ECG752 - Time Series Econometrics - Spring 2009
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Computer Exercise 2

The data series for this assignment are the natural logarithms of seasonally adjusted quarterly consumption and income for the US from 1947 quarter 1 to 2007 quarter 4. The series can be downloaded from the course web page.

Let $x_t = [x_{1,t}, x_{2,t}]'$ and $x_{1,t}$ denote the natural logarithm of quarterly consumption, $x_{2,t}$ denote the natural logarithm of quarterly income and y_t denote its first difference, that is $y_t = x_t - x_{t-1} = [y_{1,t}, y_{2,t}]'$.

1. If you look at $x_{2,t}$, you will see that it grows over time. Perform an augmented Dickey-Fuller test to check if this behavior can be explained by a unit root (versus a time trend). In other words, perfrom a unit a unit root test allowing for a time trend. As for the "augmented" part, keep adding lags of $\Delta x_{2,t}$ until the residuals appear to be uncoreelated.

2. You believe that y_t can be modeled using a VAR(p) but you are unsure which is the best value for p out of the set $\mathcal{P} = \{1, 2, 3, 4\}$. Calculate and report $p = p_{AIC}$ and $p = p_{SBC}$, the estimated orders based on AIC and SBC with the set of possible orders equal to $\mathcal{P}$. Summarize the estimation results based on the VAR(p_{AIC}) and VAR(p_{SBC}).

For the remaining questions, assume that the right model for y_t is a VAR(3).

3. Suppose you wishes to assess whether $y_{2,t}$ Granger causes $y_{1,t}$. State the null and alternative hypotheses of the test of whether $y_{2,t}$ Granger causes $y_{1,t}$ in terms of VAR parameters. Does $y_{2,t}$ Granger cause $y_{1,t}$, using a 5% significance level?

4. Let a_t denote the innovation in the VAR model for y_t. Let us refer to a_t as the reduced-form shock/innovation. Denote the variance matrix of a_t by Σ_a, so that we can write $a_t = \Sigma_a^{1/2} u_t$ where $\Sigma_a^{1/2}$ is the cholesky decomposition of Σ_a. Let us refer to u_t as the structural shock/innovation.

   Compute and plot the impulse response function for

   (a) The impact of $a_{1,t}$ on $y_{2,t+k}$, $k = 0, 1, 2, \ldots, 20$.
   (b) The impact of $u_{1,t}$ on $y_{2,t+k}$, $k = 0, 1, 2, \ldots, 20$.

   Summarize the plots and comment on the number of quarters for which a perturbations affect the behavior of $y_{2,t}$.