Homework 7 – Maximum Likelihood Estimation + Forecasting

Due 2nd Mar 2007

Analytical Exercises

Greene Chapter 17: Exercises 2, 3, 4, 7, 8, 9 and 11.

EViews Exercise – There is none.

Matlab Exercises

1) **Forecasting Unemployment Rate** – Use the 1958:01 – 2006:12 unemployment rate data you have used before in HW5.

i) First, use the sample 1958:01 – 1995:12 to fit an AR(1) model $un_t = c + \phi un_{t-1} + e_t$.

Based on the estimates, forecast the unemployment rate in 1996:01. Next, use the sample 1958:01 – 1996:01 to fit the same AR(1) model, and then forecast the unemployment rate in 1996:02. Keep doing this until you have made the last forecast for 2006:12. For the forecasting period, calculate the **root mean squared error**

$RMSE = \sqrt{\frac{1}{n_f}\sum_{i=1}^{n_f}\left(un_i - un_i^f\right)^2}$, where un_i^f is your forecast, and n_f is the length of the forecasting period (in our case it is 120, the ten years of 1996:01-2006:12).

ii) Calculate the RMSE for the **random walk forecast** over the same forecasting period. The random walk forecast is simply "no change", i.e. your forecast for the unemployment rate in 1996:01 is the unemployment in 1995:12, and so on.

iii) Which forecasting method has a smaller RMSE? What does it mean to have a smaller RMSE?

2) **Maximum Likelihood Estimation** – This easy question teaches you how to do maximum likelihood in Matlab. Generate 1000 observations from the distribution $N\left(\mu,\sigma^2\right) = N\left(3,4\right)$. Using the generated sample, write a maximum likelihood procedure to estimate the parameters μ and σ^2 (i.e. you *minimize the negative of the log likelihood function* by choosing the parameters μ and σ^2). You know your program is

right when the estimates are close to the true values 3 and 4. [**Hint: Figure out how to use the "fminunc" command and write a "function m-file" in Matlab**].