Analytical Problems: Chapter 9

1. (a) The increase in desired investment shifts the IS curve up and to the right, as shown in Figure 9.21. The price level rises, shifting the LM curve up and to the left to restore equilibrium. Since the real interest rate rises, consumption declines. In summary, there is no change in the real wage, employment, or output; there is a rise in the real interest rate, the price level, and investment; and there is a decline in consumption.

![Figure 9.21](image-url)
(b) The rise in expected inflation shifts the \( LM \) curve down and to the right, as shown in Figure 9.22. The price level rises, shifting the \( LM \) curve up and to the left to restore equilibrium. Since the real interest rate is unchanged, consumption and investment are unchanged. In summary, there is no change in the real wage, employment, output, the real interest rate, consumption, or investment; and there is a rise in the price level.

(c) The increase in labor supply is shown as a shift in the labor supply curve in Figure 9.23 (a). This leads to a decline in the real wage rate and an increase in employment. The rise in employment causes an increase in output, shifting the \( FE \) line to the right in Figure 9.23 (b). To restore equilibrium, the price level must decline, shifting the \( LM \) curve down and to the right. Since output increases and the real interest rate declines, consumption and investment increase. In summary, the real wage, the real interest rate, and the price level decline; and employment, output, consumption, and investment rise.

(d) The reduction in the demand for money gives results identical to those in part (b).
2. The increase in the price of oil reduces the marginal product of labor, causing the labor demand curve to shift to the left from \( ND^1 \) to \( ND^2 \) in Figure 9.24. Since households’ expected future incomes decline, labor supply increases, shifting the labor supply curve from \( NS^1 \) to \( NS^2 \) (but by assumption, the shift to the left in labor demand is larger than the shift to the right in labor supply). At equilibrium, there is a reduced real wage and lower employment. The productivity shock results in a shift to the left of the full-employment line from \( FE^1 \) to \( FE^2 \) in Figure 9.25, as both employment and productivity decline. Because the shock is permanent, it reduces future output and reduces the future marginal product of capital, both of which result in a downward shift of the IS curve. The new equilibrium is located at the intersection of the new IS curve and the new FE line. If, as shown in the figure, this intersection lies above and to the left of the original LM curve, the price level will increase and shift the LM curve upward (from \( LM^1 \) to \( LM^2 \)) to pass through the new equilibrium point. The result is an increase in the price level, but an ambiguous effect on the real interest rate. Since output is lower, consumption is lower. Since the effect on the real interest rate is ambiguous, the effect on saving and investment are ambiguous as well, though the fall in the future marginal product of capital would tend to reduce investment.

![Figure 9.24](image)

![Figure 9.25](image)
The result is different from that of a temporary supply shock; when the shock is temporary there is no impact on future output or the marginal product of capital, so the IS curve does not shift. In that case the price level increases to shift the LM curve up and to the left from $LM^1$ to $LM^2$ in Figure 9.26 to restore equilibrium. In that case, the real interest rate unambiguously increases. Under a permanent shock, the IS curve shifts down and to the left, so the rise in the real interest rate is less than in the case of a temporary shock, and the real interest rate can even decline.

![Figure 9.26](image)

3. (a) The decrease in expected inflation increases real money demand, shifting the LM curve up, as shown in Figure 9.27. The real interest rate rises and output declines.

![Figure 9.27](image)
(b) The increase in desired consumption shifts the IS curve up and to the right, as shown in Figure 9.28. This causes the real interest rate and output to rise.

![Figure 9.28](image)

(c) The increase in government purchases shifts the IS curve up and to the right, with the same result as in part (b).

(d) If Ricardian equivalence holds, the increase in taxes has no effect on either the IS or LM curves, so there is no change in either the real interest rate or output. If Ricardian equivalence doesn’t hold, so that the increase in taxes reduces consumption spending, the IS curve shifts down and to the left, as shown in Figure 9.29. Both the real interest rate and output decline.

![Figure 9.29](image)

(e) An increase in the expected future marginal productivity of capital shifts the IS curve up and to the right, with the same result as in part (b).