Penalized shifted and trimmed RMSE

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Let x_t, y_t, $t = 1, \dots T$, denote the simulated and observed trajectory, respectively, for a given configuration. To account for time-shifts, we compute the following modified MSE metric.

$$\min_{s \in \mathcal{S}} \sum_{t=T_{\min}}^{T_{\max}} (y_t - x_{t+s})^2 \tag{1}$$

where $\mathcal{S} = -48, \dots, 48$, $T_{\min} = 0.2 \times T$, and $T_{\max} = 0.8 \times T$.

1 Penalizing timeshift

For many of the configurations, the shift s that minimizes 1 is -48 or 48 which is not desirable. Therefore, we penalize timeshift by adding the following term to 1.

$$P_s(x) = (s/s_{\max})^2 \mathrm{Var}(\tilde{x}) \tag{2}$$

where $s_{\max} = 48$ and $\tilde{x} = \{x_t : t = T_{\min}, \dots, T_{\max}\}$. We tried a couple different penalties but the one based on variance seems to be the most reasonable.

2 Penalized shifted and trimmed RMSE

The final RMSE metric we calculate is given by

$$\sqrt{\min_{s \in \mathcal{S}} \Big\{ \sum_{t=T_{\min}}^{T_{\max}} (y_t - x_{t+s})^2 + P_s(x) \Big\}}$$