Lecture 14

Short-Run Tradeoff between Inflation and Unemployment

Eric Doviak

Economic Growth and Economic Fluctuations

Inflation and Unemployment

- **When we first looked at inflation in Lecture 10, we saw that the inflation rate depends primarily on growth of the money supply, which is controlled by the Fed.**

- **When we first looked at unemployment in Lecture 9, our discussion focused on the natural rate of unemployment – the unemployment that does not go away on its own even in the long run**

- **And we saw that there is always a certain number of people who are unemployed due to:**
  - **frictional unemployment** – the unemployment that results from the time that it takes to match workers with jobs
  - **structural unemployment** – the unemployment that results from a wage rate that is set above the market-clearing level, because of minimum-wage laws, unions and efficiency wages

- **We also saw that there is cyclical unemployment – the year-to-year fluctuations in unemployment around its natural rate that are associated with short-term ups and downs of the business cycle**

- **This lecture focuses on the short-run tradeoff between cyclical unemployment and inflation.**

the Tradeoff

- **Assuming that the short-run aggregate supply curve is upward sloping, expansionary fiscal and monetary policy:**
  - **shifts the aggregate demand curve outward**
  - **which raises the inflation rate** (after all, the inflation rate is just the percentage change in the price level)
  - and **reduces the unemployment rate,** since firms need to employ more labor to produce the higher level of output.
- Contractionary fiscal and monetary policy have the opposite effects.
- **Society therefore faces a tradeoff between unemployment and inflation in the short run. This tradeoff is illustrated by the Phillips Curve.**
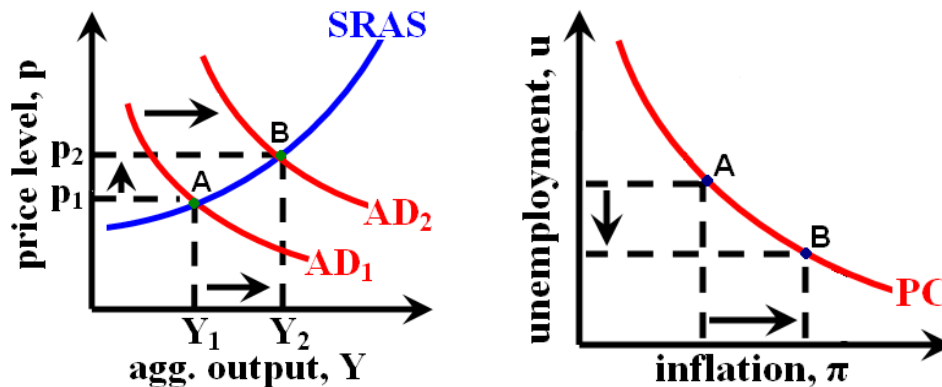
the Long-Run Phillips Curve

- **The Phillips Curve shows the short-run combinations of unemployment and inflation that arise as shifts in the aggregate demand curve move the economy along the short-run aggregate supply curve.**
- **But in the long run, the classical dichotomy holds:**
  - different forces influence real and nominal variables
  - changes in the money supply only affect the price level
  - changes in the money supply do <u>not</u> affect real variables, such as the amount of output produced and the amount of labor hired
- **Therefore, the long-run Phillips Curve is horizontal at the natural rate of unemployment.**
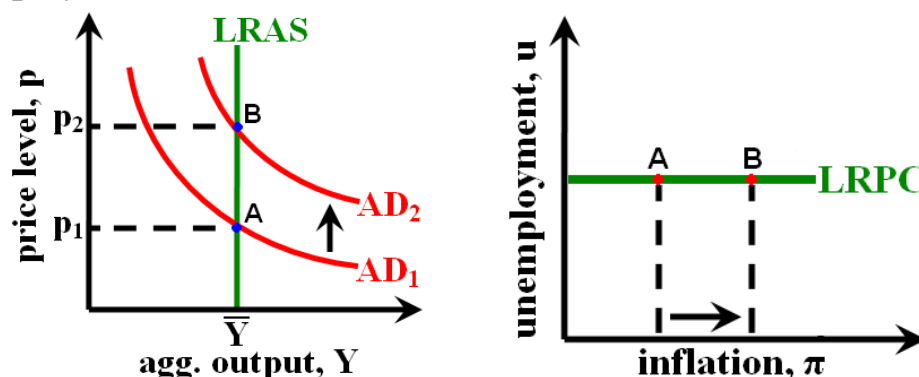
the Phillips Curve

$$u = u^n + \beta \cdot \left(\pi^e - \pi\right) + \varepsilon \qquad \text{where:} \quad \begin{cases} u = \text{observed unemployment rate} \\ u^n = \text{natural rate of unemployment} \\ \beta \text{ is a parameter, } \beta > 0 \\ \pi^e = \text{expected inflation rate} \\ \pi = \text{observed inflation rate} \\ \varepsilon = \text{supply shock} \end{cases}$$

- **The linear Phillips relationship given in the equation above tells us that the observed unemployment rate is a decreasing function of the observed inflation rate.** (Nothing surprising here. This is precisely what is shown in the graphs above).

- **The equation above also tells us that the observed unemployment rate fluctuates around the natural rate of unemployment. This is called the natural-rate hypothesis.**

- **The other two terms in the equation shift the Phillips Curve.**
  - **If people expect that the inflation rate will be higher than it was in the past, then the Phillips Curve will shift outward.**
  - **A supply shock** (such the OPEC oil embargo discussed in Lecture 13) **will also shift the Phillips Curve outward.**

the Phillips Curve

- **The expected inflation rate, π^e, is the inflation rate that people think will prevail. After all, we won't know the rate at which prices are increasing this year until the measurements are released next year.**

- **In the long run, the expected inflation rate adjusts to the inflation rate that we actually observe** (i.e. $\pi = \pi^e$). **For example:**
  - if the Fed says that it will restrict growth of the money supply to ensure that the inflation rate is only 2 percent, then people will expect an inflation rate of 2 percent
  - but if the Fed has a habit of promising 2 percent inflation, but actual inflation is always 4 percent, people will catch on and expect 4 percent

- **So in the absence of supply shocks** (i.e. $\varepsilon = 0$), **when $\pi = \pi^e$, the observed unemployment rate will equal the natural rate of unemployment. This is why the Long-Run Phillips Curve is horizontal at the natural rate.**

- **Now let's say the Fed has consistently promised 2 percent inflation and has consistently delivered 2 percent inflation. This year however:**
  - **the Fed allows the inflation rate to rise to 4 percent, causing**
  - **the unemployment rate to be lower than the natural rate** (so long as there are no supply shocks this year)

So how well does the Phillips Curve work?

The rates of inflation and unemployment in the 1960s traced out a Phillips Curve fairly well.
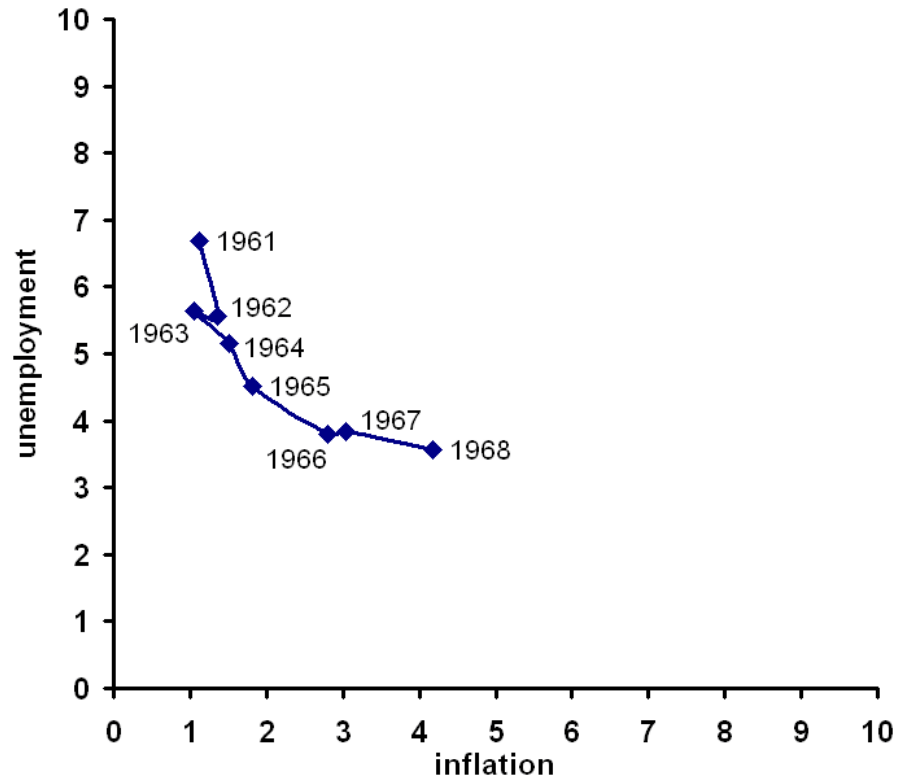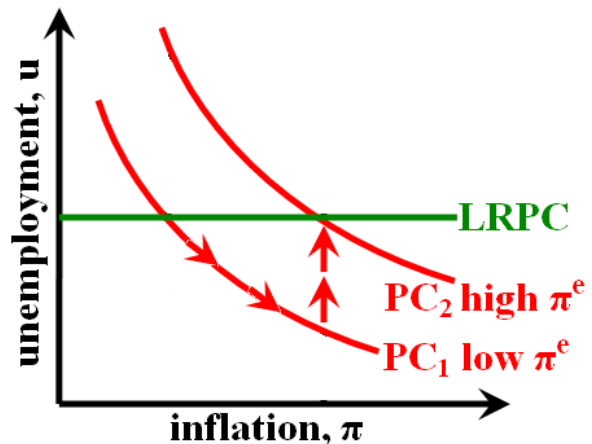

One Shift of the Phillips Curve

- Notice that the inflation rate increased each year from 1963 to 1968.
- As the inflation rate increased, people began to expect higher inflation.
- Now look again at the equation describing the Phillips Curve:

$$u = u^n + \beta \cdot \left(\pi^e - \pi \right) + \varepsilon$$

- As mentioned previously, when people expect higher inflation, the Phillips Curve shifts outward.

- People's expectations of inflation didn't change as the inflation rate rose from 2.8 percent in 1966 to 4.2 percent in 1968.
- This caused the unemployment rate to fall temporarily.

- Around 1969 or 1970, people's expectations of inflation began to change.
- As their expectations changed, the Phillips Curve shifted outward and the unemployment rate rose.

A Shift of the Phillips Curve

When people's expectations of inflation began to change the Phillips Curve shifted outward and the unemployment rate rose.
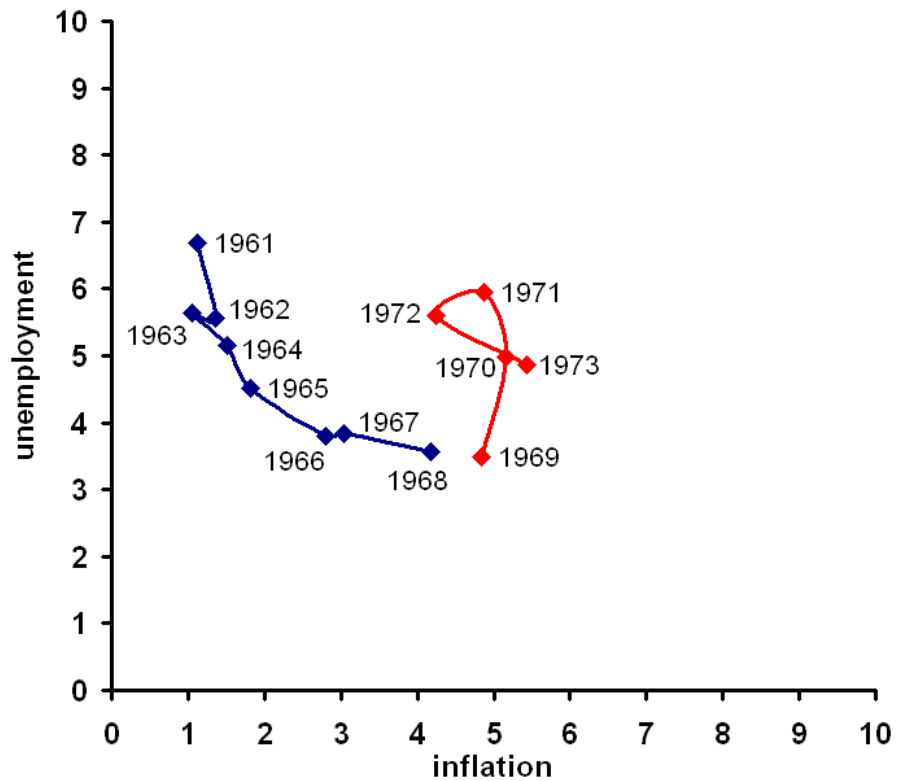
Another Shift of the Phillips Curve

- In the 1970s, the price of oil increased tremendously in response to the 1974 OPEC oil embargo, the 1979 Iranian Revolution and the outbreak of war between Iran and Iraq.
- These **supply shocks** shifted the short-run aggregate supply curve inward, which drove up the price level and induced recessions.
- As a result, people began to expect much higher inflation – which shifts the Phillips Curve outward and gives policymakers a less favorable tradeoff between inflation and unemployment.
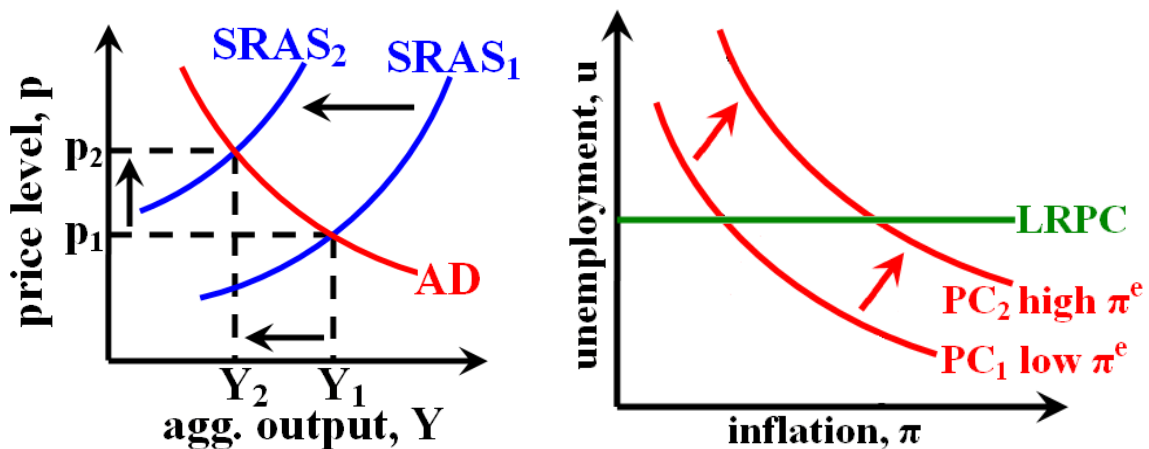
Oil Prices, Inflation and Unemployment

year	percentage change in oil prices	inflation rate (GDP deflator)	unemployment rate
1973	11.0	5.4	4.9
1974	68.0	8.6	5.6
1975	16.0	9.0	8.5
1976	3.3	5.6	7.7
1977	8.1	6.2	7.1
1978	9.4	6.8	6.1
1979	25.4	8.0	5.9
1980	47.8	8.7	7.2
1981	44.4	9.0	7.6
1982	− 8.7	5.9	9.7
1983	− 7.1	3.9	9.6
1984	− 1.7	3.7	7.5
1985	− 7.5	3.0	7.2
1986	− 44.5	2.2	7.0
1987	18.3	5.4	4.9

Another Shift of the Phillips Curve

The 1974 OPEC oil embargo, the 1979 Iranian Revolution and the outbreak of war between Iran and Iraq caused supply shocks which increased the inflation rate and the unemployment rate.
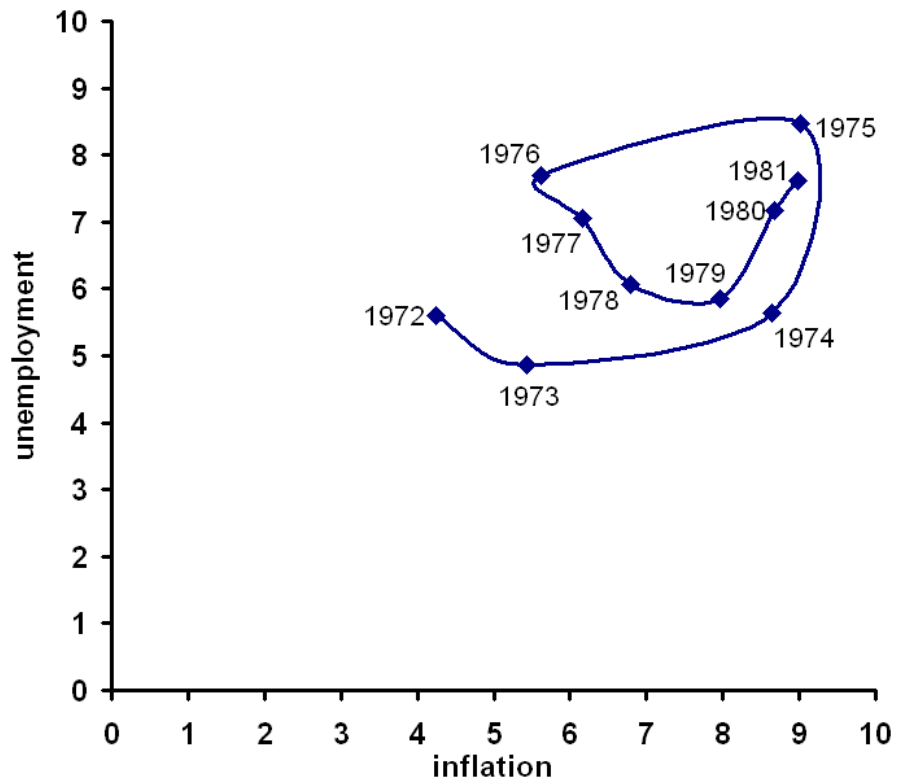
What would you do?

- **Now imagine that you are the chairperson of the Fed in the early 1980s. You face two unappealing choices:**
  - You can reduce unemployment by expanding aggregate demand through increases in the money supply. The trouble with this course of action is that it will accelerate inflation. OR
  - You can fight inflation by contracting aggregate demand through reductions in the money supply. The trouble with this course of action is that the American people will have to endure even higher unemployment.

the sacrifice ratio

- **The sacrifice ratio is the number of percentage points of annual output** (i.e. a year's worth of real GDP) **that is lost in the process of reducing the inflation rate by one percentage point.**

- **In the late 1970s, a typical estimate of the sacrifice ratio was five.**

- **In other words, it was estimated that reducing the inflation rate from 9 percent to 3 percent** (a 6 percentage point reduction) **would require a sacrifice of 30 percent of annual output.**

- **Is that what really happened? No.**

The Volcker Disinflation

In the early 1980s, Fed Chairman Paul Volcker succeeded in reducing inflation – from 9 percent in 1981 to 3 percent in 1985 – **but at the cost of high employment** – about 10 percent in 1982 and 1983.
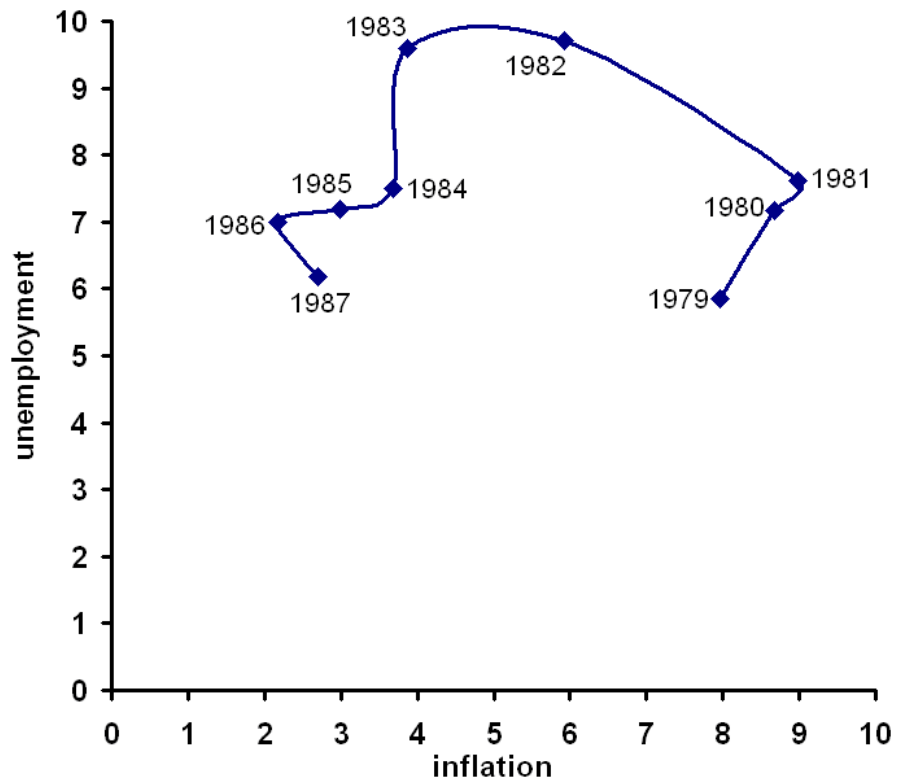
Expectations

- **Up until this point, we have been assuming that it takes time for households and firms to change their expectations of future inflation rates. This is called the assumption of adaptive expectations.**

- **But what if people used all the information available to them – including information about the likely future course of fiscal and monetary policy – when setting their expectation of the inflation rate?**

- **In such a case, we would say that people have rational expectations.**

- **Remember that the tradeoff between inflation and unemployment in the short run depends on how quickly expectations adjust.**

- **The theory of rational expectations suggests that the sacrifice-ratio could be much smaller than estimated – "disinflation can be painless."**

- **After all, if policymakers are credibly committed to lowering the inflation rate, then rational people will understand their commitment and quickly revise their expectations of inflation downward.**

Sacrifice Ratio during the Volcker Disinflation

- **We mentioned previously that one estimate of the sacrifice ratio is five –** five percent of one year's real GDP must be sacrificed to reduce the inflation rate by one percentage point.

- **But if people have rational expectations, then the sacrifice ratio should be zero.**

♦ ♦ ♦

- **Between 1947 and 1980, real GDP grew at about 3.7 percent per year.**

- **If we assume that real GDP would have continued to grow at that rate from 1981 until 1985 in the absence of the disinflation, then we can estimate the loss of real GDP attributable to the Volcker Disinflation.**

year	observed real GDP	predicted real GDP (at 3.7% annual growth)	lost real GDP	inflation rate (GDP deflator)	change in inflation rate
1981	5292			9.0	
1982	5189	5491	– 301	5.9	– 3.1
1983	5424	5697	– 273	3.9	– 2.0
1984	5814	5911	– 98	3.7	– 0.2
1985	6054	6133	– 80	3.0	– 0.7

Observed vs. Predicted values of Real GDP

The blue dots in the graph at right represent the observed values of real GDP between 1970 and 1985.

The red line represents the values real GDP would have taken if it had grown smoothly at 3.7 percent per year.
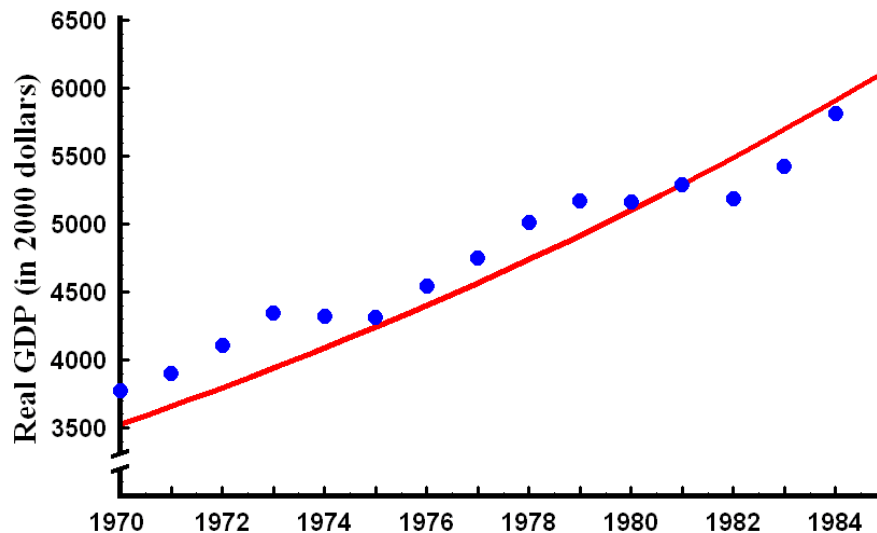
The predicted value of real GDP is constrained to equal the observed value of real GDP in 1981.

Sacrifice Ratio during the Volcker Disinflation

year	lost real GDP as a percentage of predicted real GDP	change in inflation rate	sacrifice ratio	unemployment rate
1982	− 5.5	− 3.1	1.8	9.7
1983	− 4.8	− 2.0	2.4	9.6
1984	− 1.7	− 0.2	8.3	7.5
1985	− 1.3	− 0.7	1.9	7.2
sum	**− 13.2**	**− 6.0**	**2.2**	–

- **The sacrifice ratio during the Volcker Disinflation was much lower than previously predicted at the time.** (In the 1970s, the estimated value of the sacrifice ratio was five).

- **Did Volcker get lucky? Maybe, but it's more likely that his credible promise to reduce inflation influenced people's expectations of inflation.**

- **Because people's expectations were rational, the loss of real GDP and the unemployment rate turned out to be much lower than predicted.**

- **In fact, the most rapid disinflations tend to have the smallest sacrifice ratios. In contrast to the prediction of the Phillips Curve with adaptive expectations, quick disinflations are less painful than gradual ones.**

What would you do?

- **Now imagine that you are the chairperson of the Fed in 2011.**
- **Would you focus on fighting inflation or unemployment?**