

**Assignment 2**  
**International Macroeconomics**  
**Fall 2007**  
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**Due October 1**

Consider the economy with rule-of-thumb consumers of Galí et al. (2007) as presented in the technical handout posted on the course website. Focus first on the case of a perfectly competitive labor market.

1. Define the average gross markup as

$$\mu_t = \int_0^1 \frac{P_{it}}{P_t m c_{it}} di$$

Derive a recursive representation of  $\mu_t$  valid in the symmetric equilibrium in terms of  $m c_t$ ,  $p_t^*$ , and  $\pi_t$ .

2. Calibrate the model using the baseline parameterization of Galí et al. (2007). Compute the steady-state value of all variables in the model, including  $\mu_t$ .
3. Compute a log-linear approximation to the equilibrium conditions of the model. Let  $x_t$  denote the vector of (endogenous and exogenous states) and  $x_t = h_x x_{t-1} + \eta \epsilon_t$  its law of motion up to first order. Report the eigenvalues of the matrix  $h_x$ .
4. Compute the impulse response functions to a unit innovation in government spending of  $y_t$ ,  $c_t$ ,  $c_{rt}$ ,  $c_{ot}$ ,  $\mu_t$ ,  $R_t$ ,  $\pi_t$ ,  $i_t$ ,  $h_t$ . Make a plot of this impulse responses with 9 subplots organized in 3 rows and 3 columns. Provide interpretation.
5. Set  $\gamma \rightarrow 0$  and plot impulse response functions. Comment.
6. Now compute impulse response functions in the case  $\theta \rightarrow 0$  and  $\gamma \rightarrow 0$ . Comment.
7. Now introduce imperfect competition in labor markets as in Galí et al. (2007). In obtaining the new set of equilibrium conditions, what equations must be eliminated from the system defining an equilibrium in the economy with perfect competition in labor markets and what equation must be added to this system?
8. Recalibrate  $\tau_o$  and  $\tau_r$  to ensure that  $c_r = c_o$ . Set all other parameters at their baseline values. Answer items 2-6 for the case of imperfect competition in the labor market. Comment.
9. Suppose now that government spending Shocks are anticipated. Specifically, assume the following law of motion for  $g_t$ :

$$\frac{g_t - g}{y} = \rho_g \left( \frac{g_{t-1} - g}{y} \right) + \epsilon_{t-1}^g,$$

where  $\epsilon_t^g$  is an i.i.d. white noise. Assume that the labor market is imperfectly competitive and adopt the baseline calibration. Answer item 4 and compare your results to those obtained under unanticipated shocks. Provide interpretation.

10. Finally, calibrate  $\tau_o$  and  $\tau_r$  so that tax payments over personal income is the same across the two groups of consumers in the steady states. Answer item 4 under this setup. Comment.