14.02 Principles of Macroeconomics
Problem Set 2 Solutions
Spring 2003

Part 1:

1. On average, in the United States, the number of people who change their jobs in a given year is greater than the number of people who are unemployed at any one time.
True. The US has an extremely active labor market. From 1994-1999, the average number of people changing jobs in any given *month* is around 3.5 million, while the stock of unemployed is around 7 million people.

2. In an economy dominated by monopolies, the markup will be high. (Think of the presence of monopolies being equivalent to a lack of competition).
True. A lack of competition implies that firms will have greater pricing power and profits, in other words a higher markup.

3. If we want to consider the effects of price changes in the short run, we can use the IS-LM model.
False. The IS-LM model assumes prices are constant.

4. The government of Macronesia decides to permanently increase unemployment benefits. The AS-AD model shows that there will be a short run effect on output, but no medium run effect.
False. A permanent change in unemployment insurance levels will permanently shift the AS curve. Here the unemployment insurance increase will move the AS curve upwards, raising the price level and decreasing output. Also, the natural rate of unemployment depends on the level of unemployment benefits.

5. Suppose workers and firms all perfectly anticipate changes in the money supply, know exactly when they will happen, and are able to change prices and wages immediately. In this environment, monetary policy will no longer have an effect on output even in the short run.
True. In this case $P=P^e$ even in the short run. The AS curve is consequently vertical in the short and medium run.

6. An increase in the interest rate leads workers to ask for higher wages, leading to a shift of the wage setting curve.
False. The interest rate does not enter the wage setting equation. In the short run, a change in the interest rate (for example due to monetary policy) might lead to a change in the wage rate, but this is a movement along the wage setting curve, not a shift. In the AS-AD model, this is due to a shift in the AD curve, which corresponds to a movement along the short run AS curve, and consequently a movement along the wage setting curve, as P^e is fix in the short run.

7. Increases in the marginal propensity to save decrease output in the short run, is neutral in the medium run, and may be beneficial in the long run through their positive effect on capital accumulation.
True. Higher savings leads to lower demand in the short run. In the medium run, output returns to its normal level due to a decline in the price level (which acts to increase the real money supply). Even though output is unaffected in the medium run, investment is unambiguously higher and this will lead to a higher capital stock in the long run.

8. The president's political adviser says that war with Iraq will cause oil prices to increase only temporarily. He says that when prices drop to their original level, the AS curve will move back to where it was, and output will also return to its original level. If this is the case, the economy will have lost nothing in the process.
False. During the time when oil prices are higher than normal, output is lost. Some of this loss in income leads to lower consumption during the high oil price time.

Part 2:
In our favorite country, Macronesia, there are 100 people. The table below describes these people.
Not in labor force:
Kids: 25
No job, of working age, not looking: 20
In labor force:
Employed: 50
No job, but looking: 5

1) What is the unemployment rate in this economy?
U = 50/55 = 9.1%

2) What would the unemployment rate be if half the employed lost their jobs and all 30 of the unemployed decided that there was no hope of finding work in Macronesia, leading them to stop looking for work? What does this tell us about the usefulness of unemployment as an indicator of labor market health?
U = 0%. This tells us that, in addition to the unemployment rate, we should consider the fraction of discouraged workers, too.

Consider a nearby country, Macronesia2, which has a high proportion of children in the economy.
Not in labor force:
Kids: 55
No job, of working age, not looking: 20
In labor force:
Employed: 20
No job, but looking: 5

3) Suppose real GDP is 5000 in Macronesia and 4000 in Macronesia2. So per capita GDP is 50 in Macronesia and 40 in Macronesia2. Does this imply that Macronesia is more productive than Macronesia2? Why or why not?

No. Per capita GDP may be an appropriate measure of welfare in the economy (although we would want to include inequality, too), but GDP/worker or GDP/(member of the labor force) is where we would want to look to see how much the economy is getting out of its workers or its potential workers. In terms of GDP per worker, Macronesia2 is twice as productive as Macronesia and GDP per capita misses this due to the different demographics of the countries.

Go back to plain old Macronesia. Assume each worker produces $100 of real output. Take the wage-setting relation in the labor market to be described by the following equation, where Z refers to unemployment insurance levels and u is unemployment:

$$\frac{W}{P^e} = Z - 50u$$

Assume the markup, μ, is 1 and that Z = 1.

4) What is the natural level of unemployment in this economy and the natural level of output in Macronesia (given that each worker produces $100 in output)?

Using the price-setting relation, we have:

$$\frac{1}{1+\mu} = \frac{1}{2} = Z - 50u \Rightarrow u = \frac{1}{100} = 1\%$$

Since we have 1% unemployment, 99 of the 100 people in the labor force are employed, and $Y = \$9900$.

5) Show on a graph the comparison between the real wage and unemployment for μ = 1 and the case of perfect competition. What is the effect on the unemployment rate?
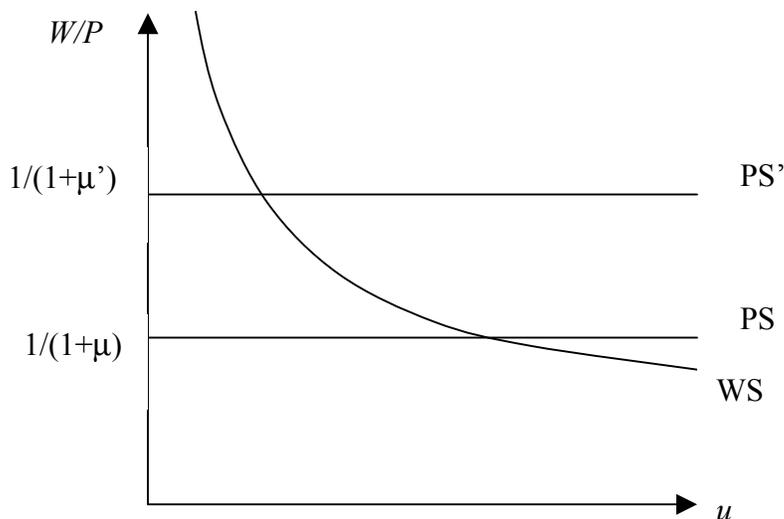
If the markup decreases from μ to μ' (specifically from 1 to 0), the unemployment rate falls in the labor market equilibrium. Intuitively, the price is lower, which means the real wage is higher. In equilibrium a higher real wage is associated with greater worker bargaining power and lower unemployment.

6) What happens to unemployment and output when the Macronesian government decides to raise unemployment insurance from 1 to 2? Show your answer both in terms of algebra and a graph.
Using the price-setting relation, we have:

$$\frac{1}{1+\mu} = \frac{1}{2} = Z - 50u \Rightarrow u = \frac{3}{100} = 3\%$$

Since we have 3% unemployment, 97 of the 100 people in the labor force are employed, and $Y = \$9700$.

The graph below shows that unemployment has to be higher in the new labor market equilibrium. Intuitively, unemployment insurance increases the wage that has to be paid at a given unemployment rate. For a given markup to hold then, unemployment has to be higher to counteract the increase in worker bargaining power.
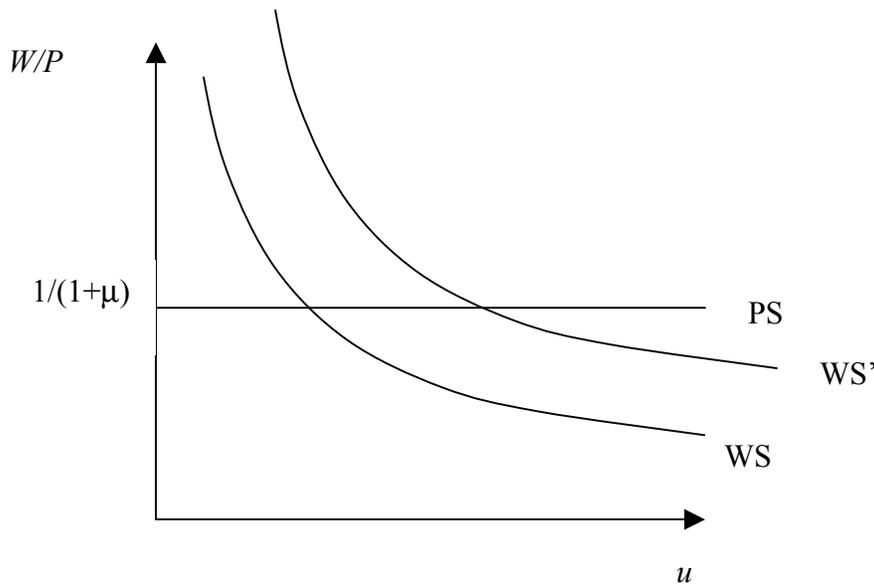
7) In the medium run when $P = P^e$, what happens to wages, the natural rate of unemployment, unemployment and employment in Macronesia2 when 10 of the kids grow up and enter the labor force in the medium run when?
An increase in the size of the labor force does not have an effect on the unemployment rate. This can be seen from the wage setting equation. Furthermore, in equilibrium, the real wage will not change. The number of unemployed and the number of employed will increase.

Part 3:
After all its success with short-run policy in IS-LM, Macronesia is feeling good about itself and decides it wants to acquire an empire. It decides to try to conquer half of the rest of the world. Consider there to be two effects of this imperialism on the Macronesian economy: 1) Increased spending on the military buildup and 2) an increased cost of production due to restrictions on travel within Macronesia.

1) *Assuming the economy starts at the natural level of output and unemployment, shows what happens to the AS and AD curves. Explain in words what happens in the short run. When you draw the curves, assume that the overall effect on output is to decrease it in the short run.*
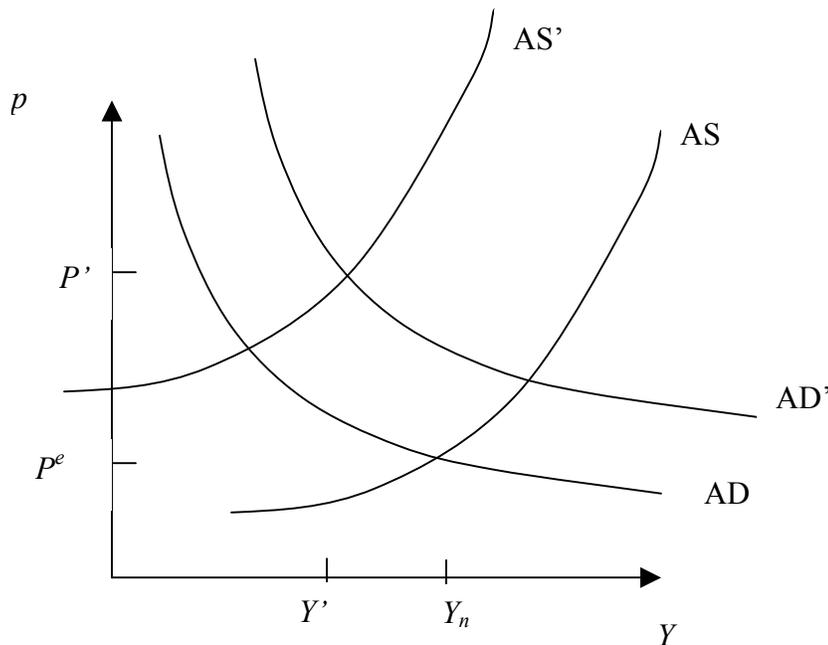
The AS curve shifts in to AS' and the AD curve shifts out to AD'. So in the short run, output falls from Y_n to Y' and the price rises from P^e to P'. The aggregate demand curve shifting out reflects the fact that the increase in government spending will lead output to be higher at any given price level in the goods-financial market equilibrium. The aggregate supply curve shifting in is exactly analogous to the effect of an increase in oil prices considered in the book. We can think of this as a decrease in the markup. Both effects push the short-run price higher. The AD shift will push output higher, the AS shift will push output lower, and here the AS shift is drawn to have the larger impact on short-run output. In general, the effect on output is ambiguous.

2) *Now consider what changes as the economy moves to the new natural level of output. Does the price increase further or decrease from the short to the medium run? What happens to output? Can we tell in the AS-AD framework? Show on a graph.*

AS''

AS'

AS

P'

p

AD'

P^e

AD

Y_n' Y' Y_n
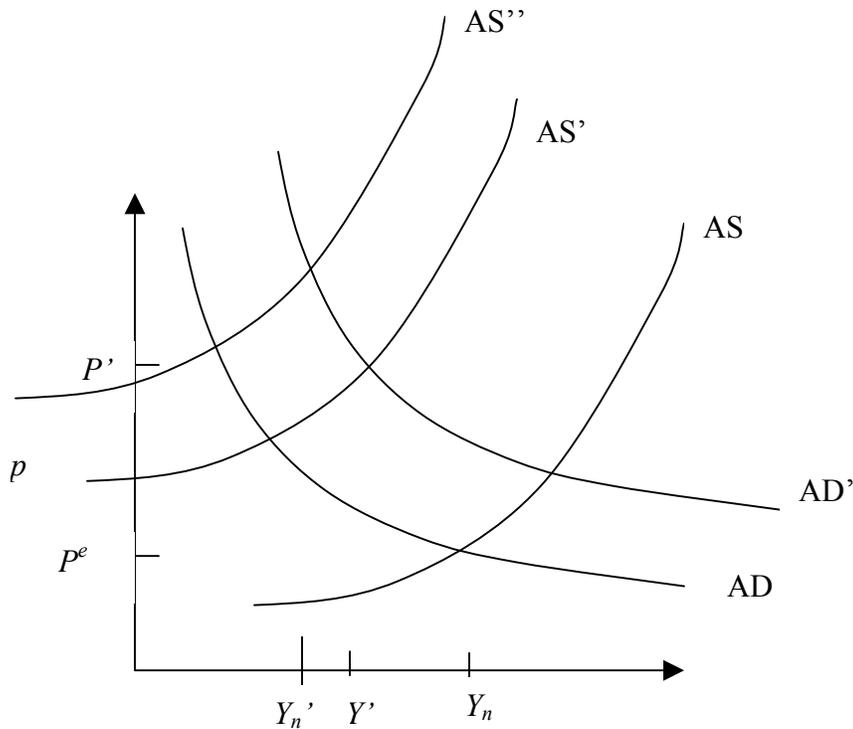
We can tell in the AS-AD framework. The shift in the AS curve will cause prices to move even higher and output to decrease even further in the medium run because output is still above the natural level. The shift in the AD curve also pushes output beyond its natural level. So the medium run effects are to push output lower and prices higher.

3) *Summarize the short-run and medium-run effects of this combination of the two assumed effects.*
Short run:
   Increase in G (shift in AD) leads to higher Y, higher P.
   Increase in production cost (shift in AS) leads to lower Y, higher P.

Medium run:
   Shift in AD leads to lower Y, higher P.
   Shift in AS leads to lower Y, higher P.

4) *What effect does the change in military spending have on the medium run level of output?*
As was the case with just a change in government spending (a change in the AD curve without a shift in the AS curve), the effect of increased government spending is to push prices higher in both the short run and the medium run. The short and medium run effects of the AD shift will cancel each other leading, to no change in output in the medium run. The medium run change in output from Y_n to Y_n' comes entirely from the change in production costs (the shift in AS).

5) *What happens to the price level during wartime in the Macronesian economy? What would be appropriate monetary and fiscal policies to change the movement in the price level? What trade-offs do the policy makers face?*

Prices increase in the short and medium run. To get the price level back down would require contractionary monetary or fiscal policies that would shift the AD curve to the left. These policies would counteract the inflationary pressure arising from the increase in production costs and the increase in spending on the war, but might cause a recession. The issue is that monetary and fiscal policies cannot counteract the shift in the AS curve directly; they only affect the AD curve.