

THE UNIVERSITY OF CHICAGO
Graduate School of Business
Business 41914, Spring Quarter 2007, Mr. Ruey S. Tsay

Homework Assignment 1

Note:

- You may discuss problems with other students, but must hand in your OWN solutions.
 - You may use any software to do the empirical analysis even though I use SCA in the demonstration.
 - The assignment is due in one week once assigned.
1. The file “data1.txt” contains two columns. Each column contains a time series and has 400 observations.
 - Build a univariate ARIMA model for each time series.
 - Perform a test to identify the input variable, i.e. the exogenous variable. You may use 5 lags of the other (i.e., output) variable to perform the test.
 - Build a transfer function model for the data.
 - Re-estimate the ARIMA model for the output variable and the transfer function model using the first 350 data points. Use the last 50 data points for forecasting comparison. Conduct 50 1-step ahead forecasts in the forecasting subsample. Calculate the root mean squares of forecast errors for both models. Comment on the results of comparison.
 2. Consider the transfer function model

$$Y_t = (\beta_0 + \beta_1 B)X_t + N_t,$$

where N_t follows the model $(1 - B)N_t = (1 - \theta B)a_t$, where $|\theta| < 1$. Suppose further that X_t follows the model $(1 - \phi_1 B)X_t = (1 - \omega B)b_t$, where $\{b_t\}$ is independent of $\{a_t\}$ and $\phi_1 \neq \omega$. The two innovation series $\{a_t\}$ and $\{b_t\}$ are white noise with mean zero and unit variance. Let $Z_t = (X_t, Y_t)'$. Find a vector ARMA-type model for Z_t .