# Econometrics 871

## Time Series Exercise 1

In this exercise, you are expected to apply the Box-Jenkins methodology to find the best univariate model of two series: one simulated and one observed.

What you need: the excel files SA\_inflation\_sample.xlsx and Econometrics 871 - TS exercise 1 data.xlsx) and the MATLAB tutorial script “Box\_Jenkins\_illustration”.

1. A simulated stationary ARMA(p,q) process
   * Here you will know the true model (i.e., the true data generating process), so you can compare the estimated models to the true model. Ignore the variable named y in the “Econometrics 871…” data file; generate your own random sample.
   * Note: the example in the MATLAB file (with a zero restriction on the first lag, but not the second lag, of the AR process) does not obviously select the correct estimated model. You may therefore adjust the true model to your own preferred specification – anything up to an ARMA(2,2).
2. The spread between a 1 year and a 3-month US Treasury bill (named spread in the one data file) **OR** inflation (named inflation in the second data file)

For each series (simulated and actual/observed), I would like you to present:

1. The basic first step analysis (plot, ACF and PACF with interpretations/conclusions).
2. Then investigate at least four different ARMA models: AR(1), AR(2), MA(2), ARMA(1,1), ARMA(2,1).

Suggestion on layout:

* For each of the above models you could first compute the AIC and BIC and find the best one according to this measure – i.e., the AIC and BIC was done last in the tutorial.
* Recall: while you already know the true DGP (“true model”) for the simulated stationary ARMA(p,q) process, you do not know what the true model is for the observed series.
* Then evaluate whether the selected model is congruent and parsimonious. That is, you have to do all the “usual” steps only for one model per series for this exercise – this is not what you would do in a full study, just to cut the repetition for this exercise.
* Present the estimated results of the best model (coefficients with measures of their significance) and all necessary specification tests for congruency.
* You need not bother much about layout but try for a concise presentation of only the necessary.
* My LiveScript is not the ideal structure for this analysis, so it would be worth it to think about how to streamline the analysis as an exercise in coding. A simple script version of the tutorial we did with the explanatory text omitted can serve as a starting point.
* You are welcome to also do this all in a LiveScript if you prefer, but you will just have to write your own text to explain what you are presenting, as I am asking for things in a different order. You can also create a word/pdf document presenting your results.

You may use any other statistical program if you are not comfortable with learning Matlab.