**Time Series Analysis Problem Sets**

*Please type all answers. Provide your annotated code in-line with responses to all questions involving calculations. Provide all graphs and plots in a large enough size to be easily viewed.*

**PS 3 –Non-Stationarity, Unit Roots, Intervention Effects, VAR**

1. Generate a simulation of the difference equation where is the forcing process , is a white noise, and . Define the intervention variable as binary (0,1) but you may choose the start time of the intervention; assume the intervention lasts for 2 units of time.
   1. Calculate the impulse response function for with respect to . Plot the impulse response function over time.
   2. Calculate the initial and long-run effects of the intervention both theoretically and through the estimated coefficients of a model fit to the data.
   3. Does the intervention change the mean of the function in the long-run?
2. Generate data for the difference equation via simulation. Separately detrend and difference the simulated data. Plot both transformations.
   1. Which transformation is most appropriate for this difference equation? Explain your answer.
   2. What does the transformed data represent in each case? Use the realized values of the series used in the simulation to motivate your answer.
3. Download the file **stockmarket.dat** from Blackboard. This contains daily stock market index values for various markets from January 6, 1986 to December 31, 1997.
   1. Plot the London and New York time series and then test them for unit roots. Are these series stationary or non-stationary?
   2. Fit a VAR(1) model to the following series of equations where represents the London series and represents the New York series. Interpret the coefficients of the model.

* 1. Fit a VAR() model to the series using the R command **ar**. Compare the results against the VAR(1) model. If the order of VAR() differs from VAR(1) confirm that VAR() is indeed the better model fit by comparing the AIC values.
  2. Perform steps a) - c) above for either the pair of Amsterdam and Frankfurt or Hong Kong and Japan.