Seminar3 - ECON 4325 Monetary Policy

March 16/18, 2016

Seminar presentations

• Veronica (Wednesday) and Kristin (Friday): The ECB decision from 10 March
• Alizamin (Wednesday) and Eirik (Friday): The Fed decision from 27 January

Seminar problem 1

Consider the basic New Keynesian Model:

$$\pi_t = \beta E_t \pi_{t+1} + \kappa \widetilde{y}_t, \tag{1}$$

$$\widetilde{y}_t = E_t \widetilde{y}_{t+1} - \left(i_t - E_t \pi_{t+1} - r_t^{natural}\right), \tag{2}$$

where we let monetary policy be given by the following interest rate rule:

$$i_t = \rho + \phi_\pi \pi_t + \nu_t \tag{3}$$

and where the natural interest rate is given like on lecture slide 33, lecture 5:

$$r_t^{natural} = \rho + (1 - \rho_z) z_t + \sigma \psi_{ya}^{natural} E_t\{\Delta a_{t+1}\} \tag{4}$$

The disturbances are $AR(1)$, that is, $\nu_t = \rho_\nu \nu_{t-1} + \varepsilon_t^\nu$, and $z_t = \rho_z z_{t-1} + \varepsilon_t^z$, and $a_t = \rho_a a_{t-1} + \varepsilon_t^a$ where ε_t^ν and ε_t^a are white noise terms. With no preference shocks or technology shocks in the economy: $r_t^{natural} = \rho$.

(a) Show that the equation system can be written as:

$$\left[\begin{array}{c}\pi_t\\ \widetilde{y}_t\end{array}\right] = AE_t\left[\begin{array}{c}\pi_{t+1}\\ \widetilde{y}_{t+1}\end{array}\right] + C\left[\hat{r}_t^{natural} - \nu_t\right], \tag{5}$$

where

$$\begin{aligned} A &= \left[\begin{array}{cc}\Gamma(\kappa+\beta) & \Gamma\kappa\\ \Gamma(1-\beta\phi_\pi) & \Gamma\end{array}\right],\\ C &= \left[\begin{array}{c}\Gamma\kappa\\ \Gamma\end{array}\right],\end{aligned}$$

and $\hat{r}_t^{natural} = r_t^{natural} - \rho$, $\Gamma = \frac{1}{1+\kappa\phi_\pi}$.

(b) For which values of ϕ_π will this system have a unique solution?

(Hint: From lecture 7 we know that this is when the Blanchard-Kahn conditions are satisfied, i.e. when both eigenvalues of the matrix A lie within the unit circle. The eigenvalues of matrix A can be found by solving $|A-\lambda I| = 0$ for λ where $|A-\lambda I|$ is the determinant of $A-\lambda I$ and I is the identity matrix. Solving for λ will give a second order equation of the form $a\lambda^2 + b\lambda + c = 0$ and the two solutions for λ will then be the eigenvalues. The necessary and sufficient conditions for ensuring that both eigenvalues lie within the unit circle is that the absolute value of c is smaller than 1 and the absolute value of b is smaller than $1 + c$. You can read more about eigenvalues used for our purpose in appendix A in Mitra and Bullard (2002), found under *supplementary reading* on the reading list)

(c) What is the effect of a monetary policy shock on equilibrium inflation and the output gap (You can assume $a_t = z_t = 0$ at this point)? The solution will take the form:

$$\left[\begin{array}{c}\pi_t\\ \widetilde{y}_t\end{array}\right] = \Psi\nu_t, \tag{6}$$

where

$$\Psi = \left[\begin{array}{c}\psi_1\\ \psi_2\end{array}\right].$$

Show that:

$$\begin{bmatrix} \psi_1 \\ \psi_2 \end{bmatrix} = \begin{bmatrix} -\Gamma d\kappa \\ -\Gamma d\left(1-\beta\rho_\nu\right) \end{bmatrix},$$

where

$$d = \frac{1}{1-\Gamma\rho_\nu\left(1+\kappa+\beta\left(1-\rho_\nu\right)\right)}.$$

Hint: Use the method of undetermined coefficients.

Seminar problem 2

Use the solution above to characterize the monetary policy transmission mechanism (impulse responses from a monetary policy shock). We let the parameters be:

β	κ	ϕ_π	ρ_ν
0.99	0.1	1.5	0.5

How does the transmission mechanism depend on the parameter κ? In particular, what happens if κ increases to 0.2?

Make use of the excel sheet and give a thorough explanation of the impulse responses of inflation, output gap and the nominal interest rate from a monetary policy shock (for both values of κ).

NB: The excel sheet has some yellow cells with hints (and formulas) on how to calculate the impulse responses.

Seminar problem 3

Let us instead consider a shock to demand, call it e_t. In order to isolate the effect of such a shock, lets assume for now that $\nu_t = z_t = a_t = 0$, i.e. no shocks to monetary policy or technology. In this case the DIS equation becomes:

$$\widetilde{y}_t = E_t\widetilde{y}_{t+1} - \left(i_t - E_t\pi_{t+1} - r_t^{natural}\right) + e_t, \tag{7}$$

and we let $e_t = \rho_e e_{t-1} + \varepsilon_t^e$.

(a) Compute the dynamic effects of a shock to demand (let $\rho_e = 0.8$).

(b) What happens to the output gap when ϕ_π increases from 1.5 to 3?

Hint: You do not need to compute everything again (although this is good practice for later). The solution will be similar to the one in exercise (1.b) as long as you make sure to:

- Change the sign of the parameters ψ_1 and ψ_2 (since the demand shock enters the IS equation with a positive sign, while the monetary policy shock enters with a negative sign)
- Change the AR-coefficients.