MONASH University

MONASH BUSINESS SCHOOL

Deriving forecast variances

Rob J Hyndman

16 April 2020

Mean

Assume ε_t has mean 0 and variance σ^2

$$\begin{aligned}
y_t &= \mu + \varepsilon_t \\
y_{T+h} &= \mu + \varepsilon_{T+h} \\
\mathrm{E}[y_{T+h|T}] &= \mu \\
\mathrm{V}[y_{T+h|T}] &= \mathrm{V}(\hat{\mu}) + \mathrm{V}(\varepsilon_t) \\
&= \sigma^2/T + \sigma^2 \\
&= \sigma^2(1 + 1/T)
\end{aligned}$$

Naive

$$\begin{aligned}
y_t &= y_{t-1} + \varepsilon_t \\
y_{T+h} &= y_{T+h-1} + \varepsilon_{T+h} \\
&= y_{T+h-2} + \varepsilon_{T+h-1} + \varepsilon_{T+h} \\
&\vdots \\
&= y_T + \sum_{i=0}^{h-1} \varepsilon_{T+h-i} \\
\mathrm{E}[y_{T+h|T}] &= y_T \\
\mathrm{V}[y_{T+h|T}] &= h\sigma^2
\end{aligned}$$