Probabilistic Forecasting of Imbalance Prices in the Belgian Context

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Introduction

Focus on **imbalance** prices

**Probabilistic** forecasting

A two-step **probabilistic** forecasting approach in the **Belgian** context

A tool for decision making
Summary

• Problem formulation
• Belgian Context
• A two-step probabilistic approach
• Case study description
• Numerical results
• Conclusions
Problem formulation

\[ \Delta t \text{ Resolution} \\
H_T \text{ Horizon} \\
\Delta f \text{ Frequency} \]

\[ \hat{\pi}_t^{H_T} := \{ \hat{\pi}_{t+k \cdot \Delta_t} \} \quad k \in [1, \frac{H_T}{\Delta_t}] \]
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Belgian context

Source: ELIA (TSO)
Belgian context

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*Marginal and imbalances prices on 08/01/2018*

*Source: ELIA (TSO)*
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A two-step probabilistic approach

Step 1: computing the NRV state transition probabilities

Step 2: forecasting the imbalance prices
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Case study description: Belgium

**Dataset:** imbalance prices, NRV and ARC table
- Learning Set = 2017
- Validation Set = 2018

We compare to two approaches:
- **Deterministic:** Multi Layer Perceptron (MLP)
- **Probabilistic:** Gaussian Processes (GP)

**Forecasting horizons:** from 15 minutes to 6 hours ahead

**Metrics:**
- Probabilistic: CRPS & PLF
- Deterministic: NMAE & NRMSE
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Numerical results: one-shot forecast

Horizon = 6 hours ahead 10/01/2018, 12h00 UTC

TSPA = Two-Step Probabilistic Approach
Numerical results: last value forecasted

Horizon = 6 hours ahead, 10/01/2018
Numerical results: scores

Mean scores for horizon from 15 to 360 minutes
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Conclusions

A first step:
- outperforms other approaches on probabilistic error measures
- is less accurate at predicting the precise imbalance prices

Future work:
- add input features to better describe the market situation
- extend the approach to implement the whole bidding strategy
Thank you, any question?
A two-step probabilistic approach
A two-step probabilistic approach

1. NRV forecast

2. Selection of the most probable MIP/MDP into the ARC table.
Case study description: Belgium

MLP & Two-Step Probabilistic Approach

GP