MID-TERM EXAM
Macro M1 - 2015

14 pts + 0.5 + 0.5 → 15 pts

Ex 1 (1) 4 pts (+0.5 Bonus)

1 pt — A competitive equilibrium is a system of prices $\{p_1, p_2, w\}$ and real allocations $\{c_1, c_2, n_2, g_2\}$ such that:

1 pt — 1) The consummer maximizes the intertemporal utility (the representative household) given prices and taxes, subject to the intertemporal budget constraint

1 pt — 2) The firms maximizes profit, given prices and technology

0,5 pt Bonus — 3) The goverment satisfies the intertemporal budget constraint

1 pt — 4) Markets clears (supply = Demand for each market)

$$c_1 = \bar{y}$$

$$c_2 + g_2 = y_2 \quad (\equiv n_2)$$

Labor Demand = Labor supply

(2) 4 pts (+ 0.5 Bonus)

Household problem

1 pt
$$\begin{cases} \frac{1}{c_1} = \beta \frac{p_1}{p_2} \frac{1}{c_2} \\ \beta = \frac{w}{p_2} \frac{\beta}{c_2} \end{cases}$$

Firms problem

1 pt
$$\begin{cases} \text{FOC} \quad p_2 = w \quad \left(\Leftrightarrow \frac{w}{p_2} = 1\right) \\ \qquad \hookrightarrow \text{profit} = 0 \quad (\text{CRS}) \end{cases}$$

MRS consumption / leisure

$$\beta = \frac{\beta}{c_2}$$

1 pt
$$\Rightarrow c_2 = 1$$

1 pt
$$\begin{cases} \text{Period 1} \quad c_1 = \bar{y} \\ \text{Period 2} \quad 1 + g_2 = y_2 = n_2 \end{cases}$$

(0.5 pt (Bonus))
$$\frac{p_2}{p_1} = \beta \frac{c_1}{c_2} = \bar{y}$$

3/ 2 pts

Central Planner (no price)

$$\begin{cases} \max \ \ln c_1 + \beta \ln c_2 - \beta n_2 \\ \text{s.t.} \quad c_1 = \bar{y} \\ \qquad c_2 + g_2 = y_2 = n_2 \\ \qquad \hookrightarrow \ c_2 = n_2 - g_2 \end{cases}$$

1 pts

FOC $\quad \dfrac{\beta}{n_2 - g_2} = \beta$

$n_2 - g_2 = 1$

$n_2 = 1 + g_2 = y_2$

so $\quad c_2 = 1$

$c_1 = \bar{y}$

the same real allocations.

4) 2 pts

1 pt

$g_2 \uparrow \ \rightarrow$ no effect on c_2

$\rightarrow n_2 \uparrow$

$\rightarrow y_2 \uparrow$

1 pt People work more because they anticipate a negative wealth effect. The multiplier is equal to unity. No crowding-out effect

5) 2pts

Ricardian equivalence

1pt { t_1, t_2 no effect on real allocations and prices

In other words

1pt { t_1^*, t_2^* with $t_1^* \neq t_1$ and $t_2^* \neq t_2$ and t_1^*, t_2^* satisfy the intertemporal budget constraint of the government produce the same real allocations and prices

$\Rightarrow$ the timing of taxes does not matter

Exercise 2

(1) 3 pts

1 pt

$$\begin{cases} \max E_t \sum_{i=0}^{\infty} \beta^i U(c_{t+i}) \\ \text{s.t. } A_{t+1} = (1+r) A_t + y_t^d - c_t \quad \forall t \\ \text{with } U(c_t) = \alpha_0 c_t - \frac{\alpha_1}{2} c_t^2 \end{cases}$$

2 pts

$$\begin{cases} \underline{\text{FOC}} \quad U'(c_t) = \beta(1+r) E_t U'(c_{t+1}) \\ \text{with } U'(c) = \alpha_0 - \alpha_1 c_t \\ \beta(1+r) = 1 \\ \hookrightarrow E_t c_{t+1} = c_t \end{cases}$$

(2) 3 pts

$r > 0 \Rightarrow 1+r > 1$

↳ Forward substitution

1 pt

$$\begin{cases} A_t = \frac{1}{1+r} E_t \sum_{i=0}^{\infty} \left(\frac{1}{1+r}\right)^i c_{t+i} - \frac{1}{1+r} E_t \sum_{i=0}^{\infty} \left(\frac{1}{1+r}\right)^i y_{t+i}^d \\ \text{where we have imposed the transversality condition.} \\ \lim_{T \to \infty} \left(\frac{1}{1+r}\right)^T E_t A_{t+T} = 0 \end{cases}$$

4 / 2 pts

illustration of the Lucas critique with two polar cases.

1pt

- $\boxed{\ell = 0}$ $\quad \frac{\partial C_t}{\partial \tau_t} = -\frac{r}{1+r}\bar{Y}$ given $\bar{Y}$, small effect
- $\boxed{\ell = 1}$ $\quad \frac{\partial C_t}{\partial \tau_t} = -\bar{Y}$ large

1pt

Permanent income argument: Consumption is more sensitive to permanent change in tax rate than transitory changes