

# Intermediate Macroeconomics

## An Introduction to the Short Run

ECON 3311 – Spring 2025

UT Dallas

# Introduction

In this lecture, we will examine:

- How the **gap between actual GDP and potential GDP** measures the economy's performance in the short run
- How costly **fluctuations** in economic activity can be – the short run may not be a short amount of time
- How the rate of inflation tends to decline when the economy is in a recession
- A simple version of the **short-run model** that will help us understand these patterns

\*Important to remember that the terms 'GDP', 'output', and 'national income', are the same thing

# Long-run, Short-run, and Shocks

The long-run model depicts how the economy behaves on average

- It determines potential output and long-run inflation
- **Potential output** is the amount of production if all inputs were utilized at their long-run sustainable levels

At any given time, however, the output is unlikely to exactly equal the long-run average

- There will be **fluctuations below and above** the long-run average
- The extent these fluctuations is what matters in the short-run

The **short-run model** depicts **current output** and **current inflation**

- Short-run deviations from the long-run may last several years

**long-run model**  $\Rightarrow$  **potential output, long-run inflation**  
**short-run model**  $\Rightarrow$  **current output, current inflation**

# Trends and fluctuations

The actual output of an economy is equal to the long-run trend plus whatever short-run fluctuations there are:

$$\underbrace{\text{actual output}}_{Y_t} = \underbrace{\text{long-run trend}}_{\bar{Y}_t} + \underbrace{\text{short-run fluctuations}}_{\text{depends on } \tilde{Y}_t}.$$

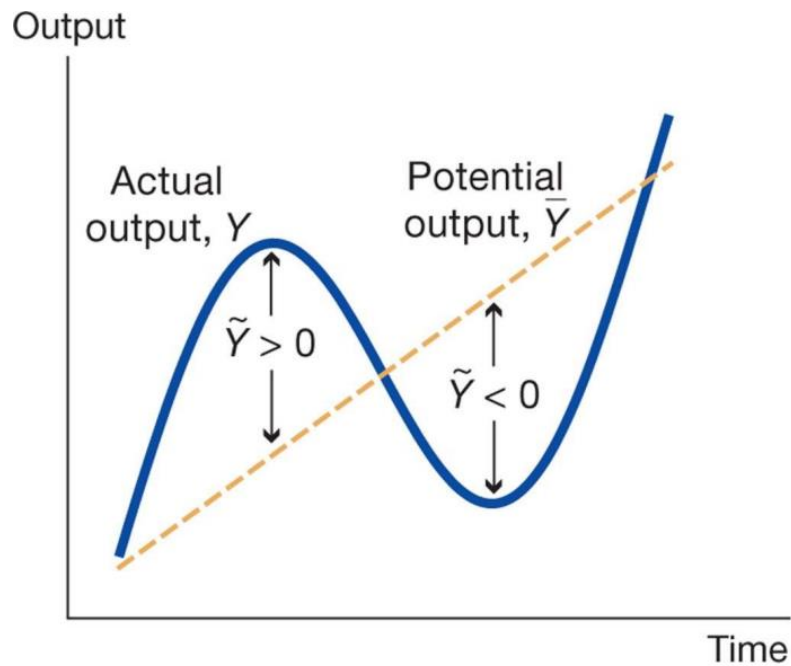
More concretely:

$$\tilde{Y}_t \equiv \frac{Y_t - \bar{Y}_t}{\bar{Y}_t}$$

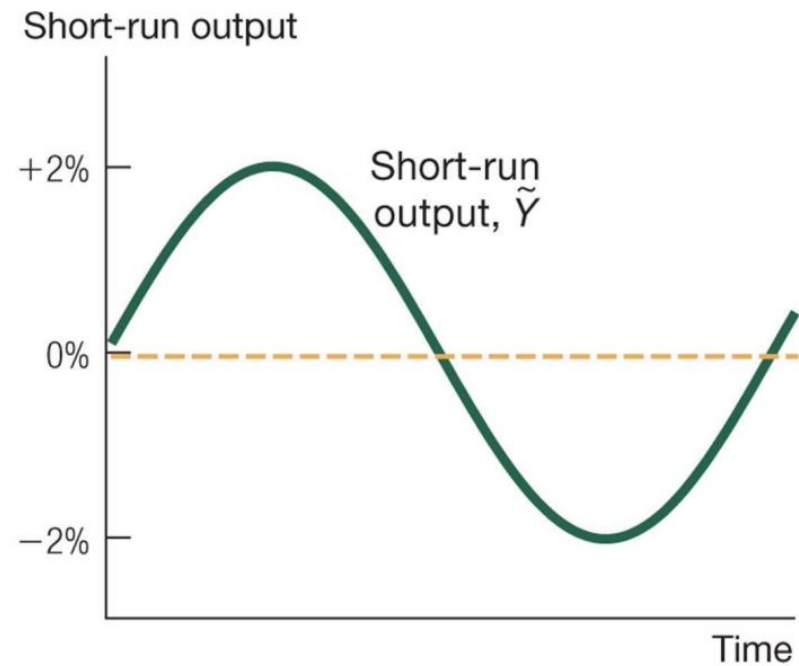
- Long-run trend: potential output ( $\bar{Y}_t$ )
- Short-run fluctuations ( $\tilde{Y}_t$ ): percentage deviations of  $Y_t$  from  $\bar{Y}_t$
- The percentage change of the deviation from the long-run trend is called **'detrended' output**

# Trends and fluctuations

These graphs describe the difference between long-run and short run output:



(a)



(b)

# Short-run versus long-run

Fluctuations in GDP are difficult to see over a long period of time

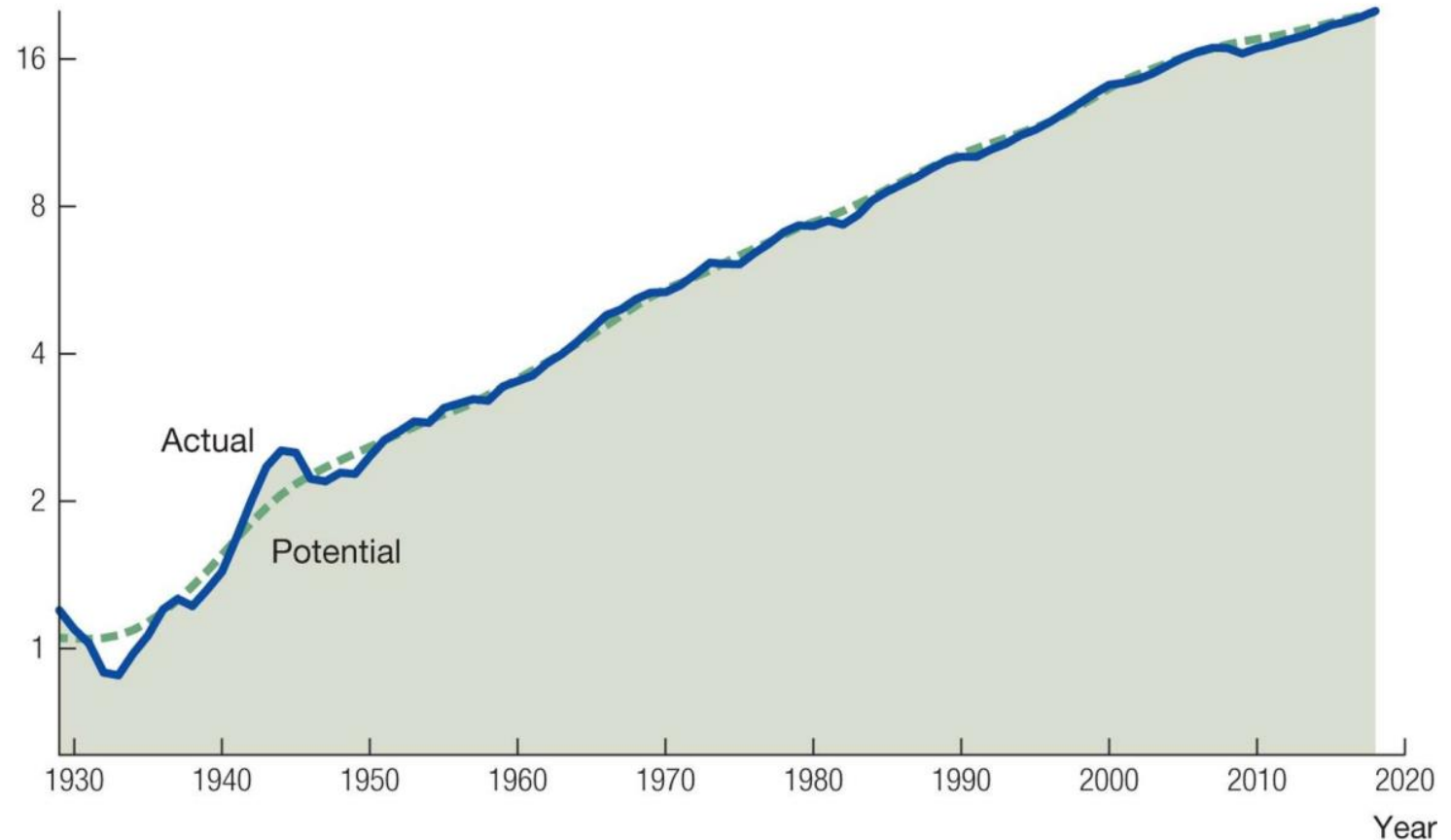
Most are between +4% or -4%, especially since 1950

One exception:

Great Depression

- Negative gap during the 1930s
- Actual output was far below potential

Trillions of chained  
2017 dollars, ratio scale



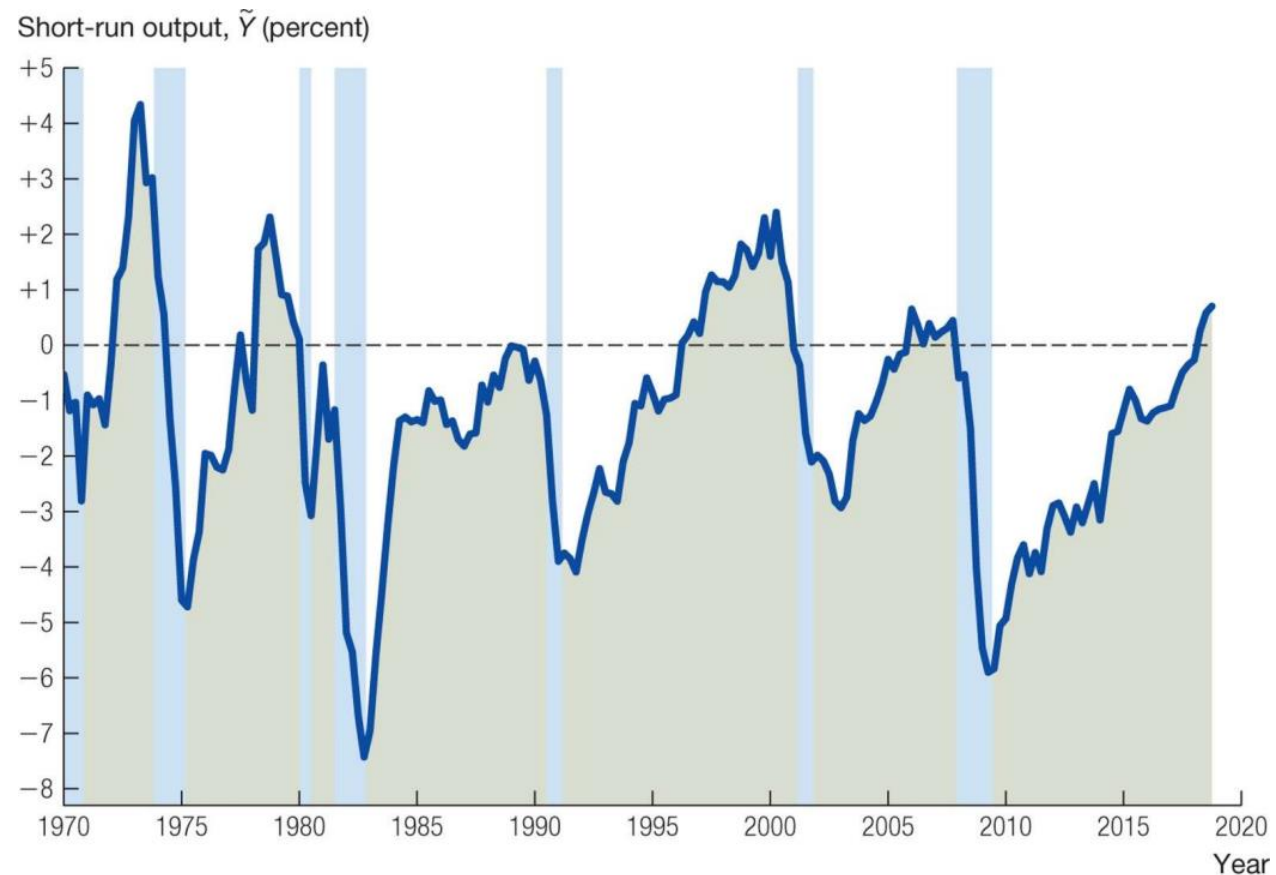
Source: U.S. Department of Commerce. Potential output is constructed by the Congressional Budget Office for years after 1949.

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# Short-run versus long-run

It's easier to see the fluctuations if we look at the percentage difference of short-run output versus potential output.

The shaded areas represent recessions (crises periods)



Source: Federal Reserve Economic Data (FRED), courtesy of the Federal Reserve Bank of St. Louis. Potential output is constructed by the Congressional Budget Office. Periods of recession are shaded, using the dates assigned by the National Bureau of Economic Research.  
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# Recession

A **recession** begins when **actual output falls below potential** output

As a consequence: **Short-run output becomes negative**

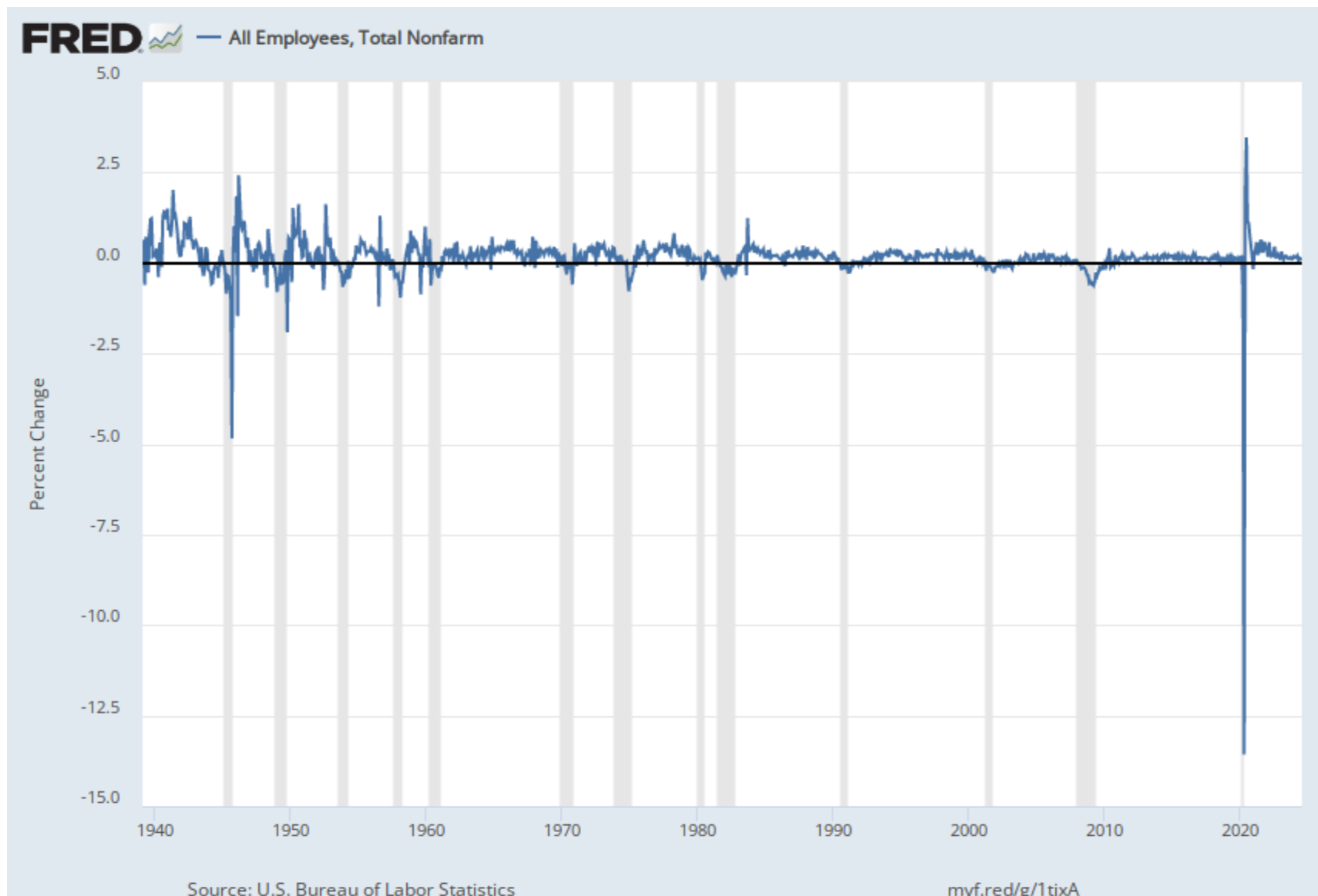
- A recession ends when short-run output rises and becomes less negative

All recessions are different, but on average:

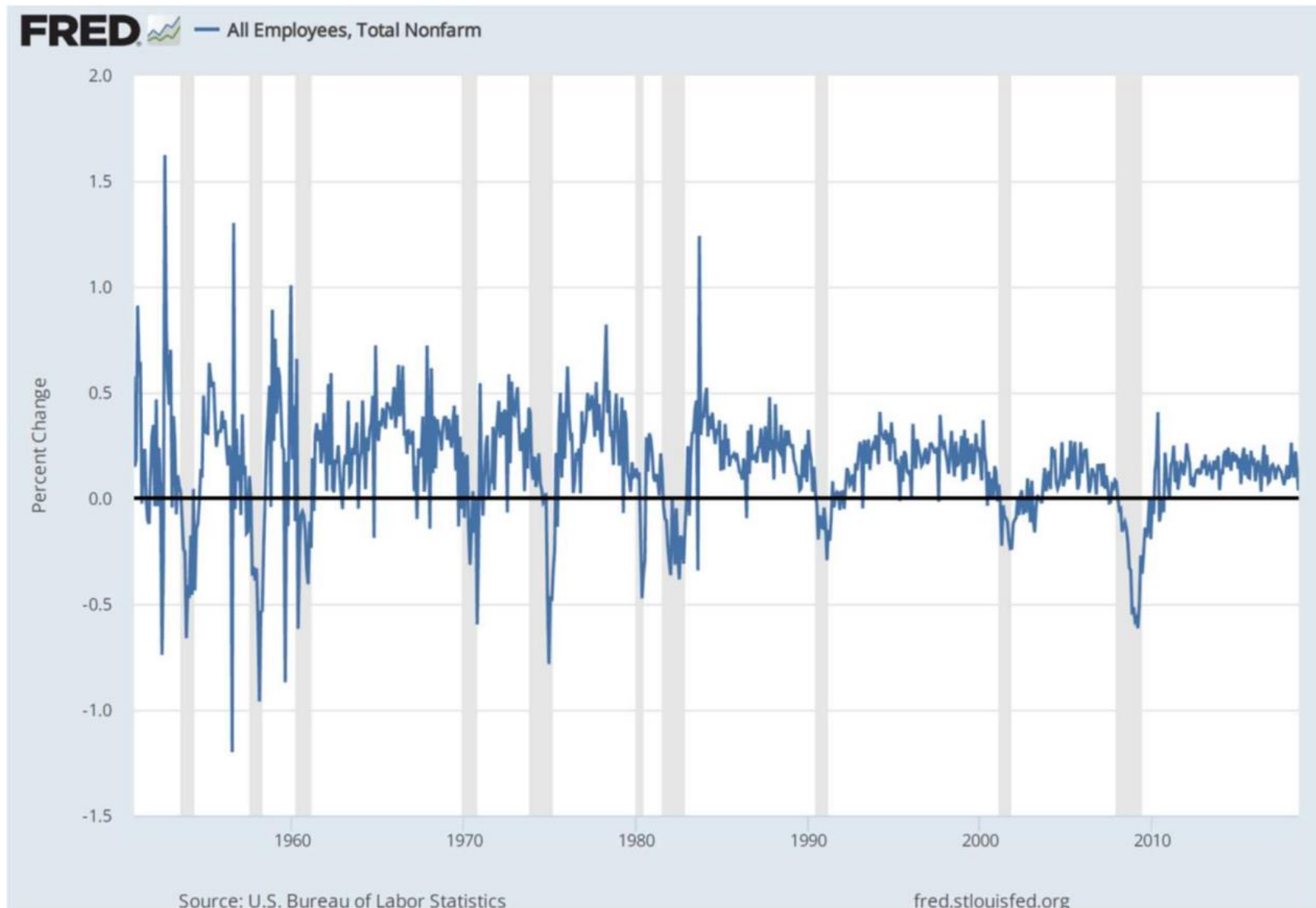
- Output falls below potential output for approximately 2 years
- Overall GDP decreases by about 6%
  - (about \$4,000 per person in today's dollars)
- Millions of jobs are lost



# Recession and employment levels



# Removing the COVID-19 episode:



# Potential output

In order to determine how much output is deviating from potential output, we need to determine what potential output is.

**Potential output:** The highest level of output that can be sustained over the long run (implies using inputs in the best yet sustainable way)

**Problem:** Potential output is not “observed” (must be calculated/approximated)

How come and what does that mean?

The GDP trend leading to a long-run potential value of it is rather a concept, is the output we expect to see once short-term shocks or surprises fade away.

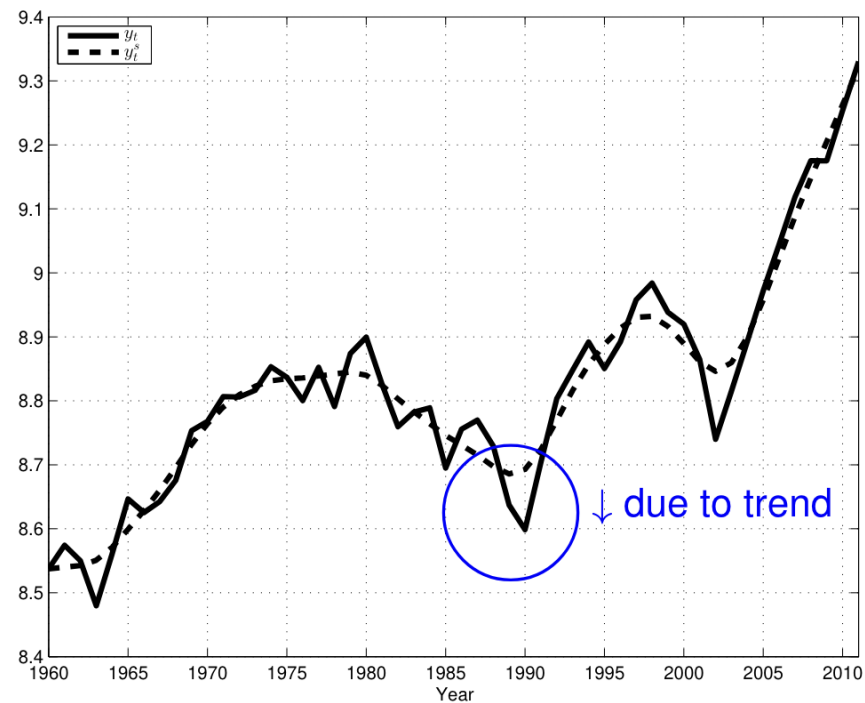
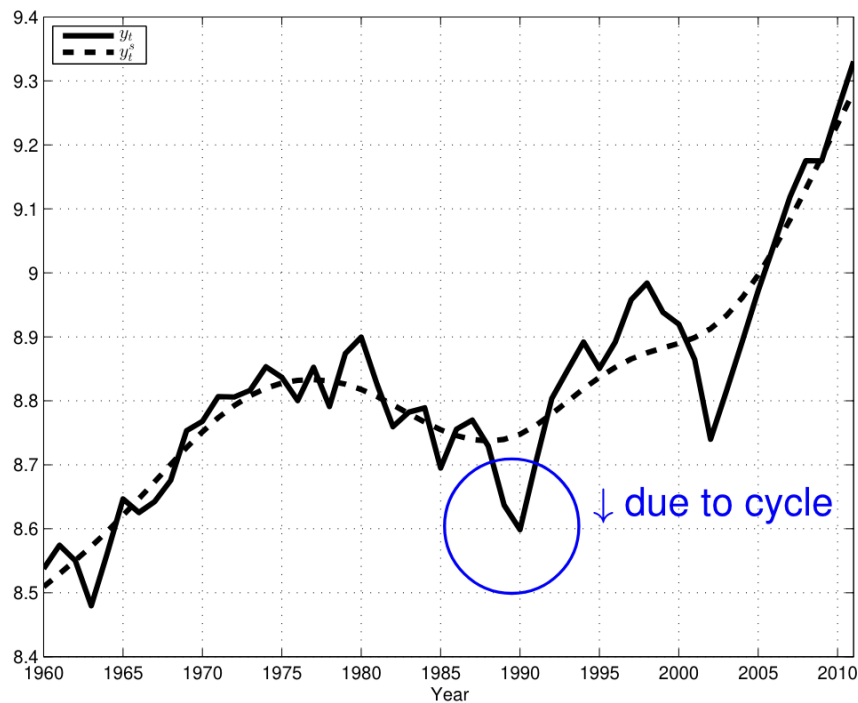
There are many statistical and economic (model based) methods yielding different proposals for what the potential output is!

And what is key is that different candidate “potential outputs” can lead to diverging diagnostics of the state of the economy.

# Potential output (cont')

If calculated as 'too high'/'to low', then decision-makers may mistakenly try and stimulate/'restrain' the economy

Example: Log of Argentine GDP and Two competing Output Gap measurements



The method in the left would indicate crises are more severe and perhaps justify more government interventions.

# Potential output (cont')

Even worse, sometimes different methods indicate actual GDP being above and below the potential output

If there is a significant increase in output, does this mean that the economy is doing well or that potential output has increased?

Some measures looked at to gauge this are:

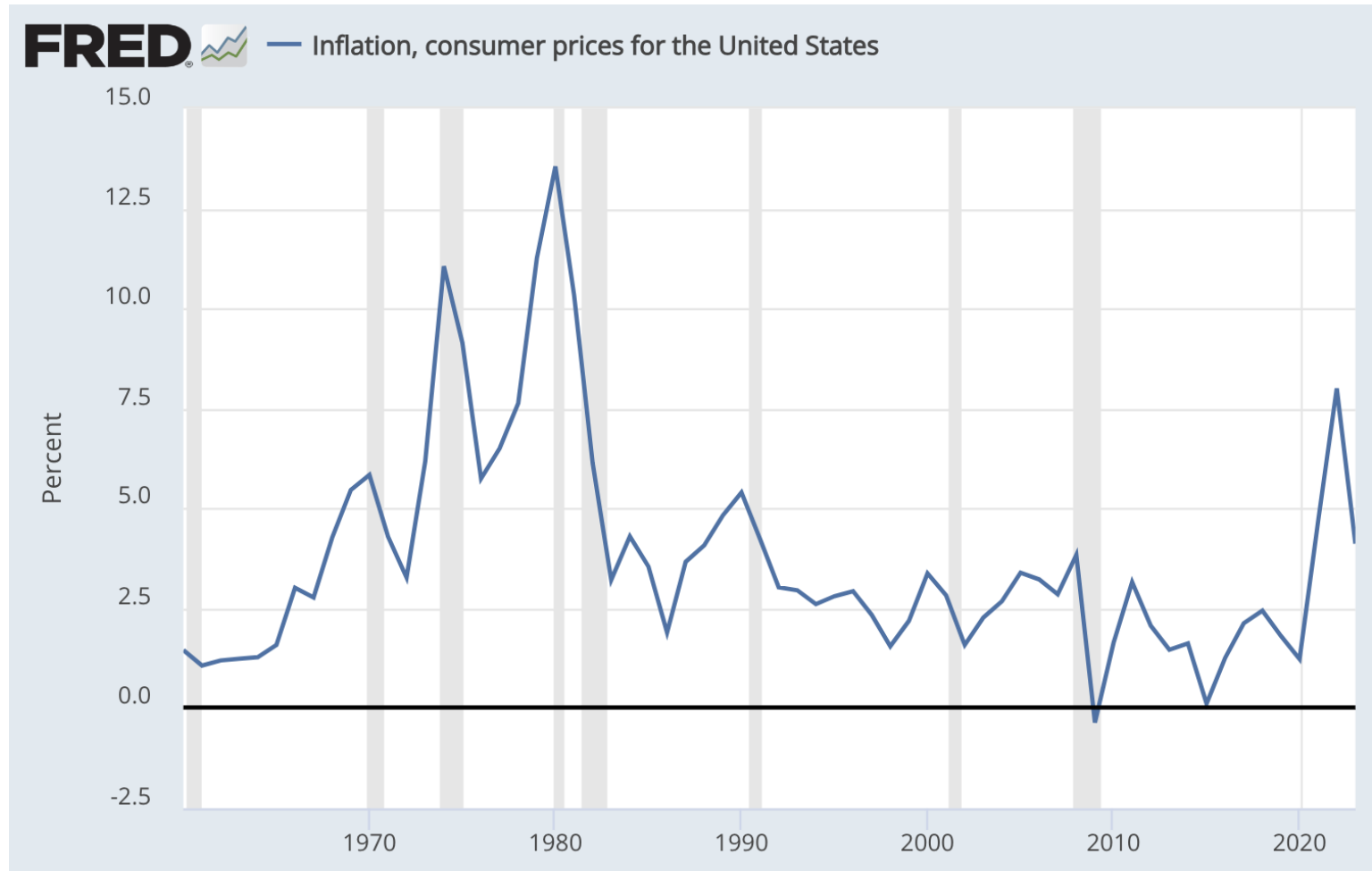
- How quickly the unemployed are finding jobs
- Surveys of particular industries
- Demand by firms for new factories and equipment

# Inflation and recessions

This plot: Inflation  
(annual)

Inflation decreases  
during recessions

There was a post  
COVID inflation surge  
AFTER the last  
recession.



We saw this in a prior lecture, but here we look at inflation again and link it to the short-run output dynamics (suggested in the data here but also from the lenses of a model)

# Short-run model

We use the short-run model to help **explain deviations of actual GDP from the long-term trend** (potential output):

The short-run model is based on three premises:

- 1) The economy is **constantly being hit by shocks**, which include
  - Changes in oil prices, new technologies, natural disasters, etc.
- 2) Monetary and fiscal policies affect output:
  - The central bank (Federal Reserve in the case of the US) can implement **monetary policy**
  - Changes in **government spending and taxes** also affect the economy
- 3) There is a trade-off between output and inflation:

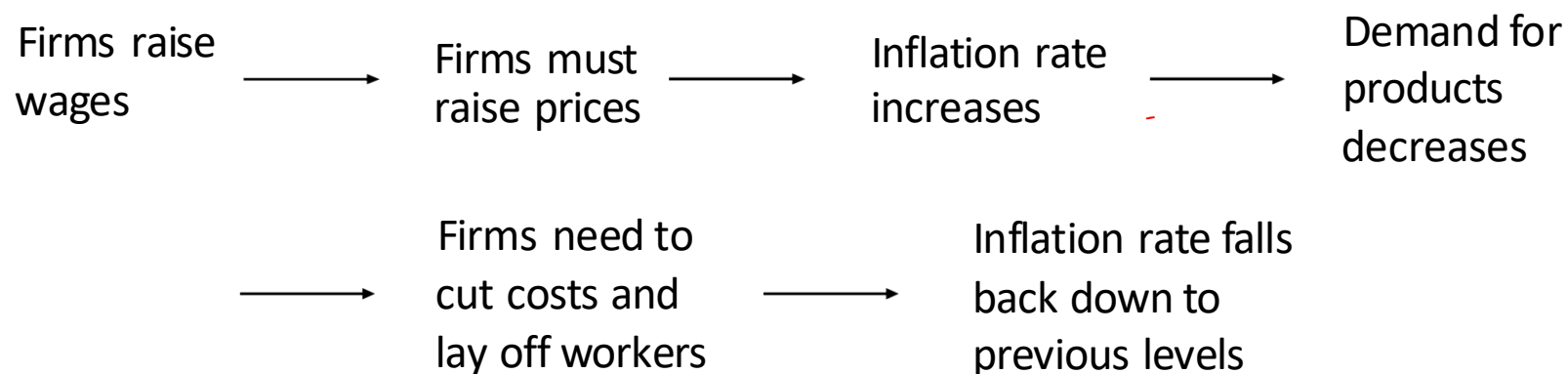
The relationship between inflation and GDP is given by the Phillips curve

# Graph of the Short-run model

The Phillips curve depicts the relationship between inflation and output

it shows that an economic boom will increase inflation and a recession will decrease inflation

The slope is about  $1/3$ , so the economy being 3% above potential output is associated with inflation increasing by 1%



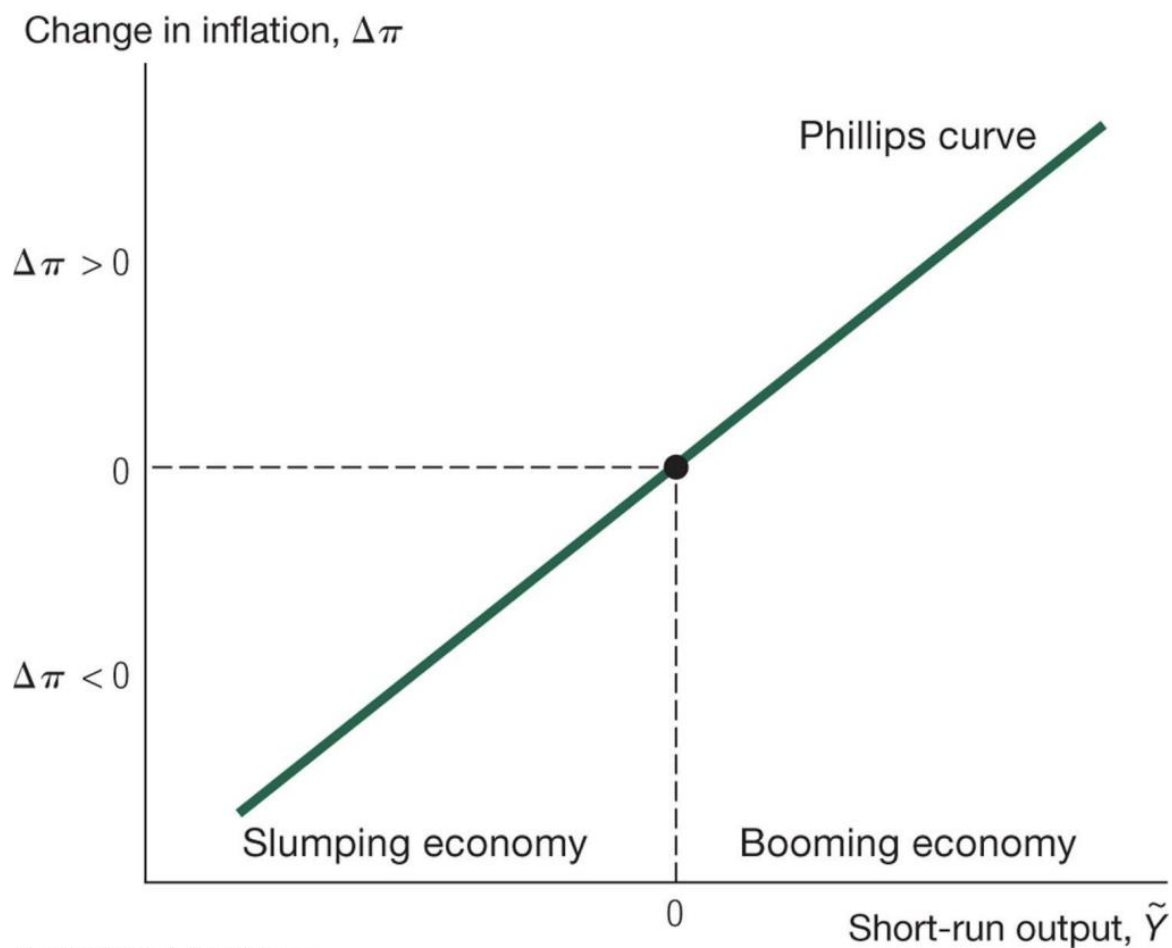


# The Phillips Curve

Depicts the short-run relationship between output and inflation

When the economy is Booming ( $\tilde{Y} > 0$ ) inflation rises

When the economy is Slumping ( $\tilde{Y} < 0$ ) inflation falls

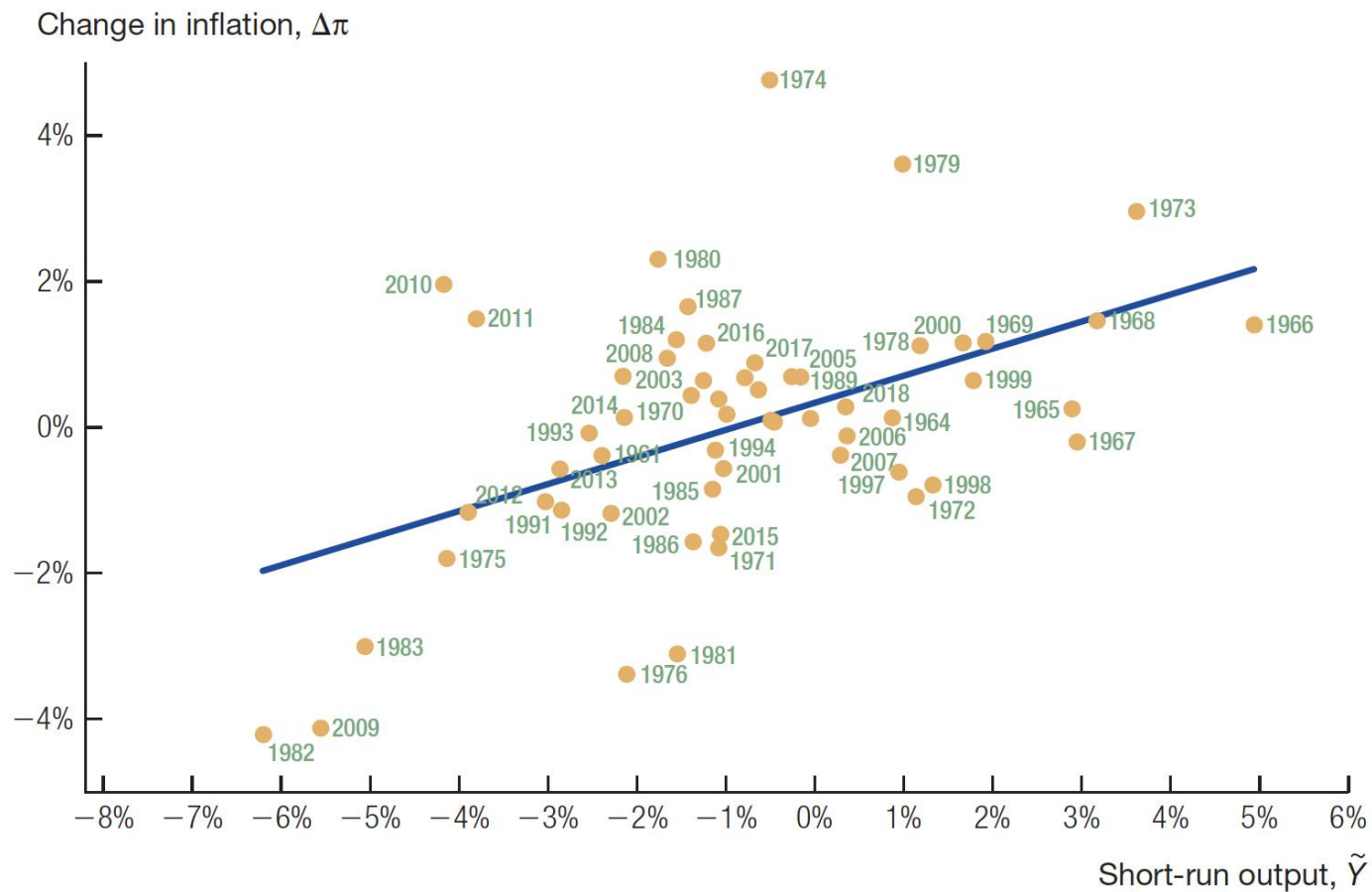


# Does the Phillips curve fit the data?

This graph is the basis for the 3% to 1% ratio that we saw in a previous slide

This is the 'best-fit' line running through the data points

Some of the outliers can be explained changes in oil prices



Source: FRED. U.S. Department of Commerce.

# Okun's law

Economic fluctuations: Measured either through output or the unemployment rate

- **Recessions** are a time with **higher unemployment and lower output**
- **Booms** are a time with **lower unemployment and higher output**

The more people are working, the higher output an economy will produce

**Okun's law** depicts the relationship between GDP (output) and the unemployment rate

This is useful because when thinking about a model we can consider only unemployment or only output rather than both variables.

Usually, economists consider output in their models (but keep in mind they are mostly working about the active number of workers in an economy).

# Okun's law (cont')

Okun's law is depicted by the following equation:

$$u - \bar{u} = -\frac{1}{2} \times \tilde{Y}$$

Where:

$u$  = Current rate of unemployment

$\bar{u}$  = Natural rate of unemployment (unemployment rate when the economy is at potential output)

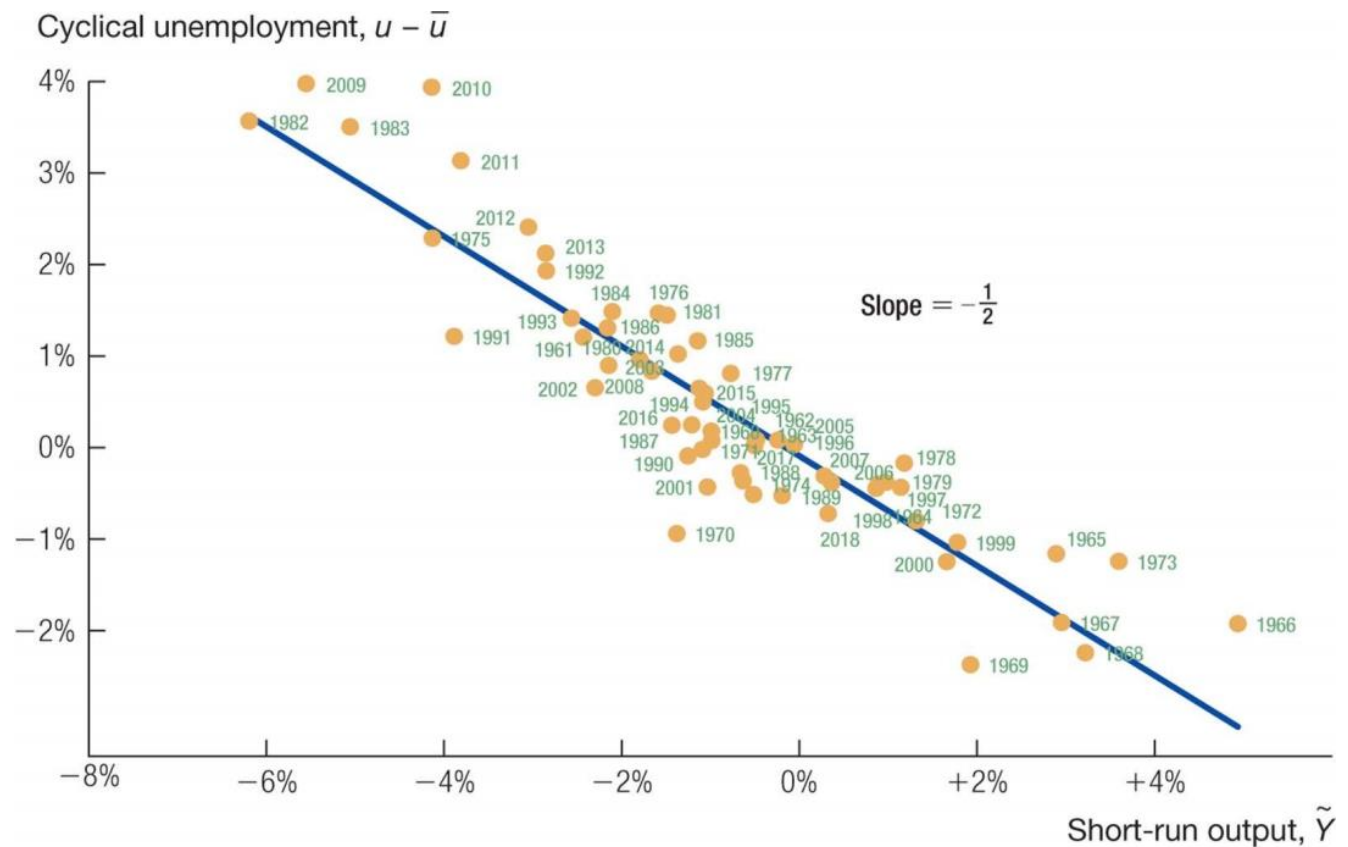
$\tilde{Y}$  = Short-run output

$u - \bar{u}$  = 'Cyclical rate of unemployment' (unemployment that is due to economic cycles)

# Does Okun's law fit the data?

Here we can see the level of cyclical unemployment and short-run output for different Years in the US

The **best fitting line** running through these points is where **Okun's law** comes from



Source: FRED. U.S. Department of Commerce.  
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# Conclusion

- Output can be viewed in two ways:
  - The long-run component associated with potential output (potential GDP)
  - The short-run component that has to do with fluctuations in output
  - Short-run fluctuations: Percentage difference (deviations) between actual output and potential output
- The inflation rate is positively related to output (**Phillips curve**)
  - Approximately at a ratio of 1% inflation to 3% output for the US
  - Note the “approximately”: capturing this slope is a current area of study
- **Okun’s law** states: A decrease in output below potential output is associated with an increase in unemployment (less than proportional or around  $\frac{1}{2}$  percentage)
- We will see later: How **monetary policy and fiscal policy can help mitigate** short-run deviations from potential output