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Principles of Economics and Management I

Session 9 · Unemployment, Inflation and the Labor Market

Introduction



Where We Came From

We already know how to measure a country's output and what makes it grow in the long run.

Today we look at the two variables central banks watch most closely: **unemployment** and **inflation**. 

And at the end, at the relationship between them: the **Phillips curve**. 



Today's Map

1. 👤 Measuring unemployment
2. 👷 Supply, demand and wage rigidity
3. 🧩 Types of unemployment and the natural rate
4. 🇪🇺 Measuring inflation: the HICP
5. 🔄 The Phillips curve

Part 1 · The Labor Market and Unemployment

Splitting the Population

Not everyone who is not working is unemployed. First, we split the adult population.



Employed: they have a job.



Unemployed: they have no job, but are **actively looking**.



Out of the labor force: they neither work nor look (students, retirees).



The Unemployment Rate

The **labor force** is the employed plus the unemployed.

$$\text{Unemployment rate} = \frac{\text{Unemployed}}{\text{Labor force}} \times 100.$$

Note: those outside the labor force do not enter. Anyone who gives up looking drops out of the calculation. 🤔



An Important Detail

If many people give up looking, they leave the labor force.

The unemployment rate can **fall** without anyone having found a job.

That is why we also look at the **participation rate**: what fraction of the adult population is in the labor force. 

 Source: OpenStax *Macro* 3e, [§8.1](#) “How Economists Define and Compute Unemployment Rate”, “Hidden Unemployment”, “Labor Force Participation Rate” and “Criticisms of Measuring Unemployment”.



Labor Supply and Demand

Just as in micro: the demand for labor comes from **firms**, the supply from **households**.

Demand depends on the **marginal productivity** of labor; supply, on the choice between work and leisure.

In a flexible market, the wage adjusts until there is no involuntary unemployment. But the real world does not work that way. 🤔



Why Wages Are Rigid

If wages were fully flexible, there would be no persistent unemployment. But there is **rigidity**:



Efficiency wages: paying above market raises productivity and reduces turnover.



Contracts and unions: wages set for fixed periods, hard to lower.

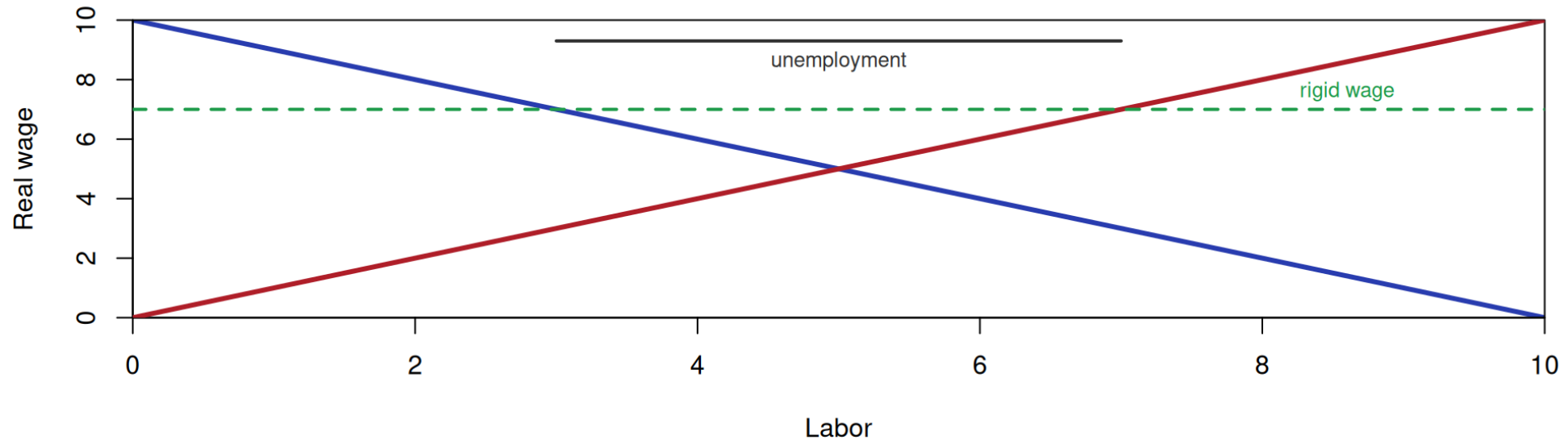


Minimum wage and social norms: legal floors and resistance to nominal cuts.

 Source: OpenStax *Macro* 3e, [§8.3](#), “Why Wages Might Be Sticky Downward”, which gives the same reasons and adds the insider-outsider and relative wage arguments.



Rigidity Generates Unemployment



A wage above equilibrium: more people want to work (7) than firms hire (3).

Types of Unemployment

 **Frictional:** between jobs, searching for the next one. It is normal and even healthy.

 **Structural:** skills do not match the vacancies (technological change, declining sectors).

 **Cyclical:** the kind that rises in recessions, when aggregate demand contracts.

The Natural Rate of Unemployment

Even in a healthy economy, unemployment is never zero.

Natural rate: frictional plus structural unemployment, when there is no recession.

Cyclical unemployment is the deviation from this natural rate. 

 Source: OpenStax *Macro* 3e, §8.4 “What Causes Changes in Unemployment over the Long Run”, which treats frictional and structural unemployment in turn and has a section on “The Natural Rate of Unemployment in Europe”. Cyclical unemployment is §8.3.

Unemployment Is a Flow, Not a Stock

A useful way to see why the natural rate is positive. Let s be the rate at which the employed lose jobs and f the rate at which the unemployed find them.

In steady state, the flow **in** equals the flow **out**:

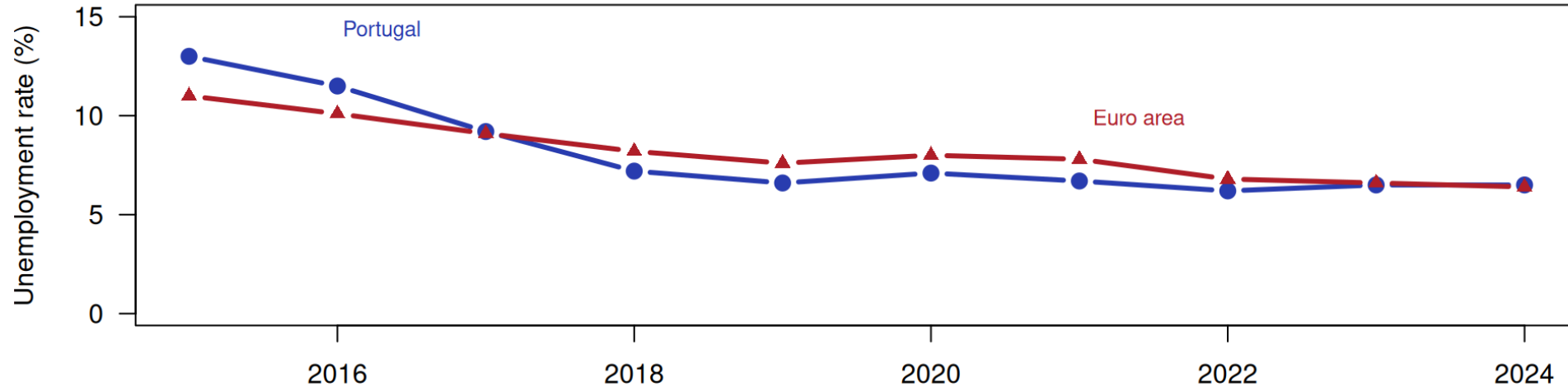
$$s(1 - u) = fu \implies u = \frac{s}{s + f}$$

Unemployment is positive whenever $s > 0$, however efficient the market is. A pool with water flowing in and out is never empty.

And it tells you what policy can actually move: the **separation rate** s (employment protection, restructuring) and the **finding rate** f (matching, training, benefit design).



Portugal and the Euro Area



Portugal started much higher in 2015 and converged. Source: Eurostat. 

? Multiple Choice 1

A long spell of bad news leads many jobseekers to give up looking. Employment does not change. The measured unemployment rate:

- A. Falls, because those people leave the labor force entirely.
- B. Rises, because more people are without work.
- C. Does not move, because employment did not move.
- D. Cannot be computed without the participation rate.

✓ **A.** They stop being counted in **both** the numerator and the denominator, so the rate improves while the situation does not. Watch the **participation rate** alongside it, which is exactly why it is published.

? Multiple Choice 2

The unemployment that rises during a recession is:

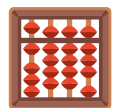
A. Frictional.

B. Structural.

C. Cyclical.

D. Natural.

☒ **C.** Cyclical unemployment follows the business cycle and rises in recessions.



Numerical Question

A country has 4.5 million employed, 0.5 million unemployed and 3 million out of the labor force.

- a) Compute the labor force and the unemployment rate.
- b) Compute the participation rate.
- c) 200,000 unemployed give up looking. Recompute both rates.
- d) With a separation rate $s = 2\%$ per quarter, what finding rate f sustains a 10 percent unemployment rate?

Solution

- a)** Labor force = $4.5 + 0.5 = 5$ million, so the rate is $0.5/5 = 10\%$.
- b)** Adult population = $5 + 3 = 8$ million, so participation is $5/8 = 62.5\%$.
- c)** Labor force = 4.8 million and unemployed = 0.3, so the rate falls to 6.25% while participation falls to $4.8/8 = 60\%$. The measured unemployment rate fell even though nobody found a job. 
- d)** $u = \frac{s}{s + f} = 0.10$ gives $f = 9s = 18\%$ per quarter: on average about five and a half quarters to find work. 

Part 2 · Inflation



What Inflation Is

Inflation: a **general and sustained** rise in the overall price level.

Prices as a whole rise, year after year. A single price going up is not the same thing.

With inflation, each euro buys **less**. The purchasing power of money falls. 



How It Is Measured: the Basket

We track the price of a **basket** of goods and services representative of a typical household.

Food, rent, transport, energy, leisure, each with a **weight** reflecting its importance in the budget.

The change in the cost of the basket over time gives the **price index**. 

 Source: OpenStax *Macro* 3e, [§9.1](#) “Tracking Inflation”, “The Price of a Basket of Goods”, which prices a college student’s basket year by year and then turns it into index numbers.



The HICP

In the euro area we use the **Harmonised Index of Consumer Prices (HICP)**.

“Harmonised” (the official EU spelling) because it follows the same rules in every country, so as to be **comparable**.

It is the index the European Central Bank uses for its inflation target. 

 The US counterpart is the CPI: OpenStax *Macro* 3e, [§9.2](#) “How to Measure Changes in the Cost of Living”, including “The Eight Major Categories in the Consumer Price Index”. The HICP is the euro area’s harmonised version of the same idea.



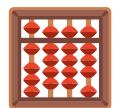
The HICP

Session 8 gave us another price index, the **GDP deflator**. They do not measure the same thing.

The deflator prices everything the country **produces**, exports included. The HICP prices what households **consume**, imports included.

So when imported energy gets more expensive, the HICP rises and the deflator barely moves. In 2022 the two gave very different inflation numbers for the same year. ⚠️

📖 Source: OpenStax *Macro* 3e, [§9.2](#), “Additional Price Indices: PPI, GDP Deflator, and More”.



Computing the Inflation Rate

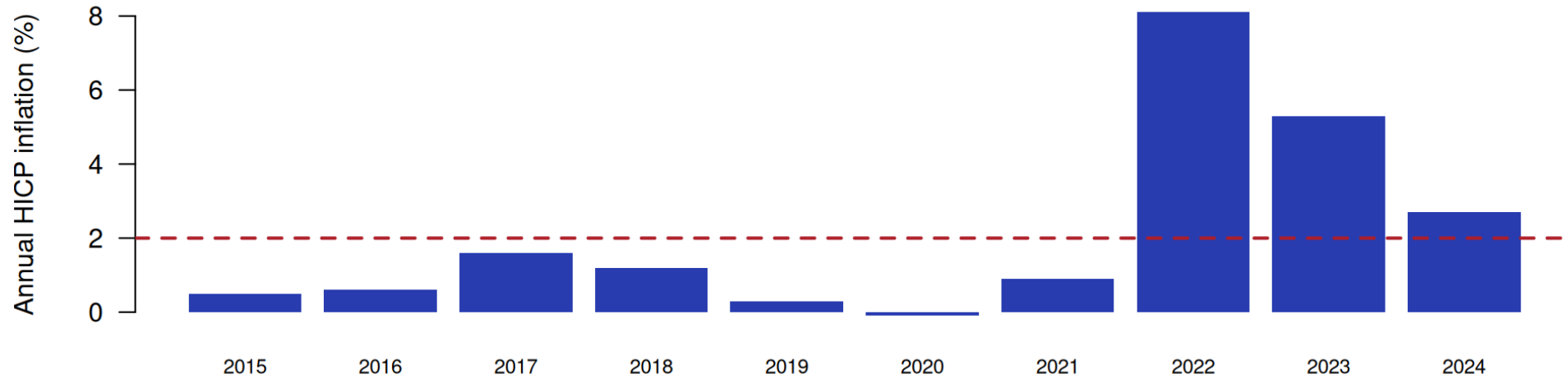
The inflation rate is the percentage change in the index between two periods:

$$\pi = \frac{\text{Index}_t - \text{Index}_{t-1}}{\text{Index}_{t-1}} \times 100.$$

If the basket cost 100 last year and 103 this year, inflation was **3%**.



Inflation Over Time



The red line marks the ECB's 2% target. Note the 2022 spike.
Source: Eurostat (HICP, Portugal). 🔥

Common Confusions

 **Falling inflation** means prices rising **more slowly**. It is not the same as prices actually falling.

 Prices that actually fall are called **deflation**, and that brings its own problems.

 What matters is the **real** wage: the nominal wage adjusted for inflation.



Headline and Core

Two numbers get published, and they answer different questions.



Headline: the whole basket. It is what households actually pay, so it is the right measure of the cost of living.



Core: the basket **excluding food and energy**, the two most volatile items and the two most driven by world prices.

Central banks watch core because it is a better signal of where inflation is **heading**, not because energy does not matter. Confusing the two is a standard mistake in commentary.

 Source: OpenStax *Macro* 3e, [§9.2](#), “The CPI and Core Inflation Index”.



The Costs of Inflation

Split them, because the two halves behave very differently:

Expected inflation costs little: contracts, wages and rates are indexed to it. What is left is shoe-leather and menu costs, plus tax distortions where the tax code is written in nominal terms.

Unexpected inflation is the expensive one. It **redistributes** from creditors to debtors, arbitrarily, on every nominal contract already signed.

Every fixed-rate bond, mortgage and pension in Europe is such a contract. That redistribution is the main cost of unexpected inflation. 

So the real objective is **predictable** inflation. That is why the ECB targets a number and announces it publicly.

 Source: OpenStax *Macro* 3e, [§9.4](#) "The Confusion Over Inflation": "Unintended Redistributions of Purchasing Power", "Blurred Price Signals", "Problems of Long-Term Planning" and, fairly, "Any Benefits of Inflation?" Indexation is [§9.5](#).

? Multiple Choice 3

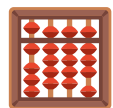
Inflation turns out much higher than everyone expected. On a fixed rate mortgage signed last year, this:

- A. Hurts the borrower, since everything costs more.
 - B. Hurts nobody, since the contract is fixed.
 - C. Hurts the bank and the borrower equally.
 - D. Transfers value from the lender to the borrower.
-  **D.** The nominal payment is fixed, so its **real** value falls. The borrower repays in cheaper euros. This is the redistribution that makes **unexpected** inflation costly, and it runs on every nominal contract at once.

? Multiple Choice 4

Imported energy prices double, while the prices of everything produced domestically stay the same. Compared with the HICP, the GDP deflator will:

- A. Rise by more, since energy is an input to everything.
 - B. Rise by the same amount, since both are price indices.
 - C. Fall, since imports are subtracted in the GDP identity.
 - D. Stay where it was, since it prices what the country produces, not what it consumes.
- ✓ **D.** The HICP prices the consumption basket, imports included, so it jumps. The deflator prices domestic production, and none of those prices changed. This is why the two inflation numbers separate during an energy shock.



Numerical Question

The consumption basket cost 120 euros last year and costs 126 this year.

- a) Compute the inflation rate.
- b) Your nominal wage rose 3 percent. What happened to your real wage?
- c) You hold a bond paying a fixed 4 percent. What is your real return?
- d) Who gained from this, and would they still have gained if the 5 percent had been expected?



Solution

a) $(126 - 120)/120 = 5\%$.

b) Roughly $3 - 5 = -2\%$. Exactly: $1.03/1.05 - 1 \approx -1.9\%$. The real wage **fell**.

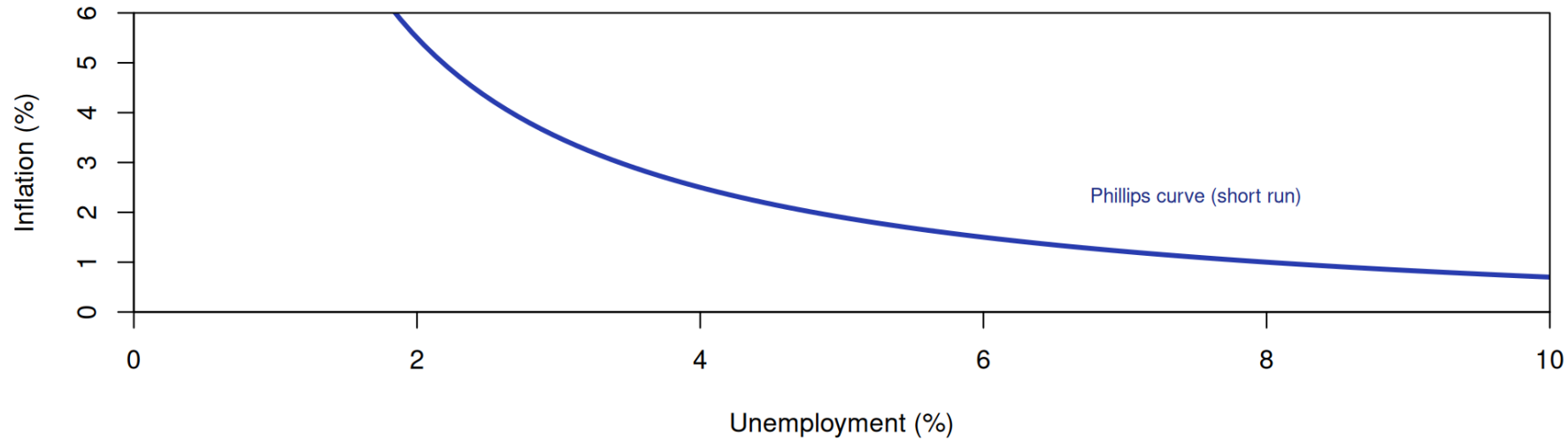
c) Roughly $4 - 5 = -1\%$. You lent money and got back less purchasing power than you put in.

d) Whoever **owed** at a fixed nominal rate. And no: had the 5 percent been expected, the bond would have been issued at a higher nominal rate in the first place. It is the **surprise** that transfers value. 

Part 3 · The Phillips Curve



The Phillips Curve



Less unemployment, more inflation. The economy appears able to **pick** a point.

 Source: OpenStax *Macro 3e*, §12.3 “The Phillips Curve”, “The Discovery of the Phillips Curve”. The next subsection, “The Instability of the Phillips Curve”, is the point of our next two slides.



The Phillips Curve

But the trade-off is **not stable**. If people expect inflation, they demand higher wages right away.

The curve incorporates **expectations**:

$$\pi = \pi^e - \beta (u - u_n).$$

π^e is expected inflation and u_n the natural rate. The curve **shifts** when expectations change.



The Phillips Curve

In the long run, expectations adjust: $\pi = \pi^e$.

From the equation, that forces $u = u_n$: unemployment returns to the **natural rate**, whatever inflation is.

The **long-run** Phillips curve is **vertical** at u_n . There is no permanent trade-off between inflation and unemployment.



The Policy Lesson

Trying to keep unemployment **below** the natural rate does not buy lasting employment. It only produces **rising inflation**.

This is why the ECB focuses on **price stability**: in the long run, it is the best monetary policy can deliver. 



What Disinflation Costs

Bringing inflation back down means running $u > u_n$ for a while. How long is not a detail:

Sacrifice ratio: the cumulative percentage points of excess unemployment needed to cut inflation by one percentage point.

And it depends almost entirely on π^e . If a credible announcement moves expectations directly, the curve shifts down without the recession.

Which is why a central bank spends so much effort on being **believed**. Credibility is what makes a disinflation cheap instead of expensive. 💡

How the ECB is built to be believed is session 10. 🏛️

? Multiple Choice 5

A central bank announces a disinflation and is **fully believed**. In $\pi = \pi^e - \beta(u - u_n)$, this means:

A. π^e falls immediately, so inflation can come down with little excess unemployment.

B. β rises, making the trade-off steeper.

C. u_n falls, so the natural rate does the work.

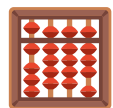
D. Nothing changes, since only actual inflation matters.

 **A.** Credibility moves the curve down directly instead of forcing the economy along it. This is why a central bank announces its target out loud.

? Multiple Choice 6

The long-run Phillips curve is vertical because:

- A. Inflation does not exist in the long run.
 - B. Wages are perfectly rigid in the long run.
 - C. The central bank chooses the unemployment rate.
 - D. Expectations catch up, so $\pi = \pi^e$ forces $u = u_n$.
-  **D.** You cannot fool people forever. Once π^e has adjusted, the only unemployment rate consistent with the equation is the natural one, whatever inflation happens to be.



Numerical Question

Phillips curve $\pi = \pi^e - 0.5(u - u_n)$, with $u_n = 6\%$ and $\pi^e = 2\%$.

- a) Find inflation if unemployment is 4 percent.
- b) Expectations catch up, so $\pi^e = 3\%$. Find inflation at $u = 4\%$ again.
- c) What happens if the central bank keeps trying to hold u at 4 percent?
- d) To cut inflation from 3 to 2 percent in one year, what unemployment is needed?



Solution

- a) $\pi = 2 - 0.5(4 - 6) = 3\%$.
- b) $\pi = 3 - 0.5(-2) = 4\%$. Same unemployment, higher inflation.
- c) Inflation keeps ratcheting up, one point per round, and never settles. That is the **accelerationist** result: below u_n unemployment does not stay low. Only inflation keeps rising.
- d) Need $\pi = 2$ with $\pi^e = 3$: $2 = 3 - 0.5(u - 6)$, so $u = 8\%$. Two points of excess unemployment for one point of disinflation, unless expectations move on their own. 

Wrap-Up

What to Take From This Session

 The **unemployment rate** counts only those in the labor force who are looking for work.

 **Wage rigidity** stops the wage from clearing the market. The gap between labor supplied and labor demanded at that wage is involuntary unemployment.

 Inflation is measured by the **HICP**, a consumption basket harmonized across the euro area.

 In the short run, the **Phillips curve** shows a trade-off between inflation and unemployment. In the long run it is **vertical**: there is no permanent trade-off.



To Review

OpenStax *Macro* 3e, the sections this session used:

- **Ch. 8, Unemployment:** [§8.1](#) · [§8.3](#) · [§8.4](#)
- **Ch. 9, Inflation:** [§9.1](#) · [§9.2](#) · [§9.4](#) · [§9.5](#)
- **Ch. 12, The Keynesian Perspective:** [§12.3](#)

For the formal treatment: Blanchard, Amighini and Giavazzi, chapters 6, 7 and 8. Optional, for labor supply: Varian, the chapter *Buying and Selling*.

Then problem set 9.

Next Session

Money, Banking and Inflation.

If inflation is a monetary phenomenon, we need to understand what **money** is and who creates it. 

See you next week. 