Errors

$x \rightarrow$ TRUE VALUE

$\hat{x} \rightarrow$ APPROXIMATION

- **Differences**

  Units

  e.g: absolute error: $|x - \hat{x}|$ Units of $[x]$

  squared error: $(x - \hat{x})^2$ Units of $[x^2]$

- **Ratios:**

  No units

  e.g: relative error: $\dfrac{|x - \hat{x}|}{|x|}$ No units (units cancel)

  (percentage error)

TS ERRORS

ERROR AT TIME τ

$$e_\tau = y_\tau - \hat{y}_\tau$$

↓ AT A SPECIFIC
POINT IN TIME

- **TRAINING** $\tau \leq \boxed{T}$ → LAST POINT WITH DATA
  OR LAST POINT IN TRAINING

$$e_\tau = y_\tau - \hat{y}_{\tau | \tau - 1}$$ → RESIDUALS
(RESIDUAL ERRORS)

- **TEST OR FORECAST** $\tau > T \implies \tau = T + h$ → > 0
  (h) (HORIZON)

$$e_{T+h} = y_{T+h} - \hat{y}_{T+h | T}$$ → FORECAST
ERRORS

Metrics to summarize errors (only those used for this course)

Summaries of the vectors of errors at different points

$$e_\tau = y_\tau - \hat{y}_\tau$$

Scaled dependent (same units as y)

==Mean abs.== ==error== $\quad MAE = \text{mean}(|e_\tau|)$

==Root mean== ==squared error== $\quad RMSE = \sqrt{\text{mean}(e_\tau^2)}$

Scale independent (no units)

Percentage error at τ

$$P_\tau = 100 \frac{e_\tau}{y_\tau} = 100 \frac{y_\tau - \hat{y}_\tau}{y_\tau}$$

==Mean absolute== ==percentage error== $\quad MAPE = \text{mean}(|P_\tau|)$