

Inflation and Unemployment

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Objectives

This section is about the trade-off between inflation and unemployment.

In this section you will learn:

1. How and when expansionary monetary policy reduces **unemployment**.
2. When does it generate **inflation** instead.
3. The importance of **expectations** for monetary policy.

The Question

Monetary policy stimulates aggregate demand.

Why not always use it gain more employment / output?

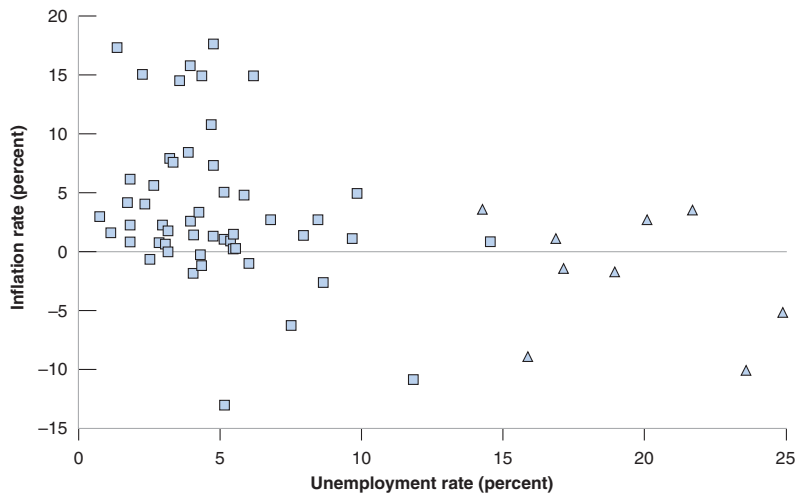
Answer: Lax monetary policy creates inflation.

Key issue

Can we buy more employment with more inflation?

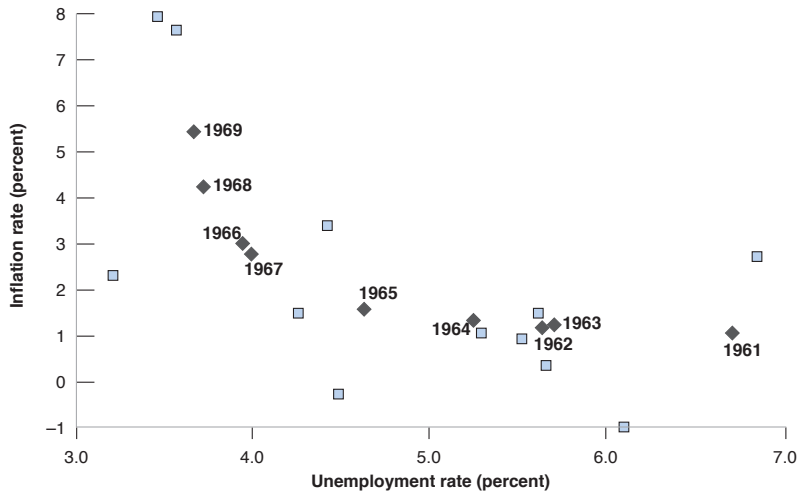
What do the data show?

The Phillips Curve: 1900-1960



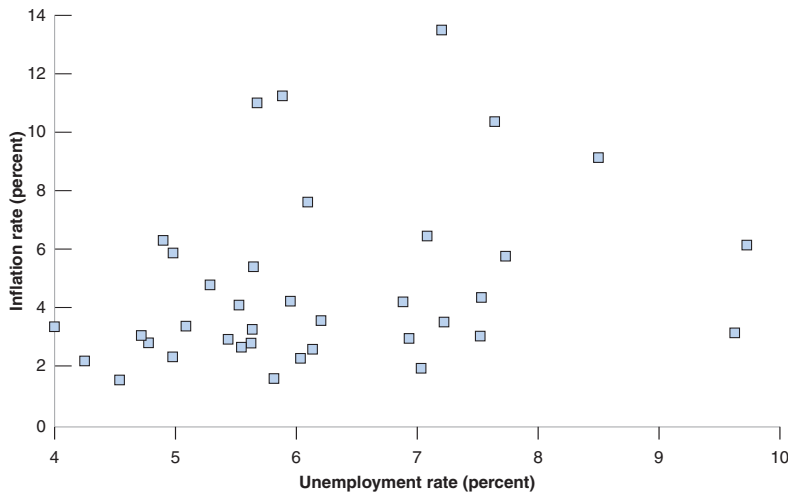
High inflation - low unemployment

The 1960s



The 1960s are especially clear.

Modern Data: 1970-2010



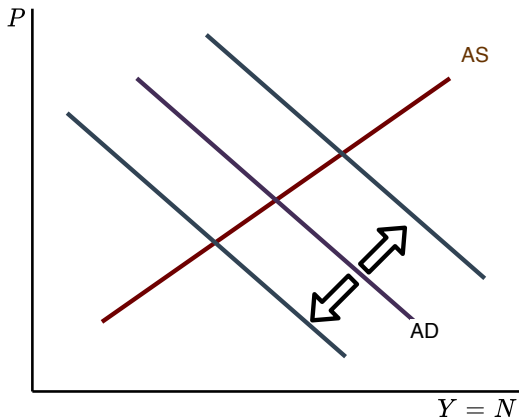
Breakdown of the Phillips Curve

Phillips Curve: Intuition

Assume that economic fluctuations are mostly driven by *AD* shocks.

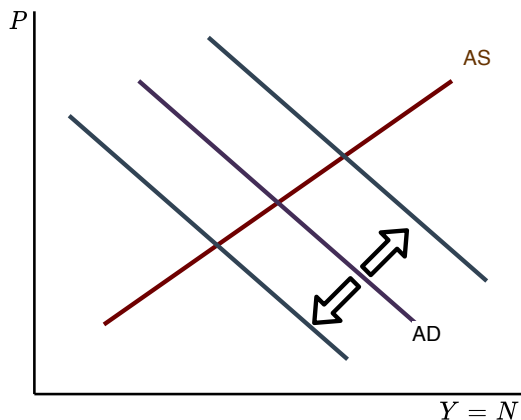
- ▶ The *AS* curve is stable over time.

Then we get a positive correlation between inflation and unemployment.



Phillips Curve: Intuition

How does the analysis change when the price changes are expected?



Why Might the Phillips Curve Break Down?

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

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

A natural idea:

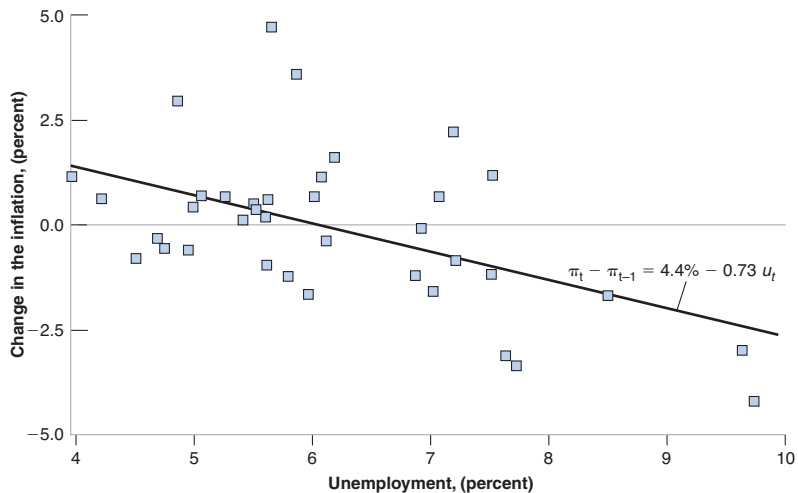
- ▶ up to the 1960s inflation was unanticipated
- ▶ afterwards it was anticipated and hence did not affect output

We need a measure of **unanticipated inflation**.

A simple measure: the change of the inflation rate

- ▶ Can we buy more output by **raising** inflation?

The New Phillips Curve: 1970-2010



Rising inflation – low unemployment

Summary

Until 1960

- ▶ higher inflation was associated with lower unemployment

After 1960

- ▶ rising inflation was associated with lower unemployment

Questions:

1. Why the change?
2. Can we buy persistently higher employment with ever rising inflation?

Theory Underlying the Phillips Curve

Deriving the Phillips Curve

Start from aggregate supply

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

Divide by last period's prices:

$$\frac{P}{P^e} = \frac{P}{P_{-1}} \frac{P_{-1}}{P^e} = \frac{1+\pi}{1+\pi^e} \quad (3)$$

π : actual inflation rate

π^e : expected inflation rate

Therefore:

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

Deriving the Phillips Curve

In words:

- ▶ AS supply rises when prices are higher than expected
- ▶ or when inflation is higher than expected

Anticipated inflation is built into wage demands

- ▶ it is “neutral” (does not affect real AS)

Next step: translate changes in Y^S into changes in unemployment.

Relationship with unemployment

$$u = \frac{L - N}{L} = 1 - \frac{N}{L} \quad (5)$$

where:

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

In words:

unemployment rate = 1 - employment rate.

Relationship with unemployment

Recall the aggregate production function:

$$Y/L = N/L = 1 - u \quad (6)$$

or

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

Implications

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

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 ($u \uparrow \implies \pi \downarrow$)

Intuition:

Simplification

$$u = 1 - F\left(\frac{1 + \pi}{1 + \pi^e} \frac{1}{1 + m}, z\right) / L \quad (9)$$

Approximately

$$\frac{1 + \pi}{1 + \pi^e} \approx 1 + \pi - \pi^e \quad (10)$$

Example:

$$\pi = 0.05, \pi^e = 0.03 \implies \frac{1 + \pi}{1 + \pi^e} - 1 = 0.0194 \approx 0.02 \quad (11)$$

Simplification

Take a linear approximation:

$$u = \frac{m + z - (\pi - \pi^e)}{\alpha} \quad (12)$$

But typically the Phillips curve is written as:

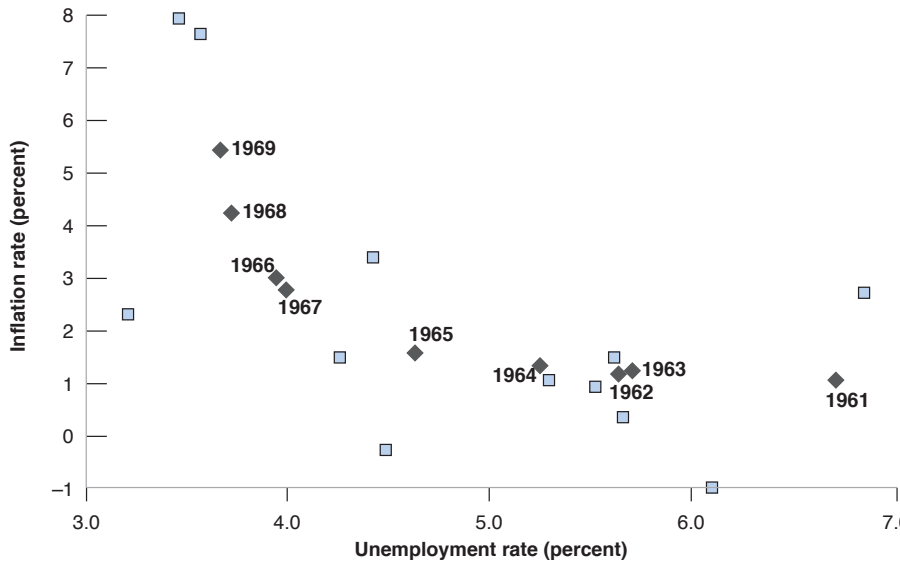
“inflation is a decreasing function of unemployment”

So the final equation is

$$\pi = \pi^e + (m + z) - \alpha u \quad (13)$$

The Phillips Curve Through Time

The 1950s and 60s



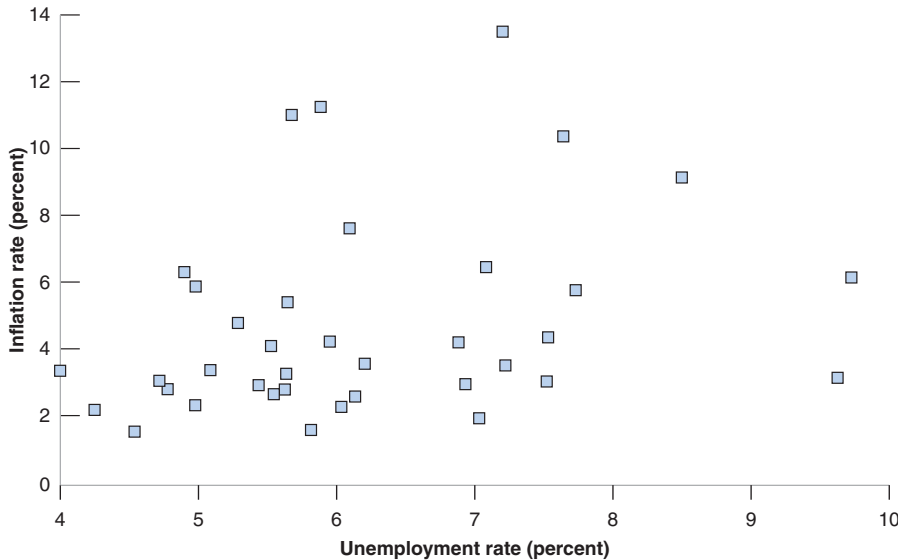
The economy moves up along a stable Phillips Curve

Interpretation

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

$$\pi = \underbrace{\pi^e}_{\text{fixed}} + (m + z) - \alpha u \quad (14)$$

The 1970s and Beyond

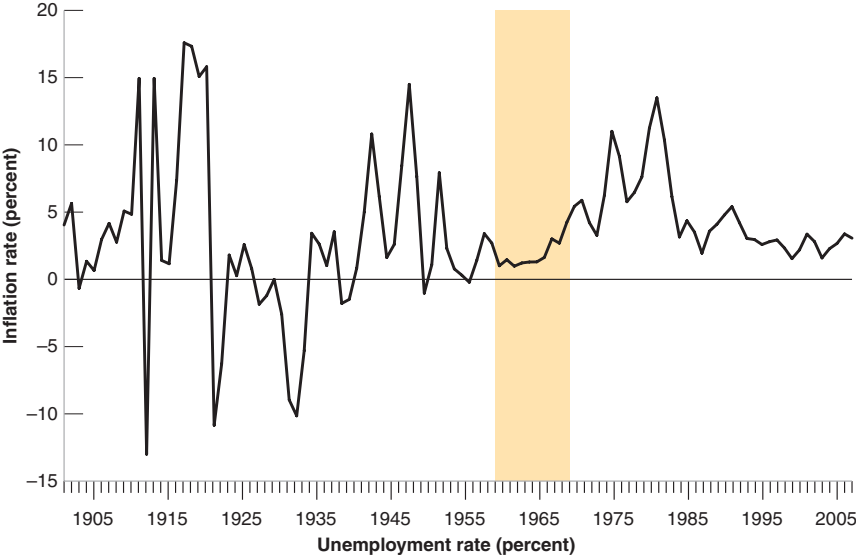


No relationship between inflation and unemployment

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

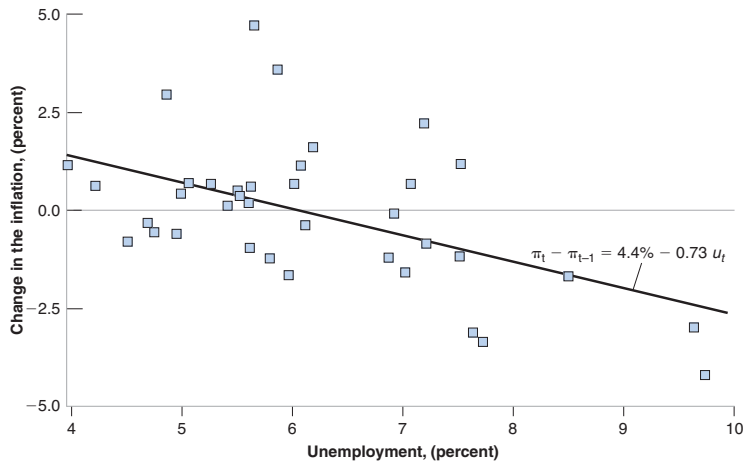
- ▶ Assume that agents form expectations according to

$$\pi_t^e = \theta \pi_{t-1} \quad (15)$$

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

$$\pi_t - \pi_{t-1} = (m + z) - \alpha u_t \quad (16)$$

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 unemployment 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)

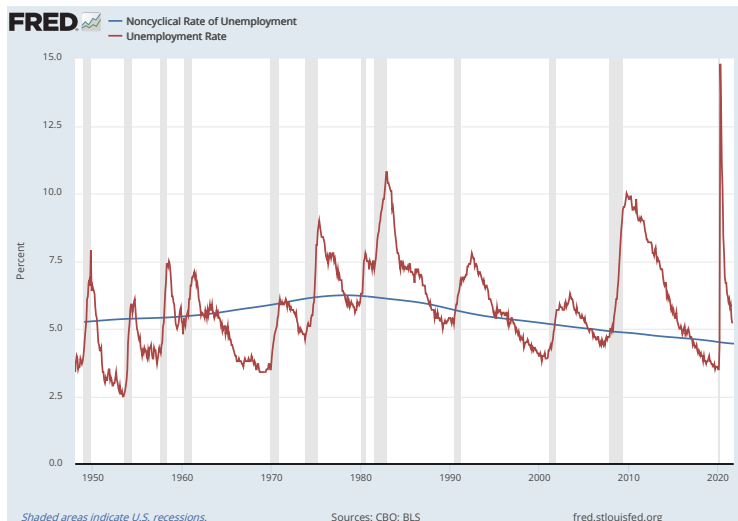
NAIRU: “Non-accelerating inflation rate of unemployment”

- ▶ the point where the PC crosses 0

Description from FRED:

The natural rate of unemployment (NAIRU) is the rate of unemployment arising from all sources except fluctuations in aggregate demand. ... The short-term natural rate is used to gauge the amount of current and projected slack in labor markets, which is a key input into CBO's projections of inflation.

NAIRU Fluctuations



Source: FRED

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:

$$Y^s = F\left(\frac{1}{1+m}, z\right) \quad (17)$$

Money is neutral

Aggregate demand

$$Y_n = Y(M/P, G, T) \quad (18)$$

fixes the price level (really: M/P)

Constant M/P implies

$$\pi = g(P) = g(M) \quad (19)$$

“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:

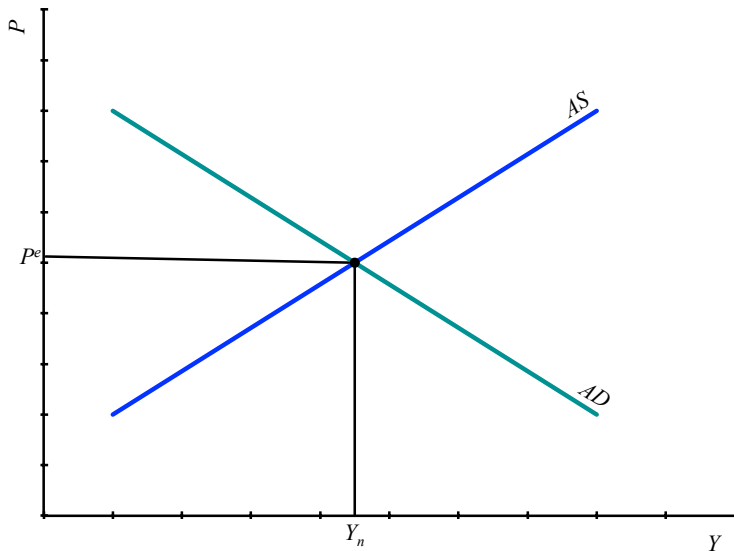
Disinflation (contractionary monetary policy) causes recession

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.

Caveats

- ▶ The parameters of the Phillips Curve are not fixed.
- ▶ Labor market policies affect m and z
- ▶ 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.