Homework 8: DSGE and Determinancy

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1. This homework is based on Smets-Wouter (2007 AER). You can download the program from the course webpage.

   (a) Read the paper and replicate a few of the results to convince yourselves that the program is working. Briefly present and discuss the couple of results you replicated.
   For the following exercise, use the baseline estimated parameters from Smets-Wouters.

   (b) Calculate the impulse response functions of the main variables to news about a monetary policy shock that is announced two quarters in advance. That is, determine the effect of a shock to the Taylor rule, where the shock that is realized at time $t+2$ is known at time t. Assume also that in quarters t and $t+1$, the Fed keeps interest rates constant. Compare and contrast your results to those of an unanticipated monetary policy shock that hits at time $t+2$.Be sure to discuss both the responses of endogenous variables to the news and the responses when interest rates actually change.

2. Consider the following two equation model of the private sector

$$x_t = E_t[x_{t+1}] - \tau(R_t - E_t[\pi_{t+1}] + g_t)$$
$$\pi_t = \beta E_t[\pi_{t+1}] + \kappa(x_t - z_t)$$

   Let the shocks g_t and z_t be given by the autoregressive processes

$$g_t = \rho_g g_{t-1} + \epsilon_{g,t} \qquad z_t = \rho_z z_{t-1} + \epsilon_{z,t}$$

   where $\epsilon_{g,t}$ and $\epsilon_{z,t}$ are independent normally distributed white noise processes. Consider the following three interest rate rules:

   (a) Contemporaneous Taylor Rule

$$R_t = \rho_R R_{t-1} + (1-\rho_R)(\psi_1 \pi_t + \psi_2[x_t - z_t]) + \epsilon_{R,t}$$

   (b) Future Taylor Rule

$$R_t = \rho_R R_{t-1} + (1-\rho_R)(\psi_1 E_t[\pi_{t+1}] + \psi_2 E_t[x_{t+1} - z_{t+1}]) + \epsilon_{R,t}$$

   (c) Lagged Taylor Rule

$$R_t = \rho_R R_{t-1} + (1-\rho_R)(\psi_1 \pi_{t-1} + \psi_2[x_{t-1} + z_{t-1}]) + \epsilon_{R,t}$$

   Choose the parameter values $\kappa = 0.75, \tau = 0.5, \rho_g = 0.8, \rho_z = 0.7, \beta = 0.975, \rho_R = 0.5, \psi_2 = 0.25$. For each of the three rules calculate if the model is determinate or indeterminate for values of ψ_1 equal to 0.5, 0.75, 1, 1.25 and 1.75. In each case nd the generalized eigenvalues of the system.

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