14.02 - Fall 2001
Problem Set 8 Solutions
Posted November 30, 2001

I. True/False (30 points, 5 each)

1. TRUE, a decrease in the price of oil is reflected in a reduction of the mark-up μ (the interpretation story described in your text book). The natural rate of unemployment declines, the natural level of output increases, so the AS shifts to the right, and in the medium run the price level is lower. Thus, for a fixed nominal supply of money, the real money supply will increase, which will result in a lower interest rate.

2. TRUE, the two policies have offsetting effects on output but both reduce the interest rate (they are usually implemented to change the mix of private vs government investments). If the AD shifts to the left because the monetary authority miscalculates the increase in M (so we have an excessive monetary contraction), then in the medium run the price level will be lower which further reduces the interest rate.

3. TRUE, more competition in the goods market reduces the mark-up, and the analysis become analogous to question 1.

4. TRUE, let $u_n^{true} > u_n^{estimated}$ and $\pi_t^i - \pi_{t-1} = -\alpha(u_t - u_n^i)$, then the authority trying to equate u_t with $u_n^{estimated}$ will let $\Delta\pi$ be larger than necessary.

5. TRUE, as long u_t is larger than u_n, we have a negative change in the inflation rate (ie, inflation is decreasing while the unemployment rate is above its natural rate, with the decrease being smaller the closer u_t is to u_n), but as soon as $u_t < u_n$ then you expect to see the change in inflation to become positive. Therefore, $\Delta\pi$ increases over time. –Of course, if you assumed (and stated) that we were talking about the *absolute value* of the change in inflation, then your answer would have to be FALSE, since the magnitude of $\Delta\pi$ will decrease (as long as it is negative) only to start increasing again (once it becomes positive).
Here are the true data for your curiosity:

8

6

4

2

0

93   94   95   96   97   98   99   00

——— INFLATION ----- UNRATE

6. FALSE, indexation increases the effect of unemployment on inflation: with indexation wages respond to price right away. In a standard economy, a given decline in the unemployment rate will have a positive impact on wages (through wage setting) which will in turn have a positive impact on prices (through price setting). Then, this increase in the current level of prices will shift price expectations for the next period up, and then we will have a further increase in wages and prices in the next period. But in an economy where a large fraction of workers earn wages that are indexed to inflation, then the same initial increase in P from the same original decline in u_t will actually feed back into further increase in the wages of those who are currently covered by wage indexation. This increase in wages will produce a further increase in the price level in this current period –which will in turn cause higher wages, and so on... As a result, a given reduction in the unemployment rate will produce higher inflation in the European economy.

II. AS-AD (40 points, 8 each)
(Note: the possible scenarios are not unique depending on the relative movements)

1. In the US $G \uparrow$, in the short run the IS shifts to the right, the AD shifts to the right (remember that because $P \uparrow$ in the short run LM shifts up, the real
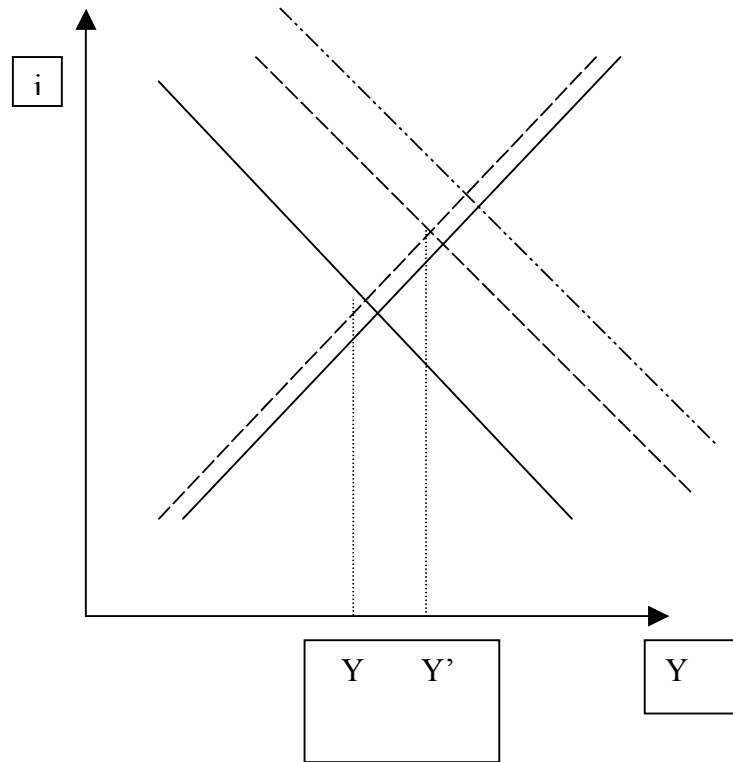
Figure 1:

exchange rate appreciate a little, the IS shifts left a little). So output, prices and the interest rate will have increased. Long run: the Price level will be higher, thus the real exchange rate has appreciated and it is through this appreciation that output declines towards its natural level. The interest rate will also be higher. The composition of output has changed (not its level, given that Y_n has not changed): G is larger, I is lower (because we have a higher i for the same Y).

Short run: See Figure 1.

Sort run and Medium Run: See Figure 2.

In the EU, in the short run, they export a little more to the US. Output, prices and the interest rate increase in the short run. In the long run, their exports to the US will be larger, and their imports will be lower. The price level and the interest rate will have increased even further. But notice that their natural level of output has not changed: only its composition (lower investment, higher net exports).

Let us now look at the assumption of fixed exchange rates. We know that having fixed nominal exchange rates implies that the interest rate has to be the
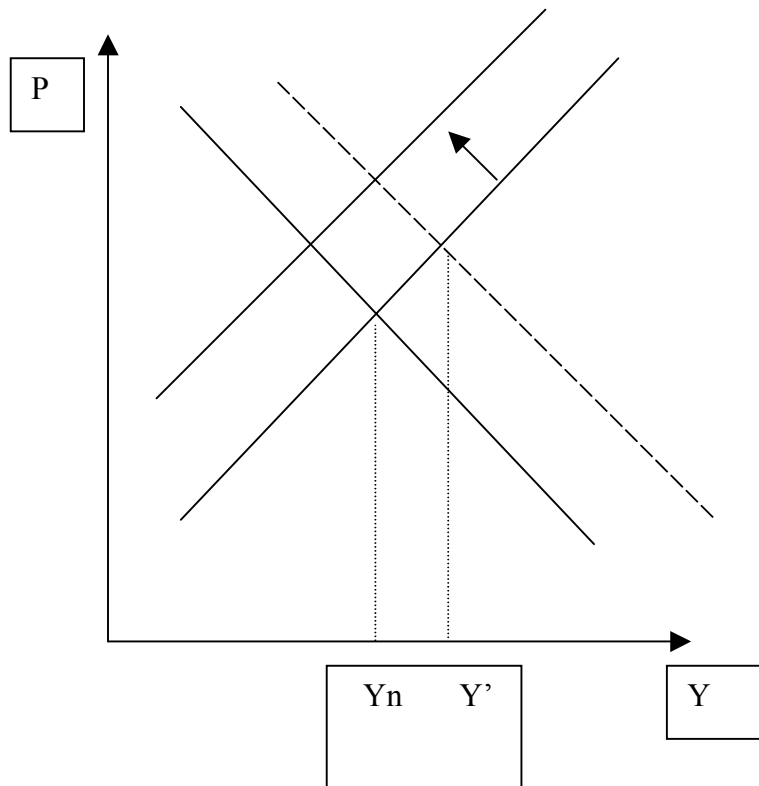
P

Yn   Y'

Y

Figure 2:

4

same in both economies. Notice that, even though the interest rates in both economies will go up both in the short and in the medium run, we might have differences between i_{US} and i_{EU} at some point in time. In such case, this would create expectations of a depreciation or appreciation of the nominal exchange rate. Therefore, the authorities might want to revalue/devalue the currency, or even abandon the fixed exchange rate system and switch to a flexible one. Alternatively, both economies can coordinate their monetary policy to make i_{US} and i_{EU} go up at the same time and never differ (mainly, by having the European Central Bank adjust its monetary policy...).

2. Oil shock: It affects both economies in the same way (since oil is sold for dollars, but the nominal exchange rate is fixed). In both cases, it reduces the natural level of output, so we have a negative supply shock. In the short run, prices and the interest rate rise while output declines. In the long run, prices and interest rates increase to even higher levels as output is reduced all the way to the lower new natural level.

The difference with the first part is that now, if there had also been a positive demand shock (coming from a fiscal expansion in the US, and an NX increase in the EU), then the AS will keep shifting up in the medium run until it intersects the new lower Y_n at a higher price level. Therefore, the decline in output would be the same (since it is given by the negative AS shock), but with the fiscal expansion we would have more inflation.

3. The mark-up will be lower in the US, which will increase Y_n in the US, while Y_n in Europe would remain unchanged. In the short run, the AS shifts to the right (positive AS shock), and therefore output increases, while the price level and the interest rate go down. In the medium run, output increases all the way to its new natural level, while there is a further decline in prices and in the interest rate. Note that now, since the exchange rate is flexible, as i decreases, the exchange rate will be increasing (i.e.: depreciating), according to the interest parity condition. This means that NX and hence Y will be increasing as i declines, which is exactly what we have: we will be moving along the IS and along the AD curve as this happens.

From the point of view of Europe, there is a real exchange rate appreciation, which reduces net exports, although that decline is to some extent partially offset by the increase in output in the US. So there will be some decline in output and prices in Europe in the short run. But in the medium run, output will go back to what it was initially, because its natural level has not changed. In order to get there, prices will have decreased by a bit more.

4. A discrete depreciation of the dollar shifts the IS, and therefore the AD to the right (positive demand shock), so output, prices and the interest rate go up, but in the medium run you have to go back to the natural level of output, so the US price level will be higher, and their real exchange rate will come back to a lower level. The opposite will be true in EU: in the short run the IS and AD shift to the left (negative demand shock), so output, prices and the interest rate will go down, but in the medium run Y will go back up its natural level, while

P and i will be lower and the real exchange rate will have gone back up. –Thus, the initial US dollar devaluation is offset by the subsequent real appreciation. (*Note for the curious*: You could argue that the increase in output in the US should partially offset the decline in NX in Europe, so the negative AD shock there should be smaller. Similarly, the reduction in output in the EU should offset part of the increase in NX in the US, and therefore moderate the AD shift there. In that case, the recession in Europe and the boom in the US would not be that large. But note that those effects cannot completely offset the effect from E, which was the reason why the AD curves were shifting in the first place! If both countries actually maintained the same level of Y, they could not possibly affect the other's net exports!)

5. if unemployment benefits in the increase in the EU, then the European natural rate of unemployment increases, and their natural level of output decreases. In the US, the natural level of output is unchanged.

In the short run, output declines in Europe, prices increase and the interest rate rises (which makes the nominal exchange rate go down, according to the interest parity condition). In the medium run, output in Europe decreases until it reaches the new lower Y_n, while P and i increase even further. Note that the reduction in E, combined with the increase in P, is reducing the real exchange rate (so there is an appreciation of the Euro).

In the US, there is a slight positive demand shock coming from the increase in net exports (because of the US dollar appreciation), which is only partially offset by the decline in EU output. In the short run, output, prices and the interest rate increase. In the medium run, prices and the interest rate increase even further, while output goes back to its (unchanged) natural rate. (The composition of output, however, has changed: investment is now lower, while net exports are higher).

III. The Phillips Curve (30 points, 6 each)

1. The derivation is in the textbook, page 165.

2. There is a higher natural unemployment rate, so the PC would shift to the right (we would have a larger $(\mu + z)$, which would imply a higher intercept and a bigger u_n). See Figure 3.

3. The natural unemployment rate remains unchanged, but it now corresponds to a higher expected inflation rate, so the PC would shift up (we would have a higher π_t^e and therefore a higher intercept as well). See Figure 3.

4. In part 2 for a given inflation rate the unemployment rate is larger because of a change in the structure of the economy while in part three because of a change in the expected inflation: in (2) an expansionary monetary policy leading to a higher inflation rate would move you along the line –to the northwest–, and thus reduce the unemployment rate. In (3) such a policy would have less or no effect because an increase in expected inflation is the result of increased
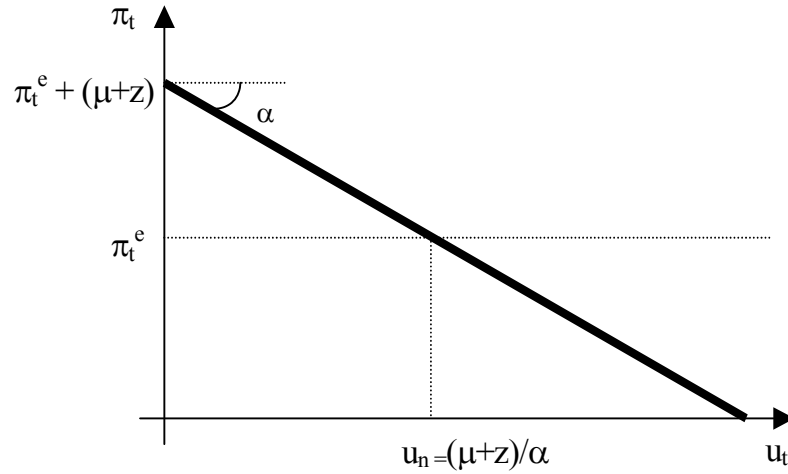
Figure 3:

inflation. Thus, in order to change the expectation on inflation you have to adopt an disinflationary policy which accentuates the unemployment in the short run but shifts down the Phillips Curve in the longer term.

5. According to the Phillips Curve (which we can always rewrite as: $\pi_t - \pi_t^e = -\alpha(u_t - u_n)$), if $\pi_t^e > \pi_t$ systematically, then $(u_t - u_n)$ must be positive, so the unemployment rate has to be above its natural rate –and as long as expectations are formed so that $\pi_t^e = \pi_{t-1}$, then u_t will be increasing over time. If $\pi_t^e = \pi_t$ systematically, the unemployment rate is always at its natural rate.

Intuitively, overestimating the rate of inflation makes workers demand higher nominal wages for any given u_t (from WS), because they think their wages will be worth less in real terms. This, in turn, will make firms charge higher prices (from PS) at the given level of Y. This implies a negative AS shock, which will result in lower output and higher u_t in the short-run.