

ECON 222
Macroeconomic Theory I
Fall Term 2009

Answers to Assignment 1

Question 1: A Formal Model of Consumption and Saving (30 Marks)

(a) Mats' present value of lifetime resources (PVL_R):

$$PVL_R = 5500 - 2000 + \frac{1500 - 400}{1.02} = 4578.43$$

which is also the highest feasible consumption in the current period.

The highest feasible consumption in period 2: $\bar{c}_2 = (5500 - 2000)1.02 + (1500 - 400) = 4670$ The budget line is downward sloping, with intercepts of 4578.43 on the c_1 axis and 4670 on the c_2 axis.

(b) Make use of consumption smoothing $c_1 = c_2 = c^*$, the lifetime budget constraint becomes:

$$c^* + \frac{c^*}{1.02} = PVL_R$$

We get $c^* = 2311.88$, and saving $s = 5500 - 2000 - 2311.88 = 1188.12$. Since Mats' saving is positive, he is a lender.

(c) With $r = 0.08$,

$$PVL_{R_2} = 5500 - 2000 + \frac{1500 - 400}{1.08} = 4518.52$$

The lifetime budget constraint becomes:

$$\dot{c} + \frac{\dot{c}}{1.08} = PVL_{R_2}$$

We get $\dot{c} = 2346.15$ and $\dot{s} = 5500 - 2000 - 2346.15 = 1153.85$. When the real interest rate rises, the price of current consumption increases relative to future consumption, thus providing incentive to save more (substitution effect). However, the future interest income on his current saving also rises, which increases the PVL_R and thereby increases both current and future consumption. This effect dampens the incentive to save (income effect). The two effects work in opposite directions. In the case here, since Mats' saving decreases, with $\dot{s} < s^*$, and current consumption increases with $\dot{c} > c^*$, the income effect dominates.

(d) Given that there is no change in government spending pattern, and the debt is retired (principal plus interest payment) in period 2 by lowering tax in period 2, the PVL_R is unchanged. We can write PVL_R as:

$$PVL_R = 5500 - 2300 + \frac{1500 - T_2}{1.02} = 4578.43$$

Solving for this we get $T_2 = 94$. Knowing the government's current and future tax plan, Mats can still be considered as a saver, but he saves less by the amount of the tax raise, therefore leaving consumptions unchanged at $c^* = 2311.88$ as in part (b). The reason is that given that there is no change in government current and future purchases, and since Mats knows that a raise in current tax is followed by a cut in future tax, these together imply that Ricardian Equivalence holds. It is a shift of tax burden from future to current period. Notice that the future tax T_2 decreases by the principal of the debt plus interest payment, $300 \cdot 1.02 = 306$, which is also the difference between the new T_2 and the old one.

Question 2: Fordlandia (20 Marks)

(a)

$$\begin{aligned}\frac{uc}{1-\tau} &= \frac{(r+d)p_k}{(1-\tau)} \\ &= \frac{(r+.25) \times 2}{(1-.6)} \\ &= 5r + 1.25 \quad (4 \text{ points})\end{aligned}$$

(b)

$$\begin{aligned}MPK^f &= \frac{uc}{1-\tau} \\ 100 - 0.05K^f &= 5r + 1.25 \\ 0.05K^f &= (98.75 - 5r) \\ K^f &= 1975 - 100r \quad (4 \text{ points})\end{aligned}$$

$$\begin{aligned}I^d &= K^f - K + dK \\ I^d &= 1075 - 100r \quad (3 \text{ points})\end{aligned}$$

(c)

$$\begin{aligned}\bar{Y} &= C + I + G \\ 2000 &= 50 + 0.4 * 2000 - 600r + 1075 - 100r + 125 \\ 700r &= 50 \\ r &= .07142 \quad (3 \text{ points})\end{aligned}$$

$$\begin{aligned}\frac{uc}{1-\tau} &= 5 * (.07142) + 1.25 \\ &= 1.6071 \quad (1 \text{ point})\end{aligned}$$

$$\begin{aligned}K^f &= 1975 - 100 * (.07142) \\ &= 1967.858 \quad (1 \text{ point})\end{aligned}$$

$$C = 807.148 \quad (1 \text{ point})$$

$$\begin{aligned}I^d &= 1075 - 100 * (.07142) \\ &= 1067.858 \quad (1 \text{ point}) \\ S &= I \quad (2 \text{ points})\end{aligned}$$

Question 3: The Effects of a Technological Innovation in a Small-Open Economy (20 Marks)

(a)

$$S^d = 30, I^d = 42.5$$

$$CA = NX = S^d - I^d = -12.5$$

$$C^d = Y - I^d - G - NX = 50 - 42.5 - 10 + 12.5 = 10$$

(b)

$$S^d = 30, I^d = 47.5$$

$$CA = NX = S^d - I^d = -17.5$$

$$C^d = Y - I^d - G - NX = 50 - 47.5 - 10 + 17.5 = 10$$

Question 4: Investment and Savings in Springfield and Shelbyville (30 Marks)

(a) (i)

$$CA_{sp} + CA_{sh} = 0$$

$$(S_{sp} - I_{sp}) + (S_{sh} - I_{sh}) = 0$$

$$CA_{sp} + CA_{sh} = 0$$

$$(S_{sp}^d - I_{sp}^d) + (S_{sh}^d - I_{sh}^d) = 0$$

$$[(5 + 150r^w) - (10 - 120r^w)] + [(5 + 90r^w) - (30 - 140r^w)] = 0$$

$$500r^w = 30$$

$$r^w = 0.06$$

$$S_{sp} = 5 + 150(0.06) = 14$$

$$I_{sp} = 2.8$$

$$CA = 11.2$$

$$S_{sh} = 5 + 90(0.06) = 10.4$$

$$I_{sh} = 21$$

$$CA = -11.2$$

(ii) Illustrate your answer with a graph (and label the axes) (10)

(b)

(i) Increase in foreign ownership of Shelbyville assets:

Shelbyville: + entry in capital account.

Springfield: - entry in capital account.

(ii) Shelbyville: Import of merchandise: - entry in current account.

Springfield: Export of merchandise: + entry in current account.

Figure 1: Question 1(b)

Figure 2: Question 1(c)

Figure 3: Question 2