

Answers to Questions: Chapter 9

1. The output ratio and the rate of inflation both rose from 1964–66, from 1976–78, from 1987–89, and from 2003–05. They both declined from 1982–83, in 2002, and from 2007–09. The output ratio fell and the inflation rate rose from 1973–75 and again from 1979–81. The output ratio rose and the inflation rate fell in 1984–86 and again from 1996–97.
2. Both the *SAS* curve and the *SP* curve are supply curves; that is, they relate a price variable to the amount of output that producers are willing to produce. The *SAS* curve shows the relationship of the price level to output. The *SP* curve shows the relationship between the change in the price level (the inflation rate) and the level of output.
3.
 - a. An increase in money supply growth increases the rate of nominal GDP growth. This causes the economy to experience some combination of higher real GDP and higher inflation, moving it up along a given *SP* curve.
 - b. An increase in the expected inflation rate causes the *SP* curve to shift upward.
 - c. A decrease in production costs associated with technological improvement causes a downward shift of the *SP* curve.
 - d. A decrease in nominal GDP growth has the opposite effect of (a). The economy experiences some combination of lower real GDP and lower inflation, moving it down along a given *SP* curve.
4. When the equilibrium real wage is constant and output is at the natural rate, the nominal wage will be increasing at the same rate as the inflation rate. If output is greater than the natural rate and actual inflation exceeds expected inflation, then the actual real wage would be falling. In this case, we would expect workers to try to increase the rate of growth of nominal wages.
5. The three conditions are: (1) the economy is on the *SP* curve; (2) $x = p$ (so that $y = 0$); and (3) expectations are accurate ($p^e = p$). The economy cannot be off *SP* because *SP* gives the amount of output firms will produce at various inflation rates. If x is greater than (less than) p , then real GDP increases (decreases) and thus cannot be at the natural level of output. If expectations are not accurate, the economy can be in short-run equilibrium, but workers will adjust their expectations (and wage demands) in the coming period.
6. Point *D* in Figure 9-4 is not on the *SP* curve, which shows how much output firms are willing to produce at different rates of inflation. Given the 6 percent increase in nominal GDP growth, the 6 percent increase in real GDP (from 100 to 106) with zero inflation,

represented by a move from Point E_0 to Point D , is a mathematically possible outcome, but it is not consistent with firms' profit-maximization. Firms would be willing to increase output to 106 only if the inflation rate were 3 percent, but that is not possible given nominal GDP growth of just 6 percent. The 6 percent nominal GDP growth must be divided between real GDP growth and inflation along the SP curve as it is at Point F .

7. Forward-looking expectations attempt to predict the implications of economic disturbances (and policy changes) in advance. The backward-looking approach adjusts to what has already happened. It is likely that workers and firms will use the backward-looking approach. The existence of long-term wage and price agreements would prevent actual inflation from responding immediately to policy changes. Thus, they know that changes in wages and prices will adjust gradually to policy changes.
8. This represents forward-looking expectations, because workers and firms use the predictions of the long-run LP model to form their expectations of the behavior of inflation. With $p^e = x$, the SP line immediately shifts upward or downward by the full amount of the change in nominal GDP growth. Thus, there is no effect on real GDP ($y = 0$). The economy moves along its LP line, and the adjustment loops pictured in Figures 9-5 and 9-7 are no longer relevant. If workers and firms adjust their expectations in this way, the output cost of disinflation is zero.
9.
 - a. If workers and business firms believe that the Fed will take actions to prevent a demand shock from causing any permanent change in the rate of inflation, then their expectations are that any changes in inflation rates are only temporary. Therefore, any change in the output ratio that raises or lowers the inflation rate does not result in a change in the expected rate of inflation. Given that the expected rate of inflation does not change, there is no shift in the short-run Phillips curve.
 - b. For workers and business firms to continue to hold these expectations, the Fed must take actions to reduce the growth of nominal GDP to its original level when there is a positive demand shock, and to increase the growth of nominal GDP to its original level when there is a negative demand shock. If the Fed fails to do so, then the demand shock could result in a permanent change in the inflation rate, which would cause workers and business firms to abandon their original expectations.
10. What happens to the rate of inflation depends on how fast actual real GDP rises. If actual real GDP rises by more than 3 percent, the growth rate of natural real GDP, then the output ratio rises. The increase in the output ratio results in a rise in the inflation rate, given the expected rate of inflation. On the other hand, if actual real GDP increases by less than 3 percent, then the output ratio falls, resulting in a decline in the rate of inflation, given the expected rate of inflation.

11. The four types of supply shocks are oil shocks, farm price shocks, import price shocks, and productivity growth shocks.

An oil price shock is when a change in the price of oil results in a rise or fall in the inflation rate, given the growth rate of nominal GDP. Oil price shocks were adverse during the 1970s, the early 1980s, 1990, 1999–2000, and from 2003 to 2008, and beneficial from 1981–86, 1996–98, and again from 2009–10.

Farm price shocks are when changes in the prices of agricultural commodities lead to a rise or fall in the inflation rate, given the growth rate of nominal GDP. Farm price shocks were adverse from 1972 to 1974 and just recently in 2005–08 as the use of ethanol as a gasoline additive drove up the price of corn.

Import price shocks are when changes in the prices of imported goods lead to a rise or fall in the inflation rate, given the growth rate of nominal GDP. Import price shocks were adverse during the 1970s, from 1985 to 1987, and from 2002–08. Import price shocks were beneficial from 1980 through 1985 and again from 1995 to 2002.

Productivity growth shocks occur when changes in the growth rate of productivity cause a rise or fall in the inflation rate, given the growth rate of nominal GDP. Productivity growth shocks were adverse from 1965 to 1980 and mildly adverse from 2004–08. Productivity growth shocks were moderately beneficial in the early 1980s, strongly beneficial from 1995 through 2004, and highly beneficial in 2009 and early 2010.

12. The three policies have different rates of nominal GDP growth. A neutral policy would keep the growth of nominal GDP constant. An accommodating policy requires an acceleration of nominal GDP growth, but an extinguishing policy requires cutting nominal GDP growth.

Policy	Inflation	Y/Y^N
Accommodating	Increases	Remains the same
Extinguishing	Remains the Same	Decreases
Neutral	Increases	Decreases

13. A permanent shock will cause a permanent increase in the price level. If the shock occurs for only one period, however, inflation will increase only during that period if policymakers choose either a neutral or an accommodating response. It will then return to its previous level if expectations do not change and if COLAs do not exist. Even if

inflation returns to its previous level, though, there will be a decrease in natural real GDP.

14. Inflation was so low in the late 1990s due to the beneficial supply shocks provided by falling oil and import prices and a rapid rise in productivity growth. The decline in import prices was due to an appreciation of the dollar during the late 1990s.

Inflation started to rise after 2003 as the same beneficial supply shocks of the late 1990s turned into adverse supply shocks. The price of oil rose more than 500 percent between 2002 and mid-2008. Import prices rose as the dollar depreciated from 2002 through 2008. The growth rate of productivity, which had been strong from 1995 up through the first half of 2004, declined from 2005 to 2008.

15. a. Inflation and the output ratio both increase if nominal GDP growth increases, moving the economy up along a given SP curve.
- b. Inflation increases and the output ratio decreases if an adverse supply shock, which shifts the SP curve upward, combines with a neutral policy response, which holds the rate of nominal GDP growth constant.
- c. Inflation is constant and the output ratio decreases if an adverse supply shock combines with an extinguishing policy response, which reduces the rate of nominal GDP growth so as to prevent any increase in the inflation rate.
- d. Inflation decreases and the output ratio is constant if a beneficial supply shock, which shifts the SP curve downward, combines with an accommodating policy, which reduces the rate of nominal GDP growth.
16. The “headline” inflation rate is the actual inflation rate; it will move up in response to an adverse supply shock and down when a beneficial supply shock hits the economy. The core inflation rate excludes food and energy prices.

The Fed pays attention to the core inflation rate in deciding how to react to supply shocks. If the core inflation rate does not change, it will ignore the supply shock; however, it will respond to a supply shock if it sees that the supply shock is starting to have an impact on the core inflation rate.

17. The fact that fewer workers had cost-of-living-adjustments (COLAs) as part of their labor contracts meant that nominal wages did not automatically increase when inflation initially rose as a result of the sharp run up of oil prices between 2002 and mid 2008. The fact that labor costs did not increase as a result of the rise in energy prices limited the impact of the adverse supply shock on the overall inflation rate.
18. Okun’s Law shows that the unemployment rate is inversely related to the output ratio. The reason is that if real GDP rises relative to natural real GDP, employers need to hire

more workers in order to produce the additional output, which drives down the unemployment rate.

However, the fact that the unemployment rate moves in the opposite direction from the output ratio does not allow us to say anything about the relationship between the inflation rate and the unemployment rate. For example, demand shocks that initially move the output ratio and the inflation rate in the same direction eventually cause the output ratio and the inflation rate to move in opposite directions as the short-run Phillips curve shifts due to changes in expected inflation. During the initial phase of the economy's adjustment to the demand shock, the inflation and unemployment rates are negatively correlated as they move in opposite directions. Thereafter, the correlation between the unemployment and inflation rates becomes positive as the short-run Phillips curve shifts up or down.

Furthermore, supply shocks initially cause the output ratio and the inflation rate to move in opposite directions, giving rise to a positive correlation between the inflation and unemployment rates. But subsequent movements in the output ratio and the unemployment and inflation rates depend on whether the government chooses a neutral, accommodating, or extinguishing policy response to the supply shock. If the government chooses either an accommodating or extinguishing policy response, then the correlation between the unemployment and inflation rates equals zero.

19. a. If the unemployment rate did not change, then there was also no change in the output ratio. A fall in the inflation rate and no change in the output ratio result from an accommodating policy.
- b. A decline in the unemployment rate results from a rise in the output ratio. A rise in the output ratio and a fall in the inflation rate result from a neutral policy.
- c. A decline in the unemployment rate results from a rise in the output ratio. An increase in the output ratio and no change in the inflation result from an extinguishing policy.