

EC302 Problem Sets

PROBLEM SET #1

1. Explain whether the following statements are true or false:
 - a. If the production function has a negative slope, the marginal product of labor is negative.
 - b. We can be fairly certain consumption is an inferior good.
 - c. People's preferences between work and consumption are measured by their production functions.
 - d. The marginal product of labor is calculated from the slope of the indifference curve.
 - e. A shift in the production function causes a shift in the indifference curves.
2. Do question 2.7 in Barro.
3. Do question 2.8 in Barro.
4. Do question 2.11 in Barro.

PROBLEM SET #2

1. Explain whether the following statements are true or false:
 - a. The credit market allows a person's consumption in any period to differ from his income in that period.
 - b. The credit market allows people to decide whether or not their sources of funds will equal their uses of funds.
 - c. An increase in the interest rate inflicts a negative wealth effect on people who plan to be borrowers in the near future.
 - d. Because the average person is neither a borrower nor a lender, the aggregate wealth effect of a change in the interest rate is zero.
2. Suppose two people have the same utility function and both have $b_0 = b_2 = m_0 = m_2 = 0$. Suppose also that person A has $y_1 = 150$ and $y_2 = 143$, whereas person B has $y_1 = 110$ and $y_2 = 187$.
 - a. Explain how their levels of consumption in each period compare when the interest rate is 0.2.
 - b. Do the same for an interest rate of 0.1.
3. Suppose an individual has $b_0 = b_2 = 0$. Also suppose that his labor supply (and therefore also his income) is fixed for both periods 1 and 2, so he only has to choose consumption levels c_1 and c_2 .
 - a. Suppose $y_1 > 0$, $y_2 = 0$. Explain how c_1 and c_2 would change if the interest rate rose.
 - b. Suppose instead that $y_1 = 0$, $y_2 > 0$. Explain how c_1 and c_2 would change in this case if the interest rate rose.
4. A person learns at the beginning of the current period that his marginal product of labor will rise at the beginning of the next period. Explain what happens to his choices of consumption and labor in the current period

and in the next period.

PROBLEM SET #3

1. Do question 3.10 in Barro.

2. Suppose initial bond holdings are $b_0 = \$1000$, $P_{y_t} = 0$ for all t , the interest rate is $R = 10\%$ per year, the price level is constant, and the horizon is infinite.

a. What is the level of permanent income? If consumption is constant, what is the amount of saving each year? What is the level of permanent income when we calculate it during period 2?

b. Suppose now that $c_1 = 0$. What is permanent income when we calculate it during the second period? Explain this result.

3. (Term Structure of Interest Rates.) Suppose there are two kinds of bonds, 1-period and 2-period bonds. A 1-period bond issued at the beginning period t pays interest at rate R_{1t} at the end of period t , so that the total payment of interest plus principal is $(1+R_{1t})$ per dollar initially invested in the bond. A 2-period bond issued at the beginning of period t pays interest at the rate R_{2t} in both periods t and $t+1$, so that the total payment of interest plus principal at the end of period 2 (when the bond matures) is $(1+R_{2t})^2$ per dollar initially invested in the bond.

Now consider two investment strategies for a two-period horizon:

(1) Buy a 1-period bond in period t , take the interest plus principal and use it to buy another 1-period bond in period $t+1$, yielding a total payment of $(1+R_{1t})(1+R_{1t+1})$ at the end of period $t+1$.

(2) Buy a 2-period bond in period t , yielding a total payment of $(1+R_{2t})^2$.

a. Explain the relation that must hold between R_{2t} on the one hand and R_{1t} and R_{1t+1} on the other. Derive the function relating R_{2t} to R_{1t} and R_{1t+1} .

b. If $R_{1t+1} > R_{1t}$, what is the relation between R_{1t} and R_{2t} ?

c. In March 1980 the yield on Aaa-rated (premium grade, long-term) corporate bonds was 13% per year, whereas that on three-month maturity prime commercial paper (short-term notes issued by large corporations) was 17% per year. What does this relation suggest for March 1980 about the financial markets' prediction of subsequent yields on commercial paper?

PROBLEM SET #4

1. Explain whether the following statements are true or false:

a. Empirical evidence suggests that the nominal demand for money rises more than proportionally when the price level increases.

b. Empirical evidence suggests that an increase in the interest rate increases the demand for money.

c. An individual who has more real money initially than he plans to have in the future enjoys a positive wealth effect from the excess money.

d. The aggregate velocity of money decreases when interest rates decline.

2. Do question 4.4 in Barro.

3. Do question 4.7 in Barro.

PROBLEM SET #5

1. Explain whether the following statements are true or false:

- a. Growth in real GNP in the US has been smooth, with no fluctuations around the trend.
- b. The average unemployment rate in the US has been about 2%.
- c. Over the last 100 years in the US, the price level has never fallen.
- d. The historical record for the US shows it is impossible for real GNP to rise unless the price level also rises.

2. Do question 5.2 in Barro.

3. Do question 5.7 in Barro.

4. Do question 5.9 in Barro.

5. Do question 5.10 in Barro.

6. Theory says that an increase in the interest rate motivates people to decrease current consumption and increase current production, thereby increasing current saving. Yet a temporary downward shift in the production function leads to an increase in the interest rate but does not lead to an increase in saving. Explain how these results can be reconciled.

PROBLEM SET #6

1. Over the last 20 years, have the following risen, fallen, or stayed the same?

- a. Total government spending in the U.S., as a share of GNP.
- b. Total government purchases in the U.S., as a share of GNP.
- c. Federal government purchases in the U.S., as a share of GNP.
- d. State and local government purchases in the U.S., as a share of GNP.

2. What accounts for the difference between items (a) and (b) in question 1?

3. Explain whether the following statements are true or false:

- a. Because the federal government can always print additional money, it does not have a budget constraint.
- b. Total federal purchases of goods and services tends to rise during wars.
- c. Private spending fell during the Korean War, World War I, and World War II.
- d. Lump-sum taxes do not cause substitution effects.

4. Suppose the government never has and never will issue any bonds. Use the government's budget constraint to complete the following table.

| | | | | |
|-------|-------|-------|-------|-----------------|
| P_t | G_t | V_t | T_t | $M_t - M_{t-1}$ |
|-------|-------|-------|-------|-----------------|

| | | | | | |
|----|---|-----|-----|------|-----|
| a. | 2 | 500 | 200 | — | 400 |
| b. | 2 | — | 300 | 500 | 200 |
| c. | 3 | 300 | 300 | 500 | — |
| d. | 6 | 300 | 600 | 1200 | — |

5. During the current period, people find out that government purchases will increase permanently in some future period. There is no change in current purchases.

- What happens currently to the real interest rate and the quantities of consumption and employment?
- Can you think of some real-world cases to which this question applies?

PROBLEM SET #7

1. Explain whether the following statements are true or false:

- The nominal amount of privately-held US national debt has increased over the past 35 years.
- The ratio of public debt to GNP has persistently increased in the US since 1945.
- In the US, the ratio of public debt to GNP has been higher in recent years than at any other time in history.
- Empirical evidence does not support the conventional view that deficits raise real interest rates.

2. Suppose that in year t the government reduces a household's lump-sum taxes by \$1 and issues a one year bond paying interest at a rate of 5% to finance the tax cut. In addition, the government announces that in the following year, $t+1$, it will raise lump-sum taxes to retire the bond and pay the interest on it. No other changes in government purchases or taxes occur.

- By how much does the household's disposable income rise in year t ?
- What is the present value of the increase in part A?
- By how much does the household's disposable income fall in year $t+1$?
- What is the present value of the fall in part C?
- What is the net effect of the government's refinancing scheme on the present value of the household's disposable income?

3. Do question 14.1 in Barro.

4. Do question 14.4 in Barro.

5. Assume that taxes are lump sum. Suppose the government cuts current taxes and runs a deficit. Discuss the effects for the current period on the real interest rate, the quantity of output, and the price level, assuming that

- the path of government purchases does not change
- the same, except that people expect future government purchases to fall.

PROBLEM SET #8

1. Explain whether the following statements are true or false:

- a. Empirical evidence suggests that a percentage point increase in the growth rate of the nominal money supply is accompanied by approximately a percentage point increase in the inflation rate.
- b. Data from the United States show that it is possible for the actual real interest rate to be negative.
- c. It is the expected real interest rate, not the nominal interest rate, that influences the demand for money.
- d. The (expected) real interest rate, not the nominal interest rate, creates intertemporal substitution effects.
- e. An increase in the monetary growth rate that creates inflation requires people to work additional hours if they want to keep their real consumption from falling.

2. One way to define the individual's real saving is

$$(a) \quad s_t = (m_t + b_t)/P_t - (m_{t-1} + b_{t-1})/P_{t-1}$$

which is the change in his real assets. Another way to define it is

$$(b) \quad s_t = y_t + (R - \pi)(b_{t-1}/P_t) - \pi(m_{t-1}/P_t) + v_t/P_t - c_t$$

which is real income minus real expenditures.

Show that (a) and (b) are equivalent by deriving (b) from (a).

3. Do question 8.10 in Barro.

PROBLEM SET #9

1. Explain whether the following statements are true or false:

- a. When the labor market clears, the real wage equals the marginal product of labor.
- b. Changes in the real wage can have large aggregate wealth effects.
- c. The demand for labor increases when the interest rate rises.

2. Do question 6.7 in Barro.

3. Do question 6.9 in Barro.

4. Do question 6.11 in Barro.

5. Do question 10.4 in Barro.

PROBLEM SET #10

1. Explain whether the following statements are true or false:

- a. A marginal tax rate is the percentage of any additional dollar of income that must be paid as additional taxes.

b. If transfer payments depend on income, they exert substitution effects similar to those from income taxes.

2. Suppose the following table shows part of the tax law.

| Taxable Income | Total Tax |
|----------------|-----------|
| \$1000.00 | \$300.00 |
| 1001.00 | 300.30 |
| 1002.00 | 300.70 |
| 1003.00 | 301.15 |
| 1004.00 | 301.65 |

a. What is the marginal tax rate when income is

- i. \$1000?
- ii. \$1001?
- iii. \$1002?
- iv. \$1003?

b. What are the average tax rates for the same income levels?

3. Do question 13.2 in Barro.

4. Do question 13.4 in Barro.

5. Do question 13.11 in Barro.

6. Suppose that, when the tax rate equals 0%, aggregate taxable income is \$1000. Also suppose that for every 1 percentage point increase in the tax rate, aggregate taxable income falls by \$10.

a. What will be the total tax revenue collected if the tax rate is

- i. 1%
- ii. 2%
- iii. 99%

b. What tax rate raises the maximum revenue?

c. Is it possible for tax revenue to be \$300?

PROBLEM SET #11

1. Suppose that when the real interest rate is 3%, the desired capital stock is 1050.

a. If the initial capital stock is 1000 and the rate of depreciation is 7%, what will be gross investment and net investment?

b. Suppose that, if the real interest rate rises to 4%, the desired capital stock falls to 1040. If the initial capital stock and rate of depreciation are the same as in part (A), what will be gross and net investment?

c. What is the percentage fall in the desired capital stock from part (A) to part (B)? What is the percentage fall in gross investment?

2. Do question 9.2 in Barro.

3. Do question 9.4 in Barro.
4. Do question 9.9 in Barro.
5. Do question 9.12 in Barro.

PROBLEM SET #12

1. Explain whether the following statements are true or false:
 - a. In the steady state with no growth, net investment equal zero.
 - b. Since 1840, the per capita growth rate of real GNP in the US has tended to fall.
 - c. An increase in the capital stock raises consumption demand.
 - d. An increase in the capital stock raises gross investment demand.
2. Do question 11.1 in Barro.
3. Do question 11.2 in Barro.
4. Suppose both population growth and technological growth are zero. Then which of the following combinations of the real interest rate, r , the rate of time preference, ρ , and the real return to capital, $MPK-\delta$, could be steady state combinations? Which could be market clearing combinations even though not steady state combinations? Which could not be market clearing combinations?

| | r | ρ | $MPK-\delta$ |
|----|------|--------|--------------|
| a. | 0.05 | 0.03 | 0.05 |
| b. | 0.04 | 0.03 | 0.07 |
| c. | 0.06 | 0.05 | 0.06 |
| d. | 0.06 | 0.06 | 0.06 |

5. If the population is growing but technology is not changing, which of the following could be consistent with a situation of steady state growth. Explain your answers.

| | <i>Growth rate of</i> | | | |
|----|-----------------------|--------|-------------------|------|
| | Population | Output | Per capita output | r |
| a. | 0.03 | 0.06 | 0.03 | 0.03 |
| b. | 0.02 | 0.02 | 0.00 | 0.02 |
| c. | 0.03 | 0.03 | 0.00 | 0.00 |
| d. | 0.04 | 0.05 | 0.01 | 0.00 |

6. Do question 11.9 in Barro.