

ECON 110, Professor Hogendorn

Problem Set 9

1. *Sticky*. Let the economy-wide labor demand curve be  $L^D = 1000 - 20w$ . Let economy-wide labor supply be  $L^S = 800$ .
  - (a) Draw the labor market and show the equilibrium wage.
  - (b) Let firms reduce hiring, shifting labor demand to  $L^{D'} = 800 - 20w$ . If the labor market clears, show what happens to wages and employment.
  - (c) Now suppose that wages are completely sticky and do not adjust. Show what happens to wages and employment.
  - (d) If the Ministry of Labor of this economy did a telephone survey to find the unemployment rate, which would be the most realistic unemployment rate under the conditions of part (c): 30%, 25%, or 20%? Explain.
2. *OkunsLaw*. Suppose the natural rate of unemployment is 4%. Let current unemployment be 6% due to a Keynesian recession.
  - (a) Is the difference between  $U$  and  $U^*$  attributable to frictional or cyclical unemployment? Explain.
  - (b) How large is the GDP gap?
3. *GrowthIsGood2*. Economic growth is generally a great thing for a country, but it can also complicate economic analysis. Let's look at some ways this can happen.

Suppose an country starts out with production function

$$Y = f(L) = 67L^{4/5}$$

but then it experiences 4% growth in total factor productivity.

- (a) What is the new production function? Graph the new and old production functions.
- (b) What are the old and new economy-wide labor demand curves in this economy?
- (c) Suppose the supply of labor is 243 and does not change. Suppose that wages are completely sticky in the short run. What happens to the marginal product of labor? Explain.
- (d) Suppose the country was initially at a long run equilibrium with inflation expectations of 4%. Show this on an LRIA/ADI diagram, and then show what changes as a result of the TFP growth. Hint: what happens to the full employment level of output?
- (e) Is there a recession? What is likely to happen next?

### Review Problem only, not to turn in:

4. *Recession.* Suppose the economy begins with a labor supply of  $L^S = 10,000$  and a production function of  $Y = f(L) = L^{1/4}$ . There is no money, so the "price" of output is just 1.
  - (a) Graph the labor market and find the equilibrium real wage for this economy (*assuming the labor market clears*). Note that you will have to find the equation for the labor demand curve to do this.
  - (b) Suppose that government statistics show a 4% unemployment rate at the time period corresponding to part (a). Since the labor market clears, how could this be?
  - (c) Now suppose that a drop in aggregate demand occurs, resulting in a parallel shift of labor demand. Wages are completely sticky, and unemployment rises to 10%. Show the situation on a graph of the labor market.

(d) Recall that Okun's Law is

$$\frac{Y^f - Y}{Y} \approx 2(U - U^*)$$

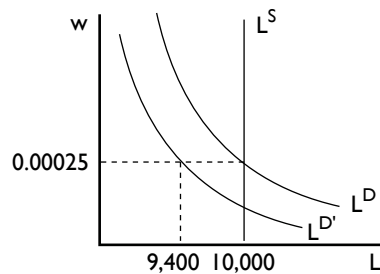
Assuming that Okun's Law holds, draw an ADI/LRIA diagram of the economy, showing the situation in parts (a) and (c). Make sure to find and label the *numerical* levels of GDP and explain how you did this.

- (e) Draw the capital market diagram for this economy, with savings supply and investment demand. Show how a government budget deficit affects the capital market in two cases: (i) the capital market always clears at real interest rate that makes  $S=I$ , and (ii) the capital market does not clear because the real interest rate is struck above the equilibrium level.
- (f) Suppose the government of this economy was originally running a balanced budget with  $G = 0.10Y^f$  and  $T = 0.10Y^f$ . In response to the recession, it changes  $G$  to  $G' = 0.14Y^f$ . Show this change in the ADI/LRIA diagram.

## Answer to Review Problem:

### 4. *Recession\_a.*

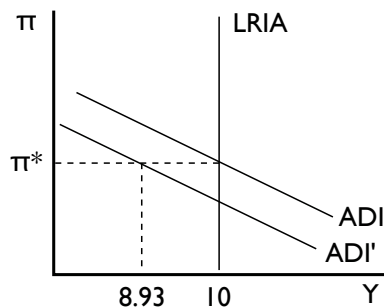
- (a) The representative firm in this market will set  $pMP_L = w$ , or  $\frac{1}{4}L^{-3/4} = w$ . Thus  $L^D = (4w)^{4/3}$ . Setting labor demand equal to labor supply gives an equilibrium real wage of 0.00025.



- (b) This is not surprising, because even when the labor market “clears” there is still frictional unemployment (people between jobs) and structural unemployment (people whose skills do not match available jobs). In this case, 4% is the natural rate of unemployment that occurs from these imperfections in the labor market.
- (c) The shift in demand does nothing to change the wage, so it only reduces the quantity employed. Since there was 4% unemployment even when 10,000 were employed, there must now be 6% structural unemployment, or 9400. (There are other reasonable ways of adjusting the 10,000 in labor supply to reflect unemployment numbers).
- (d) We know that the natural rate of unemployment is 4% and and the current rate is 10%. In this problem we know the production function, so we can directly calculate the full employment level of output:  $Y^f = f(L^S) = 10,000^{1/4} = 10$ . This allows us to use Okun’s Law backwards from the normal way to find the level of output during the recession:

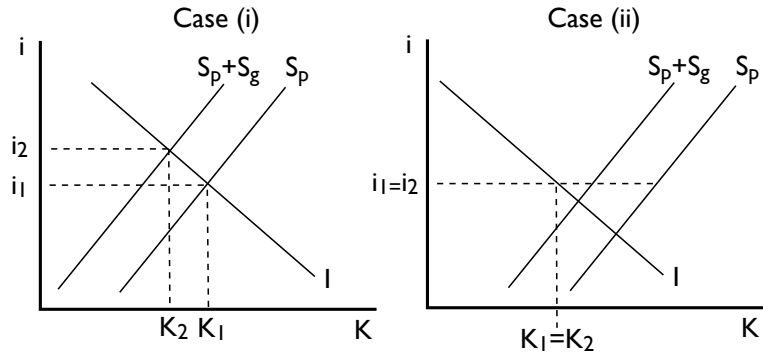
$$\frac{10 - Y}{Y} \approx 2(10\% - 4\%) \Rightarrow 10 = 112\%Y \Rightarrow Y = 8.93$$

Thus, the ADI/LRIA diagram would look like this:



- (e) If the capital market clears, an increase in the government deficit will crowd out investment by reducing the amount of capital available. If, on the other hand, the capital market is

stuck out of equilibrium, then there is a gap between savings and investment anyway and there will not be reduction in investment.



- (f) Since the government did not raise taxes, this change will stimulate aggregate demand. In fact, if prices are completely sticky, we know it will shift aggregate demand to the left by exactly 4% of  $Y^f$ , which is 0.4 in this problem. Thus, the output of the economy will increase from 8.93 to 9.33, helping to alleviate the recession.

