Economics 8861.01
Project 3
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Ramsey Optimal Fiscal Policy

As per Ramsey (1927) and the ensuing DSGE macro-Ramsey fiscal policy literature that began in the 1980's, the government has exogenous government spending that has to be financed using state-contingent real government debt and linear income taxes on labor income and capital income – lump-sum taxes are assumed to be unavailable.

The functional forms for period-t utility and period-t production of goods are $u(c_t, n_t) = \ln c_t - \frac{\varphi}{1 + 1/\psi} n^{1 + 1/\psi}$ and $f(k_t, n_t) = z_t k_t^{\alpha} n_t^{1-\alpha}$, and the goods resource constraint for the economy is $c_t + k_{t+1} - (1 - \delta)k_t = z_t k_t^{\alpha} n_t^{1-\alpha}$.

The household's period-t budget constraint is

$$c_t + \sum_j \frac{1}{R_t^j} b_{t+1}^j + k_{t+1} = (1 - \tau_t^n) w_t n_t + \left[1 + (1 - \tau_t^k)(r_t - \delta) \right] k_t + b_t,$$

in which τ_t^n is the proportional labor income tax rate, τ_t^k is the proportional capital income tax rate (inclusive of a depreciation allowance), and the vector b_{t+1}^j $\forall j$ is holdings of state-contingent real government debt that pays off in period t+1.

The steady-state value of government purchases ($\bar{g}$) is 20% of steady-state GDP, the initial (as well as long-run) government debt (b_0) is 50% of steady-state GDP, and the steady-state level of TFP is $\bar{z} = 1$.

The exogenous TFP process evolves as

$$\ln z_{t+1} = \rho_z \ln z_t + \varepsilon_{t+1}^z,$$

in which ε_{t+1}^z is distributed as i.i.d. $N(0, \sigma_z^2)$. The persistence and standard deviation parameters are, respectively $\rho_z = 0.95$ and $\sigma_z = 0.007$. The exogenous government spending process evolves as

$$\ln g_{t+1} = (1 - \rho_g) \ln \bar{g} + \rho_g \ln g_t + \varepsilon^g_{t+1},$$

in which ε^g_{t+1} is distributed as i.i.d. $N(0, \sigma^2_g)$. The persistence and standard deviation parameters are, respectively $\rho_g = 0.97$ and $\sigma_g = 0.027$.

The remaining parameter values to be used (some of which are left for you to determine) are listed in Table 1.

		Description
β	0.99	Quarterly subjective discount factor
δ	0.02	Quarterly depreciation rate of physical k
ψ	2	Utility parameter
α	0.36	Elasticity of Cobb-Douglas output with respect to physical k
φ	???	**To be determined (target so that n in Ramsey steady state is $n = 0.3$)**
$\bar{g}$	???	**To be determined (target so that $\bar{g}$ is 20% of Ramsey steady-state GDP)**
b_0	???	**To be determined (target so that b_0 is 50% of Ramsey steady-state GDP)**

Table 1. Parameter values.

For the first-order approximation, use $x_t = [k_t, z_t, g_t]'$ as the state vector and $y_t = \left[c_t, n_t, w_t, wedge^{labor}_t, inv_t, \tau^n_t \right]'$ as the co-state vector.

What To Submit

Your submission should be a brief paper – i.e., one should be able to read it independently of knowing what the "description" of "Project 3" was. A sketch is provided below.

Abstract

Section 1. Introduction

Section 2. Model

2.1 Households
2.2 Firms
2.3 Government
2.4 Definition of Private-Sector Equilibrium

Section 3. Optimal Policy

3.1 Definition of Ramsey Problem
  - PVIC
  - Full commitment to optimal policy functions decided upon in $t = 0$ for $t > 0$
3.2 First-order conditions of Ramsey Problem with for $t > 0$

Section 4. Numerical Results

4.1 Calibration
  - How you calibrated the steady-state values of φ, $\bar{g}$, and b_0.
4.2 Ramsey Steady-State
  - Ramsey allocations
  - Labor income tax rate and capital income tax rate
4.3 Ramsey Dynamics
  - Include shocks to both TFP and government spending
  - Present the numerical results for the g_x and h_x matrices
  - Ramsey allocations (e.g., business-cycle moments table and IRFs)
  - Labor income tax rates (e.g., business-cycle moments table and IRFs) (NOTE: fluctuations of capital-income tax rates can be left out of analysis)
  - **Labor wedge (e.g., business-cycle moments table and IRFs)**

Section 5. Conclusion
  - Brief summary of findings

As for earlier Projects, attach a print-out of your code to your submission.