Introductory Econometrics: Computer Problem Sheet 3

Empirical Topic: Time Series

The data sets referred to in this problem sheet are available through the course website: http://personal.strath.ac.uk/gary.koop/ie.html

1. Use the data set, SAFETY.XLS, for this question. This data set contains T=60 observations on Y = accident losses and X = hours spent in safety training.

In the lectures, the lag lengths is the ADL model were labelled p and q. In this question, for simplicity set p=q.

a) Create the explanatory variables you would use in an autoregressive distributed lag (ADL) model with lag lengths both equal to 4. How many observations do the explanatory variables have?
b) Using your answer to a), use OLS to estimate the ADL model
c) Create the explanatory variables you would use in an ADL model with lag lengths equal to 2. How many observations do the explanatory variables have?
d) Using your answer to c), estimate the ADL model with q=2.
e) Compare your answers to part d) and part b). Discuss why they differ, paying particular attention to the question of omitted variables bias.
f) Suppose you believe that 6 months is the maximum time that safety training might affect accident losses and accordingly, you set qmax=6. Using the sequential testing strategy described in lectures, select the lag length of the ADL model.

2. LONGGDP.XLS contains annual data on real GDP per capita for four of the largest English-speaking countries (USA, UK, Canada and Australia) for the years 1870-1993.[1] Investigate whether there are common movements or trends between GDP in these different countries. In particular, you should go through the following steps to answer this question:

a) Plot all the data in one time series graph and discuss your results (e.g. Does GDP seem to be trending in all countries? Do there appear to be common trend patterns across countries?).
b) Carry out unit root tests on the time series. Discuss your findings.
c) For the time series which have unit roots carry out cointegration tests. Begin by carrying out cointegration tests between different combinations of two countries (e.g. first do USA and UK, then USA and Canada, etc.). Does GDP seem to be cointegrated between any pair of countries?
d) In our lecture discussion of cointegration, we have focussed on the case considered in part c), namely, where there are only two variables. Using Y = USA and the other countries as explanatory variables, test for cointegration among *all* the time series. Discuss your results.

---

[1] Note that each of these time series is an index (with 1913=100). As an example, you can see that the value of the data for the UK is 64.85 in 1870. The fact that the variables are indices means that we cannot interpret the value of each observation as saying, for instance, that GDP per capita in the U.K. was £64.85 in 1870. We can, however, interpret changes in the series as GDP growth rates. More importantly for cointegration analysis, the trend in the index for each country accurately reflects trend behaviour in GDP per capita.