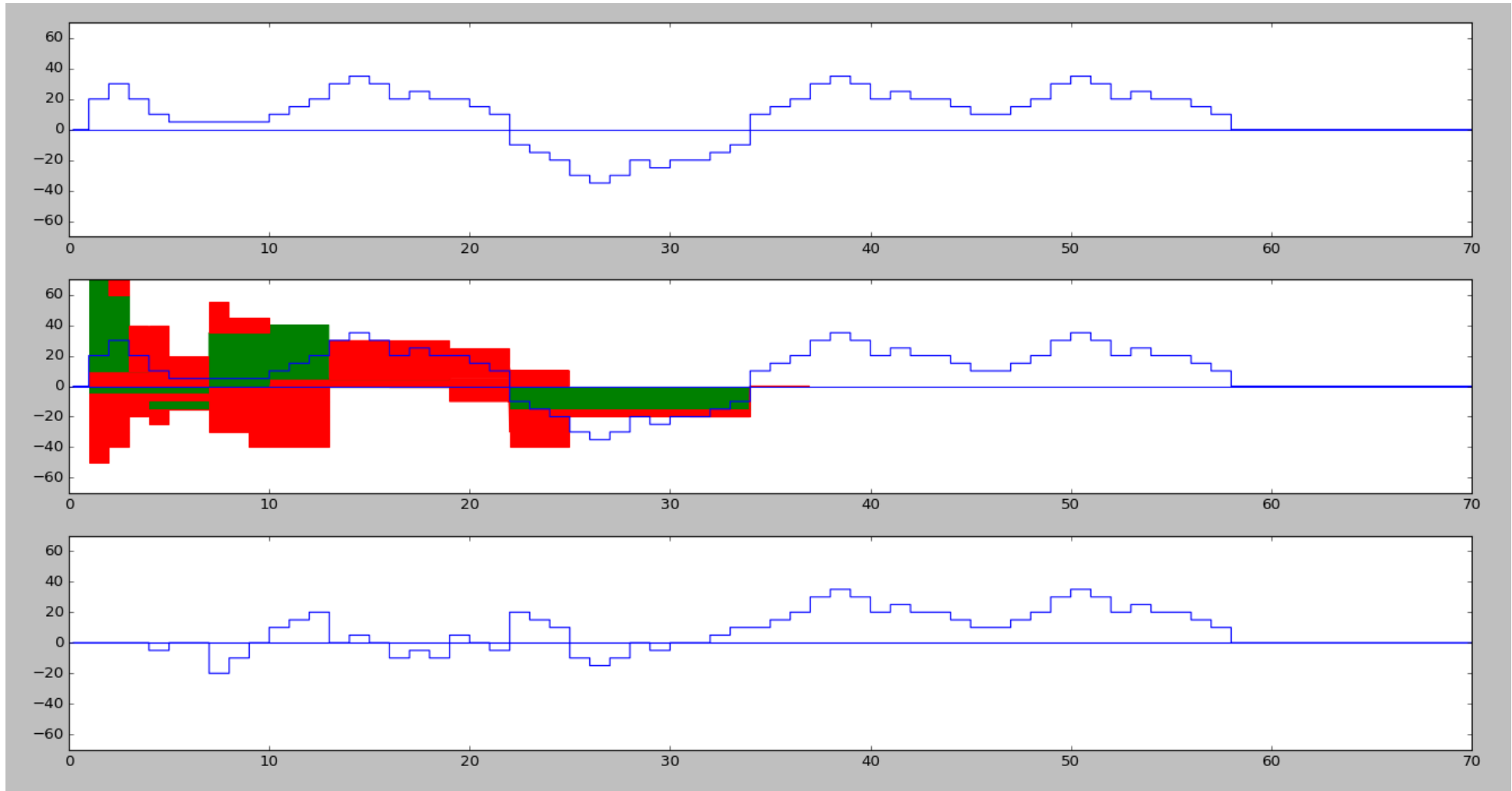
Competence

- DEVnet has algorithms available, that may be adapted according to local circumstances to Pricing or Customer Portals (on premise or cloud based) to calculate „live“ Prices and „live“ Price-Forward-Curves.
- DEVnet offers integrated mathematical (quantitative) competence, developer Know-How and energy sector experience.
- DEVnet can deliver a complete market data infrastructure including a „live“ Price-Forward-Curve as Managed Service (on premise or cloud based).

References

- Development and implementation of a market data infrastructure for actual market data and derived data for Commodities, currencies, rates and energy products, data collection and storage of app. 200 external and additional internal data feeds.
- Development and implementation of a system to archive Price-Forward-Curves.

Outlook: Position Hedging



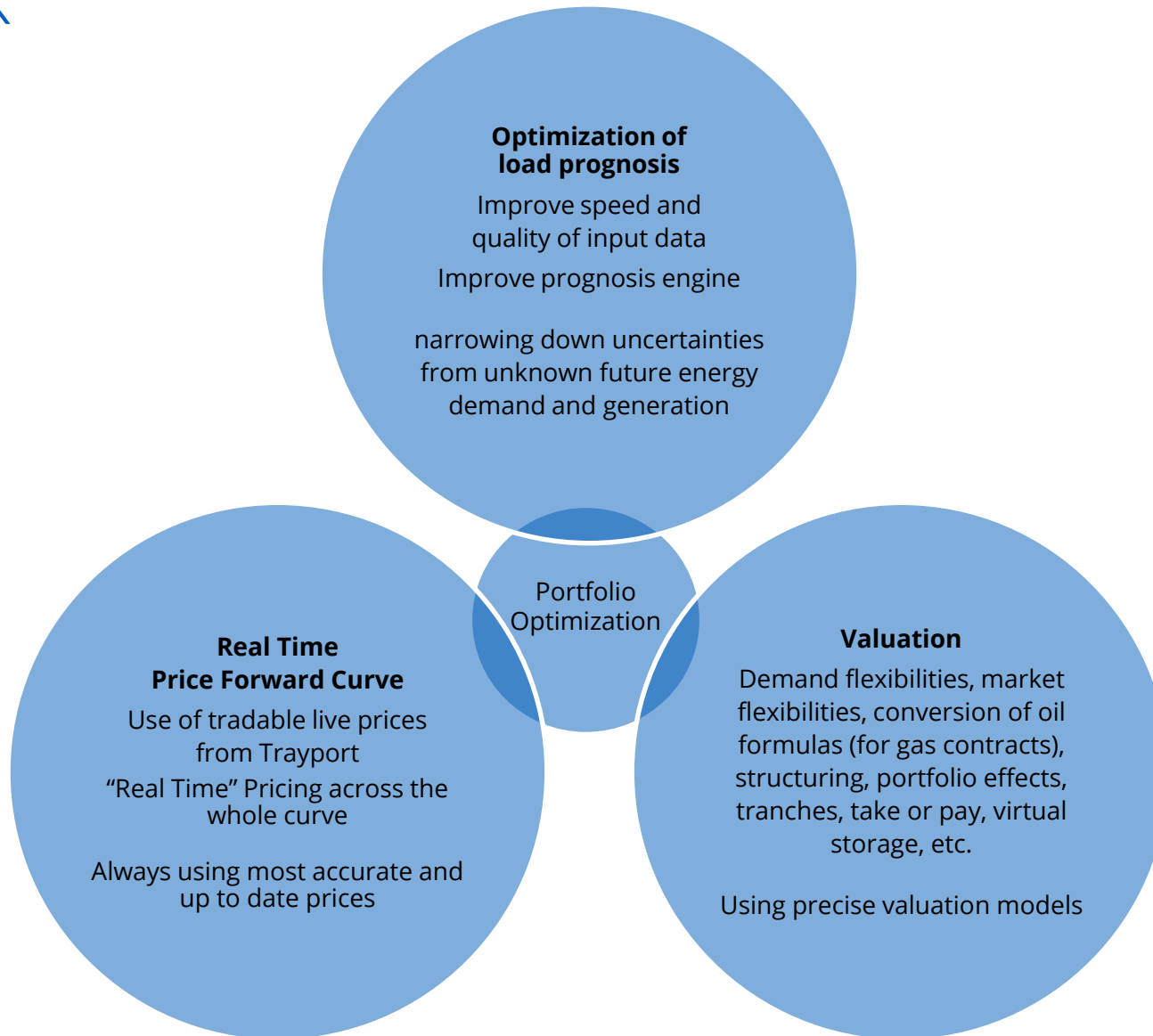
Prototype: Operational mathematical optimization, graphical expression not optimized, time scale in months

Red: Outright-Products Green: Spread-Products

Outlook: Real-Time Valuation

- Structuring of Pricing to achieve a flexible coverage of the product landscape
- Development of methods and algorithms for sales pricing of registered metered customers, utility portfolios consisting basically of standard load customers (full service contracts, including separation in relevant elements)
- Determination of specific portfolio effects for sub-portfolios
- Synthetic valuation of illiquid products for customers
- Automatization of the preparation of indications
- Integration of risk managements requirements in the system architecture

Outlook





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