Econ 6356
Granados

Small Open Economy RBC

1 Outline

This handout explains how to solve Mendoza (1991) open economy RBC model using Dynare (perturbation method). You will be able to investigate the effect of different calibrations of the parameters ρ and ϕ, governing persistence of the exogenous technology shock and adjustment costs respectively, on the trade balancce.

2 The model

The model describes a small open economy populated by a representative household with preferences defined over consumption c_t and hours worked h_t according to

$$U(c_t, h_t) = \mathbb{E}_0 \left[\sum_{t=0}^{\infty} \beta^t \frac{\left(c_t - \frac{h_t^\omega}{\omega}\right)^{1-\sigma}}{1-\sigma} \right]$$

where $\beta \in (0,1)$, $\sigma > 0$, and $\omega > 1$. The representative household directly carries out production, and can borrow and lend in international financial markets at the net interest rate r_t. Let d_t denotes the stock of net foreign liabilities. The budget constraint is

$$c_t + k_t + \frac{\phi}{2}(k_t - k_{t-1})^2 - d_t = A_t k_{t-1}^\alpha h_t^{1-\alpha} + (1-\delta)k_{t-1} - (1 + r_{t-1})d_{t-1}$$

where k_t is capital, $\phi > 0$ is an adjustment cost parameter, At is total factor productivity, $\alpha \in (0,1)$ is the capital share, and $\delta \in (0,1)$ is the depreciation rate.

Productivity follows a first-order autoregressive process in logs

$$\ln A_t = \rho \ln A_{t-1} + \epsilon_t$$

where $\rho \in (0,1)$ and $\epsilon_t \sim N(0, \eta^2)$.

Finally, the interest rate the country faces equals the constant world interest rate $r^* > 0$ plus a premium increasing in the deviation of the stock of net foreign liabilities above its steady state value

$$r_t = r^* + \psi(\exp(d_t - \bar{d}) - 1)$$

where $\psi > 0$ and $\bar{d}$ denotes the steady state net foreign liabilities (to be treated as a parameter). The representative household does not internalize the consequences of its borrowing decisions on the interest rate

3 Equilibrium Conditions

After solving the optimization problem of the household, the model is summarized by the following system of equations

$$\left(c_t - \frac{h_t^{\omega}}{\omega}\right)^{-\sigma} = \lambda_t \tag{1}$$

$$\lambda_t = \beta(1+r)\lambda_{t+1} \tag{2}$$

$$\left(c_t - \frac{h_t^{\omega}}{\omega}\right)^{-\sigma} h_t^{\omega-1} = \lambda_t(1-\alpha)A_t\left(\frac{k_{t-1}}{h_t}\right)^{\alpha} \tag{3}$$

$$\lambda_t(1+\phi(k_t-k_{t-1})) = \beta\lambda_{t+1}\left(\alpha A_{t+1}(k_t/h_{t+1})^{\alpha-1} + 1 - \delta + \phi(k_t - k_{t-1})\right) \tag{4}$$

$$c_t + k_t + \frac{\phi}{2}(k_t - k_{t-1})^2 - d_t = A_t k_{t-1}^{\alpha} h_t^{1-\alpha} + (1-\delta)k_{t-1} - (1+r_{t-1})d_{t-1} \tag{5}$$

$$i_t = k_t - (1-\delta)k_{t-1} \tag{6}$$

$$nx_t = y_t - c_t - i_t - \frac{\phi}{2}(k_t - k_{t-1})^2 \tag{7}$$

$$y_t = A_t k_{t-1}^{\alpha} h_t^{1-\alpha} \tag{8}$$

$$\ln A_t = \rho \ln A_{t-1} + \epsilon_t \tag{9}$$

$$r_t = r^* + \psi(\exp(d_t - \bar{d}) - 1) \tag{10}$$

4 Exercise

We will solve different versions of the programs where we are changing the parameters and re-running the IRFs. Two files have been provided:

- main_mendoza.m is the main file;
- mend91.mod is the Dynare file solving the model ;

To run the solution:

1. run main_mendoza.m, notice it runs the Dynare code several times, in each case after changing parameters in the model;

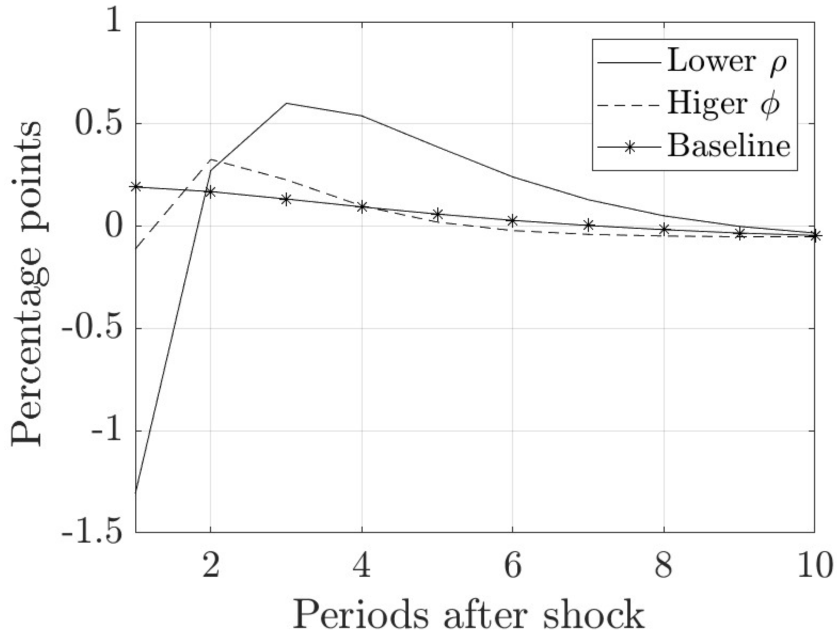

Figure 1: Robustness of nx/y behavior to different calibrations of ρ and ϕ.

2. Plot the resulting IRFs and compare the results.