

## Problem Set 4

### Question 2

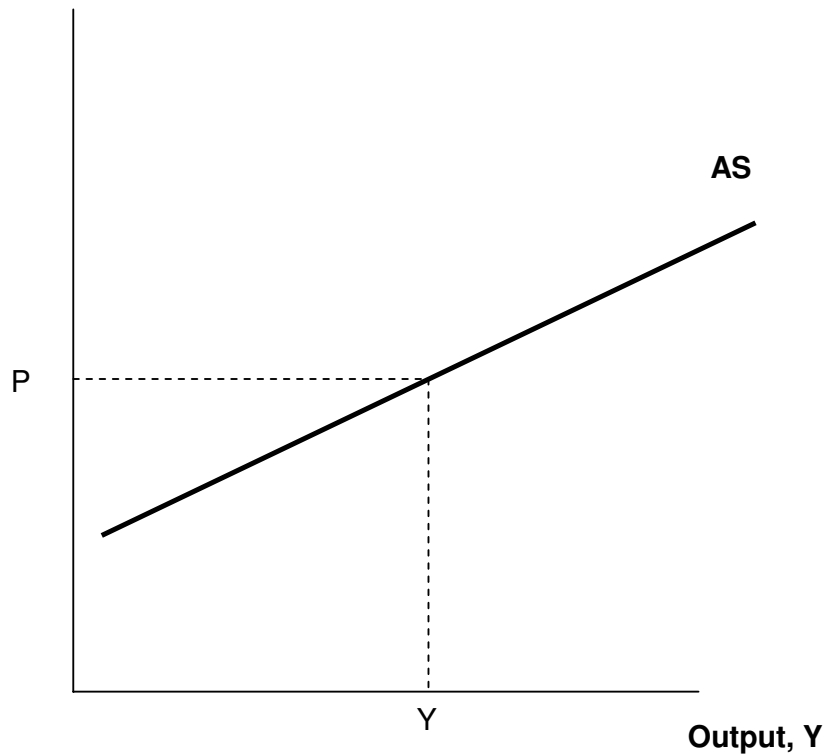
We are asked to label each of the seven statements as true, false or uncertain and to justify our answers briefly.

**(a) The aggregate supply relation implies that an increase in output leads to an increase in the price level.**

TRUE.

The aggregate supply relation describes how changes in output affect the price level. We can see from the graph below that an increase in the level of output leads to an increase in the price level.

**Price Level, P**



This process is a four step process:

1. An increase in output leads to an increase in the level of employment.
2. The unemployment rate falls as a result.
3. The lower unemployment rate leads to a rise in nominal wages.
4. This increase in the nominal wage causes firms to increase their prices, so raising the overall price level in the economy.

**(b) The natural level of output can be determined by looking at the aggregate supply relation alone.**

TRUE.

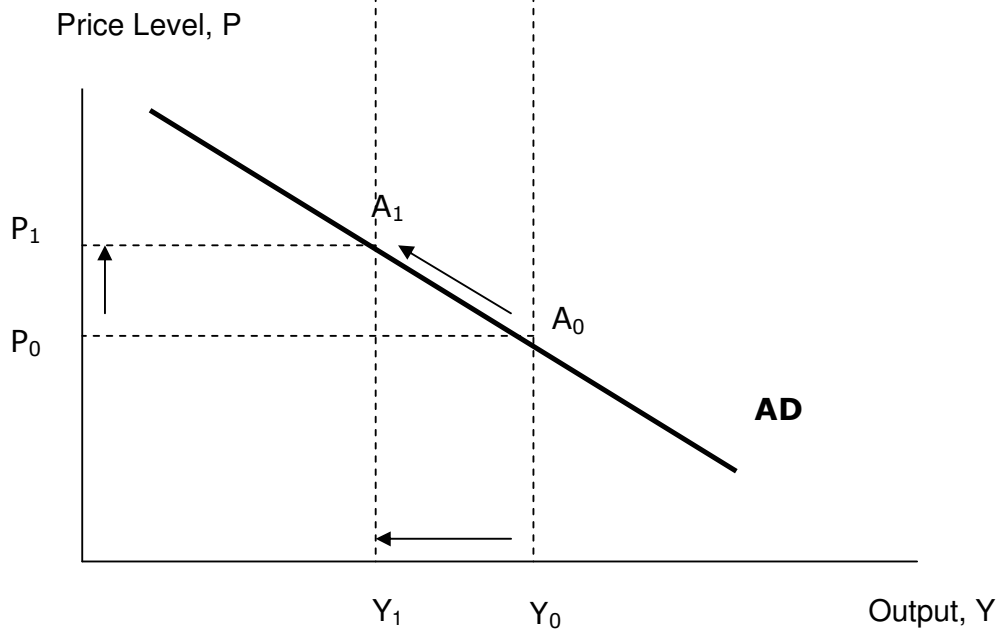
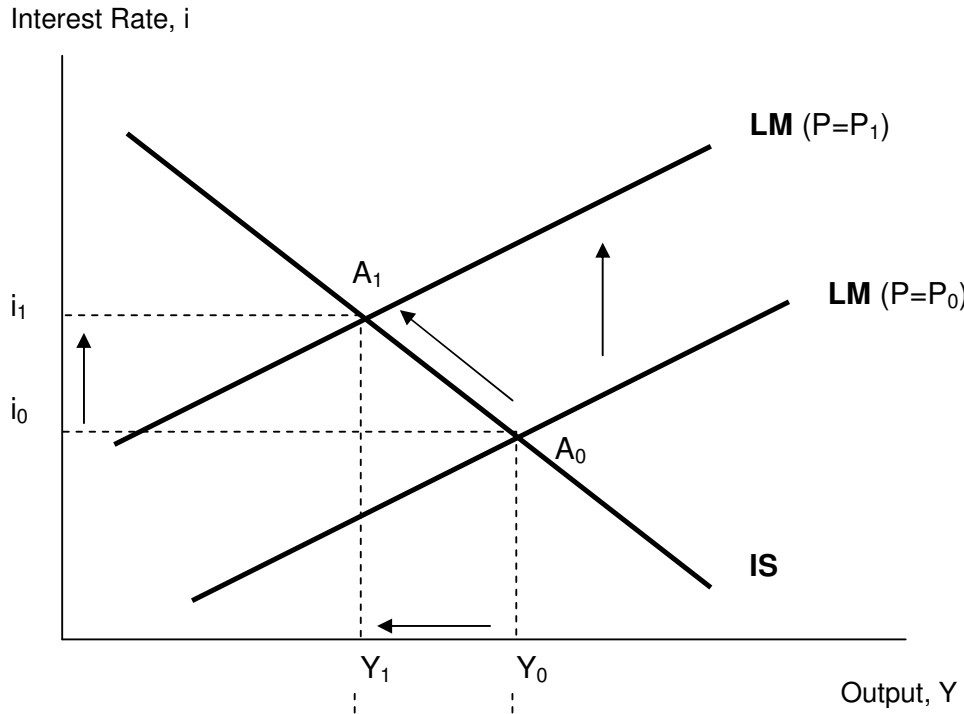
The natural rate of unemployment, and hence the natural level of output, is determined by labour market conditions.

The natural level of output  $Y_n$  is such that, at the associated rate of unemployment  $u_n$ , the real wage ( $W/P^e$ ) chosen in wage setting (workers' side) is equal to the real wage ( $W/P$ ) chosen in price setting (firms' side).

Therefore, the aggregate supply relation determines the natural level of output, for given labour market conditions, when the actual price level  $P$  is equal to the expected price level  $P^e$ .

(c) The aggregate demand relation slopes down because at a higher price level, consumers wish to purchase fewer goods.

FALSE.



The aggregate demand relation is derived from the IS-LM Model. The AD curve represents the locus of equilibria in the IS-LM model.

The LM Curve represents the set of equilibria in the Money Market for a given price level,  $P = P_0$ . If the price level rises to  $P_1$  (inflation), then the real money supply ( $M/P$ ) falls. This causes the LM curve to shift upwards. The equilibrium,  $A_0$ , moves along the IS Curve to the new equilibrium at  $A_1$ . The interest rate increases and output therefore decreases from  $Y_0$  to  $Y_1$ .

Mapping these equilibria in  $(P, Y)$  space gives us the aggregate demand (AD) curve. This is downward-sloping and shows the negative relationship between the price level and the level of output. As the price level increases from  $P_0$  to  $P_1$ , the level of output falls from  $Y_0$  to  $Y_1$ .

Summary: The AD curve slopes down, because a rise in the price level causes a fall in the real money supply. This shifts the LM Curve upwards and so causes a rise in interest rate and a fall in the level of output.

**(d) In the absence of changes in fiscal or monetary policy, the economy will always remain at the natural level of output.**

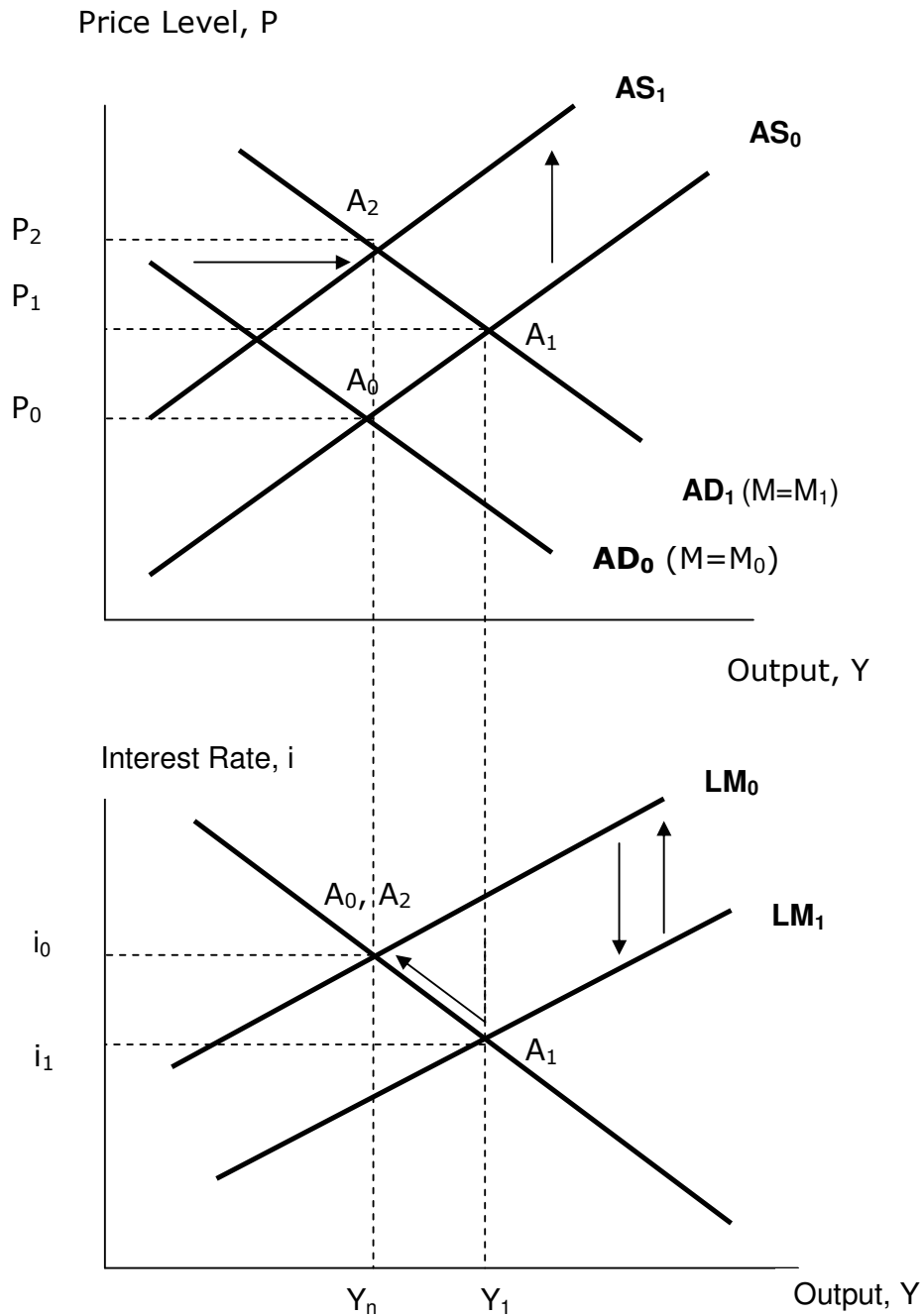
FALSE.

This is untrue, because there are other causes of changes in supply and demand that cause the economy to deviate from the natural level of output. These include shocks such as changes in oil prices (as seen in Chapter 7 of Blanchard and in lectures) and fluctuations in consumer or business confidence in the economy (as seen in Question 1 of Problem Set 4).

(e) Expansionary monetary policy has no effect on the level of output in the medium run.

TRUE.

The short run effect of an increase in the money supply is that output increases, while the interest rate falls and the price level rises. In the medium run, the output level and the interest rate are unchanged, but the price level is higher.



Looking at the IS-LM diagram first; a monetary expansion causes the money supply to rise from  $M_0$  to  $M_1$ , and so the LM Curve shifts from  $LM_0$  to  $LM_1$ . The new equilibrium is at  $A_1$ , with a consequent rise in the output level and a fall in the interest rate. This causes the AD curve to shift to the right, with the price level rising from  $P_0$  to  $P_1$ . The new (**short run**) equilibrium is at  $A_1$ , with higher output level  $Y_1$ , higher price level  $P_1$  and an lower interest rate of  $i_1$ .

**In the medium run** the price level is higher than expected and so the expected price level increases too. Workers demand higher nominal wages to compensate them for the higher cost of living. Firms in turn raise their prices to cover the increase in their wage costs. This causes the AS Curve to shift upwards to  $AS_1$ . The new equilibrium is now at  $A_2$ , with higher price level  $P_2$ .

Looking again at the IS-LM Model, we see that the rise in the price level causes the real money supply to contract again and so the LM curve shifts back upwards. The interest rate rises back to its initial level ( $i_0$ ) and the level of output falls back to its initial level ( $Y_n$ ).

Overall, in the short run, the monetary expansion causes the interest rate to fall, output to increase and the price level to rise. In the medium run, the interest rate rises back to its initial level, the level of output falls back to its initial level and the price level is higher than at the outset.

**(f) Fiscal policy cannot affect investment in the medium run because output always returns to its natural level.**

FALSE.

Fiscal policy can affect investment in the medium run, because it can affect the interest rate in the medium run.

We use the example of a deficit reduction (in the form of a decrease in government spending,  $G$ ) to illustrate the effect that fiscal policy can have on investment in the medium run.

Looking at the IS-LM diagram first, we see that the fall in government spending causes the IS Curve to shift to the left, from  $IS_0$  to  $IS_1$ . On the AS-AD diagram, the fiscal contraction causes the AD Curve to shift to the left, from  $AD_0$  to  $AD_1$ . The new equilibrium has a lower output level,  $Y_1$ , and also a lower price level,  $P_1$ . This lower price level feeds back into the IS-LM model, as it raises the real money supply ( $M/P$ ) and so shifts the LM Curve downwards, from  $LM_0$  to  $LM_1$ . The new (**short run**) equilibrium is at  $A_1$ , with lower output level  $Y_1$ , lower price level  $P_1$  and an lower interest rate of  $i_1$ .

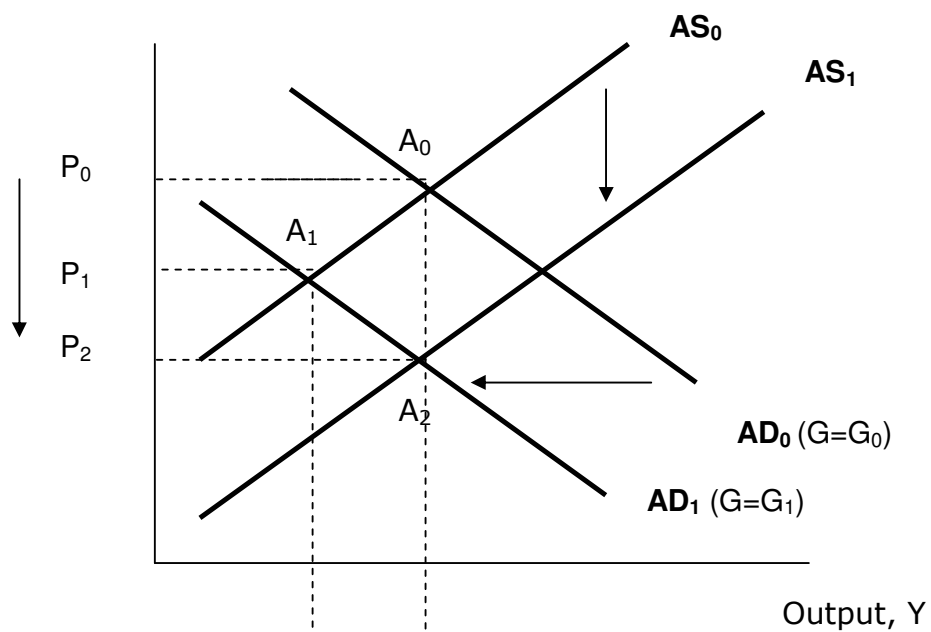
**In the medium run**, the price level has fallen below the expected price level,  $P^e$ , and so the expected price level falls too. This pushes the price level down further, which in turn pushes up the real money supply ( $M/P$ ) and so shifts the LM Curve further down, to  $LM_2$ . The level of output increases back to the natural level of output,  $Y_n$ , and the interest rate falls further to  $i_2$ . The fall in the price level shifts the AS Curve downwards, giving the medium run equilibrium at  $A_2$ , with output at the natural level ( $Y_n$ ) and the price level falling to  $P_2$ .

Overall, output is back to its natural level and the price level is lower. But the interest rate is also lower in the medium run and this is how fiscal policy can affect the level of investment in the economy. Investment is higher than before the fiscal contraction due to the fall in the interest rate. This is clear from looking at the IS relation:

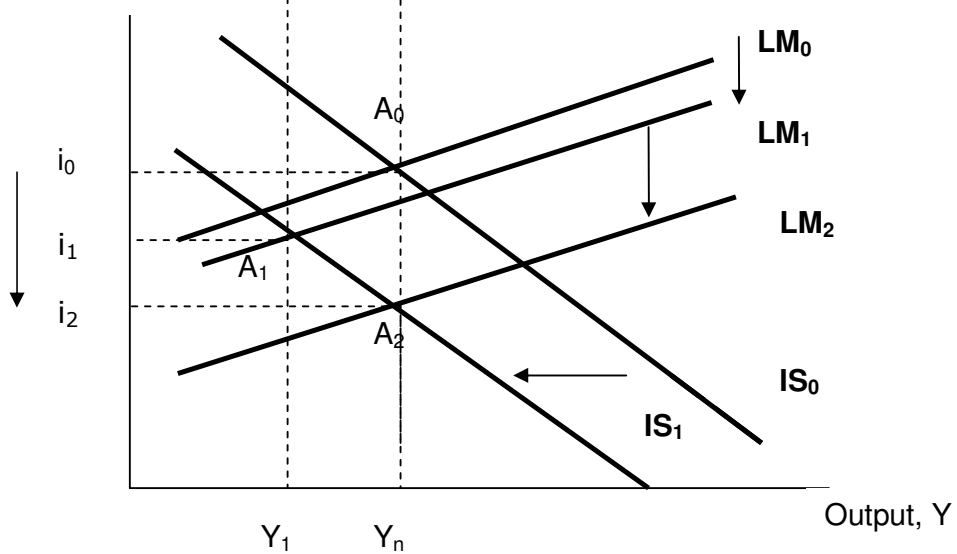
$$Y_n = C(Y_n - T) + I(Y_n, i) + G$$

The level output is the same as before ( $Y_n$ ), as is consumption ( $C$ ) and tax ( $T$ ). The fall in government spending ( $G$ ) is therefore offset by the increase in investment ( $I$ ).

Price Level, P



Interest Rate, i





**(g) In the medium run, prices and output always return to the same value.**

FALSE.

In the medium run, **the level of output** usually returns to the natural level. An exception to this is when the economy experiences supply-side shocks. A good example of this is the oil shock discussed in Chapter 7 of Blanchard and in lectures.

In the medium run, **the price level** doesn't necessarily return to its initial level either. We have already seen a number of examples where the medium run price level is not the same as the initial one:

- In part (e) of Question 2, we saw that a fiscal expansion can cause the price level to rise in the medium run.

- In part (f) of Question 2, we saw that a fiscal contraction can cause the price level to fall in the medium run.

- In part (a) of Question 1, we found that an exogenous fall in business confidence, leading to a fall in the level of investment, causes the price level to fall in the medium run.

- In Chapter 7 of Blanchard and in the lecture notes, there is the example of an oil price shock which raises the price level (and decreases also the level of output in the medium run).