Inflation and Unemployment

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Econ520

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Objectives

In this section you will learn:

1. how and when lax monetary policy reduces unemployment
2. how to derive and interpret the Phillips Curve
3. about the importance of expectations for monetary policy

The Question

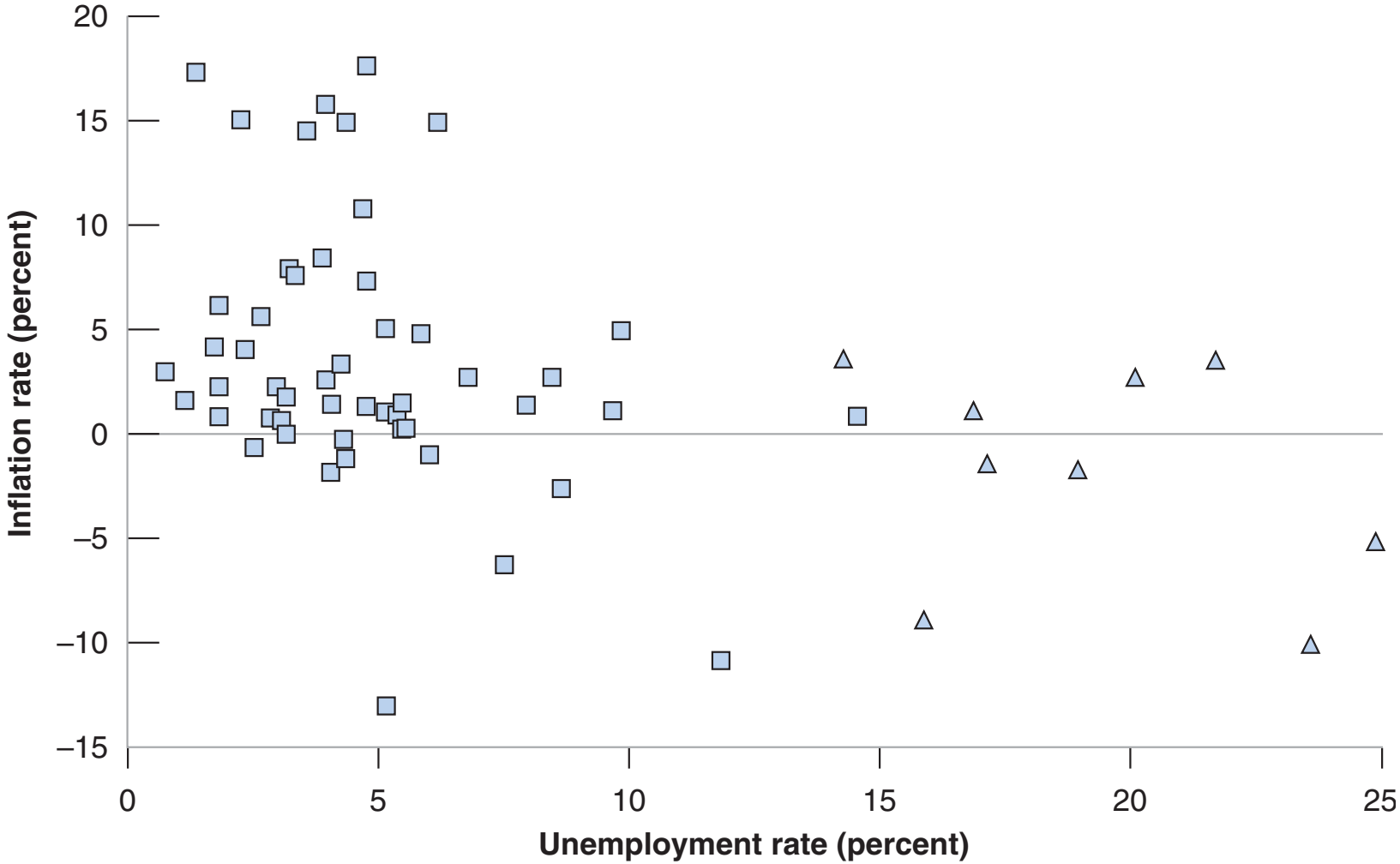
Monetary policy stimulates aggregate demand.

Why not always use it gain more employment / output?

Lax monetary policy creates inflation.

Can we buy more employment with more inflation?

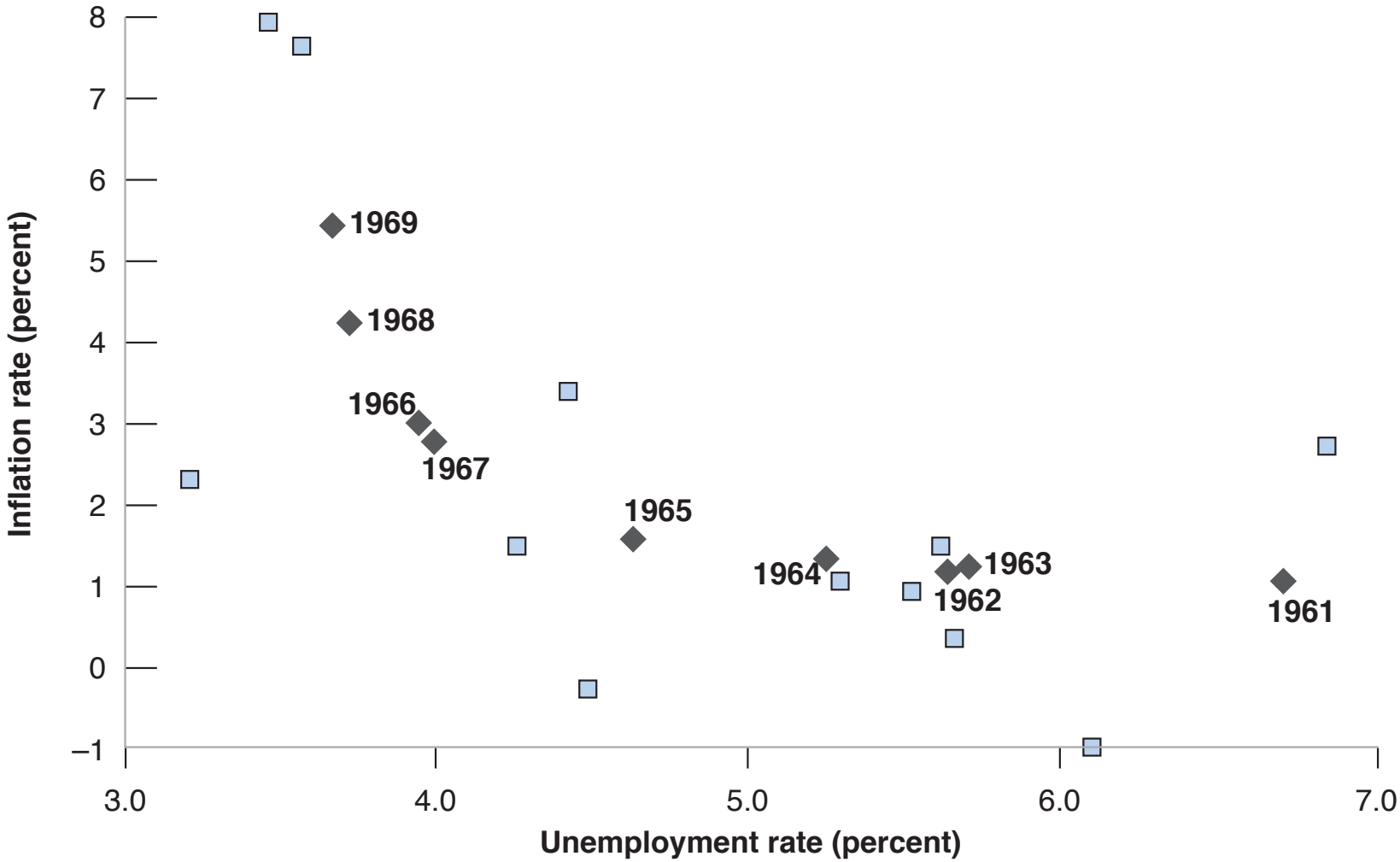
The Phillips Curve



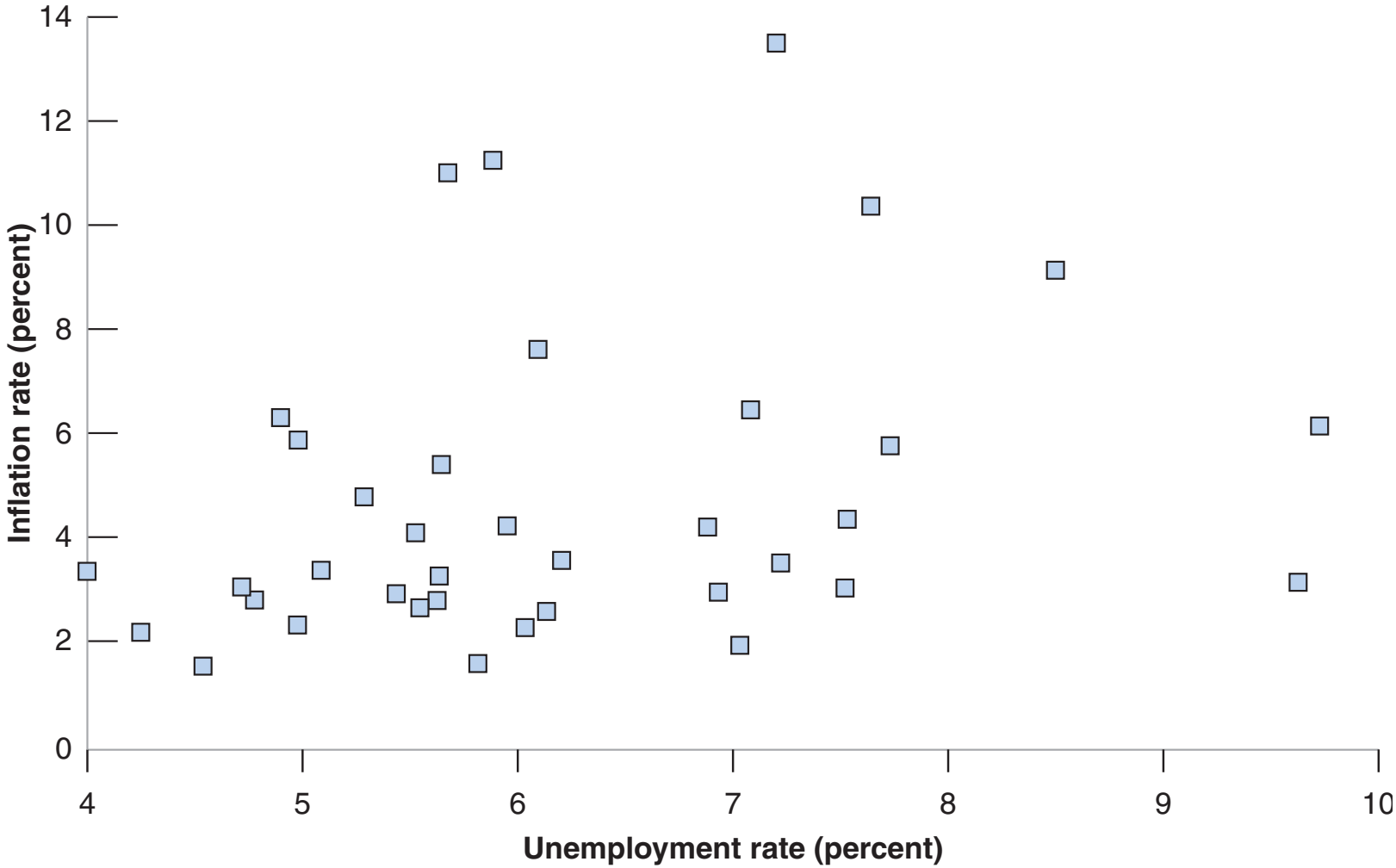
Data: 1900-1960

High inflation - low unemployment

The 1960s


Inflation rate (percent)
8
7
6
5
4
3
2
1
0
–1
3.0
4.0
5.0
6.0
7.0
Unemployment rate (percent)
1969
1968
1966
1967
1965
1964
1963
1962
1961

Modern Data



Data: 1970-2010

Breakdown of the Phillips Curve

Why Might the Phillips Curve Break Down?

We know: only **unanticipated** inflation increases output

$$Y^s = F\left(\frac{P}{P^e}\frac{1}{1+m}, z\right) \tag{1}$$

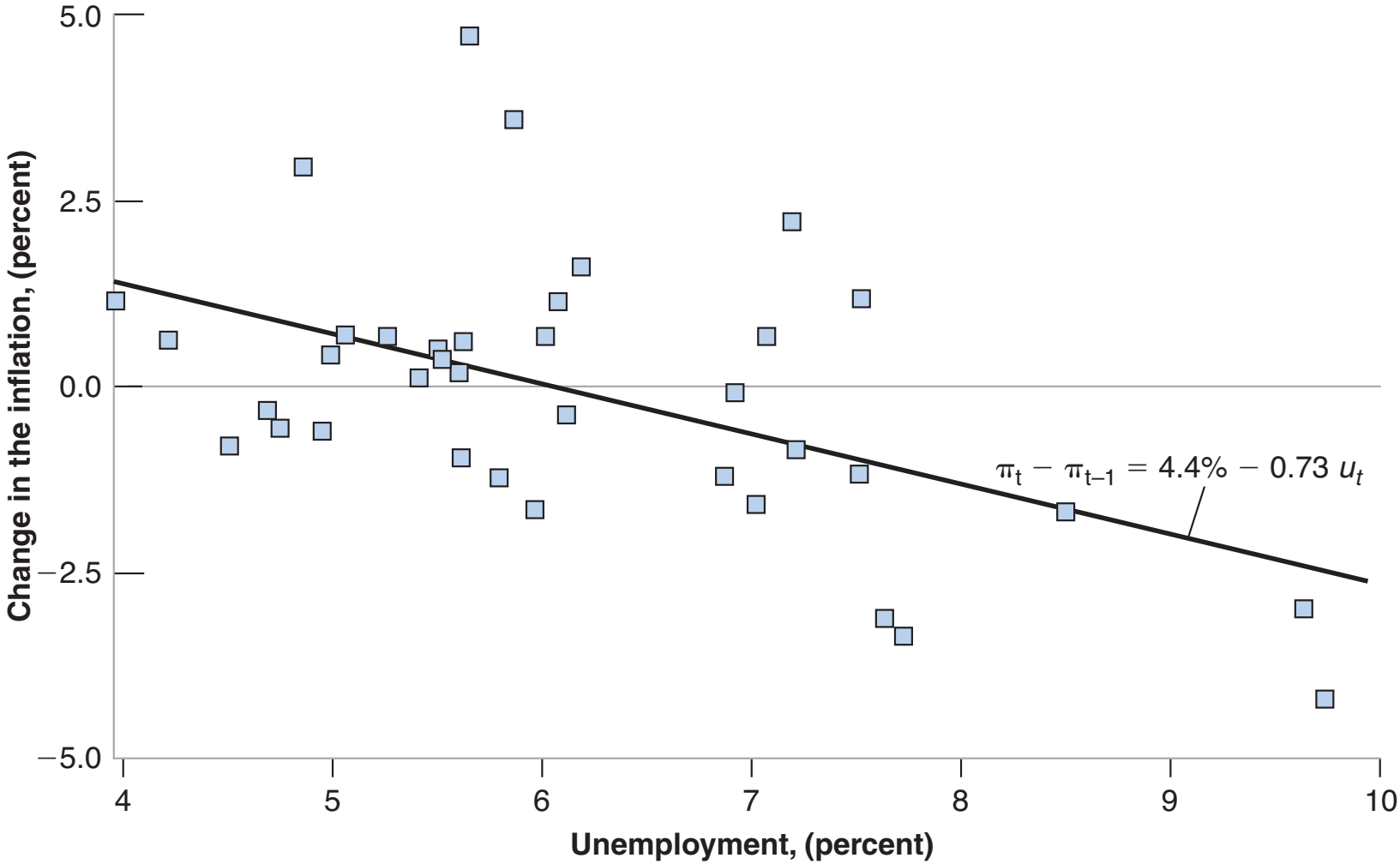
What happens with **constant** inflation?

- inflation expectations catch up to reality
- $P^e \to P$
- inflation becomes **neutral**.

A new idea:

- can we buy more output by **raising** inflation?

The New Phillips Curve



Data: 1970-2010

Rising inflation – low unemployment

Theory Underlying the Phillips Curve

Deriving the Phillips Curve

Start from aggregate supply

$$Y^s = F\left(\frac{P}{P^e}\frac{1}{1+m}, z\right) \tag{2}$$

Divide by last period's prices:

$$\frac{P}{P^e} = \frac{P}{P_{-1}}\frac{P_{-1}}{P^e} = \frac{1+\pi}{1+\pi^e} \tag{3}$$

π: inflation rate

π^e: expected inflation rate

Therefore:

$$Y^s = F\left(\frac{1+\pi}{1+\pi^e}\frac{1}{1+m}, z\right) \tag{4}$$

Relationship with unemployment

$$u = \frac{L-N}{L} = 1 - \frac{N}{L} \tag{5}$$

where:

- u: unemployment rate
- N: employment
- L: labor force

Recall the aggregate production function:

$$Y/L = N/L = 1-u \tag{6}$$

or

$$u = 1 - Y/L = 1 - F\left(\frac{1+\pi}{1+\pi^e}\frac{1}{1+m}, z\right)/L \tag{7}$$

Implications

$$u = 1 - F\left(\frac{1+\pi}{1+\pi^e}\frac{1}{1+m}, z\right)/L \tag{8}$$

1. $\pi^e \uparrow$: Need higher π to support the same u
   Intuition:

2. $m \uparrow$: $u \uparrow$ for given π, π^e
   Intuition:

3. Given π^e, we have a Phillips curve ($u \uparrow \Longrightarrow \pi \downarrow$)
   Intuition:

Simplification

Typically, the Phillips curve is written as: "inflation is a decreasing function of unemployment"

To simplify notation, suppose that function is linear:

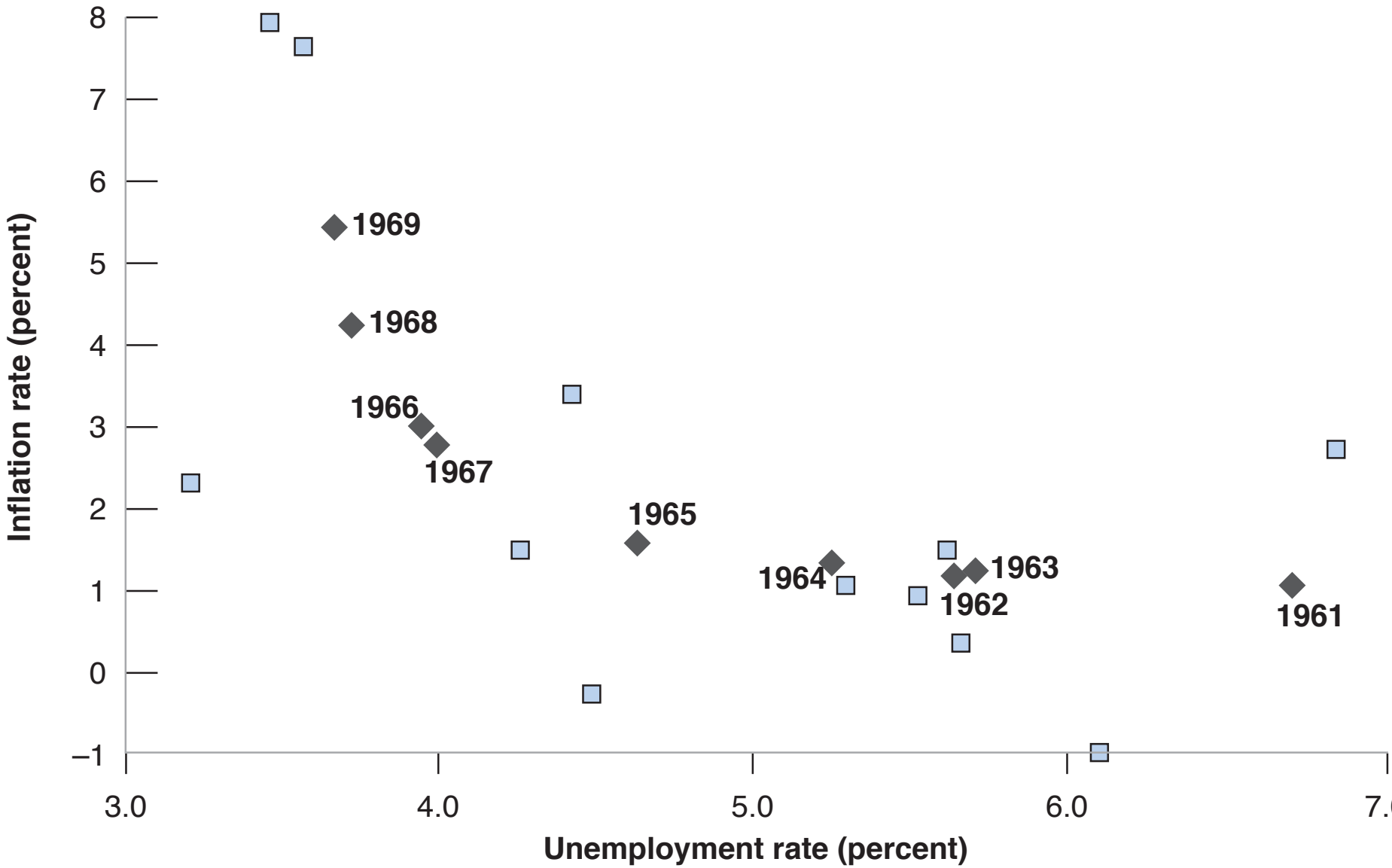
$$\pi = \pi^e + (m + z) - \alpha u \tag{9}$$

This has all the same properties as the equation we wrote down before.

$$u = \frac{m + z - (\pi - \pi^e)}{\alpha} \tag{10}$$

The Phillips Curve Through Time

The 1950s and 60s



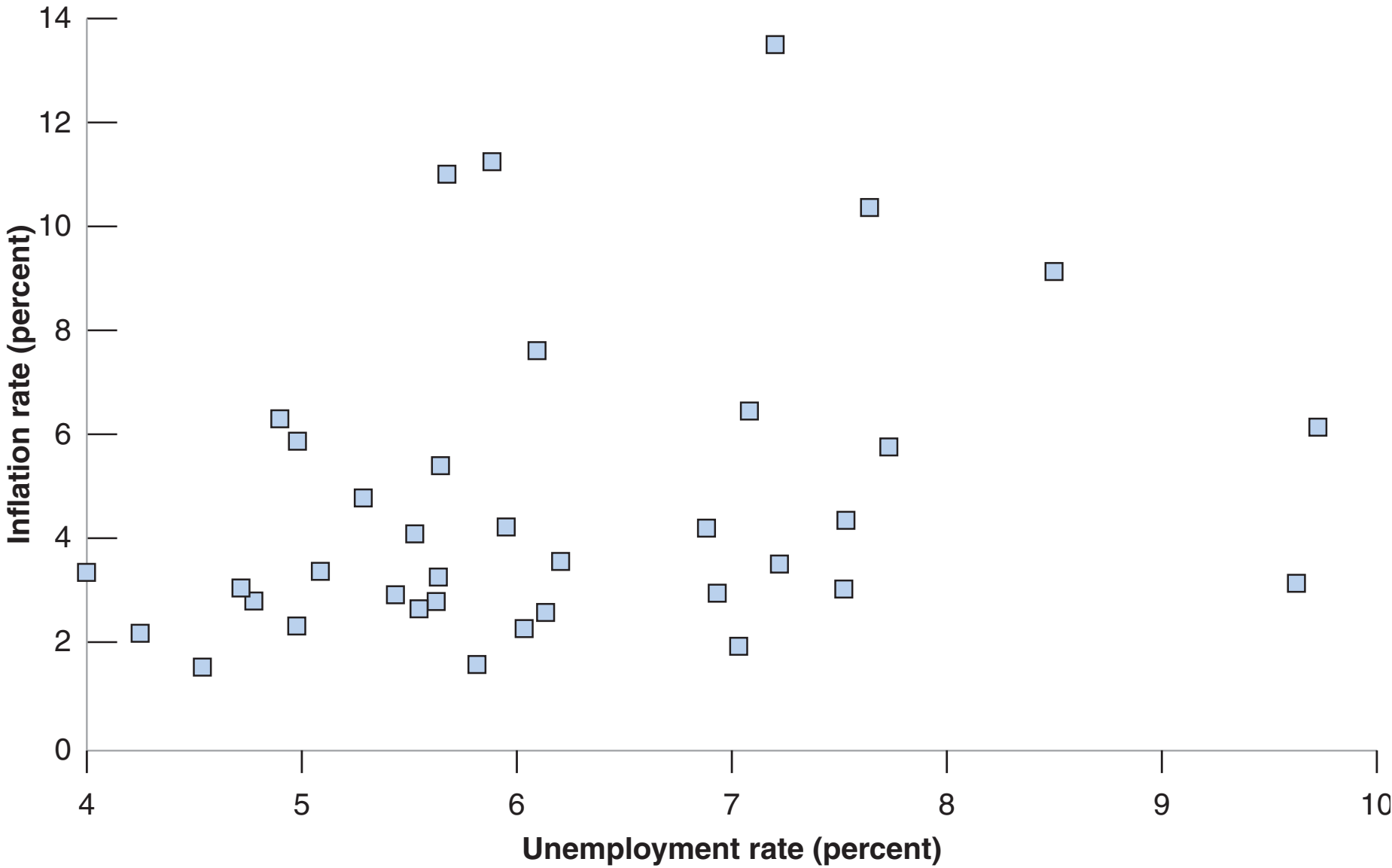
The economy moves up along a stable Phillips Curve

Interpretation

- Inflation had been stable for a long time
- π^e remained roughly fixed
- Then the original Phillips curve emerges

$$\pi = \underbrace{\pi^e}_{\text{fixed}} + (m + z) - \alpha u \tag{11}$$

The 1970s and Beyond

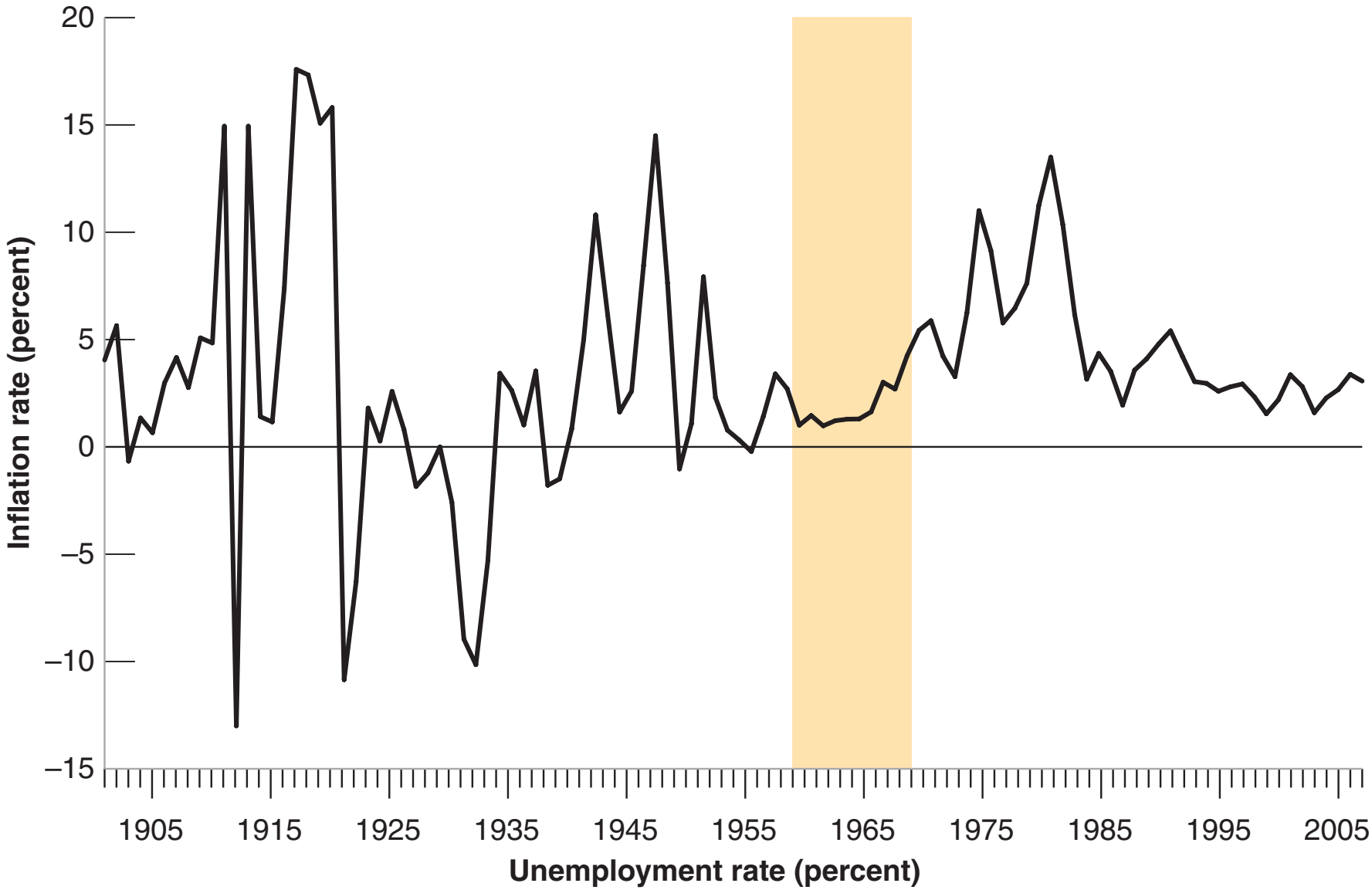


No relationship between inflation and unemployment

Interpretation

- A change in inflation expectations.
- Before the 1960s: inflation fluctuated around 0
  - little persistence
- It was reasonable to expect roughly zero inflation
- After 1960s: inflation was generally positive
  - strong persistence
- Zero inflation would have been a poor forecast

Inflation Rates



Modified Phillips Curve

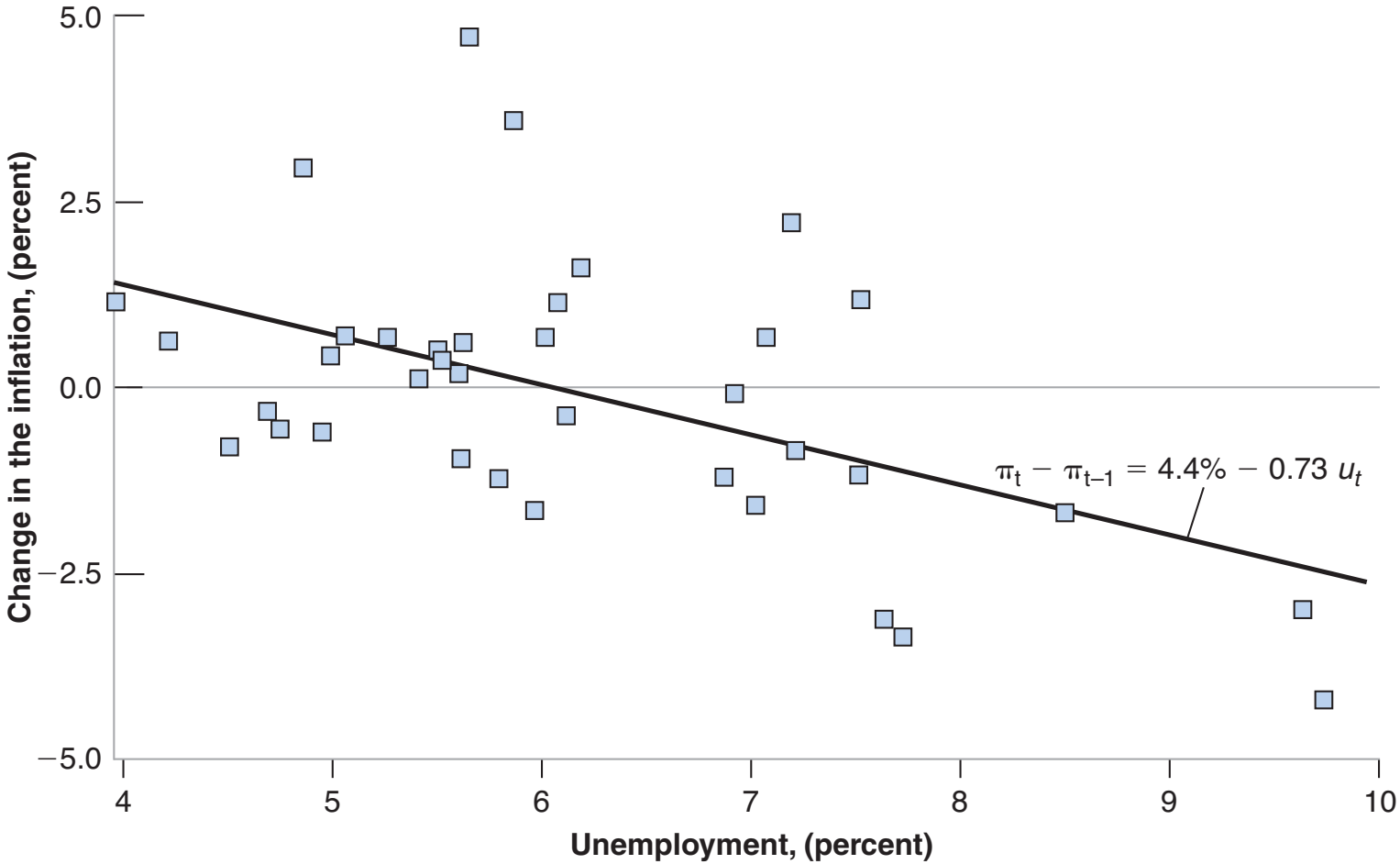
- Assume that agents form expectations according to

$$\pi_t^e = \theta \pi_{t-1} \tag{12}$$

- Of course, one could do better than that...
- A coarse approximation:
  - 1960s: $\theta = 0$
  - 1970s: $\theta = 1$
- Modified Phillips Curve

$$\pi_t - \pi_{t-1} = (m + z) - \alpha u_t \tag{13}$$

Modified Phillips Curve



Implications

- Original Phillips Curve:
  - government can buy lower unemployment by raising inflation
  - intuition: wage setters never catch on to the fact that tomorrow's prices will be higher than today's
- Modified Phillips Curve:
  - government can buy lower unempoyment by raising inflation over time
  - intuition: wage setters never catch on to the fact that tomorrow's inflation will be higher than today's
- Clearly, this can't work either (at least not forever)

NAIRU and Policy

NAIRU

If the modified PC is correct, there is one unemployment rate that is consistent with constant inflation (at any level)

NAIRU: "Non-accelerating inflation rate of unempoyment"

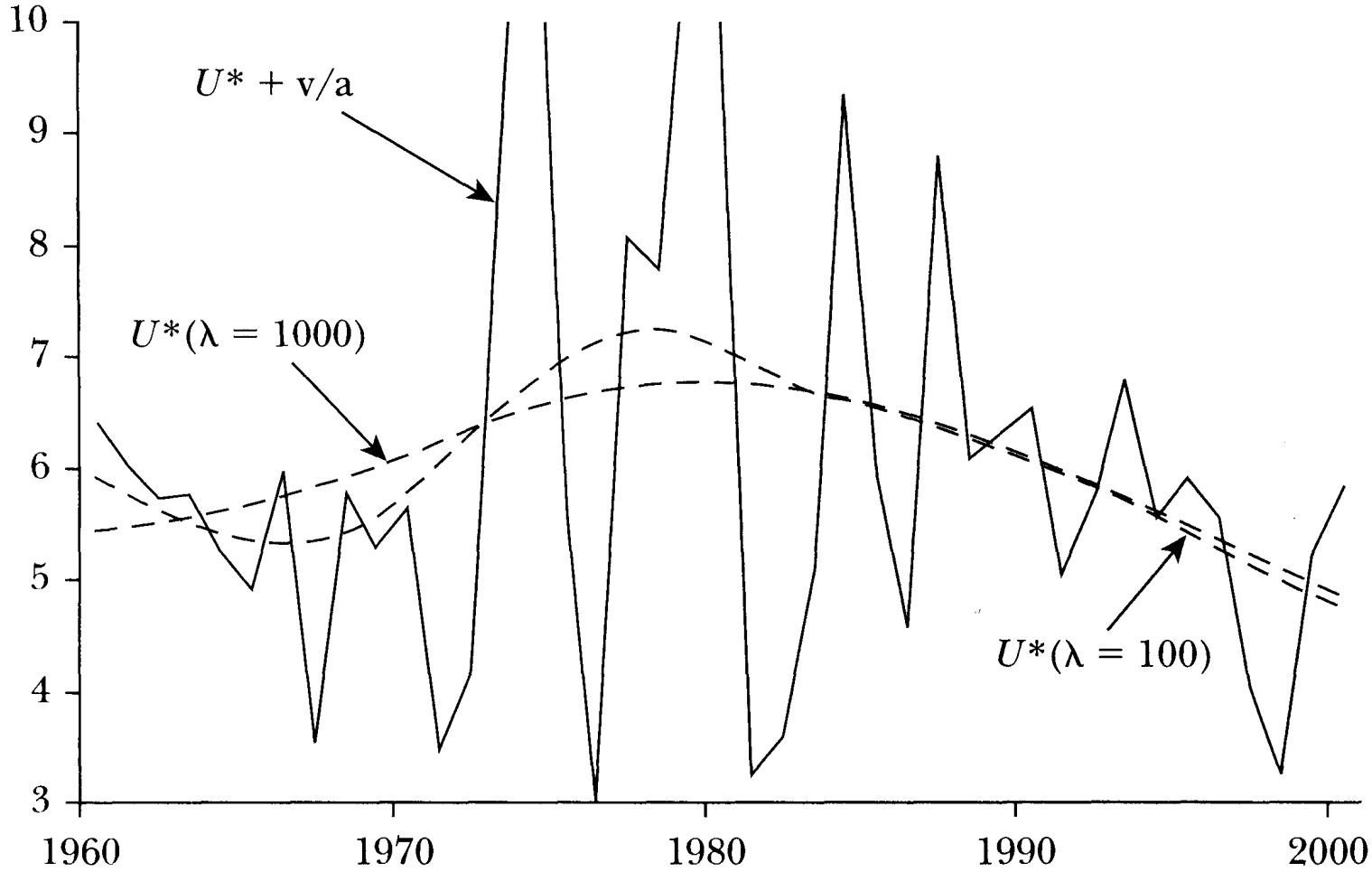
- the point where the PC crosses 0

In the US: about 6%

- but with major fluctuations over time

NAIRU Fluctuations

Time Varying NAIRUs, 1960–2000



Source: Ball and Mankiw (2002)

Money Is Neutral

The modified Phillips curve implies:

> ***Money is neutral in the medium run.***
> *Doubling* $M \implies$ *doubling* P *with no change in* Y*.*

This follows from $\pi = \pi^e$, so that aggregate supply is independent of prices:

$$Y^s = F\left(\frac{1}{1+m}, z\right) \tag{14}$$

Money is neutral

Aggregate demand

$$Y_n = Y(M/P, G, T) \tag{15}$$

fixes the price level (really: M/P)

Constant M/P implies

$$\pi = g(P) = g(M) \tag{16}$$

> *"Inflation is always and everywhere a monetary phenomenon." – Friedman*

Policy Implications

Can governments exploit the Phillips Curve?

A key result that is central for all of monetary policy

For money to be non-neutral, inflation must be **unexpected**

This is the key difficulty of monetary policy.

Simply raising inflation every year cannot work.

Credible disinflation

Conventional wisdom:

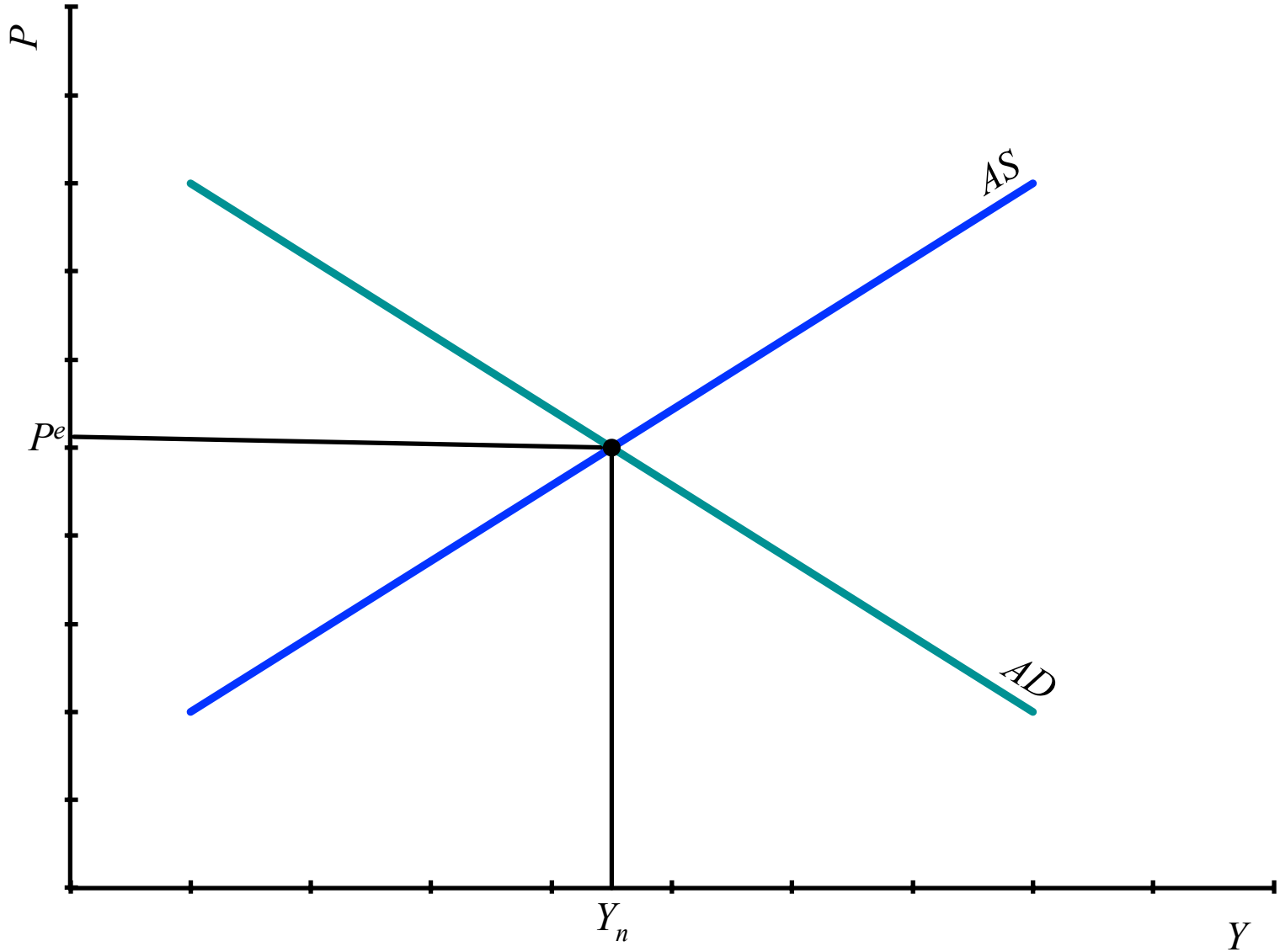
Disinflation (contractionary monetary policy) causes recession

There are several counter examples in history

- Germany after WW2
- Argentina introducing a currency board (pegging to the dollar)

The key: credibility.

Credible disinflation



Compare credible / non-credible disinflation.

Persistent Inflation Erodes Monetary Policy

- In countries with high inflation, wages are indexed to inflation
- Higher inflation does not erode real wages as much
  - and has smaller effects on real variables

A simple model of wage indexation

- fraction λ of wage contracts are indexed
- they set prices as if $\pi^e = \pi$
- PC:

$$\pi_t = [\lambda \pi_t + (1-\lambda)\pi_{t-1}] - \alpha(u_t - u_n) \tag{17}$$

- Solve:

$$\pi_t - \pi_{t-1} = -\frac{\alpha}{1-\lambda}(u_t - u_n) \tag{18}$$

- Higher $\lambda \implies$ smaller effect of inflation on unemployment.

Caveats

- The parameters of the Phillips Curve are not fixed.
- Labor market policies affect m and z
  - see our discussion of European unemployment
- Cost shocks affect m

Reading

Text: Blanchard and Johnson (2013), ch 8

On NAIRU: Ball and Mankiw (2002)

References I

Ball, L. and N. G. Mankiw (2002): "The NAIRU in Theory and Practice," *The Journal of Economic Perspectives*, 16, 115–136.

Blanchard, O. and D. Johnson (2013): *Macroeconomics*, Boston: Pearson, 6th ed.