

STAT 443: Time Series and Forecasting

Lab 7: Model building using $ARIMA(p, d, q)$ processes - Part II

- The lab must be completed in **R Markdown**. Display all the **R** code used to perform your analysis.
- Create a pdf or html file and use it as your lab submission.
- Please ensure that the file you submit is in good order (e.g., not corrupted and contains the work you intend to submit). No late (re-)submissions will be accepted.

Recall the dataset `TempPG.csv` from Lab 6, which includes minimum temperatures measured at Prince George, BC, from 1919 to 2008.

You may have considered fitting an AR(1) model based on the inspection of the sample acf and pacf for the annual minimum temperatures. In this lab, you will be guided to revisit the AR(1) model and compare it to a competing model.

1. Fit the AR(1) model to the annual minimum temperatures using the `arma()` command, and write down your fitted model.
2. Look again at the acf of the annual minimum temperatures. In what way does the acf not behave as you would expect for the fitted AR(1) model?
3. Plot the series of first differences of minimum annual temperatures. Plot the acf and pacf of the differences. What model would you suggest for the differences?
4. Fit the suggested ARIMA model to the annual minimum temperatures series. Write down your fitted model.
5. Use the `tsdiag()` function to see diagnostic plots for the model you have fitted. How well does the model appear to fit?
6. Recall the *Akaike Information Criterion (AIC)*, defined to be (proportional to)

$$-\log(\text{maximum likelihood}) + 2r,$$

where r is the number of independent parameters in the model. This statistic can be used for model selection. Models with smaller AIC values are often preferred. Compare the two competing models here via their AIC values. Which model would you select?