Time Series Econometrcs,Spring 2011
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HOMEWORK ASSIGNMENT THREE

1. [4 points] **VAR**

Use dataset money_dem.xls (in money_dem.zip) which contains monthly data on real US GDP (RGDP), nominal GDP (GDP), the money supply M2 and 3M rate on US Treasury bills. Construct the following variables:

$$dlrgdp_t = log(RGDP_t) - log(RDGP_{t-1});$$

$$price_t = GDP_t/RGDP_{t-1};$$

$$dlrm2_t = log(M2_t/price_t) - log(M2_{t-1}/price_{t-1});$$

$$drs_t = tb3mo_t - tb3mo_{t-1}.$$

A) Which specification of VAR for lagged $dlrgdp, price, dlrm2, drs$ seems to perform better, the one with 12 lags or 8 lags?

(i) Estimate VAR with 12 lags of $dlrgdp, price, dlrm2, drs$ and with a constant.
(ii) Calculate the multivariate AIC and SBC.
(iii) Estimate VAR with 8 lags of $dlrgdp, price, dlrm2, drs$ and with a constant.
(iv) Calculate the multivariate AIC and SBC.
(v) Compute the statistic for the maximum likelihood test.
(vi) Which specification is preferred?

B) As an output of the VAR estimation you will get, among other things, the impulse response functions. Plot the impulse response functions for the VAR with 12 lags. Can you say what was the ordering for the Choleski decomposition? Using command VAR in TSP do not forget that the only exogenous variable is the constant. For the tests statistics you may want to use the following variables stored after each estimation: @nob (# of observations), @ncid (# of coefficients), @covu (var-cov of the residuals). You may also find command LOGDET(x) useful. It computes the logarithm of the matrix determinant.

Make sure you include computer code and printouts.

2. [2 points] **KALMAN FILTER**

The empirical assignment 2 is the same for people sharing assigned countries. Feel free to consult with students who have the same country but submit your own work. Include computer code and printouts.

Use the data for GDP and CPI for your country from previous homework assignments. Using appropriate stationary transformation of these series, estimate the Kalman filter described in Hamilton, Time Series Analysis, 1994, equations [13.1.29] and [13.1.30] for $n = 2$ and $\mu_1 = \mu_2 = 0$. Conduct the estimation in Eviews by defining an appropriate state-space object. In your printout, make sure you include your specification of this state-space object. Comment on the results - are inflation and GDP in your country driven by a common state or not?

3. [2 points] **KALMAN FILTER**

Write the following bilinear model in a state space form:

$$y_t = \phi y_{t-1} + \theta \epsilon_{t-1} + \beta \epsilon_{t-1} y_{t-1} + \epsilon_t, \quad t = 1, ..., T., \tag{1}$$

where $\epsilon_t \sim$ i.i.d. $N(0, \sigma^2)$ and ϕ, θ, and β are unknown parameters.

4. [2 points] **VAR**

Consider the following structural bivariate VAR system:

$$\begin{aligned} y_t &= b_{10} - b_{12} z_t + \gamma_{11} y_{t-1} + \gamma_{12} z_{t-1} + \epsilon_{yt} \\ z_t &= b_{20} - b_{21} y_t + \gamma_{21} y_{t-1} + \gamma_{22} z_{t-1} + \epsilon_{zt} \end{aligned} \tag{2}$$

The system can be re-written in reduced form:

$$\begin{aligned} y_t &= a_{10} + a_{11} y_{t-1} + a_{12} z_{t-1} + e_{1t} \\ z_t &= a_{20} + a_{21} y_{t-1} + a_{22} z_{t-1} + e_{2t} \end{aligned} \tag{3}$$

Using parameters $b_{..}$ (i.e. solve for e_{1t} and e_{2t} in terms of these), illustrate that this system is not identified. Select reasonable identification conditions and get e_{1t} and e_{2t} assuming that $Var(e_1) = 0.75$, $Var(e_2) = 0.5$, and $Cov(e_{1t}, e_{2t}) = 0.25$.