Government in the Ramsey model

Econ 4310 Lecture 4

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Outline

- Assume $\gamma = 0$
- Government consumes, taxes and borrows
- Include in market version
- Effects of fiscal policy

Government

Budget equation

$$b_{t+1} = (1 + r_t)b_t + g_t - \tau_t \tag{1}$$

Budget constraint

$$\lim_{t\to\infty} b_t R_{t-1}^{-1} \leq 0 \tag{2}$$

g_t = government consumption, τ_t = lump-sum tax, b_t=government debt

Consumers

$$\max U_0 = u(c_0) + \beta u(c_1) + \beta^2 u(c_2) + ... = \sum_{t=0}^{\infty} \beta^t u(c_t) \tag{3}$$

s.t.

$$c_t = (1 + r_t)a_t + w_t - \tau_t - a_{t+1} \qquad t = 0, 1, 2, \ldots \tag{4}$$

$$\lim_{t\to\infty} a_t R_{t-1}^{-1} = 0 \tag{5}$$

$$a_0 \text{ given}$$

Consumption Euler equation

$$u'(c_t) = \beta u'(c_{t+1})(1 + r_{t+1}) \qquad t = 1, 2, \ldots \tag{6}$$

Labor and capital

$$f'(k_t) = r_t \tag{7}$$

$$f(k_t) - k_t f'(k_t) = w_t \tag{8}$$

Equilibrium conditions

$$a_t = k_t + b_t \tag{9}$$

$$c_t + g_t + k_{t+1} = k_t + f(k_t) \tag{10}$$

$$k_t \geq 0 \quad t = 1, 2, 3 \ldots, \infty \tag{11}$$

Difference equations

$$k_{t+1} = k_t + f(k_t) - c_t - g_t \tag{12}$$

$$u'(c_t) = u'(c_{t+1})\beta[1 + f'(k_{t+1})] = u'(c_{t+1})\frac{1 + f'(k_{t+1})}{1 + \rho} \tag{13}$$

Stationary state

Requires $g_t = g^*$

$$c^* + g^* = f(k^*) \tag{14}$$

$$f'(k^*) = \rho \tag{15}$$

- No effect of fiscal policy on k^*
- Government consumption crowds out private consumption

Timing of taxes does not matter

Budget constraints:

$$\text{Private } \sum_{s=0}^{\infty} R_{0,s}^{-1} c_s = (1+r_0)a_0 + \sum_{s=0}^{\infty} R_{0,s}^{-1}(w_s - \tau_s) \tag{16}$$

$$\text{Government} \sum_{s=0}^{\infty} R_{0,s}^{-1} g_s = -(1+r_0)b_0 + \sum_{s=0}^{\infty} R_{0,s}^{-1}\tau_s \tag{17}$$

$$\text{Sum } \sum_{s=0}^{\infty} R_{0,s}^{-1}(c_s + g_s) = (1+r_0)k_0 + \sum_{s=0}^{\infty} R_{0,s}^{-1} w_s \tag{18}$$

Ricardian equivalence

- Consumers understand that in the end they pay for government expenditures
- Timing of taxes does not matter
- government debt offset by expected future tax payments
- Expectations consistent with Ramsey model

Changes in government expenditure

On the blackboard:

- Permanent change - jump to new long-run equilibrium
- Temporary change - temporarily high interest rates