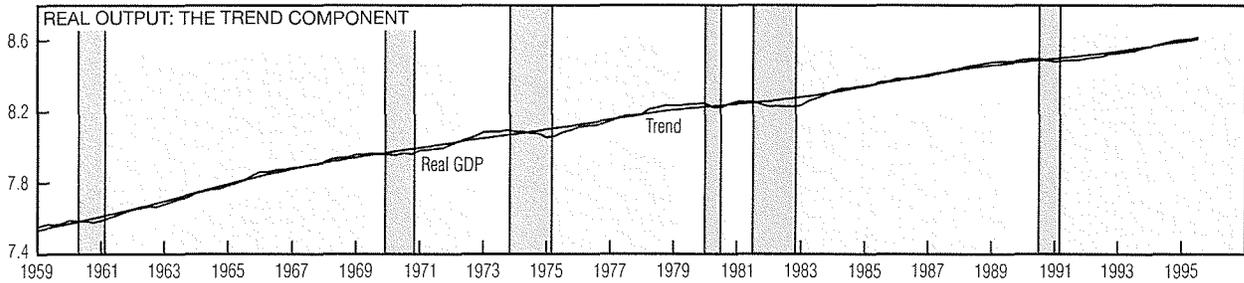
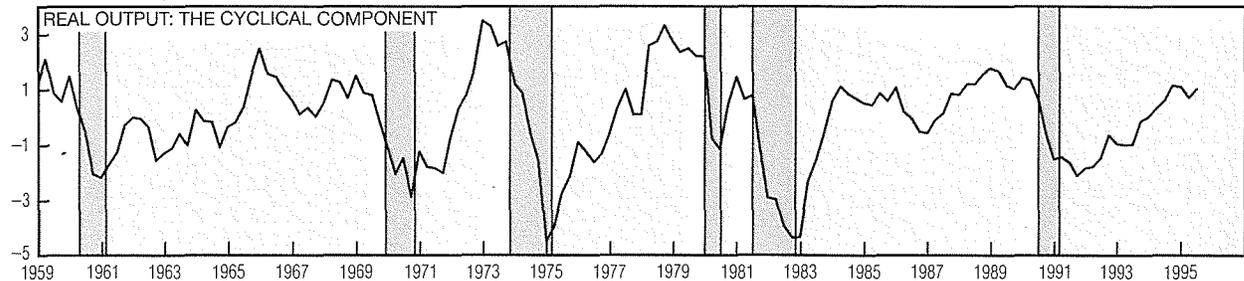


Output, Inflation, and Unemployment

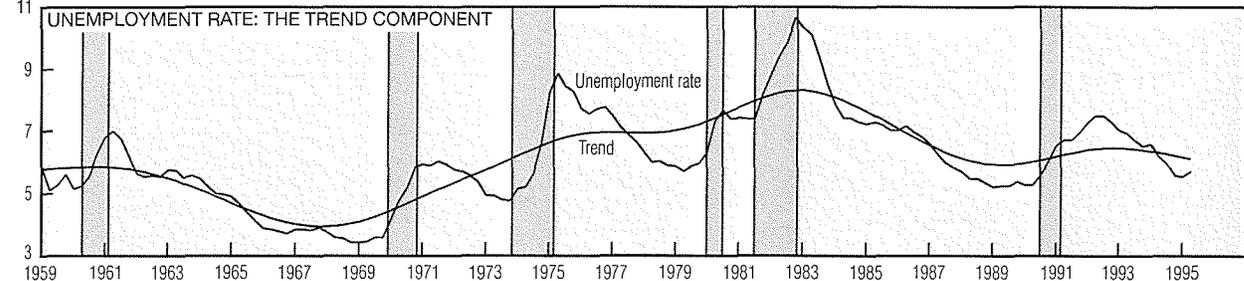
Real GDP in logarithms



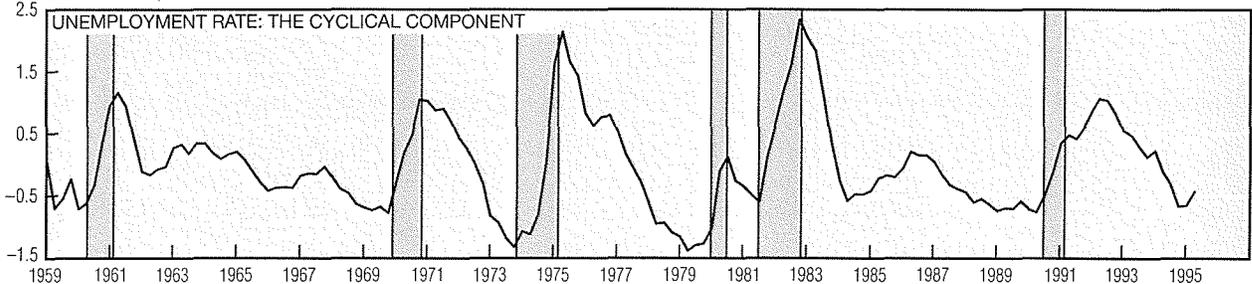
Deviation from trend, percent



Percent



Deviation from trend, percent



NOTE: Shaded areas indicate recessions. All trends are calculated using the Hodrick-Prescott filter. This technique minimizes the sum of the squared differences between the series and the trend line, subject to a constraint on the size of the second differences. A weight of 1,600 is assigned to the constraint, which is appropriate for quarterly data. See Edward C. Prescott, "Theory ahead of Business Cycle Measurement," Federal Reserve Bank of Minneapolis, *Quarterly Review*, Fall 1986, pp. 9-22.

SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis; Board of Governors of the Federal Reserve System; and the Federal Reserve Bank of Cleveland.

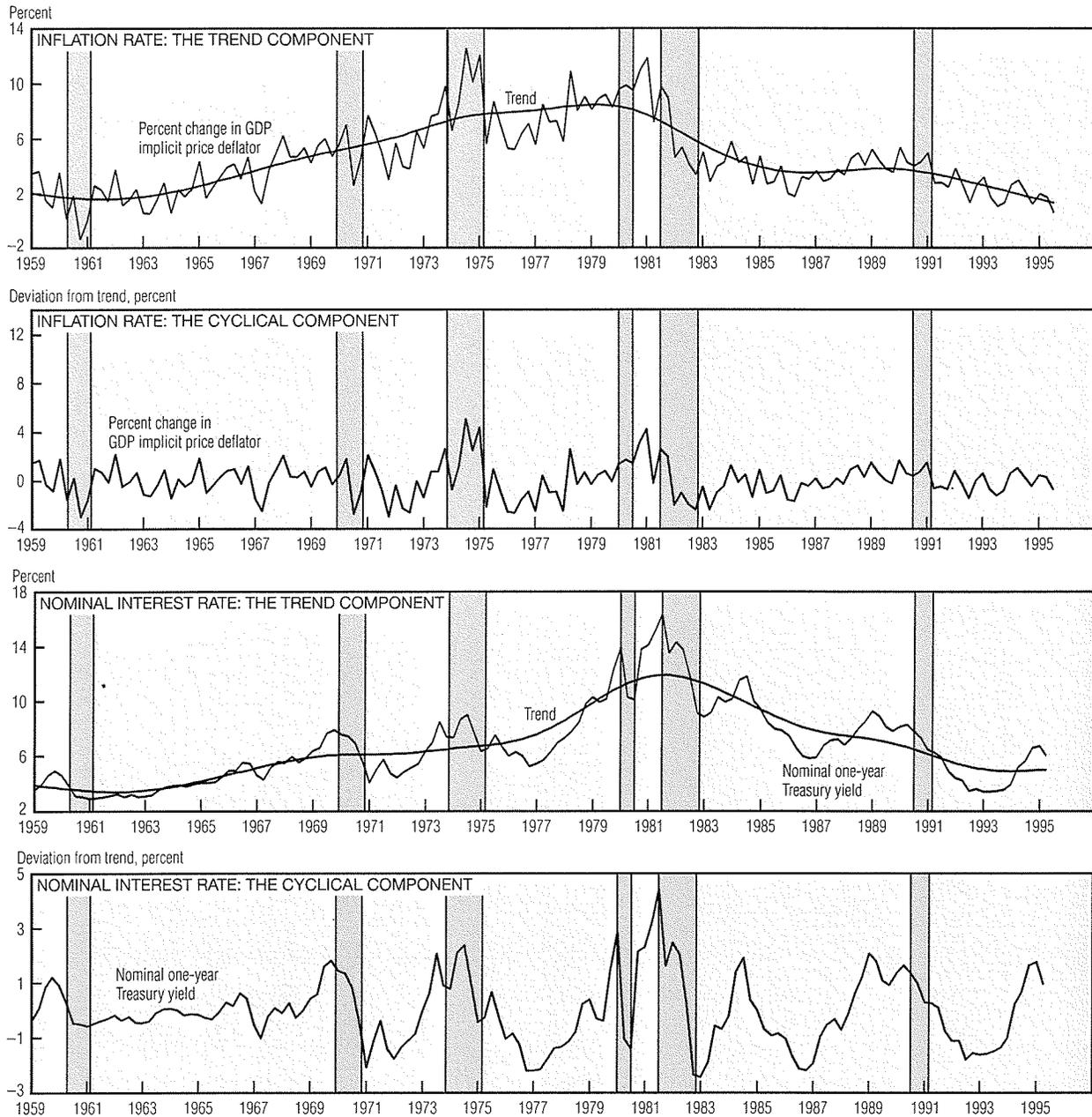
Monetary policymakers are concerned with the relationships among real GDP, the unemployment rate, and inflation. Information about these relationships can be uncovered by separating the data into two distinct components: trend and cyclical. The trend component can be defined by statistical techniques that draw a smooth line through the central tendency of the data. The cyclical component is then measured as the deviation of the variable from its trend.

During recessions, real GDP is typically below trend, which implies that the cyclical component exhibits a negative deviation. During booms, the opposite is true, that is, real GDP is above trend and the cyclical component exhibits a positive deviation. As one would expect, the unemployment rate increases during a recession. Near the end of a recession (and hence the start of a recovery), unemployment is typically well above trend.

The behavior of inflation is more erratic. During most recessions, it has been observed to fall below trend. However, during the recessions of 1974 and 1980, inflation increased sharply above trend as the economy suffered from supply-side oil shocks.

The nominal interest rate on a one-year Treasury security is heavily influenced by Federal Reserve policy actions that determine the level
(continued on next page)

Output, Inflation, and Unemployment (cont.)



NOTE: Shaded areas indicate recessions. All trends are calculated using the Hodrick–Prescott filter. This technique minimizes the sum of the squared differences between the series and the trend line, subject to a constraint on the size of the second differences. A weight of 1,600 is assigned to the constraint, which is appropriate for quarterly data. See Edward C. Prescott, "Theory ahead of Business Cycle Measurement," *Federal Reserve Bank of Minneapolis, Quarterly Review*, Fall 1986, pp. 9–22.

SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis; Board of Governors of the Federal Reserve System; and the Federal Reserve Bank of Cleveland.

of the federal funds rate. Notice that each of the last six recessions was preceded by a period when the one-year Treasury yield was above trend. This suggests that nominal interest rates are leading indicators of recessions. Once a slowdown begins, nominal interest rates start to fall—partly because the Fed typically responds to a sluggish economy by lowering the federal funds rate.

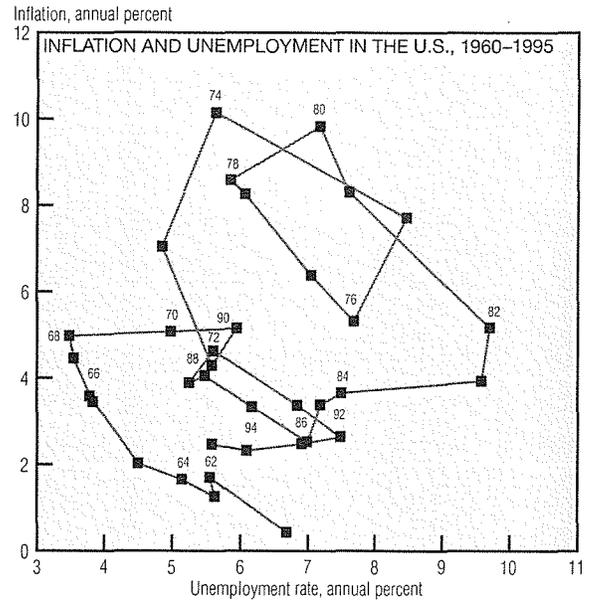
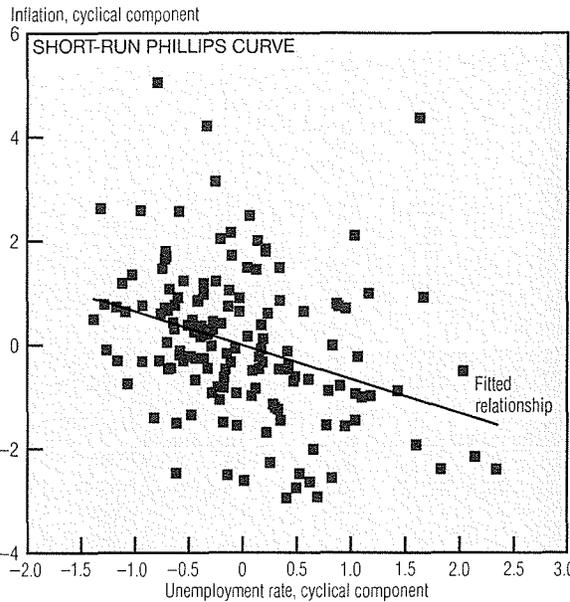
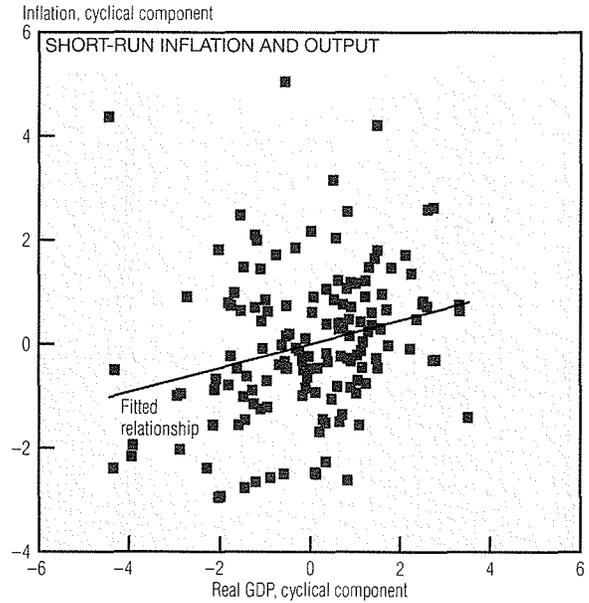
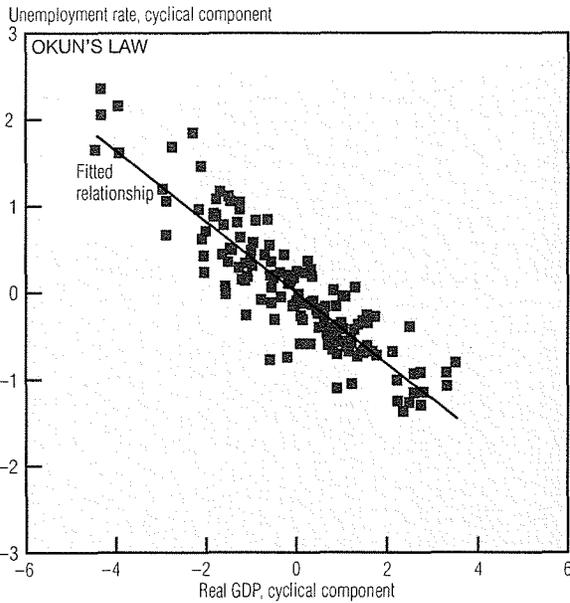
A scatterplot (page 5) reveals a negative relationship between the cyclical components of real GDP

and the unemployment rate. This relationship, known as Okun's Law, provides us with the following rule of thumb: A 1% increase in real GDP relative to trend is typically associated with a 0.4-percentage-point decline in the unemployment rate (again relative to trend). Okun's Law simply reflects the idea that additional production of goods and services requires more employed workers. As production goes up, workers are drawn into the labor force, thereby reducing unemployment.

Quarterly changes in real GDP growth are often thought to provide information about the future course of inflation. Conventional wisdom holds that if the economy grows too fast, there is a danger of higher inflation. A scatterplot of the cyclical components of real GDP and the inflation rate provides some support for this idea. When real GDP is high relative to trend—indicating brisk economic growth—the inflation rate also tends to be above its trend value. Although there is evidence of a weak positive

(continued on next page)

Output, Inflation, and Unemployment (cont.)



SOURCES: U.S. Department of Commerce, Bureau of Economic Analysis; U.S. Department of Labor, Bureau of Labor Statistics; Board of Governors of the Federal Reserve System; and the Federal Reserve Bank of Cleveland.

relationship, the link between the two variables is much less precise than the one observed for Okun's Law. For example, the recessions of 1974 and 1980 violated the conventional wisdom because real GDP was low relative to trend, while inflation was very high.

A scatterplot of the cyclical components of inflation and unemployment provides evidence of a short-run trade-off between the two variables. This trade-off, known as the short-run Phillips curve, suggests that by accepting higher inflation

levels, the Fed can use monetary policy to stimulate the economy temporarily in order to reduce unemployment. Some economists and policymakers feel that the Fed should exploit this short-term trade-off to smooth business cycle fluctuations. In particular, they believe that monetary policy should be used to keep real GDP and unemployment close to their trend levels at all times.

However, there is no *long-run* trade-off between inflation and unemployment. People eventually adjust their expectations to take into

account the Fed's policy actions, and unemployment returns to its long-run trend level. Tracing the history of inflation-unemployment combinations over the last three decades bears this out. We can see that the data spiral around a long-run Phillips curve that is thought to be very nearly vertical. This implies that monetary policy cannot permanently reduce unemployment below its long-run trend level. Attempts to do so will inevitably lead to higher inflation.