Introduction to Modern Macroeconomics I Problem Set 8: Fiscal Policy in the RBC Model

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1 Theory of Fiscal Policy in the RBC Model

This problem set studies fiscal policy in the framework of the RBC model. Instead of assuming that taxes are all lump sum, now allow for *distortionary tax* rates on capital and labor income, τ_t^k and τ_t^n. By distortionary tax, we mean tax scheme that distorts the optimal decision of agents. In the setup with lump sum and distortionary taxes, the tax rates will show up in the equilibrium conditions, but debt will not show up again.

1.1 Ricardian Equivalence

The fact that neither debt nor taxes show up anywhere in the equilibrium conditions means that the mix between debt and taxes is both (i) indeterminate and (ii) irrelevant. This result is called Ricardian Equivalence. Ricardian Equivalence states that the manner of government finance (the mix between taxes and bonds) is irrelevant for understanding the equilibrium effects of changes in government spending. It does not say that changes in government spending have no economic effects (as we will see in a minute, they do), it simply says that the manner in which they re financed is irrelevant to the equilibrium behavior in the model. This requires that taxes are lump sum and that households are forward-looking and are not subject to any liquidity constraints. Derive the intertemporal budget constraints for both the government and household combined with the Transversality/no-ponzi conditions. That is to show that

$$\sum_{i=0}^{\infty}(\frac{1}{1+r})^i G_{t+i} = \sum_{i=0}^{\infty}(\frac{1}{1+r})^i T_{t+i} \tag{1}$$

First interpret this result and then explain why under these conditions the manner of government finance is irrelevant for understanding the equilibrium effects of changes in government spending.

1.2 Tax Shocks, lump sum Finance

We assume that the government now can finance its spending decisions via issuing debt, lump sum taxes, as well as distortionary tax rates on both labor, τ_t^n, and capital income, τ_t^k, on households.

1. Write down the HH budget constraint for this problem.
2. Write down the HH problem.

3. Form the Lagrangian.

4. Write down the FOCs.

5. Form the Euler equation and the labor supply optimality condition.

6. Write down the government budget constraint for this problem.(hint: in this setup $D_t = B_t$. Since $\Pi_t = Y_t - w_t N_t - R_t K_t$, so $Y_t = C_t + I_t + G_t$)

2 Quantitative Analysis

2.1 Lump-Sum Taxes

In this part you have to simulate the model based only on lump sum tax, which have been discussed in the class, in order to derive the impulse response functions. For the RBC model that we have introduced consider these parameters:

$$\begin{array}{llll} \alpha = 1/3 & \beta = 0.99 & \chi = 1 & \delta = 0.025 \\ \theta = 4 & \rho_a = 0.97 & \rho_g = 0.95 & \omega = 0.2 \end{array}$$

Now, consider three different values for $\rho_g = [0.7, 0.99, 0.95]$ and draw IRF's for each on a graph in order to compare them. Explain how changing this parameters, changes the effect of mechanisms in play.

2.2 Distortionary Taxes

Assume that both G_t and A_t follow same log AR(1) process as model discussed in class. Also, assume that the tax rates obey stationary AR(1) processes with shocks, with tax rates without a time subscript denoting exogenous steady state values:

$$\tau_t^k = (1 - \rho_k)\,\tau^k + \rho_k \tau_{t-1}^k + \epsilon_{k,t} \tag{2}$$
$$\tau_t^n = (1 - \rho_n)\,\tau^n + \rho_n \tau_{t-1}^n + \epsilon_{n,t} \tag{3}$$

Use Dynare to derive impulse responses to shocks using the parameterization from the above, and assume that $\rho_n = \rho_k = 0.90$. I also assume that the standard deviations of the two tax shocks are 0.01. I assume that the steady state labor income tax is 0.2 and the steady state capital tax is 0.1