

Problem Set 2

February 22, 2010

Question 1

Use the same utility function incorporating a labor choice as described in problem set 1 to modify the stochastic growth model outlined in Handout 4. Let the production function take the form $y_t = k_t^\alpha (z_t L_t)^{1-\alpha}$.

Derive a set of necessary conditions for an equilibrium and express them in terms of stationary variables.

Set the parameter χ_0 such that the steady state value of labor is 1/3. Set all other parameters as described in Handout 4, except the parameters governing the shock processes. If you need to choose additional parameters, just spell out your assumptions.

Using Dynare, compare the responses of key variables in the model to an innovation that raises the level of z_t by 1 percent permanently against the responses to an innovation that raises the level of q_t so as to match the long-run increase in output.

Question 2

Consider the model described in Handout 5 and its implementation in Dynare. Modify the model to incorporate Rotemberg-type contracts for intermediate firms. Accordingly, the profit maximization problem for intermediate firms (using the notation in the handout) becomes:

$$\max_{P_t(f)} E_t \sum_{j=0}^{\infty} \psi_{t+j+1, t+j} (P_{t+j}(f)(1 + \tau_p) - \Sigma_{t+j}) Y_{t+j}(f)(1 - \phi_{t+j}(f)),$$

subject to the demand schedule $Y_t(f) = \left(\frac{P_t(f)}{P_t}\right)^{-\frac{1+\theta_p}{\theta_p}} Y_t$. The adjustment cost function ϕ_t is

given by:

$$\phi_t = \frac{\phi_1}{2} \left(\frac{P_t(f)}{\pi P_{t-1}(f)} - 1 \right)^2$$

After log-linearizing the first order condition for $P_t(f)$ in the profit maximization problem above, compare it against the corresponding first-order condition in Handout 5 obtained using Calvo-type contracts. How should we set ϕ_1 to ensure the first-order condition from the profit maximization problem above is first-order equivalent to the one for Calvo-type contracts?

Question 3

Set $\xi_w = 0.0001$, so that the wage rigidity is negligible. Set ϕ_1 to ensure first-order equivalence with Calvo contracts for intermediate prices with $\xi_p = 0.75$. Leave all the other model parameters unchanged from relative to the model file for Handout 5. Confirm that the model responses to a technology shock line up whether you use Calvo or Rotemberg contracts.