

Homework 3

Read Chapter 5. Read “The sample mean” by Robert Nau (posted on our Canvas page).

Do Chapter 5 problem 3, 6, 8, and these problems:

Drift

The random walk with drift model is specified as $y_t = y_{t-1} + c + \epsilon_t$ where c is a constant “drift” and ϵ_t is white noise with standard deviation σ .

1. For forecasting, what is the expected value $E[y_{T+h}]$? What is the variance of y_{T+h} ?
2. From `fpp3::global_economy`, compute a time series `sweden` which is the GDP per capita of Sweden (they do this at the start of Chapter 5 in our textbook).
3. Fit a random walk with drift model to the Sweden GDPPC series. What are the estimates for the drift c and the variance σ^2 ?
4. Make a residuals plot. Are the residuals unbiased? Autocorrelated? Normal? Homoscedastic?
5. Create and plot a 20-year forecast.
6. Give the 95% confidence interval for 2025.
7. Compare the RMSE of this model to the NAIVE model (random walk with no drift).

Linear trend vs. Drift

At the start of chapter 5, the textbook shows how to fit a deterministic linear trend to the Sweden GDP series. In this problem, you compare the linear trend model to the random walk with drift model.

1. Make 10 year forecasts for both models, and plot them with the original data. You can do this with one `model()` command and then facet the results to facilitate comparison.
2. Plot each model’s fitted values along with the original data. Observe that in the linear trend, fitted values are on the trend line. In the drift model, fitted values are calculated as the previous value plus the estimated drift.