Econ 411-3 Problem Set 3

Due Thursday, May 23[1]

Problem 1: balanced-budget multiplier in HA model for different incidence of taxes. Start with the calibration that we used for fiscal policy in lecture 8 (you can see this in `econ411_3_lecture8_figures.ipynb`). We've assumed that taxes reduce everyone's after-tax income proportionally, both in steady state and at the margin.

Now assume that, *only at the margin*, changes in taxes work differently. In particular, suppose that when there is some change in tax revenue dT_t at date t, that this:

(a) is assessed on all households in a lump-sum way, or

(b) is only assessed on the household type with the highest productivity

Assumptions (a) and (b) should each imply a different $\mathbf{M}^T$ matrix that appears in a modified intertemporal Keynesian cross $d\mathbf{Y} = d\mathbf{G} - \mathbf{M}^T d\mathbf{T} + \mathbf{M} d\mathbf{Y}$. In each case, calculate this matrix[2], and then solve for the impulse response $d\mathbf{Y}$ to a "balanced-budget" government spending shock that is given by $dG_t = dT_t = \rho^t$, where $\rho = 0.9$.

How does the response of output differ in each case compared to our balanced-budget benchmark, which was that (for the standard IKC where $\mathbf{M}^T = \mathbf{M}$) the multiplier is exactly 1? What do you think is the reason for this difference?

Problem 2: monetary policy with delayed overreaction. Suppose that we live in a world with sticky expectations, where after the arrival of the MIT shock at date 0, households only are visited by the Calvo "updating expectations" fairy with iid probability $1 - \theta$ each period—so that the probability that a household has updated its expectations to reflect the shock at date t is $1 - \theta^{t+1}$.

So far, this is the same as our "sticky expectations" example from class. Now add the following twist: once the Calvo fairy visits them, households don't adopt rational expectations, but instead *overreact*, believing that all future variables will deviate from steady state by some factor $\lambda > 1$ more than they actually will.

(a) What does the $\mathbf{E}$ matrix look like for this specification of expectations, for arbitrary θ and λ? (We continue to assume that households have full knowledge of current and past variables, so that the lower triangle of $\mathbf{E}$ is all 1s.)

(b) Now consider the same calibration we used in lecture 9, again with $\theta = 0.8$, but now also with $\lambda = 1.2$. What does the output response to a "forward guidance" shock that cuts the real interest rate at date 20 look like, and how does it compare to the FIRE ($\theta = 0$) and the ordinary sticky expectations ($\lambda = 1$) cases?

[1] You can work in groups of up to four; you only have to submit once per group, but remember to list all members of the group when submitting. Please email solutions to Jose Lara (`joselara@u.northwestern.edu`), including whatever code you used to produce them. You may want to do much or all of the problem set in the form of a Jupyter notebook. For this problem set, you are free to reuse any code that has been posted for the lectures on Canvas as part of your solution.

[2] To figure out how to do this, you'll probably need to take a look at how the `jacobian()` function in `sim_fake_news.py` is called.