

EC132.02

Principles of Macroeconomics

Boston College

Thursday, April 25

Announcements and Reminders

Aplia homework on the remainder of Ch 29, The Monetary System, due tomorrow, Friday, April 26, at 9am.

Aplia homework on the first part of Ch 30, The Classical Theory of Inflation, due next Thursday, May 2, at 9am.

Aplia questions on Ch 33, Aggregate Supply and Aggregate Demand, are just for practice.

Velocity and the Quantity Equation

A complementary perspective on the quantity theory of money builds on the idea of the **velocity of money**, which measures the number of times each dollar in the economy gets spent during a year.

P = GDP Deflator

Y = real GDP

$P \times Y$ = nominal GDP

M = money supply

The V , the velocity of money, is defined by

$$V = (P \times Y) / M$$

Velocity and the Quantity Equation

$$V = (P \times Y)/M$$

Suppose that an economy produces only one good: pizzas.

If the economy produces 100 pizzas per year, $Y = 100$.

If each pizza costs \$10, $P = 10$.

If the money supply is \$50, $M = 50$.

Then

$$V = (P \times Y)/M = (10 \times 100)/50 = 1000/50 = 20$$

If total spending is \$1000 and the money supply is \$50, then each dollar has to be spent 20 times.

Velocity and the Quantity Equation

Rearranging the definition of velocity

$$V = (P \times Y) / M$$

Leads to the **quantity equation**

$$M \times V = P \times Y$$

The quantity equation is an **identity**, an equation that always holds just because of the way that the variables are defined.

Velocity and the Quantity Equation

$$M \times V = P \times Y$$

But when coupled with the additional **assumption** that V is relatively stable over time, the quantity equation can be used to restate the quantity theory of money and the idea of monetary neutrality.

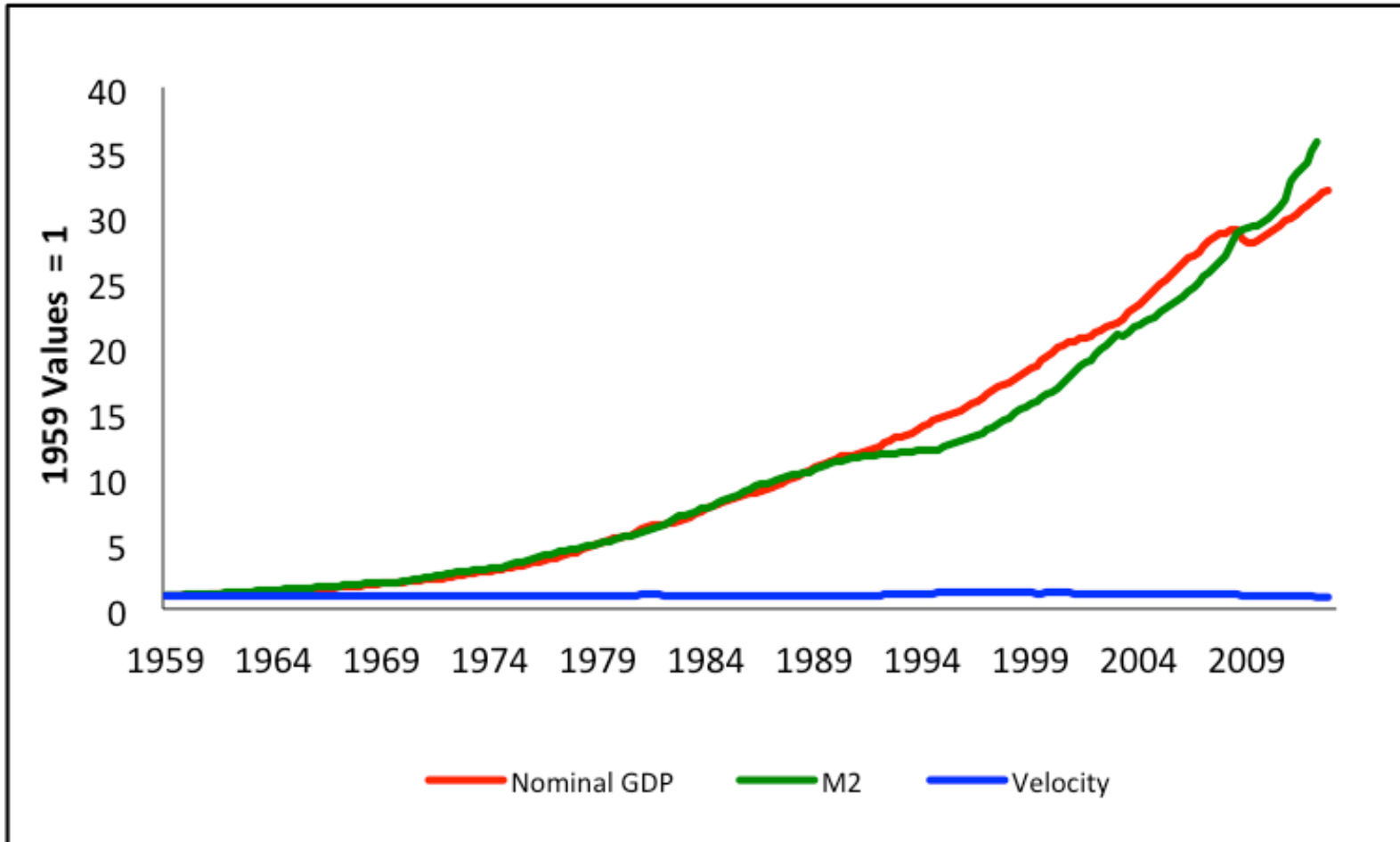
Velocity and the Quantity Equation

$$M \times V = P \times Y$$

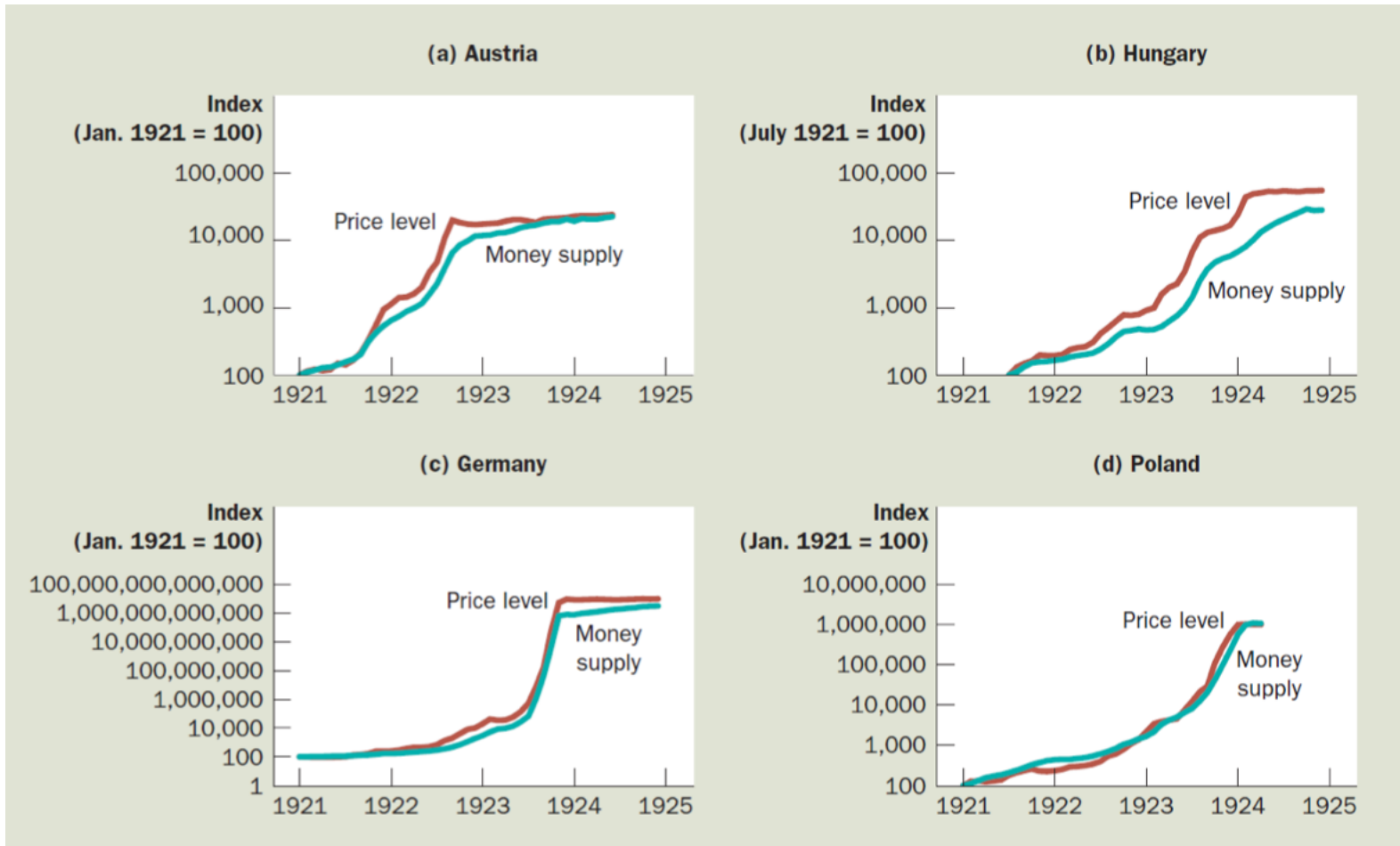
Assuming that V is constant, an increase in the money supply M will lead to an increase in nominal GDP $P \times Y$.

Assuming further that the change in M does not affect real GDP Y in the long run, the increase in M will increase the price level P but leave real GDP Y unchanged.

$P \times Y$, M , and V in the US



Money and Prices During Hyperinflations



The World's Worst Hyperinflations

| Country | Month with Highest Inflation Rate | Highest Monthly Inflation Rate | Time Required for Prices to Double |
|------------|-----------------------------------|--------------------------------|------------------------------------|
| Hungary | July 1946 | $4.16 \times 10^{16}\%$ | 15.0 hours |
| Zimbabwe | November 2008 | 79,600,000,000% | 24.7 hours |
| Yugoslavia | January 1994 | 313,000,000% | 1.4 days |
| Germany | October 1923 | 29,500% | 3.7 days |
| Greece | October 1944 | 13,800% | 4.3 days |
| China | May 1949 | 2,178% | 6.7 days |

From: Steve H. Hanke and Alex K.F. Kwok. "On the Measurement of Zimbabwe's Hyperinflation." *Cato Journal* vol.29 (Spring/Summer 2009): pp.353-364.

The World's Worst Hyperinflations



The Inflation Tax

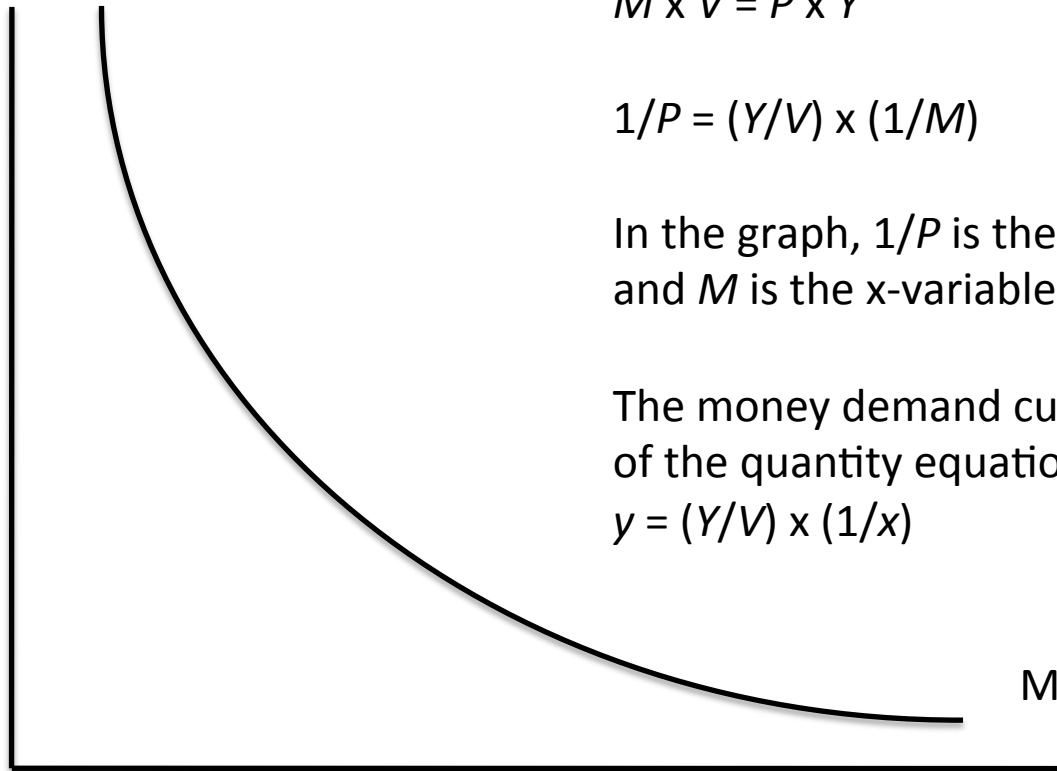
Note that when the Fed, or any other central bank, conducts an open market operation, using newly-printed money to buy government bonds, it is in effect using newly-printed money to pay back government debt.

But that same money growth will also lead to inflation.

Hence, the **inflation tax** refers to the revenue that the government raises through money creation instead of outright taxation.

Money Demand and Velocity

Goods Price
Of Money $1/P$



$$M \times V = P \times Y$$

$$1/P = (Y/V) \times (1/M)$$

In the graph, $1/P$ is the y-variable
and M is the x-variable.

The money demand curve is the graph
of the quantity equation written as
 $y = (Y/V) \times (1/x)$

Money Demand

Quantity of Money M

It is not a coincidence that money supply and demand analysis leads to the same insights as the analysis built around the quantity equation. The two approaches are really just two equivalent depictions of the same basic ideas.

Ch 33 Aggregate Demand and Supply

Over the long run, increasing productivity drives growth in output and income and leads to a rise in living standards.

But during some periods, this normal growth does not occur.

These periods of declining output and income are called **recessions** when they are relatively minor and **depressions** when they are more severe.

Macroeconomists use the model of **aggregate demand and aggregate supply** to explain these short-run fluctuations.

Ch 33 Aggregate Demand and Supply

1. Three Key Facts About Economic Fluctuations
2. Explaining Short-Run Fluctuations
3. The Aggregate Demand Curve
4. The Aggregate Supply Curve
5. Two Causes of Aggregate Fluctuations

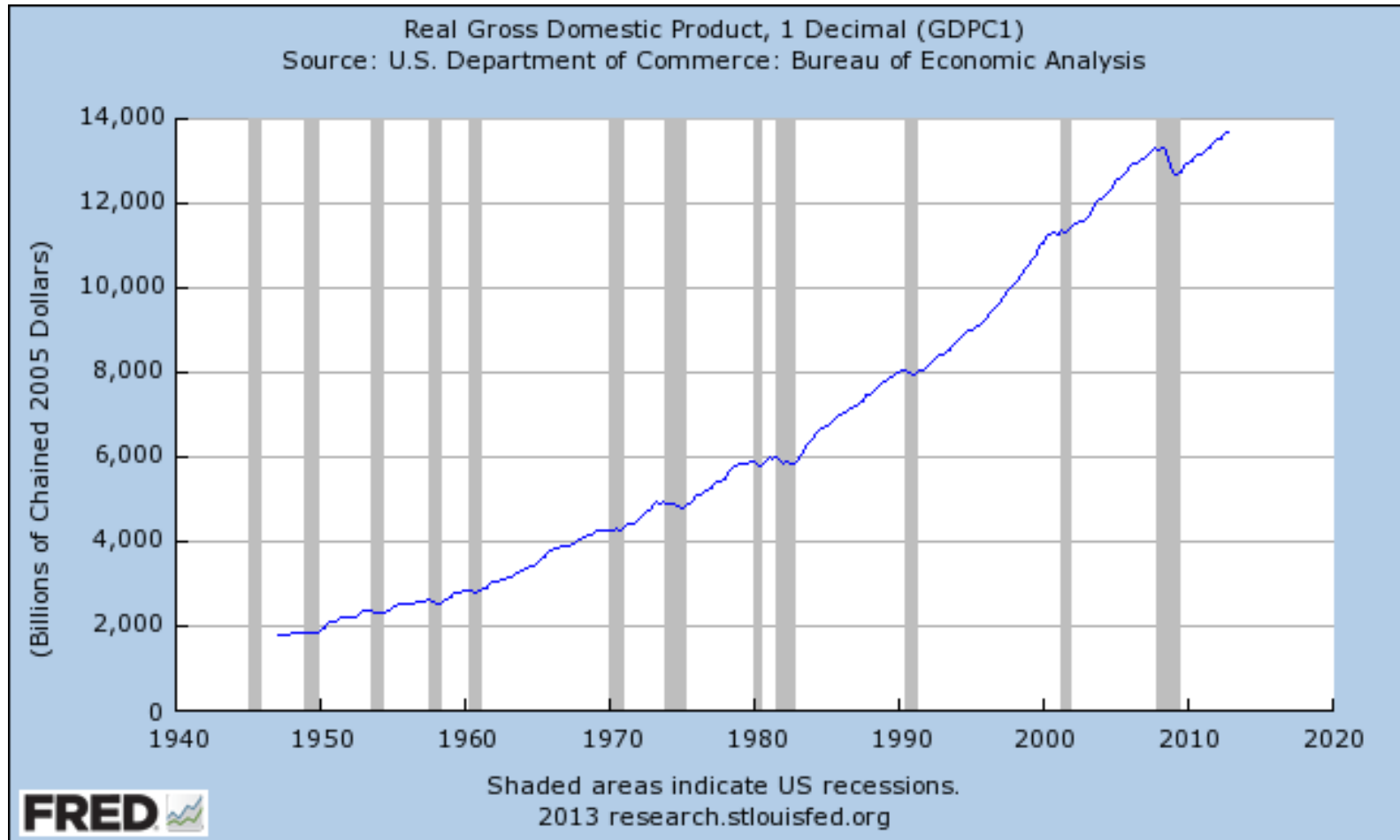
3 Facts About Economic Fluctuations

1. Economic Fluctuations are Irregular and Unpredictable

Short-run economic fluctuations are often referred to as the **business cycle**.

But these cycles do not follow a regular and predictable pattern.

1 Economic Fluctuations are Irregular



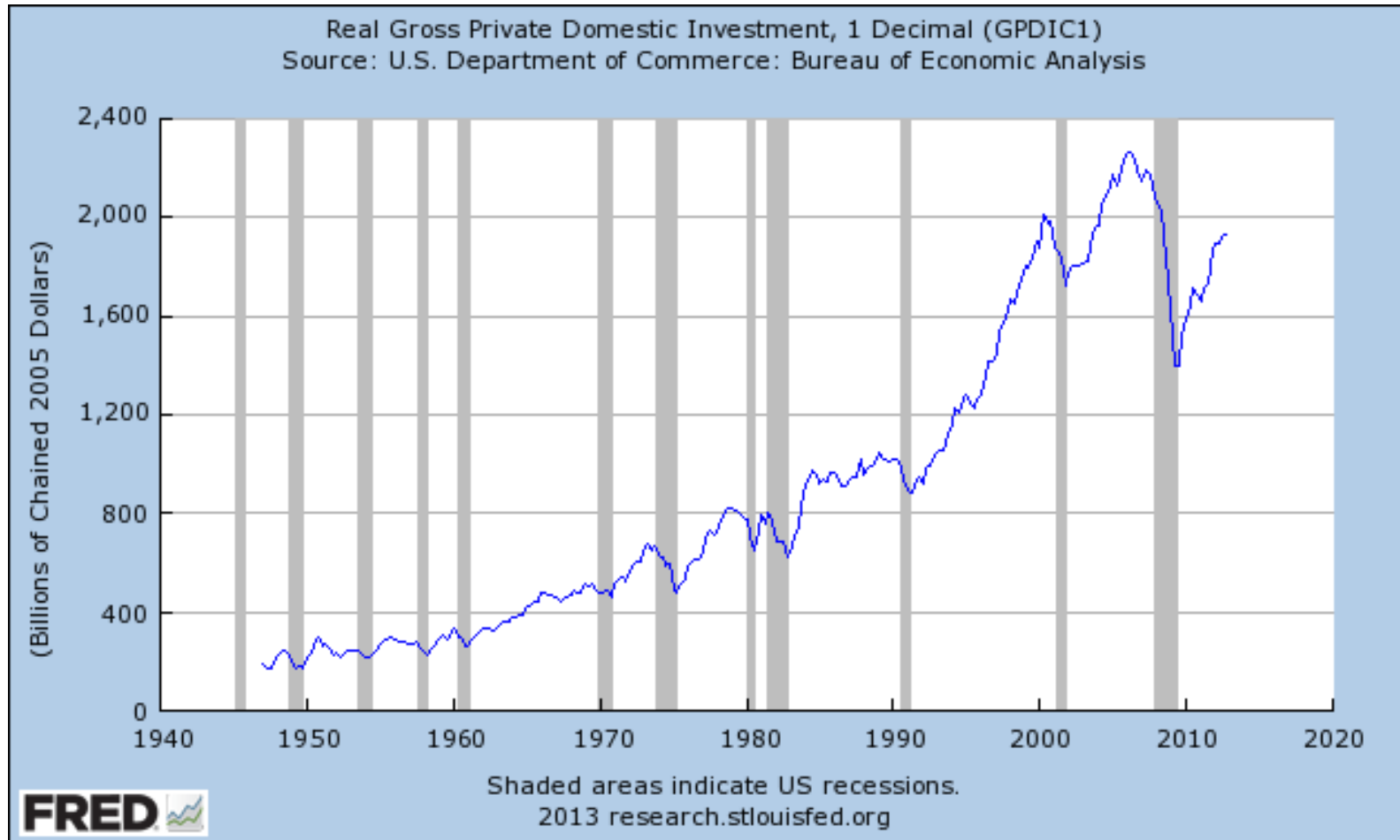
3 Facts About Economic Fluctuations

2. Most macroeconomic quantities fluctuate together.

Although macroeconomists focus mostly on real GDP, other variables also fluctuate over the business cycle: corporate profits, investment, consumption, retail sales, home sales, etc.

But some variables fluctuate more than others: although investment is about $1/7$ of GDP, its fluctuations account for about $2/3$ of the decline in GDP that takes place during a typical recession.

2 Macroeconomic Quantities Move Together



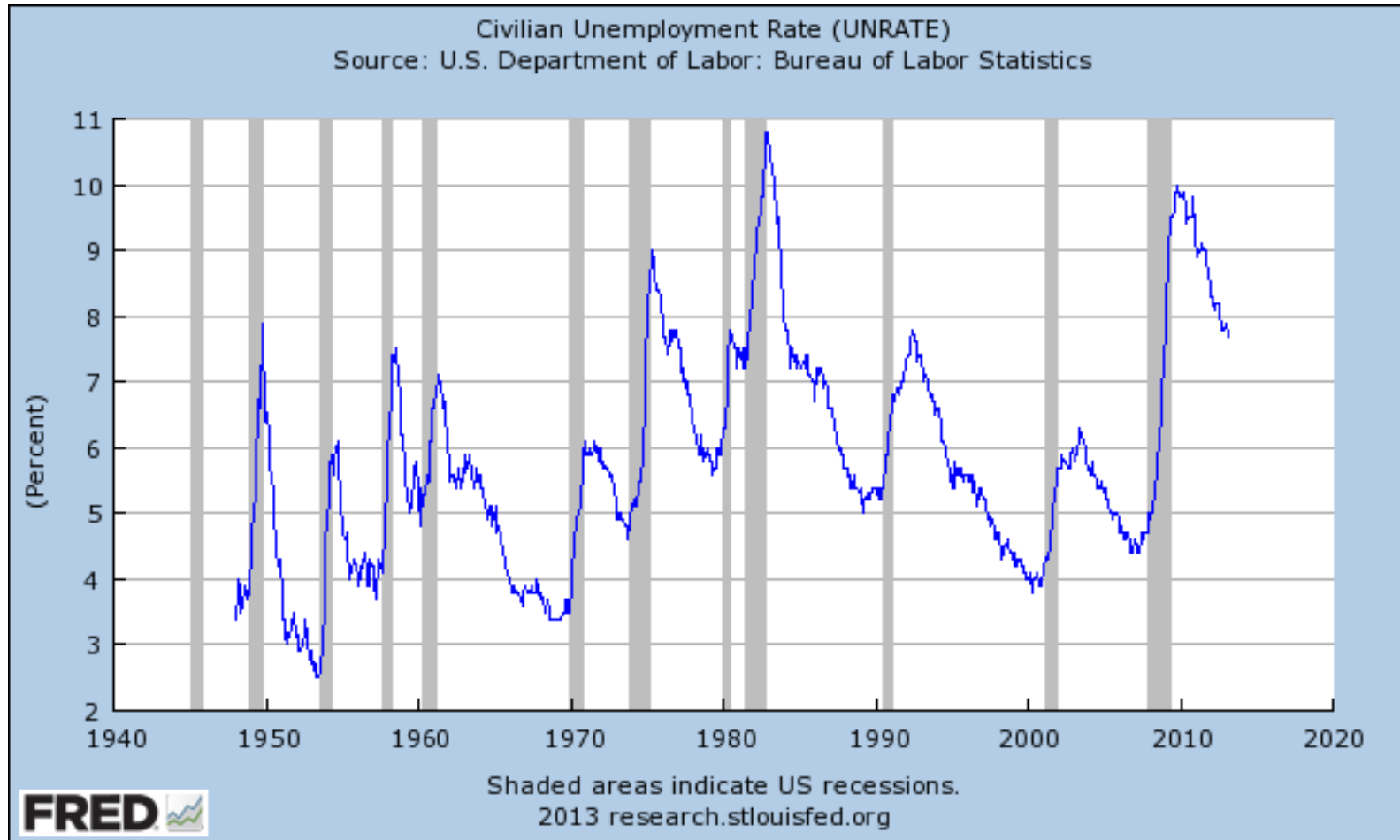
3 Facts About Economic Fluctuations

3. As output falls, unemployment rises.

But the unemployment rate never falls to zero.

Instead, it fluctuates around its natural rate
between 5 and 6 percent.

3 As Output Falls, Unemployment Rises



Explaining Short-Run Fluctuations

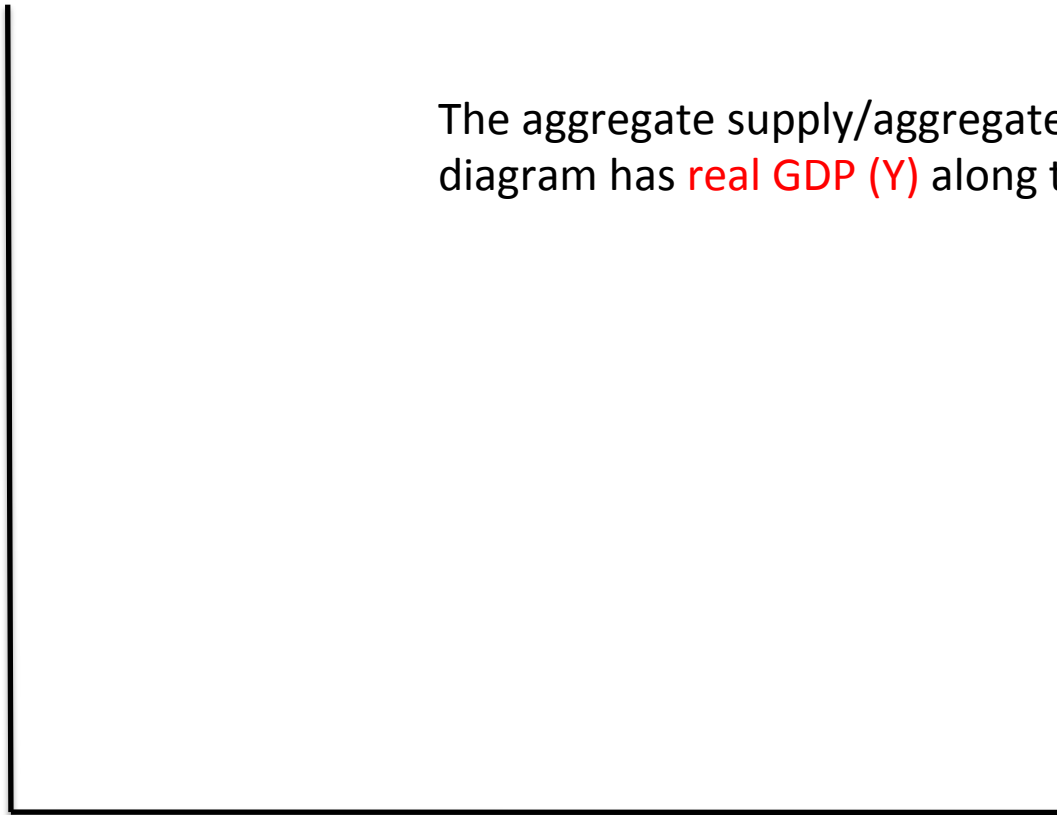
The two related ideas of the **classical dichotomy** and the **neutrality of money** allow macroeconomists to study the long-run behavior of real and nominal variables separately.

But even the classical economists, like David Hume, observed that changes in the money supply appear to affect output and employment in the short run.

To explain these observations, macroeconomists have developed the **model of aggregate supply and aggregate demand**.

Explaining Short-Run Fluctuations

The aggregate supply/aggregate demand (AS/AD) diagram has **real GDP (Y)** along the x-axis.



Y

Explaining Short-Run Fluctuations

P

The aggregate supply/aggregate demand (AS/AD) diagram has real GDP (Y) along the x-axis.

And the economy's **price level (P)** as measured by the GDP deflator or the CPI along the y-axis.

Y

Explaining Short-Run Fluctuations

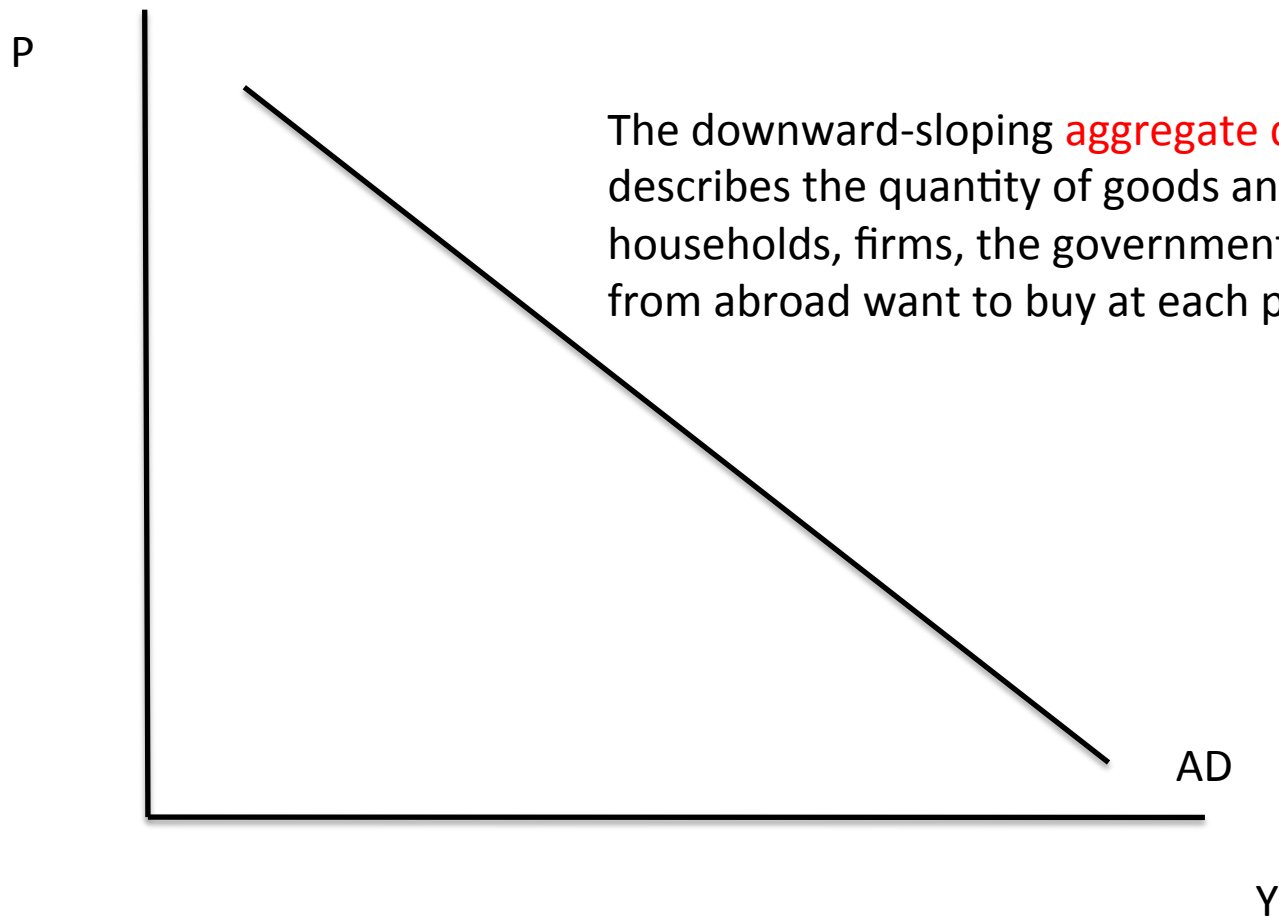
P

So right away, we can see that the primary purpose of the AS/AD model is to help us describe and understand the short-run links between real and nominal variables.

But, as we will also see, the AS/AD model is also fully consistent with ideas about the long-run behavior of the economy that we've already discussed.

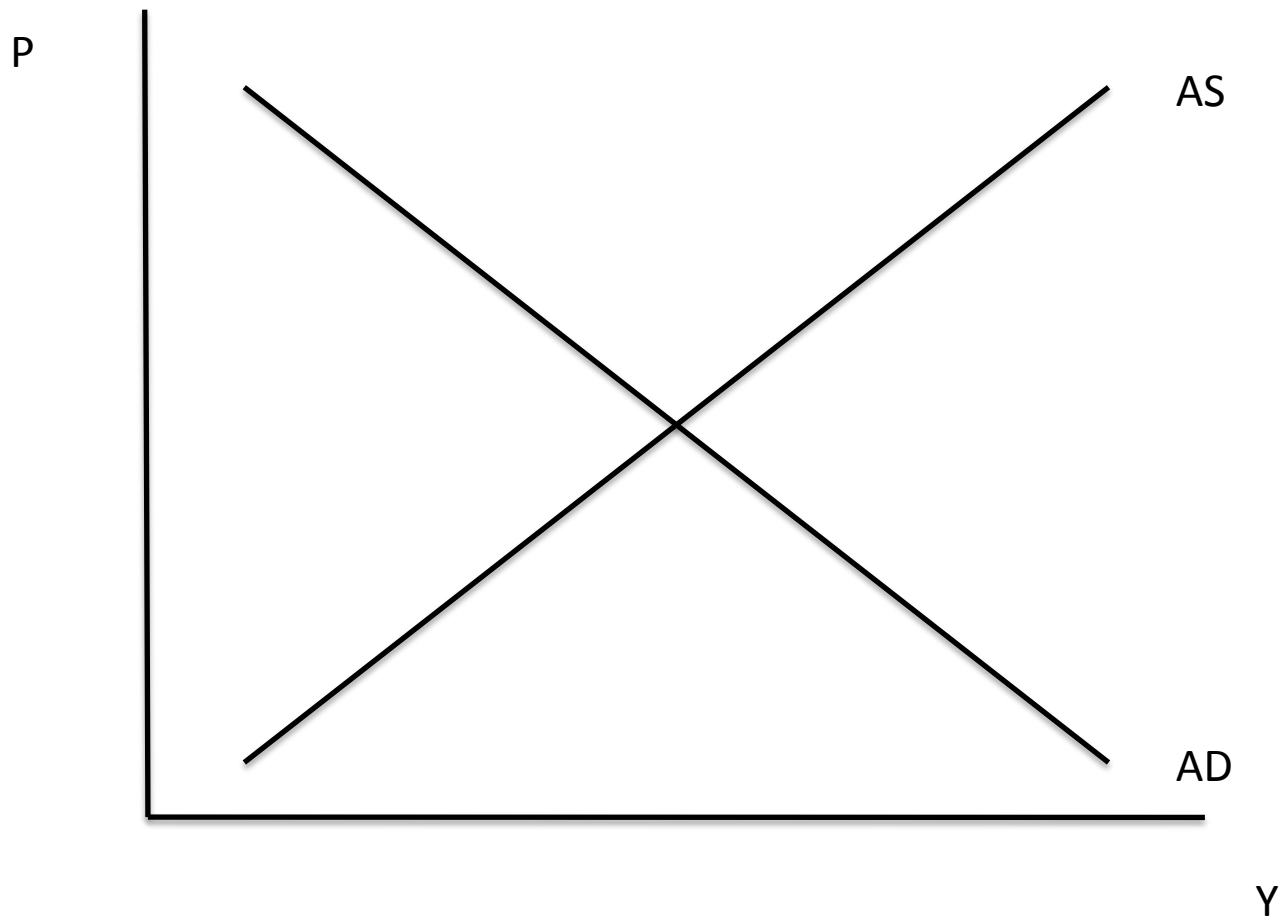
Y

Explaining Short-Run Fluctuations



The downward-sloping **aggregate demand** curve describes the quantity of goods and services that households, firms, the government, and customers from abroad want to buy at each price level.

Explaining Short-Run Fluctuations



The upward-sloping **aggregate supply** curve describes the quantity of goods and services that firms choose to produce at each price level.

Explaining Short-Run Fluctuations

But where do these curves come from?

Why does the AD curve slope down?

What factors work to shift the AD curve?

Why does the AS curve slope up?

What factors work to shift the AS curve?

The Aggregate Demand Curve

The national income accounting identity

$$Y = C + I + G + NX$$

suggests that the demand for goods and services comes from four sources: consumers (C), firms (I), the government (G), and foreigners (NX).

The Aggregate Demand Curve

$$Y = C + I + G + NX$$

For now, let's take G as being fixed by government policy.

And ask: why might the demand for consumption, investment, and net exports **rise** as the price level **falls**?

The Aggregate Demand Curve

$$Y = C + I + G + NX$$

Some of the wealth that individuals hold is in nominal form: money in their wallets or in the bank.

When the price level falls, the real value of this wealth increases.

Through this **wealth effect**, a fall in the price level leads to an increase in the quantity of goods demanded by consumers.

And through this same wealth effect, a rise in the price level leads to a decrease in the quantity of goods demanded by consumers.

The Aggregate Demand Curve

$$Y = C + I + G + NX$$

When the price level falls, the real value of each consumer's money holdings rises.

Some consumers will use the additional wealth to buy more consumption goods (the wealth effect).

But others will use the additional wealth to buy more bonds. And as they do, the interest rate will fall.

Through this **interest rate effect**, a fall in the price level leads to an increase in the quantity of investment goods demanded by firms.

And through the same interest rate effect, a rise in the price level leads to a decrease in the quantity of investment goods demanded by firms.

The interest rate effect can also impact on consumer's purchases on durable goods.