Econ 493 B1 - Winter 2023

Homework 2

Assignment Information

This assignment is due on Friday February 10 at 11:59 am.

Submit the assignment on eClass. Late assignments will receive **NO MARKS**.

Answers to computing exercises must include R commands and output files when applicable. All answers must be transcribed to your written answers which must be separate from the R printout.

Total marks = 50 (5 questions).

Exercise 1

You work for the International Monetary Fund in Washington DC, monitoring Singapore's real consumption expenditures. Using a sample of real consumption data (measured in billions of 2005 Singapore dollars), y_t, t = 1990Q1, ... 2016Q4, you estimate the linear consumption trend model

$$y_t = \beta_0 + \beta_1 t + \varepsilon_t,$$

obtaining the estimates $\hat{\beta}_0 = 0.51$, $\hat{\beta}_1 = 2.30$, and $\hat{\sigma}_e = 4$.

a. Based upon your estimated trend model, construct a point forecast for 2018Q4.

b. Based upon your estimated trend model, construct an interval forecast for 2018Q4.

Exercise 2

Describe how you would construct a purely seasonal model for the following monthly series. In particular, what dummy variable(s) would you use to capture the relevant effects?

a. A sporting goods store finds that detrended monthly sales are roughly the same for each month in a given three-month season. For example, sales are similar in the winter months of January, February and March, in the spring months of April, May and June, and so on.

b. A campus bookstore finds that detrended sales are roughly the same for all first, all second, and all third months of each trimester. For example, sales are similar in January, April, July, and October, the first months of the first, second, third, and fourth trimesters, respectively.

c. A Christmas ornament store is only open in November and December, so sales are zero in all other months.

Exercise 3 (R)

Consider the data set of quarterly Australian beer production `ausbeer` from 1990.

a. Estimate a linear model with seasonal dummies as predictors using data from 1990Q1 to 2004Q4. Evaluate the residuals. Compute the AIC and BIC.

b. Estimate a linear model with a trend and seasonal dummies as predictors using data from 1990Q1 to 2004Q4. Evaluate the residuals. Compute the AIC and BIC.

c. Which model is preferred? Explain.

d. Evaluate the predictive performance of these models in the test set 2005Q1 to 2009Q4. Which model performs better?

Exercise 4 (R)

Daily electricity demand for Victoria, Australia, during 2014 is contained in `elecdaily`. The data for the first 20 days can be obtained as follows.

```
daily20 <- head(elecdaily,20)
```

a. Plot the data and find the regression model for Demand with temperature as an explanatory variable. Why is there a positive relationship?

b. Produce a residual plot. Is the model adequate? Are there any outliers or influential observations?

c. Use the model to forecast the electricity demand that you would expect for the next day if the maximum temperature was 15° and compare it with the forecast if the with maximum temperature was 35°. Do you believe these forecasts?

d. Give prediction intervals for your forecasts.

e. Plot Demand vs Temperature for all of the available data in `elecdaily`. What does this say about your model?

Exercise 5 (R)

Data set `huron` gives the level of Lake Huron in feet from 1875-1972.

a. Plot the data and comment on its features.

b. Fit a linear regression and compare this to a piecewise linear trend model with a knot at 1915.

c. Generate forecasts from these two models for the period up to 1980 and comment on these.

d. Repeat b. and c. with a knot at 1920 and comment on any differences.