Inflation and Unemployment

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Econ520

February 26, 2024

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?

And what does the AS/AD model predict?

Higher inflation \implies more output?



What happens if the Fed keeps shifting AD out?

The Fed can buy higher output with higher inflation. Intuition...

Is the intuition plausible?



High inflation seems associated with low unemployment.

[&]quot;Phillips Curve"

The Data: 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.



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

$$Y^{s} = F\left(\frac{P}{P^{e}}\frac{1}{1+m}, z\right)$$
(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 be buy persistently higher employment with ever rising inflation?

Theory Underlying the Phillips Curve

Deriving the Phillips Curve

We derive a Philips Curve of the form

$$\pi = \pi^e + (m+z) - \alpha u \tag{2}$$

In words:

- holding fixed π^e: there is a stable Philips Curve inflation and unemployment are negatively related
- in general: there is a "modified" Philips Curve that relates unexpected inflation to unemployment

Deriving the Philips Curve

Start from aggregate supply

$$Y^{s} = F\left(\frac{P}{P^{e}}\frac{1}{1+m}, z\right)$$
(3)

Divide by last period's prices:

$$\frac{P}{P^e} = \frac{P}{P_{-1}} \frac{P_{-1}}{P^e} = \frac{1+\pi}{1+\pi^e}$$
(4)

• $\pi \equiv (P - P_{-1})/P_{-1}$: actual inflation rate • $\pi^e \equiv (P^e - P_{-1})/P_{-1}$: expected inflation rate Deriving the Philips Curve

The Philips Curve is now

$$Y^{s} = F\left(\frac{1+\pi}{1+\pi^{e}}\frac{1}{1+m}, z\right)$$
(5)

In words:

- For P to pull ahead of P^e by 5%, we need 5% unanticipated inflation
- I.e.: $\pi = \pi^e + 5\%$ • Or $\frac{1+\pi}{1+\pi^e} = 1.05$

Simplification

Approximately

$$\frac{1+\pi}{1+\pi^e} \approx 1+\pi-\pi^e \tag{6}$$

Example:

$$\pi = 0.05, \pi^e = 0.03 \implies \frac{1+\pi}{1+\pi^e} - 1 = 0.0194 \approx 0.02$$
 (7)

$$Y^{s} = F\left(\frac{1+\pi-\pi^{e}}{1+m}, z\right)$$
(8)

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

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

(9)

where:

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

In words:

unemployment rate = 1 - employment rate.

Relationship with unemployment

Recall the aggregate production function:

$$Y/L = N/L = 1 - u \tag{10}$$

or

$$u = 1 - Y/L = 1 - F\left(\frac{1 + \pi - \pi^e}{1 + m}, z\right)/L$$
(11)

Implications

$$u = 1 - F\left(\frac{1 + \pi - \pi^{e}}{1 + m}, z\right) / L$$
 (12)

1. π^{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

Take a linear approximation:

$$u = \beta_m m + \beta_z z - \beta_\pi (\pi - \pi^e)$$
(13)

But typically the Phillips curve is written as:

"inflation is a decreasing function of unemployment"

$$\pi - \pi^e = \frac{\beta_m m + \beta_z z - u}{\beta_\pi} \tag{14}$$

Or even simpler:

$$\pi = \pi^e + (m+z) + \alpha u \tag{15}$$

 $-\alpha$ is the slope of the Phillips Curve.

The Phillips Curve shifts around over time as labor market conditions (m+z) change.

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.

The Phillips Curve Through Time



Interpretation

Inflation had been stable for a long time

 π^e remained roughly fixed

Then the original Phillips curve emerges

$$\pi = \underbrace{\pi^e}_{\text{fixed}} + (m+z) - \alpha u \tag{16}$$

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



Modified Phillips Curve

Assume that agents form expectations according to

$$\pi_t^e = \theta \pi_{t-1} \tag{17}$$

Of course, one could do better than that...

A coarse approximation:

- ▶ 1960s: $\theta = 0$
- ► 1970s: $\theta = 1$

Modified Phillips Curve

$$\pi_t - \pi_{t-1} = (m+z) - \alpha u_t \tag{18}$$

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)







Text: Blanchard and Johnson (2013), ch 8

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