Project 2: The Effects of Government Spending and Taxes
Due Thursday May 11, 11:59 pm

1. **Distortionary taxation.** Use the Dynare program you worked on in class to simulate the effects of financing government spending under the following three scenarios:

   A. Lump Sum Taxes
   B. Current labor taxes
   C. Current capital taxes

   The household's budget constraint is given by:

   $$c_t \;+\; k_{t+1} - (1-\delta)k_t = (1 - \tau_{nt})n_t w_t \;\;+\;\; (1 - \tau_{kt})r_t k_t \;\;+\; \delta\tau_{kt}k_t \;\;- \varphi_t$$

   where τ_n is the tax on labor income, τ_k is the tax on capital income, and φ is lump-sum taxation.

   Start with a calibration in which government spending is around 20% of GDP. Assume that labor and capital income tax rates are each 0.05, with the rest of spending financed by lump-sum taxes.

   Study the effect of a shock to government purchases ($\varepsilon = 0.01$), where government spending follows the AR(1) process with $\rho = 0.95$.

   Compare the impulse responses of output, labor, and capital for three alternative financing mechanisms and discuss the economic intuition for the differences.

   A. The increase in government spending is financed by lump-sum taxes.
   B. The increase in government spending is financed by raising labor taxes.
   C. The increase in government spending is financed by raising capital taxes.

2. **Anticipations.** Using the model from equation (1) where increases in government spending are financed by lump-sum taxes, simulate the effect of an increase in government spending (with the same AR(1) structure), but announced three quarters in advanced. Show the graphs of government spending and output and briefly explain why output behaves as it does.

3. **Public infrastructure and taxes.** In this exercise, you are going to examine the effects of a permanent increase in public infrastructure, financed by various alternative methods.

Use the Dynare program you worked on in class as a starting point for this exercise. You need to add the following elements:

- Public capital, as in equation (3) of Baxter-King.
- Public capital accumulation, as in equation (5) of Baxter-King

For simplicity, assume that all government purchases are used for investment in public capital, i.e., in Baxter-King notation, $G_t = I_t^G$. Unless otherwise specified, use Baxter-King's model and calibration.

A. Suppose that $\frac{I_t^G}{Y} = 0.05$ initially, as in the Baxter-King benchmark, and that government spending is financed with lump-sum taxation. Solve for the steady-state values of output, private capital, public capital, etc.

B. Suppose that the government raises I_t^G so that $\frac{I_t^G}{Y} = 0.055$. Solve for the new steady-state values of output, private capital, public capital, etc.

C. What is the long-run multiplier on this type of government spending?

D. Use Dynare with the "simul" command to study the transition between the old and new steady states. Note that because the steady-state has changed, you also need "endval" in addition to "initival." (See particularly the discussion on page 25 in http://www.dynare.org/documentation-and-support/manual/pdf-version/at_download/file .) Show plots of the key variables and discuss the economics behind the results.

E. Suppose that Country U of your model convinces Country M to pay for its rise in infrastructure investment. Discuss how the hours response changes and why. (You do not need to simulate the model to answer this part of the question, though you are free to do so if you want.)