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Assignment 8

Tutorial on Optimal Monetary Policy in the Rotemberg Sticky Price Model

Consider the Rotemberg model in the lecture notes on optimal monetary policy. For questions 1-3, work with the Dynare mod file, model.mod. This program is incomplete, and requires that you type in the model equations from the lecture handout (a model file that will produce the answers to questions 1-3 is modans123.mod; a model file that addresses question 4 is modelin.mod and modelin_out.mod).

1. Enter the equilibrium conditions of the Rotemberg model into Dynare, including the following monetary policy rule:

$$R_t = \frac{\pi^{t\arg et}}{\beta} - 1 + \alpha\left(\pi_{t+1} - \pi^{t\arg et}\right),$$

where $\pi^{t\arg et}$ is a parameter set by the monetary authorities. Set the parameters as follows:

$$\begin{aligned} 3b2 &= 0.99,\ 3b5 = 5,\ 3c6 = 100,\ 3c1 = 0.9,\ 3b1 = 1.5, \\ 1 + 3bd &= 3b5/(3b5 - 1),\ 3c7 = 1,\ \pi^{t\arg et} = 1. \end{aligned}$$

Do a linear approximation on the model, instead of a log linear approximation. Compute the impulse response to a one standard deviation technology shock, when that standard deviation is 0.01 (i.e., 1 percent). In computing the impulse response functions, display the percent deviation of consumption and hours worked from their steady state, display the actual net inflation rate in annual terms (i.e., multiply by four), the actual net nominal rate of interest in annual terms, and the actual net real rate of interest.

2. In this model, the 'natural' allocations have the property that hours worked do not respond to a technology shock. In the equilibrium, hours worked do respond. What is the intuition? Consider an alternative formulation of the model for technology:

$$\log(A_t) = 1.85\log(A_{t-1}) - 0.855\log(A_{t-2}) + \varepsilon_t.$$

Note how with this model, an innovation in $logA_t$ creates the expectation of an even larger jump in $\log A_{t+1}$. Note how different the response of hours worked to a technology shock is relative to question 1.

3. Compute the natural rate of interest for this model, as defined in example 5 of the notes on solving models. Plot that along with the real equilibrium interest rate. Do the results allow you to see why it is that in question 2 hours worked rises too much in response to a technology shock?

4. Follow the instructions in the readme.m file, to prepare the model for computing the optimal policy (key steps: split out the economically endogenous and economically exogenous variables; include Util and Welf in the model statement; include the comment line // Monetary Policy Rule just before the monetary policy rule; set infilename and outfilename at the MATLAB command prompt; run Andy Levin's code, get_Ramsey; combine all the var statements in the outfile; set up the steady state calculations).

    1. Have a look at the first order conditions produced by get_ramsey. Have they been correctly computed?
    2. Solve the model with the parameters in question 1 and verify that the multipliers on the intertemporal Euler equation and the pricing equation are zero, as conjectured in the lecture notes. Explain that we now have time consistency.
    3. Now, set the tax subsidy to zero and re-solve the model. What happens to the multipliers? Explain that now the Ramsey plan is not time consistent. Do the Ramsey allocations look like the 'natural' allocations?