Time Series Analysis Y.D. Tu

2019 Spring

Homework #1

(Due Wednesday 27 March)

1. Explain how would you specify the order of AR/MA/ARMA model. Then run simulations to compare the performance of each method.

   (Tips: Take AR model as an example. You first simulate 200 observations from a given AR(1) model, then you try to specify an AR(p) model to the simulated data, with order p selected by the methods you considered. Repeat this procedure, say 200 times, and see how many times you will get the correct order under each method. This should give you a flavor of how each method performs.)

2. For the following three models:

   (1) $Z_t = a_t + 0.5a_{t-1}$,

   (2) $Z_t = a_t - 0.3a_{t-1} - 0.1a_{t-2}$,

   (3) $Z_t = 0.8Z_{t-1} + a_t$,

   Where $a_t \sim i.i.d.N(0,1)$ for all t.

   (a) Check if model (1) and model (2) are invertible.

   (b) Check if model (3) is stationary.

   (c) Compute the ACF and PACF for each series.

   (d) Obtain the 1-step ahead and 2-step head forecast for each series, and the corresponding forecast errors and their standard errors.

   Then simulate 100 observations from each series.

   (e) Plot each series and comment on their shapes.

   (f) Obtain the SACF and SPACF for each series, and compare with what you get in (c).

   (g) Produce forecast for each series for 10 periods.