

This homework is due on Thursday September 24 at the end of class

Please answer each question on a separate sheet; write your name and PSU ID on each sheet of paper you turn in.

When you are asked to make a graph please carefully label all variables, axis, and the slope of each line you draw.

The homework consists of 5 questions

Question 1: (20 points)

Please do Exercise 2.1 and 2.2 at the end of Chapter 2 in the lecture notes.

Question 2: (15 points)

- i) Please define what does it mean for preferences to be convex and concave.
- ii) Please explain why: a) if indifference curves are convex then individual prefers to smooth consumption over time; b) if preferences are concave then individual does not prefer to smooth consumption over time.
- iii) If $U(C_1, C_2) = \min\{C_1, C_2\}$ does the individual prefers to smooth consumption? What if $U(C_1, C_2) = \max\{C_1, C_2\}$? What if $U(C_1, C_2) = C_1 + C_2$? (Plot the indifference curves in all three cases)

Question 3: (25 points)

Consider a small open economy that lasts for two periods as the one we considered in class. What happens if the international interest rate that households face is r_L if they save abroad and $r_H > r_L$ if they borrow from abroad? In this case the budget constraint for a households in period 1 is

$$C_1 + B_1 \leq Q_1$$

and in period 2 if $B_1 > 0$ (i.e. saving)

$$C_2 \leq Q_2 + (1 + r_L)B_1$$

and if $B_1 < 0$ (i.e. borrowing)

$$C_2 \leq Q_2 + (1 + r_H)B_1$$

- i) Plot the budget line and the set of budget feasible allocations.
- ii) *Bonus question:* In this case, can you derive a unique intertemporal budget constraint, $C_1 + \frac{C_2}{1+r} \leq Q_1 + \frac{Q_2}{1+r}$, to characterize the set of consumption bundles that are budget feasible (as in the case with perfect credit market)? Please explain.
- iii) Is it true that the marginal rate of substitution (MRS) between consumption in period 1 and 2 is such that $MRS = 1+r_L$ if the trade balance is positive in period 1 and $MRS = 1+r_H$ if the trade balance is negative in period 1? If it is not the case please provide a graphical example of a situation when MRS is not equal to either $1+r_L$ or $1+r_H$ at the optimal solution.
- iv) Can this market imperfection help us understand why a country that is growing a lot (like China) accumulates large current account surpluses?

Question 4: (20 points)

Consider a small open economy that last for two periods. The economy is only producing oil and it is consuming imports from abroad. The amount of oil produced in period $t=1$ is $q_1 = 100$ and in period $t=2$ is $q_2=100$. Preferences are given by $U(C_1,C_2) = \min\{C_1,C_2\}$, $B_0=0$ and $1+r=1$. The price of the consumption good (what the country imports) is 1 in both periods, $PM_1 = PM_2 = 1$.

- i) Let the price of oil in period 1 be $PX_1= 1$ and in period 2 be $PX_2 =1$. Please calculate the equilibrium under perfect credit market (i.e. the country can borrow and lend internationally at rate $1+r$).
- ii) Now suppose there is an increase in the price of oil in period 1 so that $PX_1=2$ but the price in period 2 is still $PX_2=1$. Please calculate the equilibrium under perfect credit market.
- iii) Now suppose there is an increase in the price of oil in period 2 so that $PX_2=2$ but the price in period 1 is still $PX_1=1$. Please calculate the equilibrium under perfect credit market.
- iv) Finally, consider the case in which the price of oil increases in both periods so that $PX_1=PX_2=2$. Please calculate the equilibrium under perfect credit market.

(Please show all your calculations)

Question 5: (20 points)

Consider the same economy as in Question 4. Now assume that the preferences for the country are such that the system of indifference curve is convex and "smooth" (as the ones shown in any picture in Chapter 3). In particular, suppose that when $PX_1=PX_2=1$

(case i) preferences are such that the households in the small open economy choose the consumption profile $(C_1, C_2) = (100, 100)$.

- i) When oil prices are as in case i) in question 4 i.e. $P_{X1}=1$ and $P_{X2}=1$ please show graphically the equilibrium (and how to compute it) a) under perfect credit markets, b) when households in the small open economy cannot borrow from abroad but can save;
- ii) When oil prices are as in case ii) in question 4 i.e. $P_{X1}=2$ and $P_{X2}=1$ please show graphically the equilibrium (and how to compute it) a) under perfect credit markets, b) when households in the small open economy cannot borrow from abroad but can save;
- iii) When oil prices are as in case ii) in question 4 i.e. $P_{X1}=2$ and $P_{X2}=1$ please show graphically the equilibrium (and how to compute it) a) under perfect credit markets, b) when households in the small open economy cannot borrow from abroad but can save;
- iv) When oil prices are as in case ii) in question 4 i.e. $P_{X1}=2$ and $P_{X2}=2$ please show graphically the equilibrium (and how to compute it) a) under perfect credit markets, b) when households in the small open economy cannot borrow from abroad but can save;
- v) Please comment the results in part i)-v) above. When the inability to borrow from abroad alters the equilibrium outcome?