

Midterm 2

Section day & time: \_\_\_\_\_

Total points on exam: 200. Good luck! If you need more room for an answer, use the back page.

- 1) 10 pts. Recall that the nominal exchange rate  $e$  is the number of units of foreign money you can buy for one dollar, and the real exchange rate  $\epsilon$  is the quantity of foreign output you can get by giving up one unit of American output. Suppose
- it costs you \$2 to buy one pound sterling (a unit of British money)
  - a restaurant meal in America costs \$20
  - a restaurant meal of the same quality in Britain costs £10 (ten pounds sterling)

What is the nominal exchange rate  $e$ ? \_\_\_\_\_

What is the real exchange rate  $\epsilon$ ? \_\_\_\_\_

- 2) 10 pts. Suppose that

- if you borrow \$10 today, you must pay back \$12 a year from today
- the value of the GDP price index today is 100
- you expect the value of the GDP price index one year from today to be 106

What is the real interest rate  $r$ , in percent? \_\_\_\_\_ percent

- 3) 10 pts. Suppose that, if your income increases from \$10,000 to \$11,000, your consumption spending increases by \$700. What is your "marginal propensity to consume" (expressed as a fraction)? \_\_\_\_\_

- 4) 20 pts. Consider an economy described by the Solow model of economic growth. Consider the effect of an *increase* in the economy's savings rate  $s$  on the long-run steady state (long-run equilibrium) values of the variables listed below. Your choices are "increase," "decrease," "stay the same," or "don't know." "Don't know" means that you need more information to say what happens to the variable.

Output per unit of labor (or per person) \_\_\_\_\_

Capital per unit of labor (or per person) \_\_\_\_\_

Consumption per unit of labor (or per person) \_\_\_\_\_

Marginal product of capital \_\_\_\_\_

5) 30 pts. Consider a closed economy of the type we discussed in class. Draw “loanable funds” graphs that show what happens to the natural rate of interest  $\bar{r}$  and the quantity of investment in response to the events described below (assuming that other exogenous variables remain unchanged). Denote “before” values with a subscript 1, “after” values with a subscript 2, for example  $\bar{r}_1$ ,  $\bar{r}_2$ .

a) There is an increase in  $\bar{G}$ .

b) There is an increase in  $\bar{G}$  accompanied by an *equal* increase in  $\bar{T}$ .

c) There is an increase in the amount of investment spending firms would want to undertake at a given real interest rate.

6) 30 pts. Consider a small open economy of the type we discussed in class. Draw graphs to show what happens to the economy in response to the following events. Again denote “before” values with a subscript 1, “after” values with a subscript 2. Assume that “before,” trade was balanced.

a) There is an increase in  $\bar{G}$ .

b) There is an increase in the amount of investment spending firms would want to undertake at a given real interest rate.

c) There is an increase in the world real interest rate  $r^*$ .

7) 30 pts. Consider a "closed economy" in which  $Y = C + I + G$

$$C = a + b(Y - T) - z r$$

$$I = c - d r$$

$$G = \bar{G}$$

$$T = \bar{T}$$

Notice that in this economy consumption spending is negatively related to the real interest rate.  $z$  is the coefficient that gives the magnitude of this relationship.

a) Using algebra, derive an equation that gives the natural rate of interest  $\bar{r}$  as a function of  $\bar{G}$ ,  $\bar{T}$ , and  $\bar{Y}$ . Your answer should be an equation with  $\bar{r}$  alone on the left-hand side.

b) Using algebra, derive the equation that gives national savings  $S$  when output is equal to the natural rate of output  $\bar{Y}$ . We called this  $\bar{S}$ . Your answer should be an equation with  $\bar{S}$  alone on the left-hand side.

### CONTINUATION OF QUESTION 7

c) Draw what the “loanable funds graph” looks like in this economy. Mark the natural rate of interest  $\bar{r}$  on the vertical axis.

8) 20 pts. Suppose that, as in the model presented in class,

The total labor force  $L$  is made up of employed people and unemployed people.

$U$  is the total number of unemployed people.

$E$  is the total number of employed people.

The unemployment rate is  $u = U/L$ .

The number of employed people losing jobs in a period is  $sE$  where  $s$  is a fraction (between zero and one).

The number of unemployed people finding jobs in a period is  $fU$  where  $f$  is a fraction (between zero and one).

But unlike the model presented in class, the size of the labor force is not fixed. Instead, it is growing. In every period, there are new entrants to the labor force. New entrants enter the pool of unemployed, just like the existing workers who become unemployed in that period. The number of new entrants to the labor force in a period is equal to  $gL$  where  $g$  is a fraction between zero and one, and  $L$  is the size of the labor force in that period. Derive the long-run equilibrium value of the unemployment rate  $u$ . Show your work!

9) 40 pts. Consider an economy described by the Solow growth model. The aggregate production function is  $Y = AK^\alpha L^{1-\alpha}$ . In your answers below, I want you to show all the steps of your work. You will receive no credit for an answer unless I can see how you got it.

a) Derive the “per worker production function.”

b) Derive the value of long-run equilibrium capital per unit of labor (or per person)  $k^*$ , given the savings rate  $s$  and the depreciation rate  $\delta$ . Your answer will be an equation with  $k^*$  alone on the left-hand side.

**CONTINUATION OF 9)**

c) On the graph below, draw what happens to the long-run steady state (long-run equilibrium) of the economy in response to an *increase* in  $A$ . Denote “before” values with a subscript 1, “after” values with a subscript 2, for example  $y_1^*$ ,  $y_2^*$ .

d) Now suppose the depreciation rate is one-tenth (0.10), the savings rate is also one-tenth,  $A = 2$ ,  $\alpha = 2/3$ . Note that I said  $\alpha$  equals two-thirds *not* one-third. What is the value of  $k^*$ ? I am looking for a number here.