The Short-Run Trade-off Between Inflation and Unemployment
In this chapter, look for the answers to these questions:

- How are inflation and unemployment related in the short run? In the long run?
- What factors alter this relationship?
- What is the short-run cost of reducing inflation?
- Why were U.S. inflation and unemployment both so low in the 1990s?
Introduction

- In the long run, inflation & unemployment are unrelated:
  - The inflation rate depends mainly on growth in the money supply.
  - Unemployment (the “natural rate”) depends on the minimum wage, the market power of unions, efficiency wages, and the process of job search.

- In the short run, society faces a trade-off between inflation and unemployment.
The Phillips Curve

- Phillips curve: shows the short-run trade-off between inflation and unemployment
- 1958: A.W. Phillips showed that nominal wage growth was negatively correlated with unemployment in the U.K.
- 1960: Paul Samuelson & Robert Solow found a negative correlation between U.S. inflation & unemployment, named it “the Phillips Curve.”
Deriving the Phillips Curve

- Suppose $P = 100$ this year.

- The following graphs show two possible outcomes for next year:
  
  A. Agg demand low, small increase in $P$ (i.e., low inflation), low output, high unemployment.

  B. Agg demand high, big increase in $P$ (i.e., high inflation), high output, low unemployment.
Deriving the Phillips Curve

A. Low agg demand, low inflation, high u-rate

B. High agg demand, high inflation, low u-rate
The Phillips Curve: A Policy Menu?

- Since fiscal and mon policy affect agg demand, the $PC$ appeared to offer policymakers a menu of choices:
  - low unemployment with high inflation
  - low inflation with high unemployment
  - anything in between

- 1960s: U.S. data supported the Phillips curve. Many believed the $PC$ was stable and reliable.
Evidence for the Phillips Curve?

During the 1960s, U.S. policymakers opted for reducing unemployment at the expense of higher inflation.
The Vertical Long-Run Phillips Curve

1968: Milton Friedman and Edmund Phelps argued that the tradeoff was temporary.

Natural-rate hypothesis: the claim that unemployment eventually returns to its normal or “natural” rate, regardless of the inflation rate.

Based on the classical dichotomy and the vertical LRAS curve.
In the long run, faster money growth only causes faster inflation.
Reconciling Theory and Evidence

- Evidence (from ’60s):
  \( PC \) slopes downward.

- Theory (Friedman and Phelps’ work):
  \( PC \) is vertical in the long run.

- To bridge the gap between theory and evidence, Friedman and Phelps introduced a new variable: expected inflation – a measure of how much people expect the price level to change.
The Phillips Curve Equation

\[
\text{Unemp. rate} = \text{Natural rate of unemp.} - a \left( \text{Actual inflation} - \text{Expected inflation} \right)
\]

**Short run**
Fed can reduce u-rate below the natural u-rate by making inflation greater than expected.

**Long run**
Expectations catch up to reality, u-rate goes back to natural u-rate whether inflation is high or low.
Initially, expected & actual inflation = 3%, unemployment = natural rate (6%).

Fed makes inflation 2% higher than expected, u-rate falls to 4%.

In the long run, expected inflation increases to 5%, PC shifts upward, unemployment returns to its natural rate.
Active Learning 1: Exercise

Natural rate of unemployment = 5%
Expected inflation = 2%
Coefficient $a$ in $PC$ equation = 0.5

A. Plot the long-run Phillips curve.

B. Find the u-rate for each of these values of actual inflation: 0%, 6%. Sketch the short-run $PC$.

C. Suppose expected inflation rises to 4%. Repeat part B.

D. Instead, suppose the natural rate falls to 4%. Draw the new long-run Phillips curve, then repeat part B.
**ACTIVE LEARNING 1: Answers**

An increase in expected inflation shifts $PC$ to the right.

A fall in the natural rate shifts both curves to the left.
Early 1970s: unemployment increased, despite higher inflation.

Friedman & Phelps’ explanation: expectations were catching up with reality.
Another *PC* Shifter: Supply Shocks

- **Supply shock:**
  an event that directly alters firms’ costs and prices, shifting the AS and PC curves

- **Example:** large increase in oil prices
How an Adverse Supply Shock Shifts the $PC$

SRAS shifts left, prices rise, output & employment fall.

Inflation & u-rate both increase as the $PC$ shifts upward.
The 1970s Oil Price Shocks

<table>
<thead>
<tr>
<th>Oil price per barrel</th>
<th>1/1973</th>
<th>$ 3.56</th>
</tr>
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<tbody>
<tr>
<td>1/1974</td>
<td>10.11</td>
<td></td>
</tr>
<tr>
<td>1/1979</td>
<td>14.85</td>
<td></td>
</tr>
<tr>
<td>1/1980</td>
<td>32.50</td>
<td></td>
</tr>
<tr>
<td>1/1981</td>
<td>38.00</td>
<td></td>
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</tbody>
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The Fed chose to accommodate the first shock in 1973 with faster money growth.

Result:
Higher expected inflation, which further shifted $PC$.

1979:
Oil prices surged again, worsening the Fed’s tradeoff.
Supply shocks & rising expected inflation worsened the PC tradeoff.
The Cost of Reducing Inflation

- **Disinflation**: a reduction in the inflation rate
- To reduce inflation, Fed must slow the rate of money growth, which reduces agg demand.
- Short run: output falls and unemployment rises.
- Long run: output & unemployment return to their natural rates.
Disinflationary Monetary Policy

Contractionary monetary policy moves economy from A to B.

Over time, expected inflation falls, $PC$ shifts downward.

In the long run, point C: the natural rate of unemployment, and lower inflation.
The Cost of Reducing Inflation

- Disinflation requires enduring a period of high unemployment and low output.

- **Sacrifice ratio**: the number of percentage points of annual output lost in the process of reducing inflation by 1 percentage point.

- Typical estimate of the sacrifice ratio: 5
  - Reducing inflation rate 1% requires a sacrifice of 5% of a year’s output.

- This cost can be spread over time. Example: To reduce inflation by 6%, can either
  - sacrifice 30% of GDP for one year
  - sacrifice 10% of GDP for three years
Rational Expectations, Costless Disinflation?

- **Rational expectations**: a theory according to which people optimally use all the information they have, including info about govt policies, when forecasting the future.


- Implied that disinflation could be much less costly…
Rational Expectations, Costless Disinflation?

- Suppose the Fed convinces everyone it is committed to reducing inflation.
- Then, expected inflation falls, the short-run $PC$ shifts downward.
- Result:
  Disinflations can cause less unemployment than the traditional sacrifice ratio predicts.
The Volcker Disinflation

Fed Chairman Paul Volcker

• appointed in late 1979 under high inflation & unemployment
• changed Fed policy to disinflation

1981-1984:

• Fiscal policy was expansionary, so Fed policy needed to be very contractionary to reduce inflation.
• Success: Inflation fell from 10% to 4%, but at the cost of high unemployment…
The Volcker Disinflation

Disinflation turned out to be very costly:

u-rate near 10% in 1982-83
Inflation and unemployment were low during most of Alan Greenspan’s years as Fed Chairman.
1990s: The End of the Phillips Curve?

- During the 1990s, inflation fell to about 1%, unemployment fell to about 4%. Many felt PC theory was no longer relevant.

- Many economists believed the Phillips curve was still relevant; it was merely shifting down:
  - Expected inflation fell due to the policies of Volcker and Greenspan.
  - Three favorable supply shocks occurred.
Favorable Supply Shocks in the ’90s

- Declining commodity prices (including oil)
- Labor-market changes (reduced the natural rate of unemployment)
- Technological advance (the information technology boom of 1995-2000)