Econ 510: Applied Econometrics for Macro
Assignment 4

State-Space Modelling

Due Date: In class, May 5, 2008

Question 1

I would like you to program for yourself computer code to do the following for a Gaussian linear state-space model:

- the filtered estimates of the states and their covariances (i.e. the Kalman filter)
- smoothed estimates of the states and state covariances
- the likelihood function of the state-space model

Question 2

Using the code you programmed in Question 1, estimate the following model for US industrial production (1975m1 to 2008m3)

\[ y_t = x_{1t} + x_{2t} \]
\[ x_{1t} = \delta + x_{1t-1} + \epsilon_{1t} \]
\[ x_{2t} = \phi_1 x_{2t-1} + \epsilon_{2t} + \theta_1 \epsilon_{2t-1} \]  \hspace{1cm} (1)

where \( \epsilon_{1t} \sim N(0, \sigma_1^2) \) and \( \epsilon_{2t} \sim N(0, \sigma_2^2) \).

Plot the filtered and smoothed estimates of \( x_{1t} \) and \( x_{2t} \) respectively.