Extract of:
Risk-adequate pricing of retail power contracts

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Wholesale vs. Retail Market

### Wholesale Market
- standardised profiles
- in general fixed quantities
- observable prices
- used for sourcing

### Retail Market
- customised profiles
- quantity depends on consumption
- deduced prices
Full Supply Contract: What will be delivered
Sourcing of Retail Contracts

- Börsenprodukt Base
- Börsenprodukt Peak
- Regelenergie
- 1/4h Werte
- exchange product base
- exchange product peak
- imbalance energy
- measured consumption
- exchange product single hour
- exchange product base

1/4h values

power MW

1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91 94

Spot market products

Sourcing of Retail Contracts
Utility with generation

- Expected Generation
- Wholesale market
- Sourcing portfolio
- Retail market
- Purchased spot products
- F
- F+S+R+M
- S
- Profit and loss
- \( \hat{S}-S+M \)
Risks of Retail Contracts
Contract type: Full Supply Contract

- validity period of retail offer
- balancing power costs
- operational risk
- credit risk
- volume risk
- spreads (hourly price and load profile)
- total risk
Risk premium

- Risk premiums consist of
  - Expected additional costs
  - Strict risk premiums

- Expected additional costs covers average costs from contracts on the retail market

- Strict risk premiums cover risk of deviation from the expected loss

- Calculation of strict risk premiums with a risk measure e.g.
  - (Ratio of) standard deviation
  - Risk Adjusted Return on Capital (RAROC)
RAROC approach

- Economic capital
  - Capital allocation for coverage of possible losses
  - Calculation via standard risk measures, e.g. Value-at-Risk
- Hurdle rate
  - Return on economic capital
- RAROC

\[
RAROC = \frac{\text{Expected Return}}{\text{Economic Capital}} = \text{Hurdle Rate}
\]

- Determination of strict risk premiums so that hurdle rate is exceeded
Risks of Retail Contracts
Expected additional costs

Validity period of retail offer

› Call option free of cost
› Upfront option premium is absolutely unusual
› Risk premium increases strike price

Minimising validity period
Risks of Retail Contracts
Expected additional costs

Balancing power costs

- Depending from the TSO (Transmission System Operator)
- No strict correlation between spotprices and balancing power (different quality)
- Balancing power prices are published
- Load forecast algorithm for dates in the past can be used for estimate balancing power costs
Risks of Retail Contracts
Balancing Power

Balancing Power prices; Germany July 2010

EUR/MWh
Risks of Retail Contracts
Contract type: Full Service Contract

Credit risk

› Credit costs can be estimated using
  › quotes from credit default swaps of the counterpart resp. counterparts with an the same rating
  › calculating the credit Risk and using a RAROC Approach
Risks of Retail Contracts
Contract type: Full Supply Contract

Volume risks

- Most significant risk for retail contracts
  - Induces expected additional costs and strict risks
    - Expected additional costs
      - Caused by the correlation of load and market prices
    - Strict risks
      - Individual divergence of load and load forecast of a customer
  - Calculation of a risk premium demands modelling market prices and load and their correlation
  - Risk premium calculation uses a combined price/load model e.g. SMaPS
Volume Risk
Price/ load correlation

Merit order curve Germany (load adjusted)
Volume risk
Load in Germany – Yearly saisonality

Hourly german load 2006 - 2009
Volume risk
Load in Germany – weekly saisonality

Hourly german load 2006 - 2009
Volume risk
Modelling spot prices in Germany with SMaPS

\[ S_t = \exp \left\{ f^{(S)} \left( \frac{L_t}{v_t} \right) + X_t^{(S)} + Y_t^{(S)} \right\} \]

- \( S_t \): Spot price
- \( f \): Merit order curve
- \( L_t \): Load
- \( v_t \): Adjustment by average availability of power plants
- \( X_t \): Short term process (Seasonal ARIMA with NIG-distributed innovations)
- \( Y_t \): Long term process (GBM)
Volume risk
Volume risk cause market price risk

German electricity spot prices

Price in EUR/MWh

01-Jan-2006 01-Jan-2007 01-Jan-2008 01-Jan-2009 31-Dec-2009
Risk types in retail power contracts

Classification of risk types

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<td>Individual volume risk (quantity and structure)</td>
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- Systematic risks cause losses (expected loss > 0)
- Unsystematic risks increase probability of losses (expected loss = 0)