Residential Electricity Load Forecasting: Evaluation of Individual, Aggregate, and Cluster-based Aggregate Forecasting (Supplementary Material)

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MASE

An experience reader might ask: *Why do you not use MASE to evaluate your forecasts?* Although it is an interesting question to answer but the details is out of the scope of the main paper. Thus, we decided to answer it here.

The Mean Absolute Scaled Error (MASE) is defined as

$$\frac{1}{n-1}\sum_{t=2}^{n}\left(\frac{|y_t-\widehat{y}_t|}{\frac{1}{n-1}\sum_{i=2}^{n}|y_i-y_{i-1}|}\right),$$

where y_t is the observation at time t (see [1], Section 3) . Note that, MASE is defined to measure the effectiveness of a forecasting method against the naive forecast for the next step forecasting (or in our case, 1 hour ahead forecasting).

We do not compute the MASE because it can be inferred by dividing the NMAE of a forecasting method with the NMAE of the `benchmark` (and we do provide both values in the main paper). Note that, the `benchmark` of the 1 hour ahead forecasting in the main paper is s_{t-1}, which is y_{i-1} in the notation above.

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Let the NMAE of an arbitrary forecasting method be NMAE_F and the NMAE of the `benchmark` be NMAE_B. Below, we show that MASE $=$ $\text{NMAE}_F/\text{NMAE}_B$ for the 1 hour ahead (next-step) forecasting. Without loss of generality, suppose that we forecast from the second time slot to the last time slot, n. Let $\widehat{y_t}$ be the forecast for time t using the forecasting method F. Thus, the NMAE of the method F is:

$$\text{NMAE}_F = \frac{\sum_{t=2}^{n} |y_t - \widehat{y_t}|}{\sum_{t=2}^{n} |y_t|},$$

and the NMAE of the benchmark is:

$$\text{NMAE}_B = \frac{\sum_{t=2}^{n} |y_t - y_{t-1}|}{\sum_{t=2}^{n} |y_t|}.$$

Then, we have:

$$\begin{aligned}
\text{MASE} &= \tfrac{1}{n-1} \textstyle\sum_{t=2}^{n} \left(\frac{|y_t - \widehat{y_t}|}{\frac{1}{n-1} \sum_{i=2}^{n} |y_i - y_{i-1}|} \right) \\
&= \tfrac{\frac{1}{n-1} \sum_{t=2}^{n} |y_t - \widehat{y_t}|}{\frac{1}{n-1} \sum_{i=2}^{n} |y_i - y_{i-1}|} \\
&= \tfrac{\sum_{t=2}^{n} |y_t - \widehat{y_t}|}{\sum_{i=2}^{n} |y_i - y_{i-1}|} \\
&= \tfrac{\text{NMAE}_F}{\text{NMAE}_B}.
\end{aligned}$$

References

[1] R. J. Hyndman and A. Koehler, "Another look at measures of forecast accuracy," *International Journal of Forecasting*, vol. 22, no. 4, pp. 679–688, 2006.