

## Homework 5

Read Chapter 8.

Do Chapter 8 problems 1, 6, and:

### State space model

Section 8.5 (equations (8.3) and (8.4)) rewrites simple exponential smoothing as a state space model. In this problem, you use the state space model to generate examples of series that follow the SES model.

- Create a vector of 1000 white noise values  $e_t$  which are iid normal with sd  $\sigma = 5$ .
- Use the state equation  $\ell_t = \ell_{t-1} + \alpha e_t$  to create a vector of levels  $\ell_t$ . Use  $\alpha = 0.5$  for your smoothing parameter.
- Use the observation equation  $y_t = \ell_{t-1} + e_t$  to create a time series.
- Make your time series  $y_t$  into a tsibble and plot it as well as its autocorrelogram.
- Fit an ETS model, and check that the fitted values of the smoothing parameter  $\hat{\alpha}$  and variance  $\hat{\sigma}^2$  are close to the correct values.
- Repeat parts b-e with  $\alpha = 0.01$ . How does  $\alpha$  affect the plots from part d?