

Assignment 1

Applied Forecasting in Complex Systems 2021

Week 2
November, 5, 2021

Background on how to work effectively on this assignment:

1. Follow the [Guideline of Assignment 1 to 3](#).
2. Please explain all solutions, show the calculations and write down your foundations and reflections. When necessary, reduce your plot.

Use **library(fpp3)** to get the dataset unless specified as a file.

Exercise 1 (3 pts.)

For each of the following series, make a graph of the data. If transforming seems appropriate, do so and describe the effect.

- 1.1) (1 pt.) United States GDP from `global_economy`.
- 1.2) (1 pt.) Slaughter of Victorian “Bulls, bullocks and steers” in `aus_livestock`.
- 1.3) (1 pt.) Gas production from `aus_production`.

Exercise 2 (3 pts.)

For the Australian takeaway food turnover (`aus_retail`), use `filter(Industry == "Takeaway food services")`

- 2.1) (1 pt.) Create a training set by withholding the last four years as a test set.
- 2.2) (1 pt.) Fit all the appropriate benchmark methods to the training set and forecast the periods covered by the test set.
- 2.3) (1 pt.) Compute the accuracy of your forecasts. Which method does best? Do the residuals from the best method resemble white noise?

Exercise 3 (4 pts.)

Data set `olympic_running` contains the winning times (in seconds) in each Olympic Games sprint, middle-distance and long-distance track events from 1896 to 2016.

- 3.1) (1 pt.) Plot the winning time against the year. Describe the main features of the plot.
- 3.2) (1 pt.) Fit a regression line to the data for each event. Obviously the winning times have been decreasing, but at what average rate per year?
- 3.3) (1 pt.) Plot the residuals against the year. What does this indicate about the suitability of the fitted lines?
- 3.4) (1 pt.) Predict the winning time for each race in the 2020 Olympics. Give a prediction interval for your forecasts. What assumptions have you made in these calculations?