ECONOMETRIC METHODS II: TIME SERIES

HOME WORK 1

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Instructions

Write up your results and submit electronically (preferably in pdf format) to knimark@crei.cat before 17.00 Thursday June 11 together with any MatLab code used in the exercise. You may work in groups of up to three people. Please list all names of persons in the group on the front page. To answer the questions, you will need to download the data file `HW1data.mat` from the course web page at http://www.kris-nimark.net/TS_UPF_2009.html .

Question 1: Finding the structural coefficient matrices 4pts

The data file `HW1data.mat` contains 101 quarters of fictional GDP growth rates (ΔGDP_t) and unemployment (U_t) collected in a (2×101) matrix of the form

$$\texttt{HW1data.mat} = \begin{bmatrix} \Delta GDP_0 & \Delta GDP_1 & \cdots & \Delta GDP_T \\ U_0 & U_1 & \cdots & U_T \end{bmatrix}$$

Both ΔGDP_t and U_t are demeaned and stationary. Find the structural form coefficient matrices A_0 and A_1 in

$$A_0 y_t = A_1 y_{t-1} + \mathbf{u}_t$$

where

$$\begin{aligned} y_t &= \begin{bmatrix} \Delta GDP_t \\ U_t \end{bmatrix} \\ \mathbf{u}_t &= \begin{bmatrix} u_t^s \\ u_t^d \end{bmatrix} \\ E\left[u_t u_t'\right] &= I \end{aligned}$$

by using Blanchard and Quah's (1989) identification scheme, i.e. that demand shocks u_t^d have no permanent effect on GDP *levels.* (Remember: $\Delta GDP_t \equiv GDP_t - GDP_{t-1}$)

Hint: The Cholesky decomposition decomposes *any* symmetric positive definite matrix S into the form $TT' \equiv S$ where T is lower triangular. If Σ is a covariance matrix, then for any B, the matrix $B\Sigma B'$ is symmetric and positive semi definite.

Date: June 5, 2009.

Question 2: Impulse response functions 2pts

a) Derive and plot the impulse response functions describing the effects of a unit shock to u_t^s and u_t^d on y_t. I.e. find

$$\frac{\partial \Delta GDP_{t+j}}{\partial u_t^i} \quad : \quad i = s, d \text{ and } j = 0, 1, 2, ..., 50.$$

$$\frac{\partial U_{t+j}}{\partial u_t^i} \quad : \quad i = s, d \text{ and } j = 0, 1, 2, ..., 50.$$

How does the plot(s) relate to the identifying assumption?

b) Derive and plot the impulse response functions describing the effects of a unit shock to u_t^s and u_t^d on the level of GDP, i.e. find

$$\frac{\partial GDP_{t+j}}{\partial u_t^i} : i = s, d \text{ and } j = 0, 1, 2, ..., 50.$$

How does the plot relate to the identifying assumption?

Question 3: Variance decompositions 2pts

Compute the fractions of the variances of ΔGDP_t and U_t attributable to u_t^s and u_t^d, respectively.

Question 4: Historical decompositions 2pts

Decompose the history of ΔGDP_t and U_t into the contributions of past u_t^s, u_t^d and initial conditions y_0. That is, decompose y_t for each $t = 1, 2, ...T$ into the three terms $a_t y_0$, $\Sigma_{j=0}^{t-1} b_j u_{t-j}^s$ and $\Sigma_{j=0}^{t-1} c_j u_{t-j}^d$ for $j = 1, 2, ...(t-1)$. (I.e. find the a, b and cs.) Plot the results. What is the value of $y_t - a_t y_0 - \Sigma_{j=0}^{t-1} b_j u_{t-j}^s - \Sigma_{j=0}^{t-1} c_j u_{t-j}^d$?