

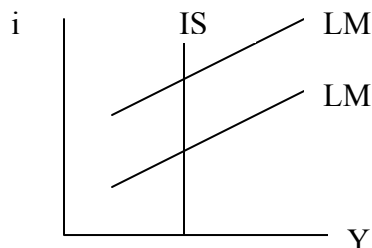
Quiz 2 Answers

PART I

1) False, capital Accumulation alone will not sustain growth in output per worker in the long run due to diminishing marginal returns to capital – as more and more capital is added to a given number of workers, the increments to output become smaller and smaller and ultimately level off. In the long run, technical progress will be needed to sustain growth.

2) Part a) False. The company's value added is \$700 - \$200 in wages and \$500 in profits. It's contribution to US GNP is therefore only \$200. I gave 3 points for "It contributes only \$200 to US GNP" or "It contributes value added to GDP rather than GNP" or "Its contribution to US GNP is not equal to its value added since profits are subtracted from GDP when calculating GNP". 0 points for anything along the lines of "The company contributes nothing to US GNP since it is foreign owned". Part b) True. The company's value added does not contribute anything to the GDP of the country which the businessman hails from, since the value is not added within that country's domestic borders.

3) If neither consumption nor investment are affected by the interest rate, the equilibrium in the goods market is given by $Y = I(Y) + C(Y) + G$, independent of the interest rate level. Monetary policies can only affect the equilibrium output in the short run through changing the interest rate level. The interest link is not present in this case, so the monetary policy is completely ineffective.



4) An oil shock affects the markup level (μ) and then the natural unemployment rate (u_n) and the natural output level (Y_n). The output level is affected both in the short run and in the long run. If tax revenues are proportional to output ($T=tY$), the revenues are going to be affected and therefore the Budget Deficit ($BD=G-T$).

PART II

1) $u_t - u_{t-1} = \beta(g_y - g_{yt})$: Okun's law

This equation recognizes the fact that productivity of labor (A) and labor itself (L) are growing at the combine rate of g_y (normal growth rate). So unemployment rate decreases every time output growth rate is above the normal rate.

The relation is derived from the production function $Y=AN$ so $u = 1-Y/AL$.

$g_{yt} = g_m - \pi_t$: AD-relation

This equation is derived from the IS-LM model. Increasing the real amount of money increases the level of output in equilibrium. The above equation is describing that relation in rate of growth terms, assuming the relation between the equilibrium output level and the real amount of money is linear ($Y = \theta M/P$).

$\pi_t - \pi_{t-1} = -\alpha(u_t - u_n)$: Phillips curve

The Phillips curve is the equivalent of the AS-curve in growth rate terms. It is describing the fact a decrease in unemployment leads to higher wages and then prices.

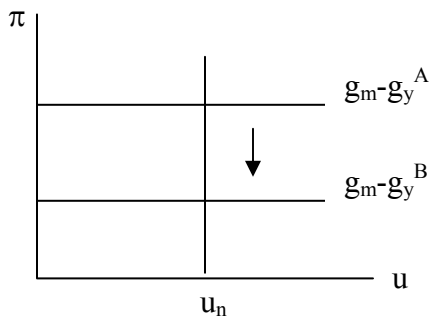
2) The medium run equilibrium is attained when $u_t = u_{t-1}$, unemployment rate is constant in the medium run.

$$u_t = u_{t-1} \rightarrow g_{yt} = g_y \rightarrow \pi_t = g_m - g_y \rightarrow \pi_t = \pi_{t-1} = \pi_t^e \rightarrow u_t = u_n$$

If the normal growth rate increases ($g_y^B > g_y^A$), the new medium run equilibrium is

$$g_{yt} = g_y^B \rightarrow \pi_t = g_m - g_y^B < g_m - g_y^A. \text{ Again, } \pi_t = \pi_{t-1} = \pi_t^e \rightarrow u_t = u_n$$

Graphically



The causes of inflation in the medium run are purely monetary. Inflation is equal to the excess of nominal money supply. Intuitively, money demand and output are proportional so an increase in the normal output growth rate is an increase in the real money demand. Keeping the growth rate of nominal money constant, the equilibrium is attained with a lower growth rate of prices.

3) A lower money growth rate is only affecting inflation in the medium run. From the previous answer, the initial and medium run equilibrium are as follow.

Initial MR equilibrium (point A in the graph): $u^A = u_n$, $g_y^A = g_y$, $\pi^A = g_m^A - g_y$

New MR equilibrium (point B in the graph): $u^B = u^A = u_n$, $g_y^B = g_y^A = g_y$, $\pi^B = g_m^B - g_y < \pi^A$

In the transition, given that adaptive expectations prevent the individuals to adjust inflation right away to the new medium run equilibrium, the nominal money growth decreases more than the inflation rate and the output growth rate decreases. That leads to a higher unemployment rate, which in turns induces a decrease in inflation. We can see that graphically (point 2 in the graph):

At time 1 (before the change in g_m), the economy is in its MR equilibrium and the PC and OL+AD curves are as follow:

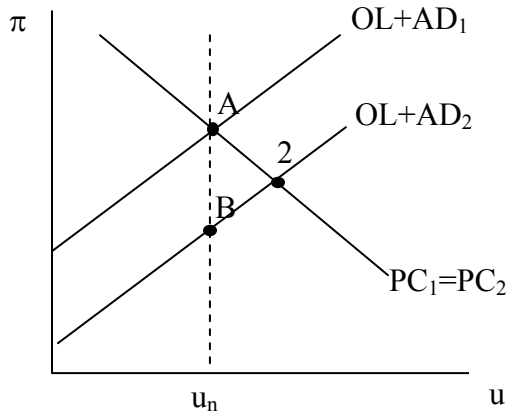
PC: $\pi_t = -\pi_{t-1} - \alpha(u_t - u_n)$, with $\pi_{t-1} = \pi_t$

OL + AD: $\pi_t = g_m^A - g_y + (u_t - u_{t-1}) / \beta$, with $u_t = u_{t-1}$.

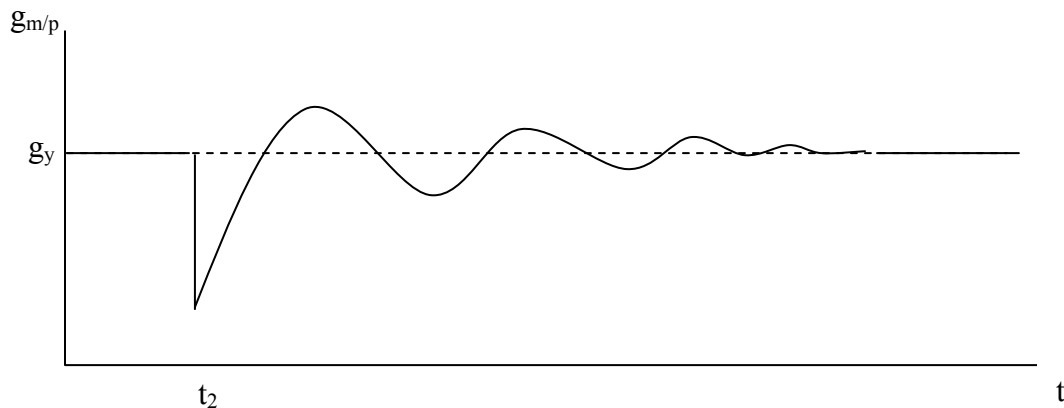
At time 2 (when g_m changes to its new level), the PC and OL+AD curves are as follow

PC: $\pi_t = -\pi_{t-1} - \alpha(u_t - u_n)$, with $\pi_{t-1} = \pi_t$

OL + AD: $\pi_t = g_m^B - g_y + (u_t - u_{t-1}) / \beta$, with $u_t = u_{t-1}$.



The nominal money growth changes once and for all from g_m^A to g_m^B . The real money is growth rate is endogenous, equal to $g_m^B - \pi_t$ (notice that the real money growth is equal to the output growth $g_{y,t}$ since the money demand is growing at the same rate as output). In the very short run (point 2) the inflation decreases less than the drop in nominal money growth, so the real money supply decreases. Then, it oscillates around its steady state till it gets to its medium run equilibrium where the real money growth is equal to g_y .



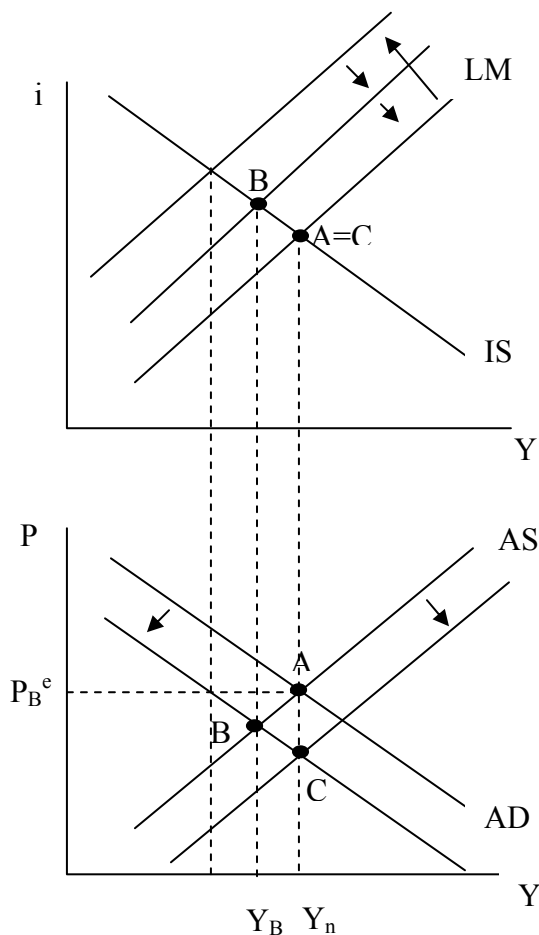
4) Sacrifice ratio accounts for the cost of a desinflationary policy in terms of unemployment. It is the number of point years of excess unemployment that an economy has to suffer in order to achieve a one-percentage point decrease in inflation.

If individuals form expectations about future inflation based on previous year's inflation rate, this ratio is equivalent to the inverse of the slope of the Phillip Curve ($1/\alpha$). In this case, the sacrifice ratio is not affected by the degree of gradualism of the desinflationary policy, since the number of point years of excess of unemployment is not affected. So, policy makers can choose between a gradual desinflationary policy that involves a lower excess unemployment rates for a long time or a high excess of unemployment for a short period of time.

5) If the Fed has a high degree of credibility, the announcement of a desinflationary policy may induce lower expected inflation rate. In the extreme case where individuals form their expectations according to the Fed's inflation target, the transition towards the new medium run equilibrium is instantaneous (in question 3, the economy jumps from equilibrium A to B) without suffering from excess of unemployment. In this extreme case, the sacrifice ratio is zero.

PART III.

1)



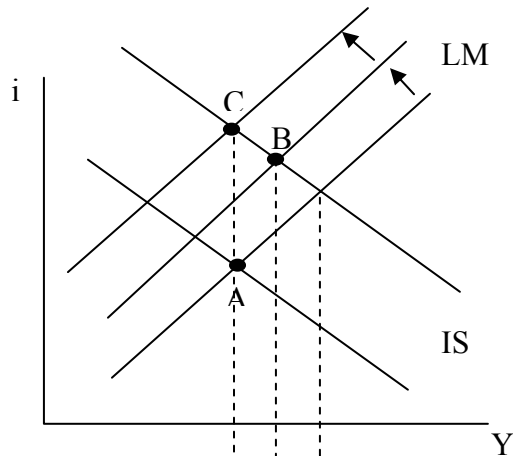
A	Initial medium run equilibrium
B	Short run equilibrium
C	Final medium run equilibrium

	BvsA	CvsB	CvsA
Y	$Y_B < Y_A$	$Y_C > Y_B$	$Y_C = Y_A$
C	$C_B < C_A$	$C_C > C_B$	$C_C = C_A$
I	$I_B < I_A$	$I_C > I_B$	$I_C = I_A$
P	$P_B < P_A$	$P_C < P_B$	$P_C < P_A$
i	$i_B > i_A$	$i_C < i_B$	$i_C = i_A$
M/P	$M/P_B < M/P_A$	$M/P_C > M/P_B$	$M/P_C = M/P_A$

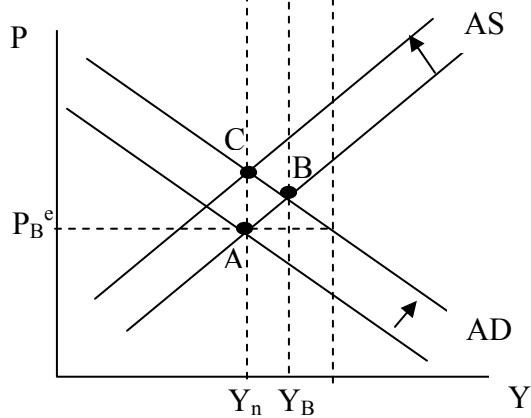
A decrease in the nominal supply of money leads to an increase in the interest rate level in order to induce a decrease in the demand of money and equilibrate the money market. That reduces private investment, which in turn leads to a decrease in the equilibrium output and therefore consumption (first movement in the LM curve and shifting the AD curve). A decrease in output is followed by a drop in prices so, even in the very short run, the LM moves back a little. In the short run (point B), the output is below its natural level (so consumption is also below its original level) and the interest is higher than in point A, so the private investment is also lower.

In the short run equilibrium (point B) prices are below the expected price level, so wage setters will revise their expectations down till they get to the actual price level (consecutive shifts in the AS curve). The point where the expected price level is equal to the actual price level coincides with the point where output is back to its natural level (point C). In this final medium run equilibrium, the overall reduction in the price level completely offset the monetary contraction and the real amount of money is back to its original level, so is output, consumption, investment and interest rate.

2)



A	Initial medium run equilibrium
B	Short run equilibrium
C	Final medium run equilibrium

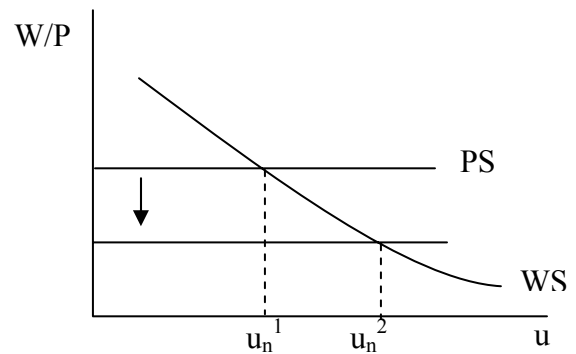
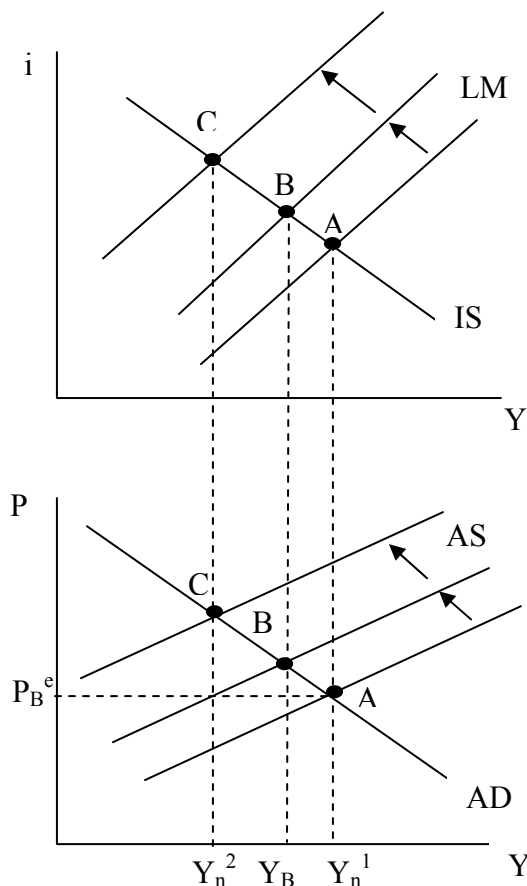


	BvsA	CvsB	CvsA
Y	$Y_B > Y_A$	$Y_C < Y_B$	$Y_C = Y_A$
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i	$i_B > i_A$	$i_C > i_B$	$i_C > i_A$
M/P	$M/P_B < M/P_A$	$M/P_C < M/P_B$	$M/P_C < M/P_A$

In the short run (point B), the increase in government expenditure results in an output expansion (shift IS and AD curves), which leads to an increase in prices (first shift in the LM curve). The interest rate has to go up in order to restore the equilibrium in the money market –i.e., first, an increase in the interest rate is needed to compensate the effects of the output expansion on the money demand, and second, to reduce the demand of money even further and equalize it to the smaller amount of real money-. The evolution of total investment in the short run is ambiguous: the fiscal expansion is partly on public investment but higher interest rate reduces the private investment.

In point B, the expected price level is below the actual price so wage setters are revising their expectations till they match with actual price level (consecutive shifts in the AS curve). At that point (point C), output goes back to its natural level (also consumption does), but the price level increases even more resulting in further real money contractions (consecutive shifts in the LM curve). The effect on investment is not ambiguous any more: $Y=C+I+G$, so if Y and C are in their initial values and G is higher than it was in point A, it has to be that I went down. In effect, the interest rate keeps on increasing till the drop in private investment is such that total investment decreases in the same amount that the government expenditure in wages increased.

3)



A	Initial medium run equilibrium
B	Short run equilibrium
C	Final medium run equilibrium

	BvsA	CvsB	CvsA
Y	$Y_B < Y_A$	$Y_C < Y_B$	$Y_C < Y_A$
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M/P	$M/P_B < M/P_A$	$M/P_C < M/P_B$	$M/P_C < M/P_A$

An increase in oil prices shifts the PS curve down, since prices are going to be higher for any level of wages (decrease in real wages). Therefore, the natural unemployment rate increases from u_n^1 to u_n^2 and the corresponding natural output level goes down from Y_n^1 to Y_n^2 . That is, the AS curve moves to the left resulting in higher prices and lower output in the short run. That increase in prices reduced the real amount of money (first shift in the LM curve) increasing the interest rate and therefore, reducing private investment. At point B then, output, consumption and investment are lower.

In point B prices are above the expected price level. So wage setters revise their expectations up till they match the actual price level (consecutive shifts in AS and the consequent shifts in LM). At that point (point C), output coincides with its new natural level.

Concluding, a permanent increase in oil prices will induce an increase in prices and a decrease in investment both in the short run and in the medium run.