Energy Market Analysis Using Kernel Methods

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Outline

Motivation

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Pinball loss

The pinball score or quantile score is used to measure the accuracy of a quantile forecast.

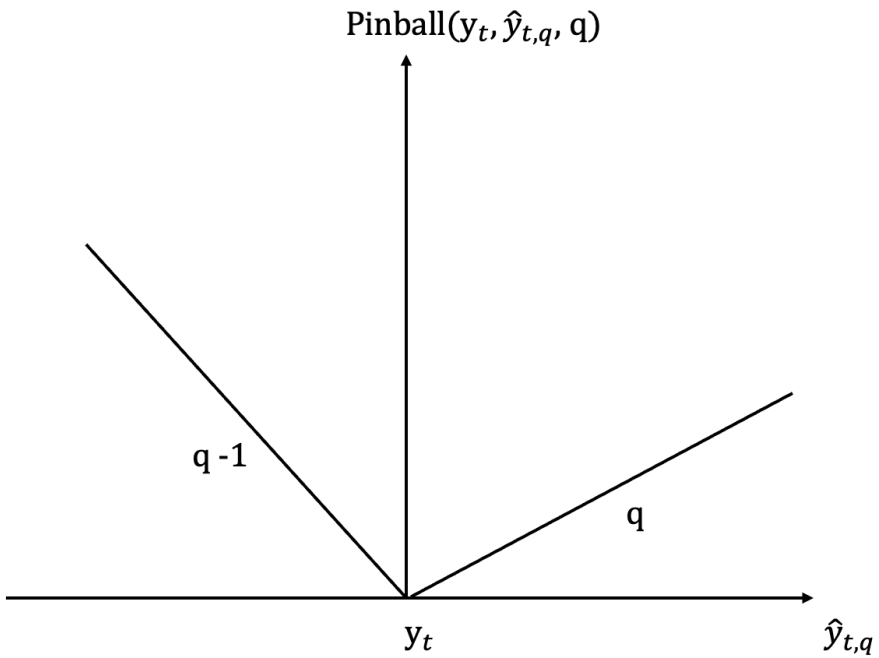
Definition

The pinball loss is defined as

$$\text{Pinball}(y_t, \hat{y}_{t,q}, q) = \begin{cases} (q-1)(\hat{y}_{t,q} - y_t) & y_t > \hat{y}_{t,q} \\ q(\hat{y}_{t,q} - y_t) & y_t \leq \hat{y}_{t,q} \end{cases}$$

Pinball loss

The pinball loss is an asymmetric function, it weights its score differently depending on the error sign and on the quantile considered. By averaging all the pinball losses over all quantiles and over the whole forecast horizon, we obtain the pinball loss of the probabilistic forecast.



Continous ranked probability score

The continous ranked probability score (CRPS) measures the difference between the estimated cumulative distribution $\hat{F}$ and the empirical cumulative density function (CDF).

Definition

The continous ranked probability score is defined as

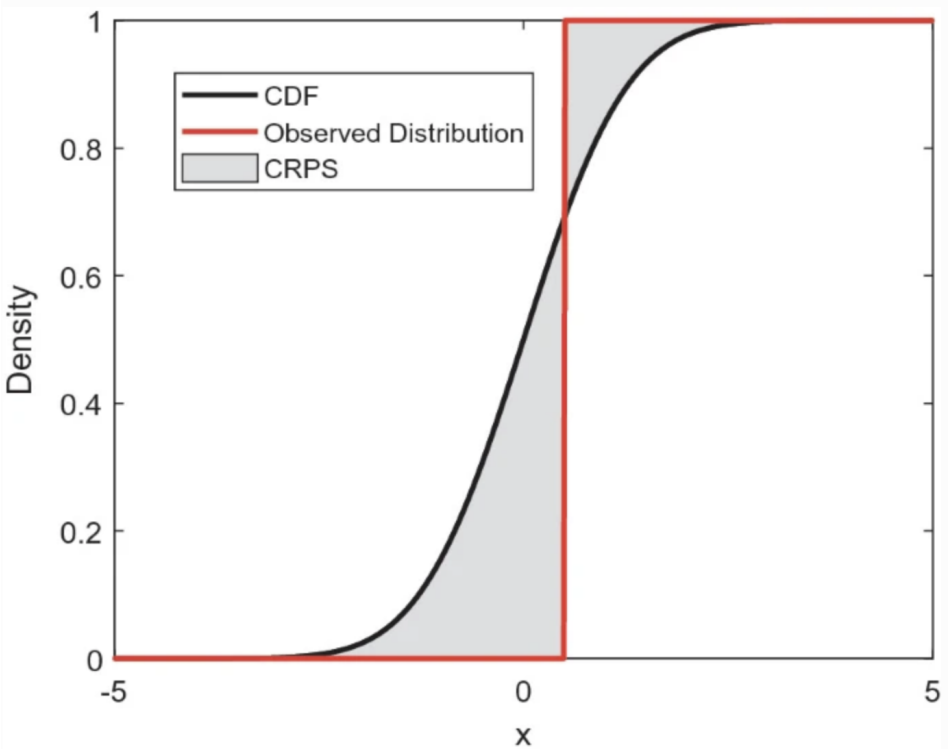
$$\mathrm{CRPS}(y, \hat{F}) = \int_{-\infty}^{\infty} \left(\hat{F}(x) - \mathbb{I}_{\{x-y\}} \right)^2 dx$$

Where the indicator function is defined as

$$\mathbb{I}_{\{z\}} = \begin{cases} 0, & z < 0 \\ 1, & z \geq 0 \end{cases}$$

Continous ranked probability score

For a visualisation see Figure. The grey area is what contributes toward the CRPS score. The better the estimated cumulative density function is the smaller the total CRPS score will be.



Thank you