International Macroeconomics and Finance

Problem Set 5

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Instructions:[1]

Assume a small open economy inhabited by four agents: a continuum of ex-ante identical households, a continuum of identical firms, a fiscal authority and a central bank. The economy produces one good that is traded freely in the economy. We assume the economy trades only bonds denominated in units of home goods.

Households The economy is inhabited by a continuum of identical infinitely-living households indexed by i. The lifetime utility a household i is:

$$\sum_{t=0}^{\infty} \beta^t log\left(C_t - \frac{(L_{i,t})^{1+\eta}}{1+\eta)}\right) \tag{1}$$

where

$$C_t \equiv (C_{i,t}^H)^{\alpha_H}(C_{i,t}^F)^{1-\alpha_H} \tag{2}$$

where $\beta \in (0,1)$ is the subjective discount factor and $C_t^{i,H}$ and $C_t^{i,F}$ are the consumption of household i of Home and Foreign goods, respectively. We define $L_{i,t}$ as the labour of households in the country i and $B_{i,t}^{US}$ as the bonds held by households in the country i denominated in US goods. The price of the consumption basket is:

$$P_t = \left(\frac{P_t^H}{\alpha^H}\right)^{\alpha_H}\left(\frac{P_t^F}{1-\alpha^H}\right)^{1-\alpha_H} \tag{3}$$

Households are subject to the following budget constraints:

$$P_t C_t = P_t^H C_{i,t}^H + P_t^F C_{i,t}^F = (1-\tau_t)W_t s_{i,t} L_{i,t} + P_t^H B_{i,t}^H R_t - P_t^H B_{i,t+1}^H. \tag{4}$$

where $P_{i,t}^H$ and $P_{i,t}^{Ch}$ are the prices of Home and Foreign goods denominated in Home-country currency and $W_{i,t}$ is the nominal wage denominated in Home-country currency. Finally, τ_t is the tax on labour

[1] We thank Andrea Ferrero for sharing his course material.

income denominated in Home-country currency. Households' labor productivity $\{s_t\}_{t=0}^{\infty}$ is stochastic and is characterized by an N-state Markov chain that can take on values $s_t \in S = \{s_1, \dots s_N\}$ with transition probability given by $\gamma(s_{t+1}|s_t)$ and $\int s = 1$. Households are subject to the following borrowing constraint:

$$B_{i,t+1} \geq -\kappa \tag{5}$$

Firms There is a continuum of firms that produce under perfect competition using the following linear technology:

$$Y_t = L_t. \tag{6}$$

where Y_t is the output and $L_t = \int_0^1 s_{i,t} L_{i,t} di$ is the aggregate labour. [2] Firms' profits are:

$$P_t^H Y_t - W_t L_t. \tag{7}$$

Central Bank, Fiscal Policy and Equilibrium Condition Assume that the central bank targets the inflation of the Home goods:

$$\frac{P_t^H}{P_{t-1}^H} = 1. \tag{8}$$

The fiscal authority consumes Home goods, G_t^H, and issues bonds $B_{g,t}^H$ in units of H goods. Finally, the fiscal authority charges a tax on labour income, τ. The fiscal authority budget constraint is:

$$G_t^H + B_{G,t+1}^H = \tau_t Y_t + B_{G,t}^H R_t. \tag{9}$$

Assumptions

- Assume that there is no home bias.

1. Write down the first order condition for the households' and firms' problems. (20 points)
2. Describe the conditions needed to close the model (*Hint: Foreign demand of Home goods and Foreign production of Foreign goods for example* Add these conditions to the model.
3. Focus on the steady state and calibrate the model to match the US economy. Use US data to calibrate the household productivity process as well. Describe your calibration. (20 points)
4. Assume that the US does not trade bonds with the rest of the world:

$$B_G^H + \int_0^1 B_i^H di = 0. \tag{10}$$

[2] We already implement the equilibrium condition that labour demand equals labour supply.

Find the steady state and the equilibrium real interest rate. Plot the policy functions for consumption and savings and the wealth distribution. We call this case the benchmark. (20 points)

5. Assume that there is an increase in the savings of the rest of the world

$$B_G^H + \int_0^1 B_i^H di < 0. \tag{11}$$

Assume that the fiscal authority debt is at one of the point 4. Assume that fiscal authority moves taxes to satisfy her budget constraint. What happens to the real interest rate and the terms of trade? What happens to the policy functions? Describe which households are gaining and losing from this inflow of resources (You need to compare this economy with the benchmark). (20 points)

6. Repeat point 5. However, assume that the fiscal authority moves public spending instead of taxation. (20 points)