LECTURE 23

April 21, 2020

INFLATION AND THE RETURN TO POTENTIAL OUTPUT

I.   AN EXAMPLE OF MONETARY POLICY MITIGATING FLUCTUATIONS: THE GREAT RECESSION

   A. The forces acting to reduce PAE

   B. The monetary policy response

   C. Effects

   D. The start of the Great Recession vs. the start of the Great Depression

II. THE LONG-RUN EQUILIBRIUM OF THE ECONOMY

   A. The Keynesian cross in the short run

   B. Inflation behavior and the Keynesian cross in the long run

      1.   Nominal rigidities and the behavior of inflation in the short run

      2.   How inflation changes over time

      3.   A key implication: The economy is in long-run equilibrium only if the PAE line crosses the 45-degeee line at Y*

III. SAVING, INVESTMENT, AND THE REAL INTEREST RATE IN THE LONG RUN

   A. The real interest rate in the long run

   B. The importance of the long-run saving and investment diagram

IV. GETTING TO LONG-RUN EQUILIBRIUM: INFLATION AND THE FEDERAL RESERVE

   C. How the ""Fed responds to inflation

   D. How the Fed's behavior feeds back to the economy

V.   EXAMPLE: THE SHORT-RUN AND LONG-RUN EFFECTS OF A TAX CUT

   A. The development we want to analyze

   B. The short run

   C. Returning to potential output

   D. The long-run effects

LECTURE 23
Inflation and the Return to Potential Output

April 21, 2020

Announcements

- Problem Set 5, Part 2 is due at 2 p.m. on Thursday.

- We will devote the first hour (1–2 PM) of our office hours tomorrow to discussion of issues related to financial crises. The second hour (2–3 PM) will be devoted to general questions, as usual.

Announcements

- Readings for next time (posted on bcourses, under "Files"):

  - Alexander W. Bartik et al. "How Are Small Businesses Adjusting to COVID-19? Early Evidence from a Survey." http://www.nber.org/papers/w26989

  - Titan M. Alon et al., "The Impact of Covid-19 on Gender Equality," Sections 1, 2, and 4. http://www.nber.org/papers/w26947

  - Read for approach and findings; don't stress over every word or parts you don't understand.

I. An Example of Monetary Policy Mitigating Fluctuations: The Great Recession

Why Might the Central Bank Undertake Expansionary or Contractionary Monetary Policy?

- To offset some other force that is shifting the PAE line (countercyclical monetary policy).

    - We'll discuss an example in a moment (monetary policy in the Great Recession).

- To pursue some other objective.

    - We'll discuss this later in the lecture (the Fed's concern with inflation).

- A mistake.

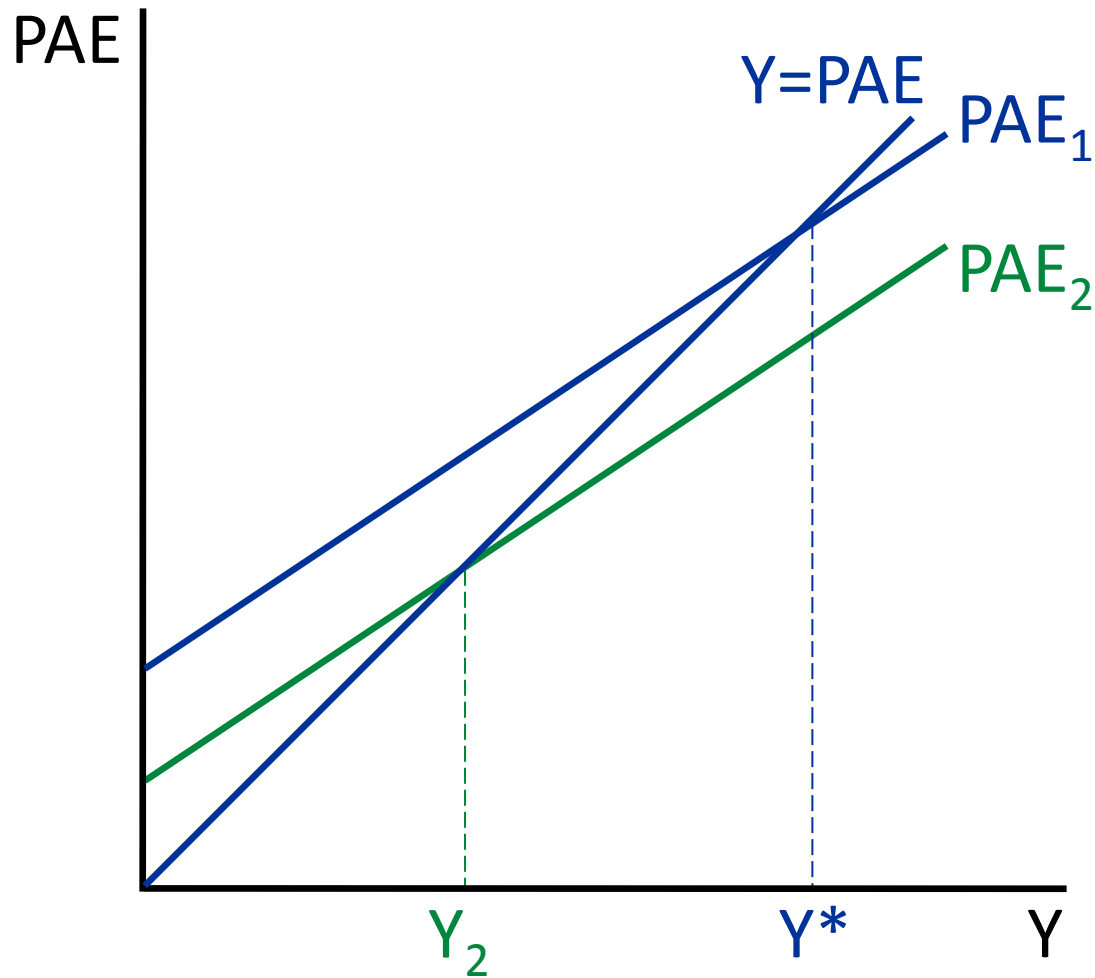   - We discussed this last time (monetary policy in the Great Depression.

House Prices, 1987–2015
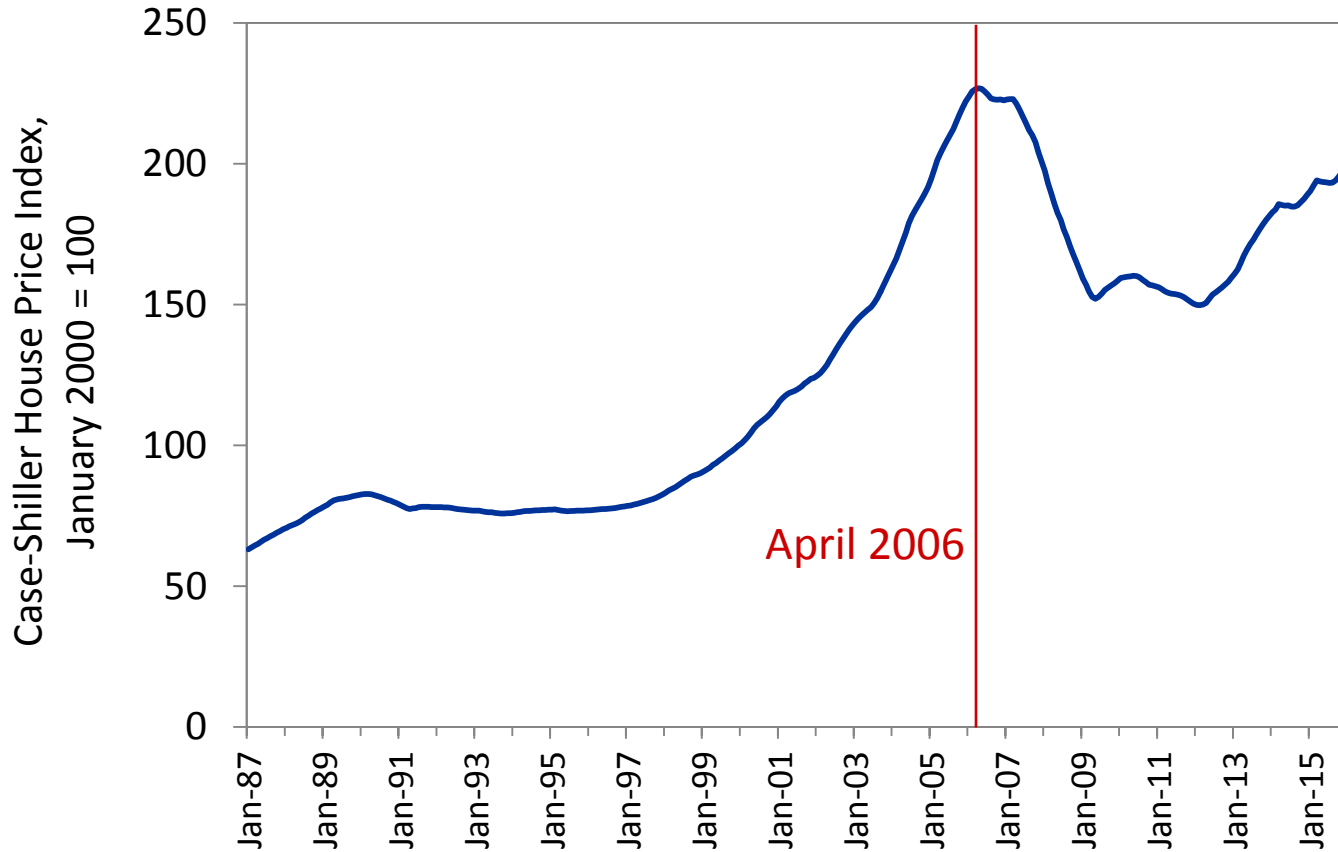
Source: Federal Reserve Bank of St. Louis, FRED.

What Happened When House Prices Collapsed?

- Led directly to a huge fall in investment in housing.

- Lowered wealth.

- Lowered consumer and firm confidence.

- Led to increased defaults, troubles at financial institutions, and eventally, a full-fledged financial crisis.
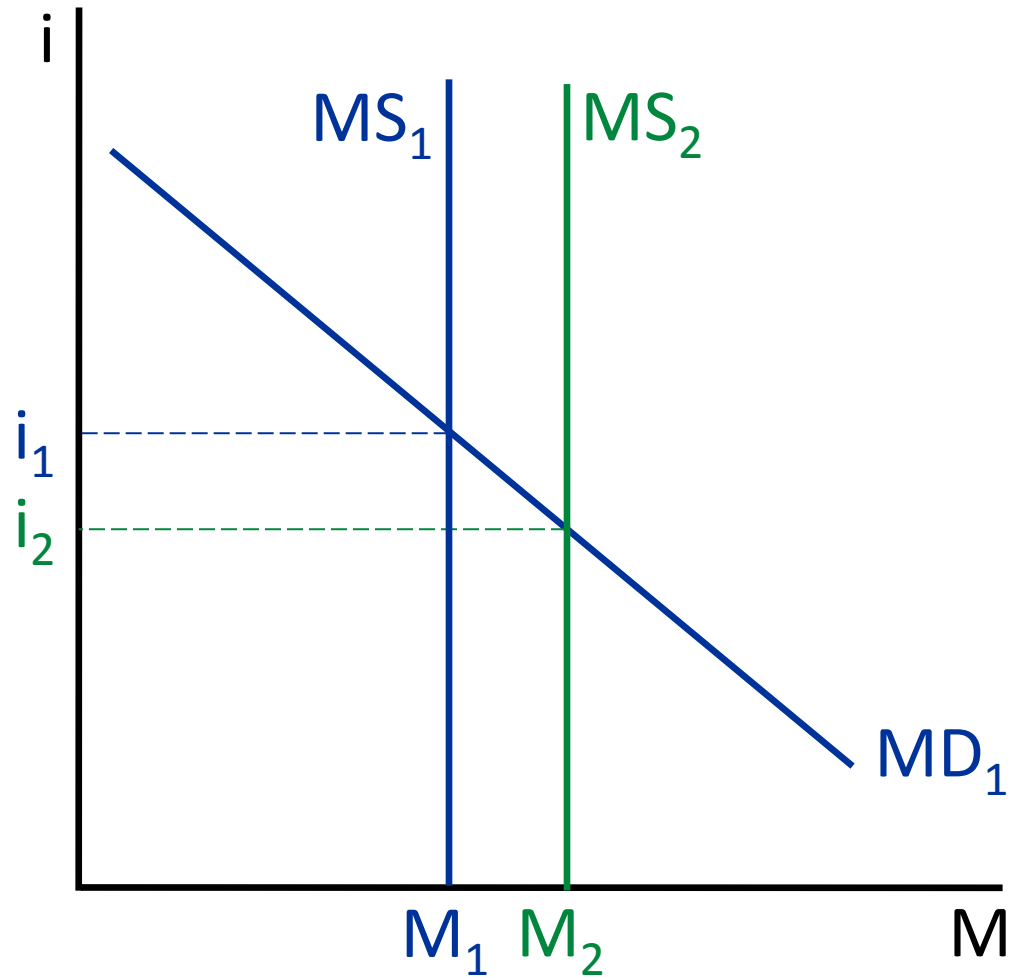
- The result was a big downward shift of the PAE line.

Effect of the Housing Bust and Financial Crisis on Output
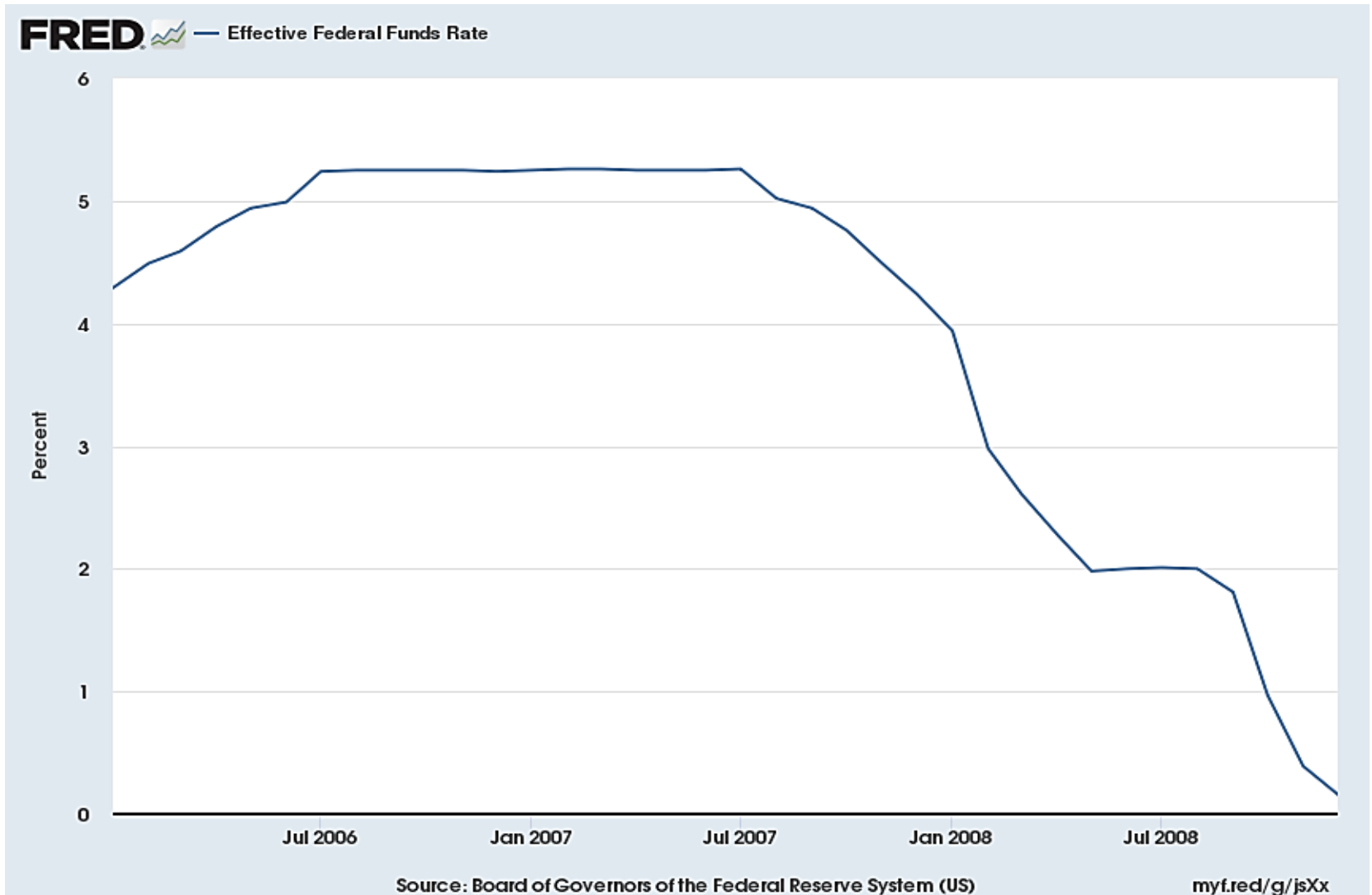
Nonfarm Payroll Employment, 2003–2008

FRED — All Employees: Total Nonfarm Payrolls

Source: U.S. Bureau of Labor Statistics

myf.red/g/jsWU
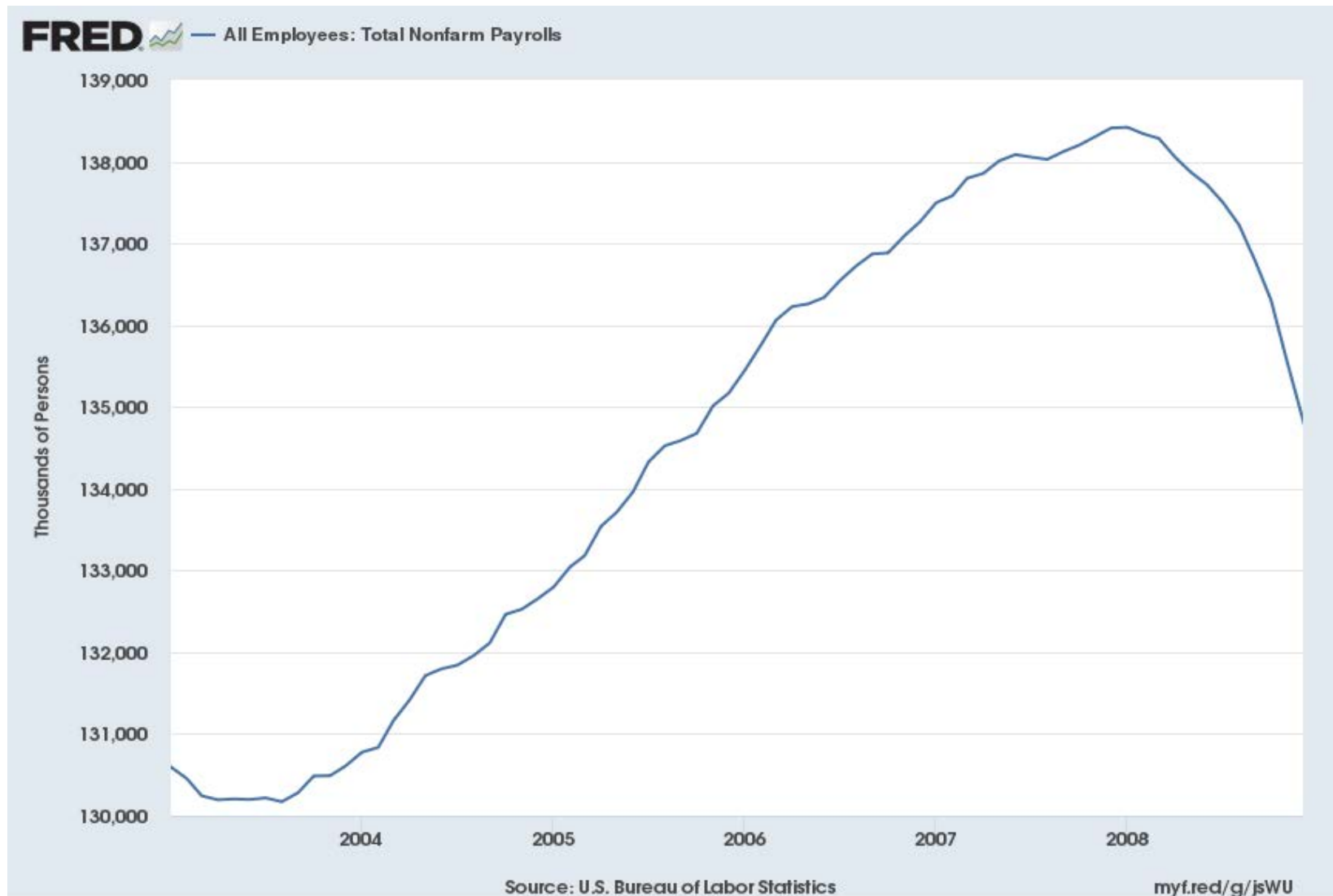
How the Fed Lowers Interest Rates

The Fed prints money and uses it to buy bonds.

The Federal Funds Rate, 2006–2008

FRED — Effective Federal Funds Rate

Source: Board of Governors of the Federal Reserve System (US)

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The Fed's Ability to Influence the Real Interest Rate in the Short Run

- By changing the money supply, the Fed can change the nominal interest rate, i.

- Recall: $r = i - \pi$ (or $r = i - \pi^e$), and there is inflation inertia (inflation only changes slowly).
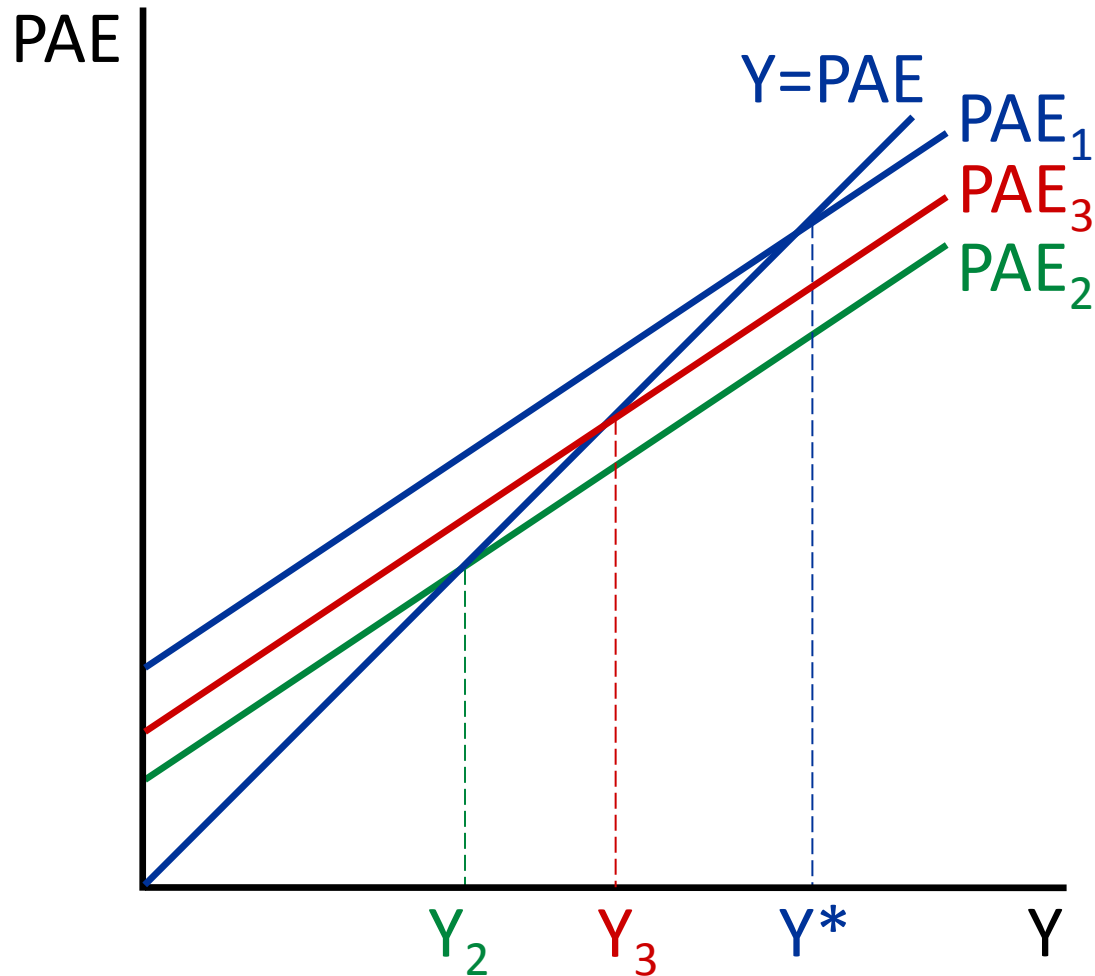
- So: When the Fed changes i, in the short run, r changes.

The Real Interest Rate and Planned Aggregate Expenditure (PAE)

Recall: PAE = C + I^p + G + NX.

- I^p is higher when r is lower.

- Saving is lower when r is lower, so C is higher when r is lower.

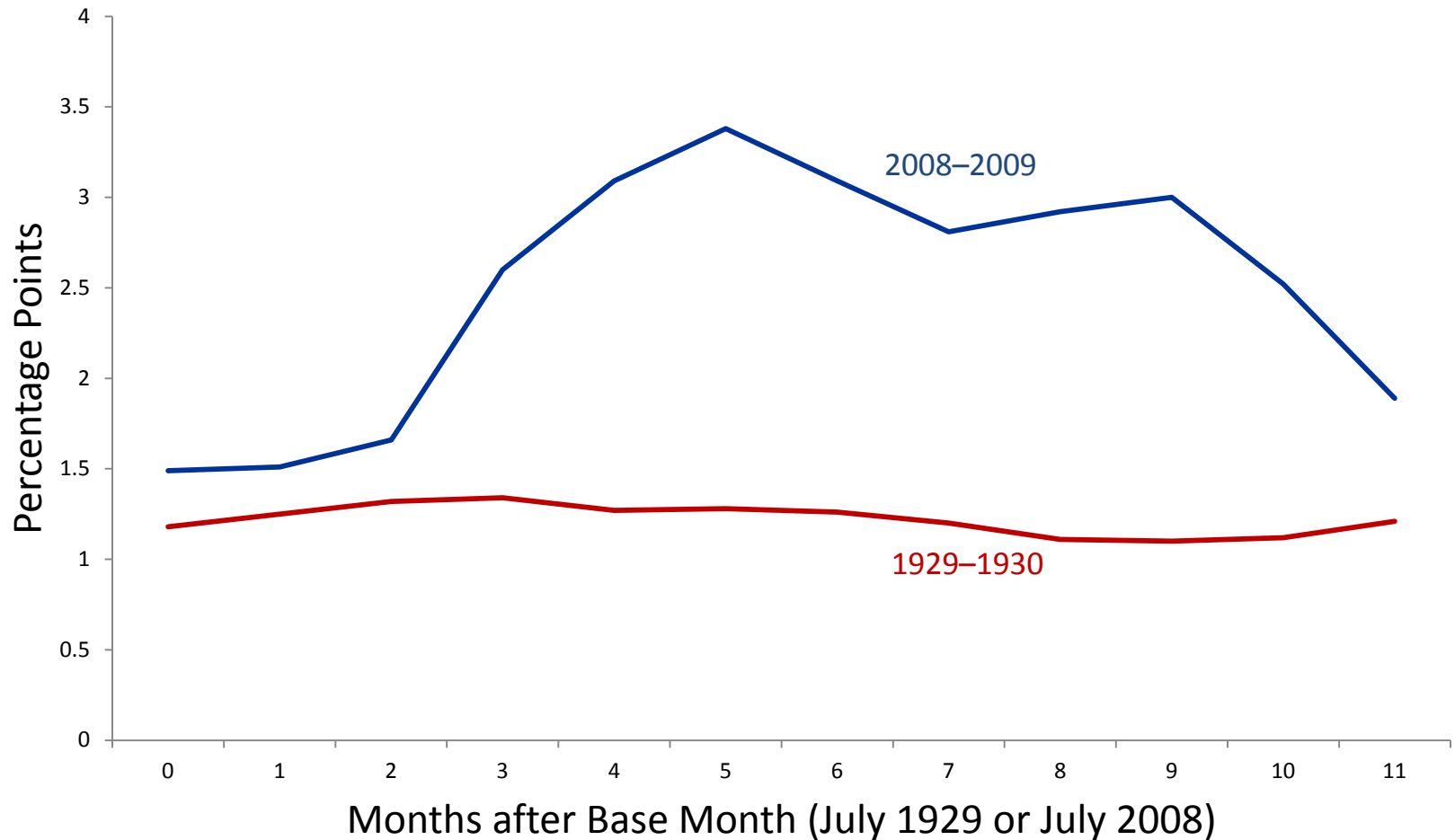- We will see next week that NX is higher when r is lower.

- We take G as given.

Thus, a decrease in r raises PAE at a given Y.
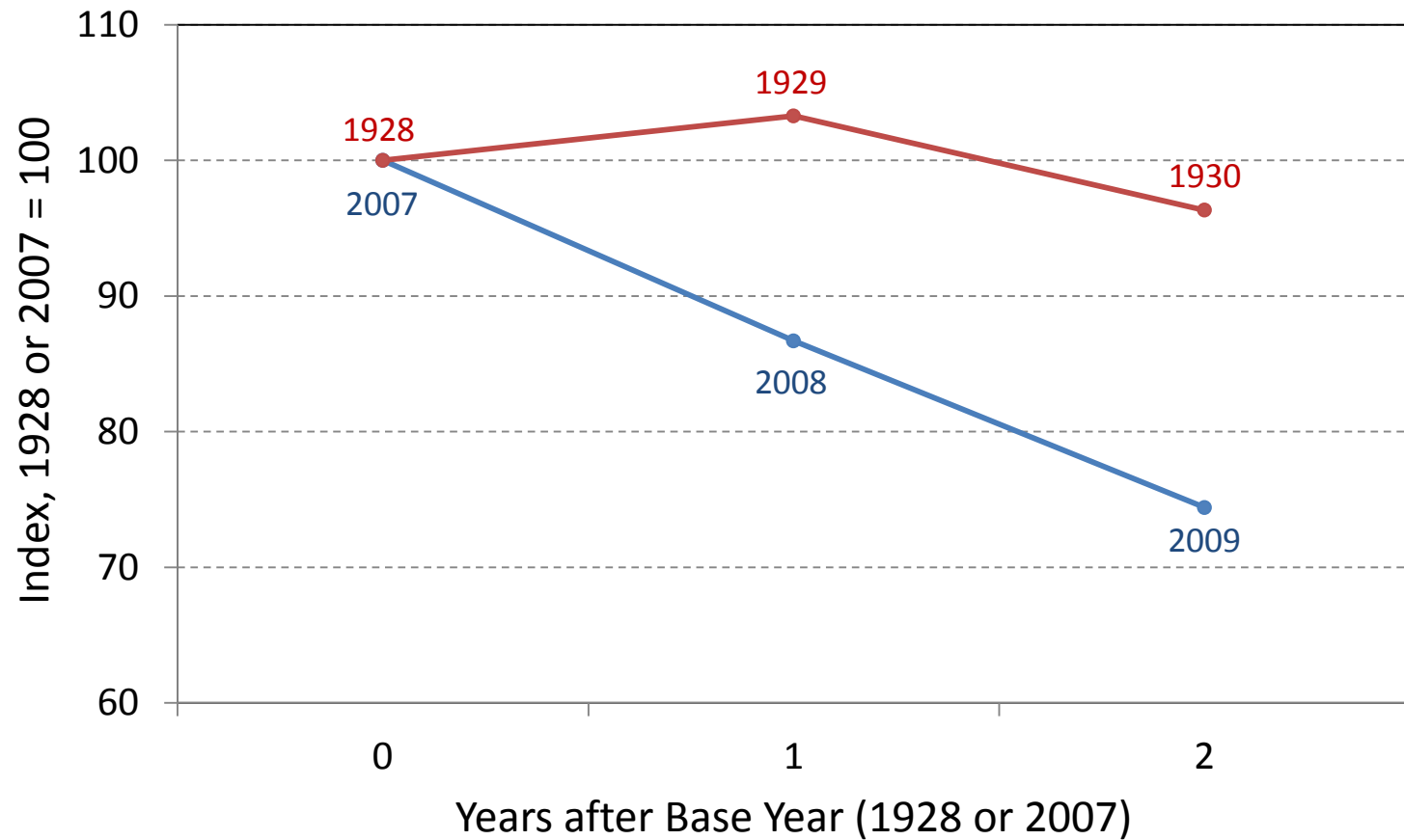
Monetary Policy in 2007–2008

An example of "countercyclical" monetary policy

BAA-AAA Interest Rate Spread Early in the Great Depression and the Great Recession
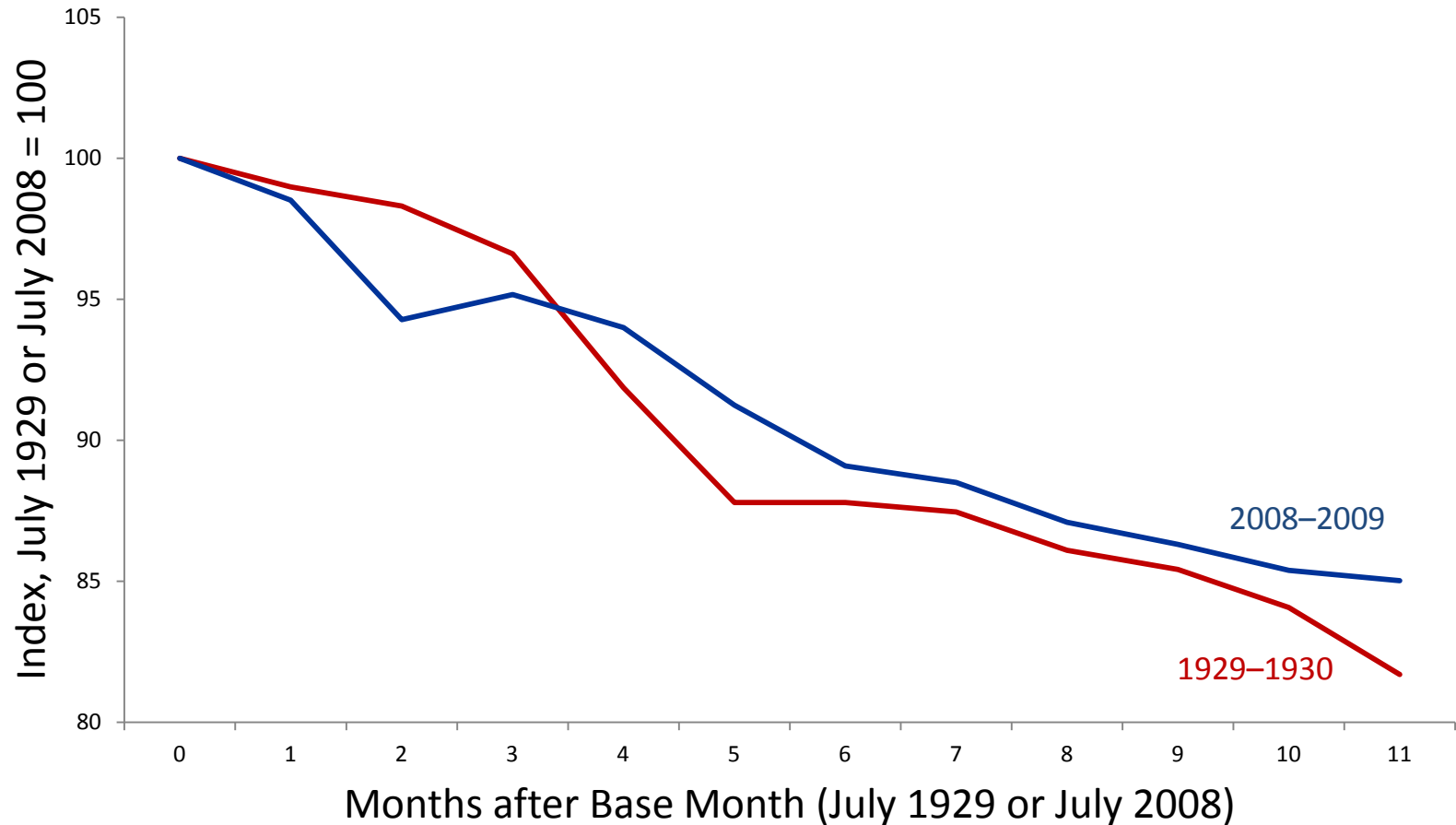

Source: FRED.

Real National Wealth in the Great Depression and the Great Recession
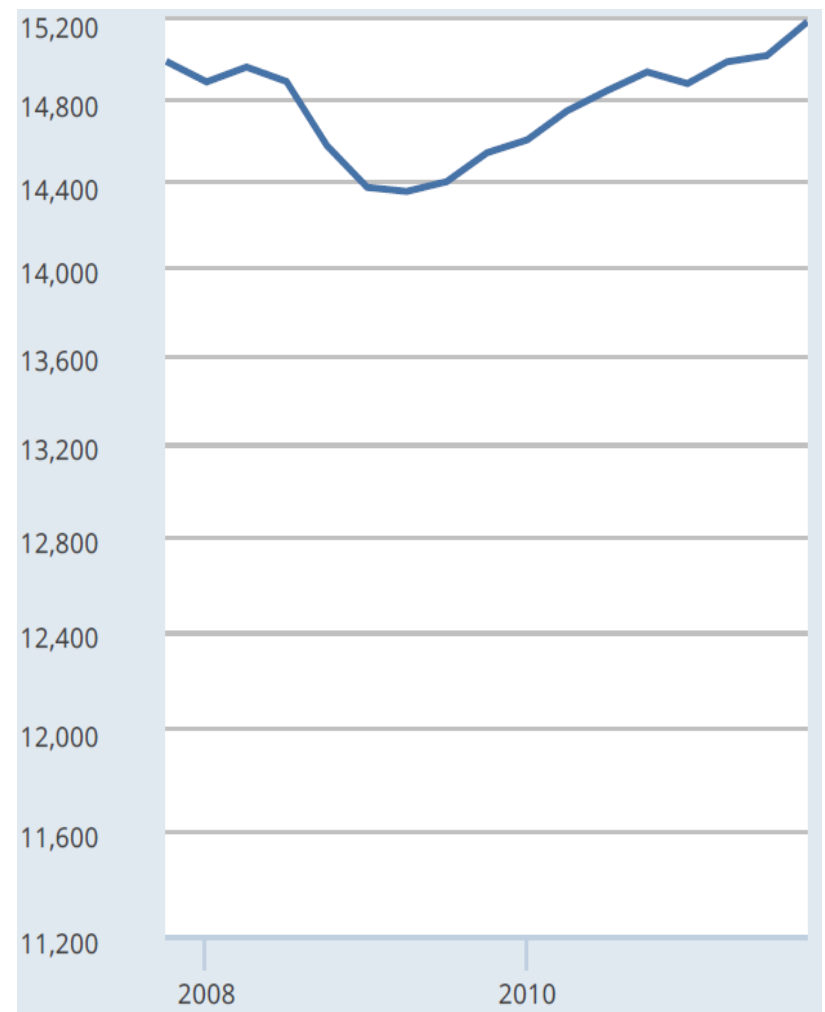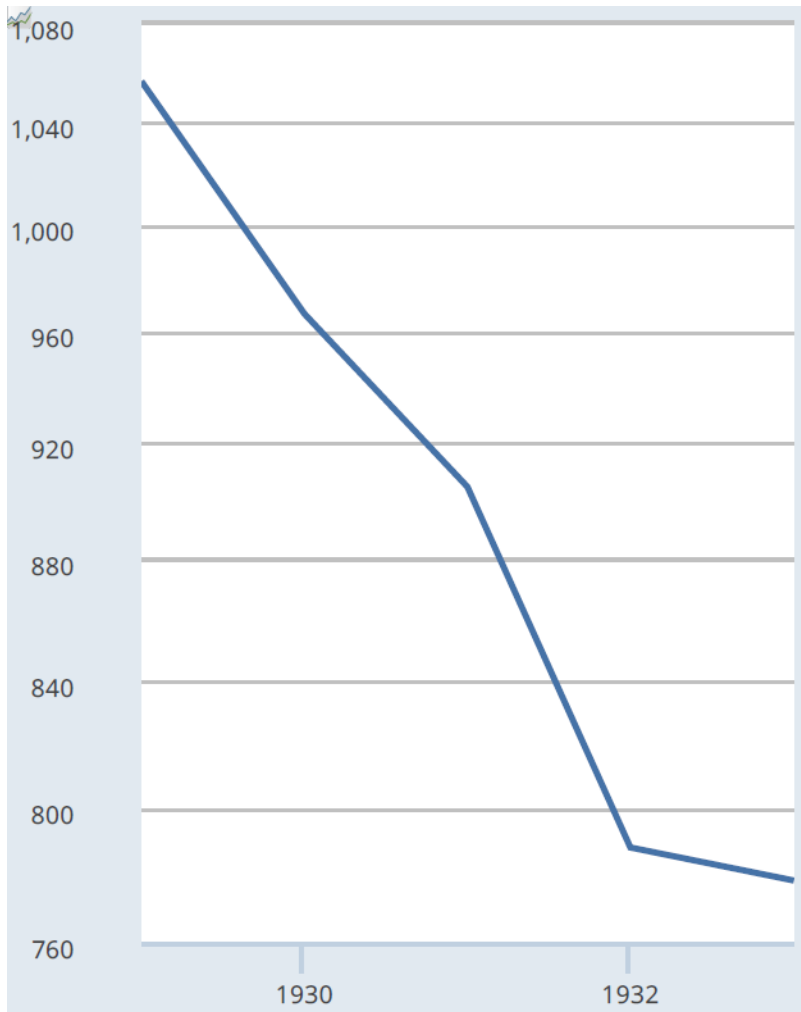
Industrial Production Early in the Great Depression and the Great Recession

Index, July 1929 or July 2008 = 100

2008–2009
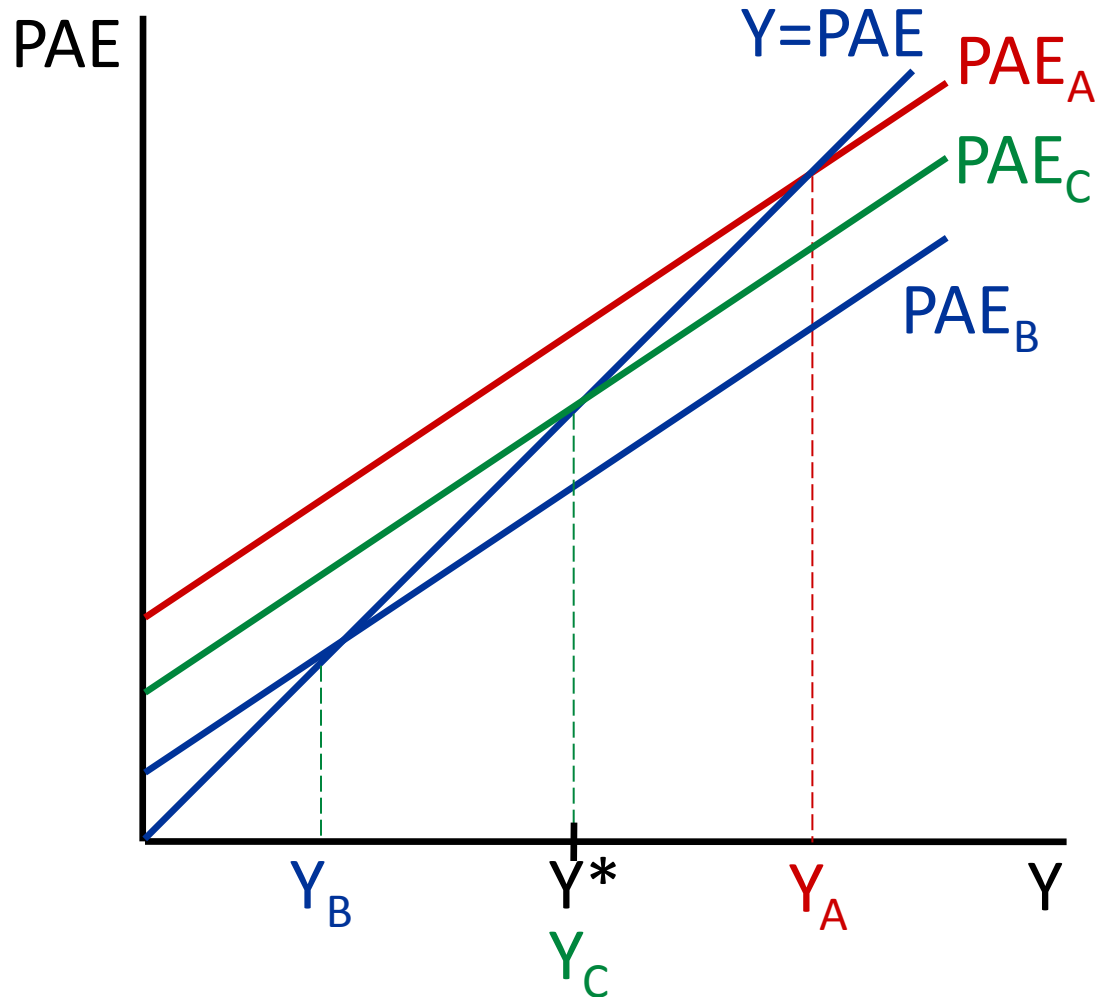
1929–1930

Months after Base Month (July 1929 or July 2008)

Real GDP in the Great Depression and the Great Recession

II. The Long-Run Equilibrium of the Economy

In the Short Run, Y Can Be Below, Above, or Equal to Y*

The Short Run versus the Long Run

- Y can be below, above, or equal to Y* in the short run.

- But the economy is only in long-run equilibrium when Y is equal to Y*.

- The reason has to do with the behavior of inflation.

Inflation in the Short Run

- Recall: there are "nominal rigidities." That is, inflation doesn't change substantially in the short run.

- Due to limited information, menu costs, long-term contracts, or other factors.

- We also call this "inflation inertia."

The Behavior of Inflation over Time

- Contracts expire, menus wear out, uncertainty is resolved, etc.

- As a result:

  - When Y > Y* (an "expansionary gap"), inflation will gradually rise.

  - When Y < Y* (a "recessionary gap"), inflation will gradually fall.

  - When Y = Y*, inflation tends to remain the same.

Inflation and Output, 1962–1970
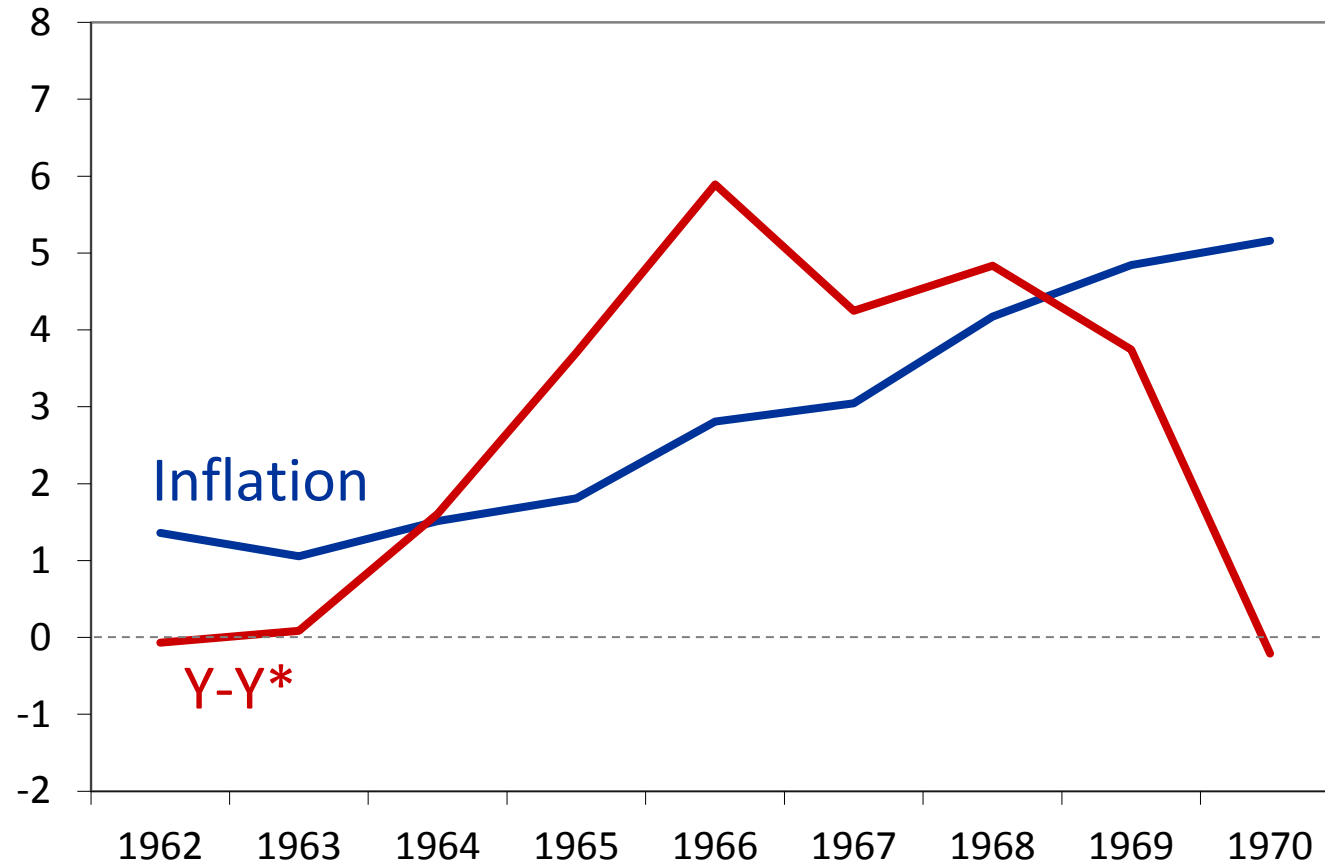
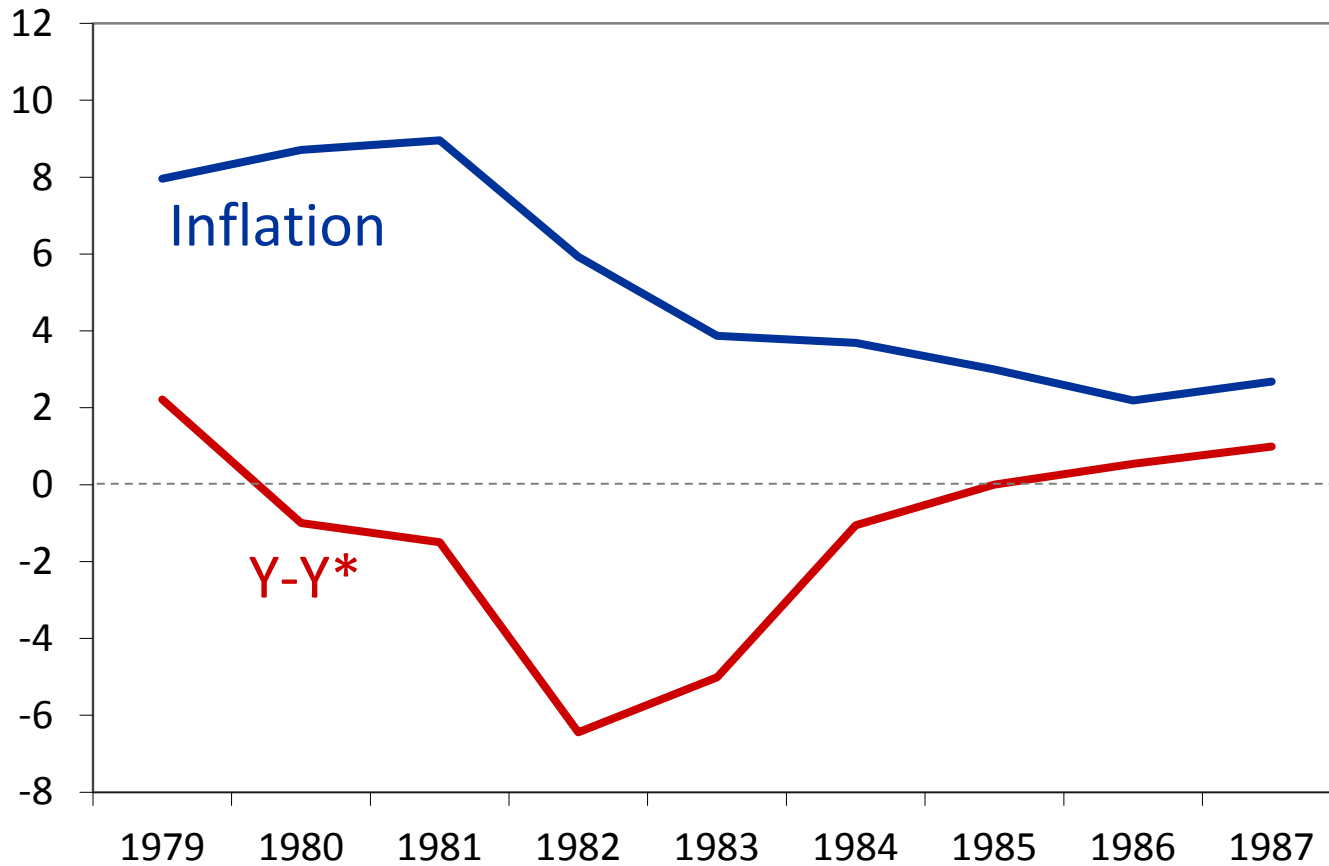
Source: Bureau of Economic Analysis.

When Y > Y*

- In the short run, inflation doesn't change substantially.

- Over time, contracts expire, menus wear out, uncertainty is resolved, etc.

- With Y > Y*, firms are operating above their comfortable capacity, and so want to raise their prices relative to other firms'.

- They therefore raise their prices by more than past inflation.

- With many firms doing this, inflation rises.
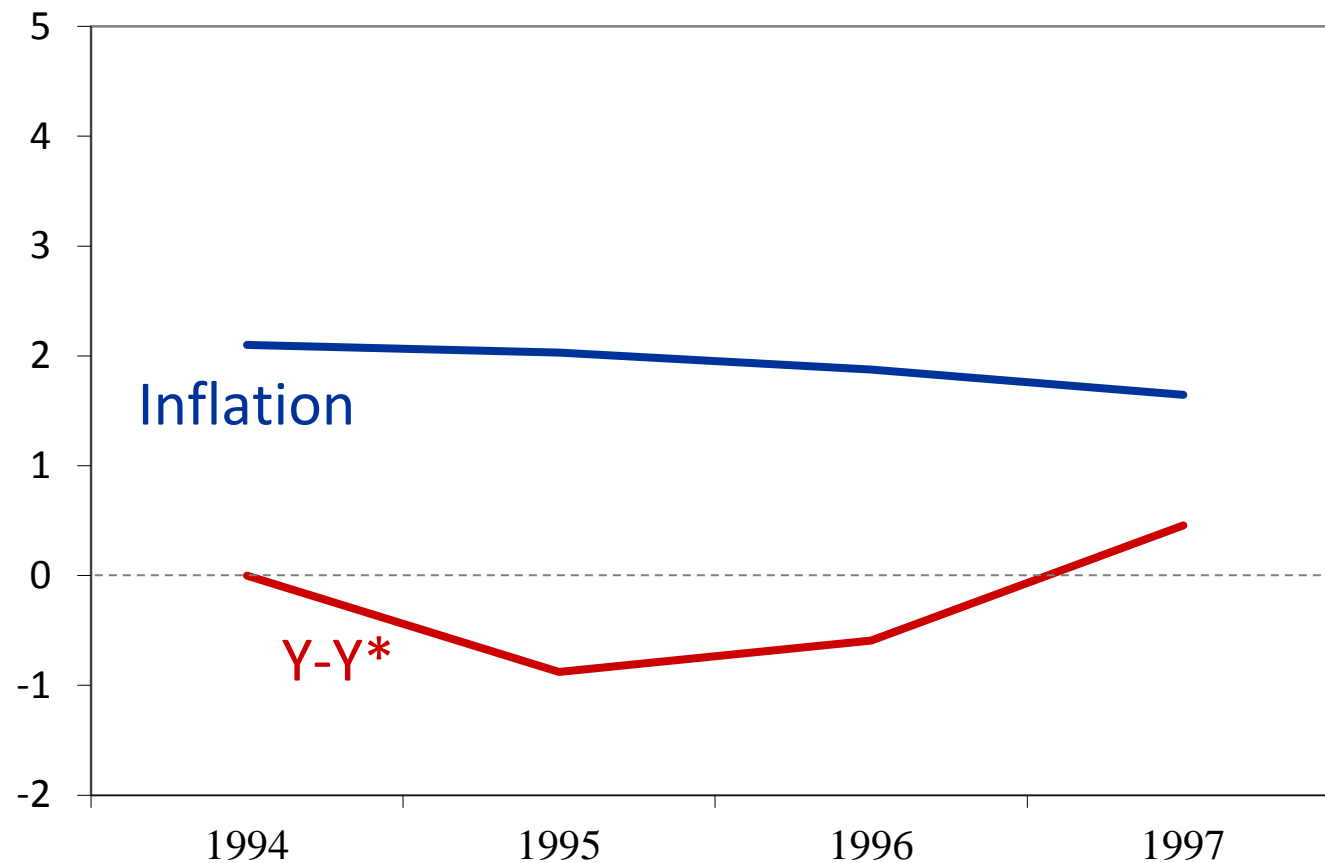
Inflation and Output, 1979–1987

Source: Bureau of Economic Analysis.

When Y < Y*

- The same forces that cause inflation to rise when Y > Y* work in the opposite direction.

- As a result, inflation will gradually fall.

Inflation and Output, 1994–1997

When Y = Y*, inflation tends to remain the same.

- Firms do not want the prices they charge to either rise or fall relative to other firms' prices.

- So, they raise prices to keep up with expected inflation.

- And past inflation is a crucial determinant of inflation expectations.

Summary: Inflation doesn't change in the short run, but over time, it responds to the difference between actual and potential output.
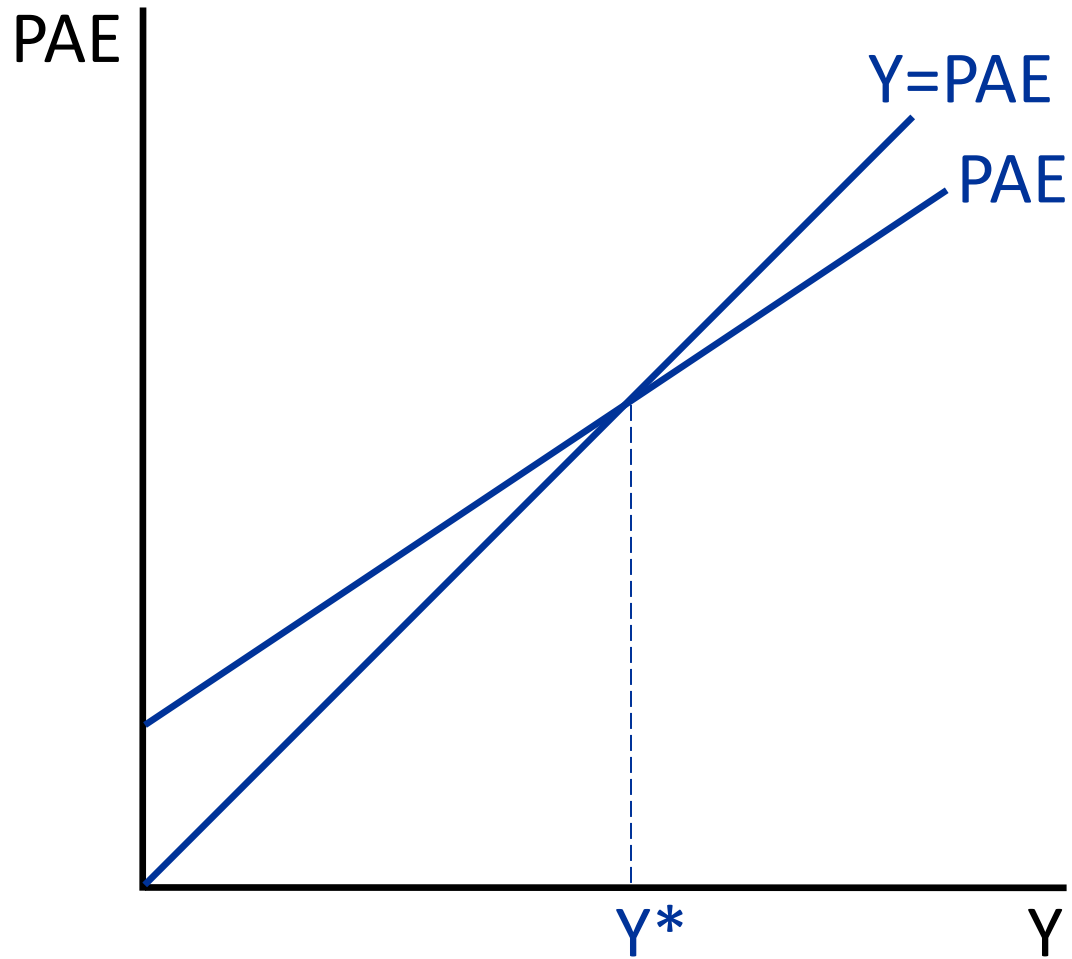
In the absence of other shocks:

- When Y > Y*, inflation rises.

- When Y < Y*, inflation falls.

- When Y = Y*, inflation holds steady.

A Key Implication: The Economy Is in Long-Run Equilibrium Only When Y = Y*

- If Y does not equal Y*, eventually inflation will start to change.

- If Y equals Y*, there is no force acting to change inflation.
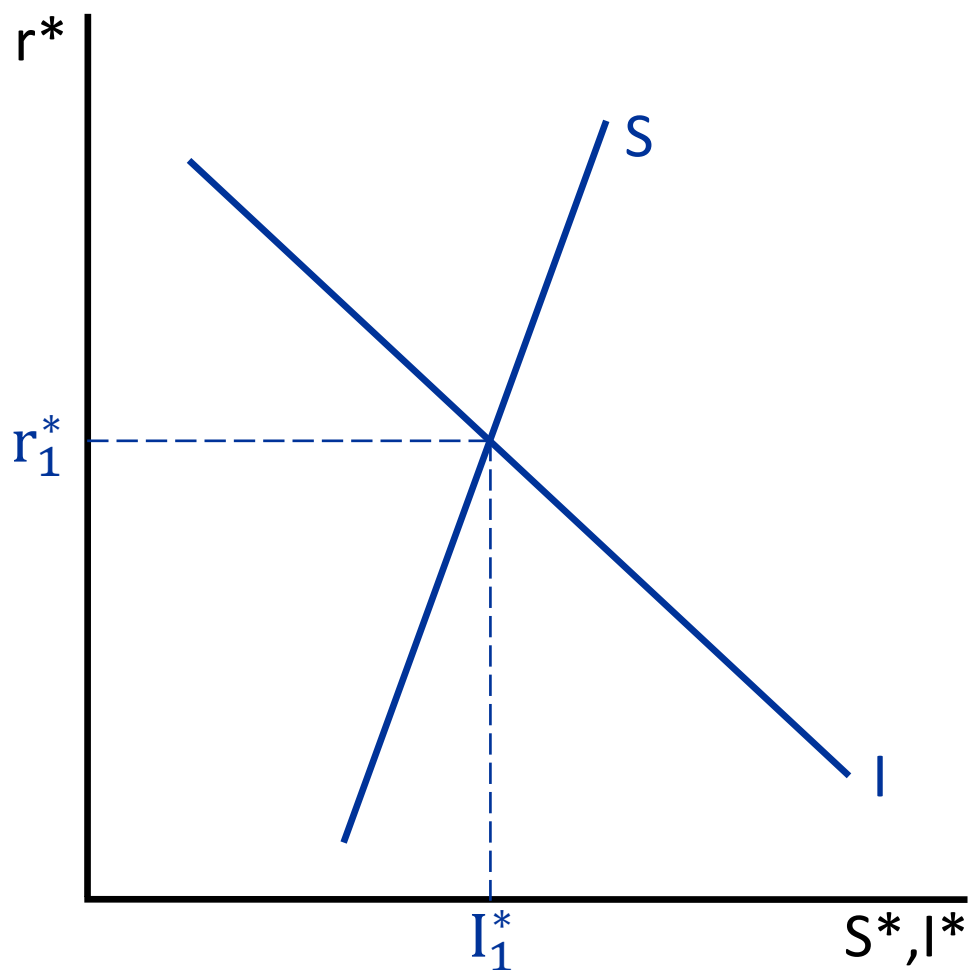
Long-Run Equilibrium

III. Saving, Investment, and the Real Interest Rate in the Long Run

S, I, and r in Long-Run Equilibrium – Overview

- The real interest rate at the long-run equilibrium we have just described is the same as r* from our long-run saving and investment diagram.

- Implication: The long-run saving and investment diagram is (still) the right tool to use to understand how saving, investment, and the real interest rate behave in the long run.
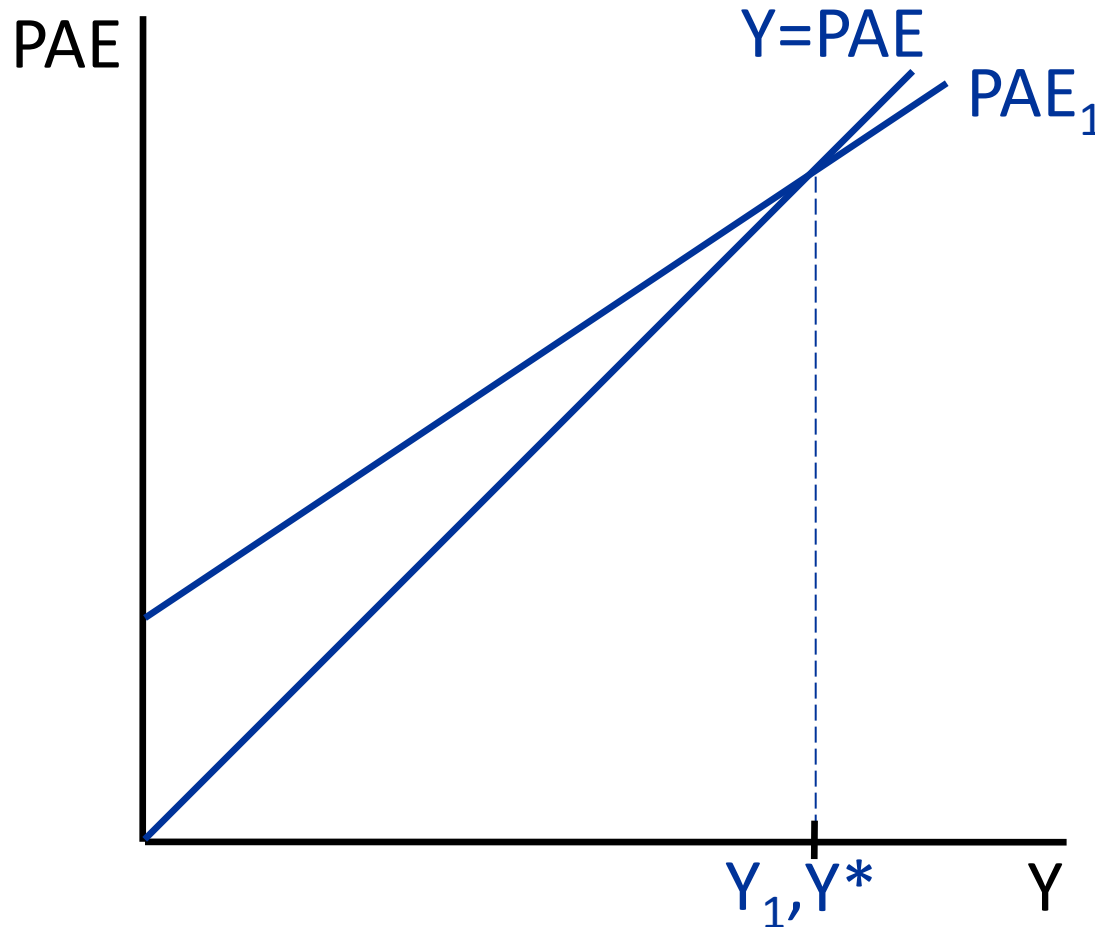
Saving, Investment, and the Real Interest Rate in Long-Run Equilibrium

S, I, and r in Long-Run Equilibrium – Details

- Recall: **The economy's normal real interest rate, r*, is the real interest rate at which Y* – C* – G = I*,** where C* is consumption when Y = Y* and I* is normal investment.

- In the long-run equilibrium we've just described (where PAE crosses the 45 degree line at Y = Y*), Y* = C* + I* + G, or Y* – C* – G = I*. Thus, **the r at that long-run equilibrium is the real interest rate at which Y* – C* – G = I*.**

- Conclusion: The real interest rate at the long-run equilibrium we have just described is the same as r* from our long-run saving and investment diagram.

The Keynesian Cross When r = r*

When r = r*, the economy is in long-run equilibrium: The PAE line crosses the 45-degree line at Y*.

The Keynesian Cross When r > r*
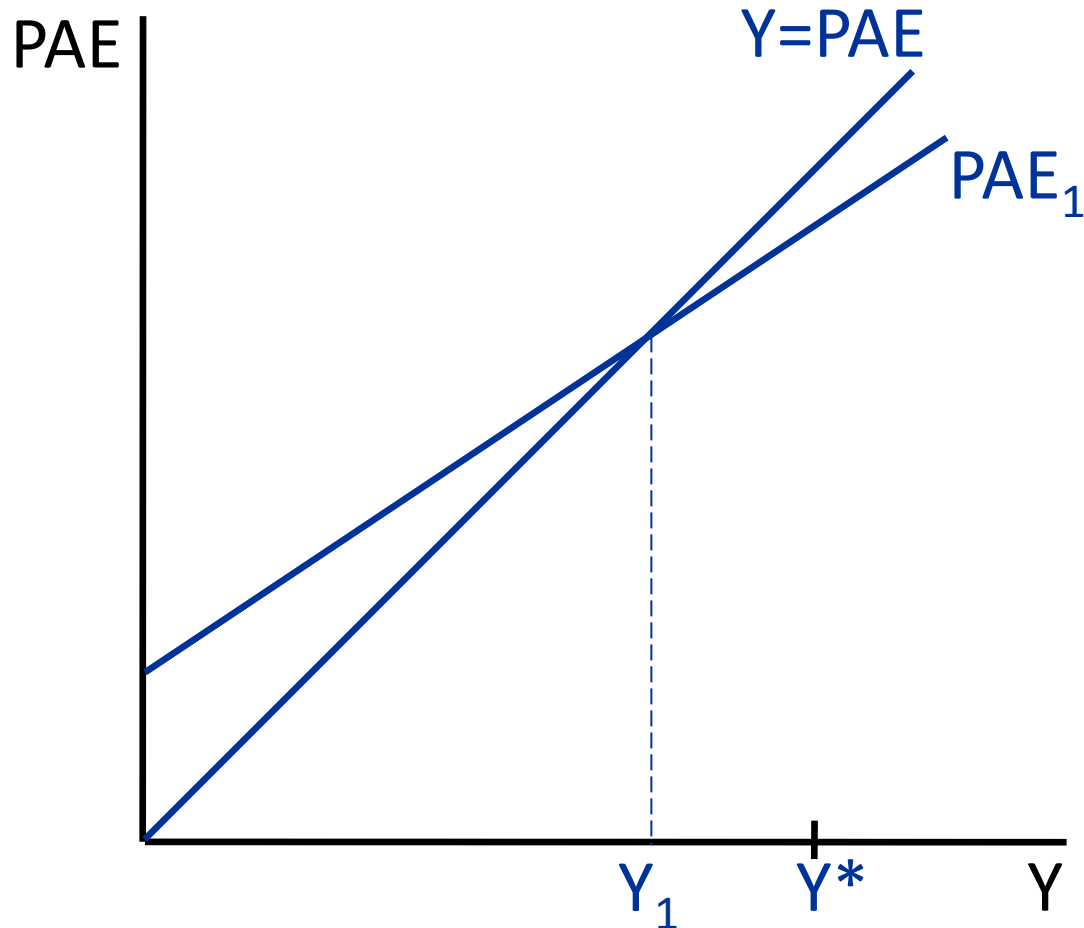
When r > r*, the PAE line is below where it is when the economy is in long-run equilibrium. So Y is less than Y*.

Implications

- The real interest rate that causes the PAE line to cross the 45-degree at Y = Y* (and so causes the economy to be in long-run equilibrium) is the same as r* from our long-run saving and investment diagram.

- The long-run saving and investment diagram is still the right tool to use to understand how saving, investment, and the real interest rate behave in the long run.

- The Fed has no choice about the real interest rate in the long run.

  - It must be the real interest rate where S* = I*.

A Key Message of All This

- In the long run, ouptut is equal to its normal or potential level.

IV. GETTING TO LONG-RUN EQUILIBRIUM: INFLATION AND THE FEDERAL RESERVE

Why Central Banks Care about Inflation

- Keeping inflation reasonably low and stable is a central part of the legal mandate and stated goals of almost every central bank.

- There is evidence that both sustained very high inflation and sustained very low inflation are harmful to the economy (and that they make people unhappy about economic conditions).

How a Central Bank Controls Inflation

- When inflation rises, the central bank raises the real interest rate.

  - This reduces planned spending, and so lowers output.

  - Because inflation responds to output over time, this helps keep inflation under control.

- When inflation is falls, the central bank lowers the real interest rate, and the process works in reverse.
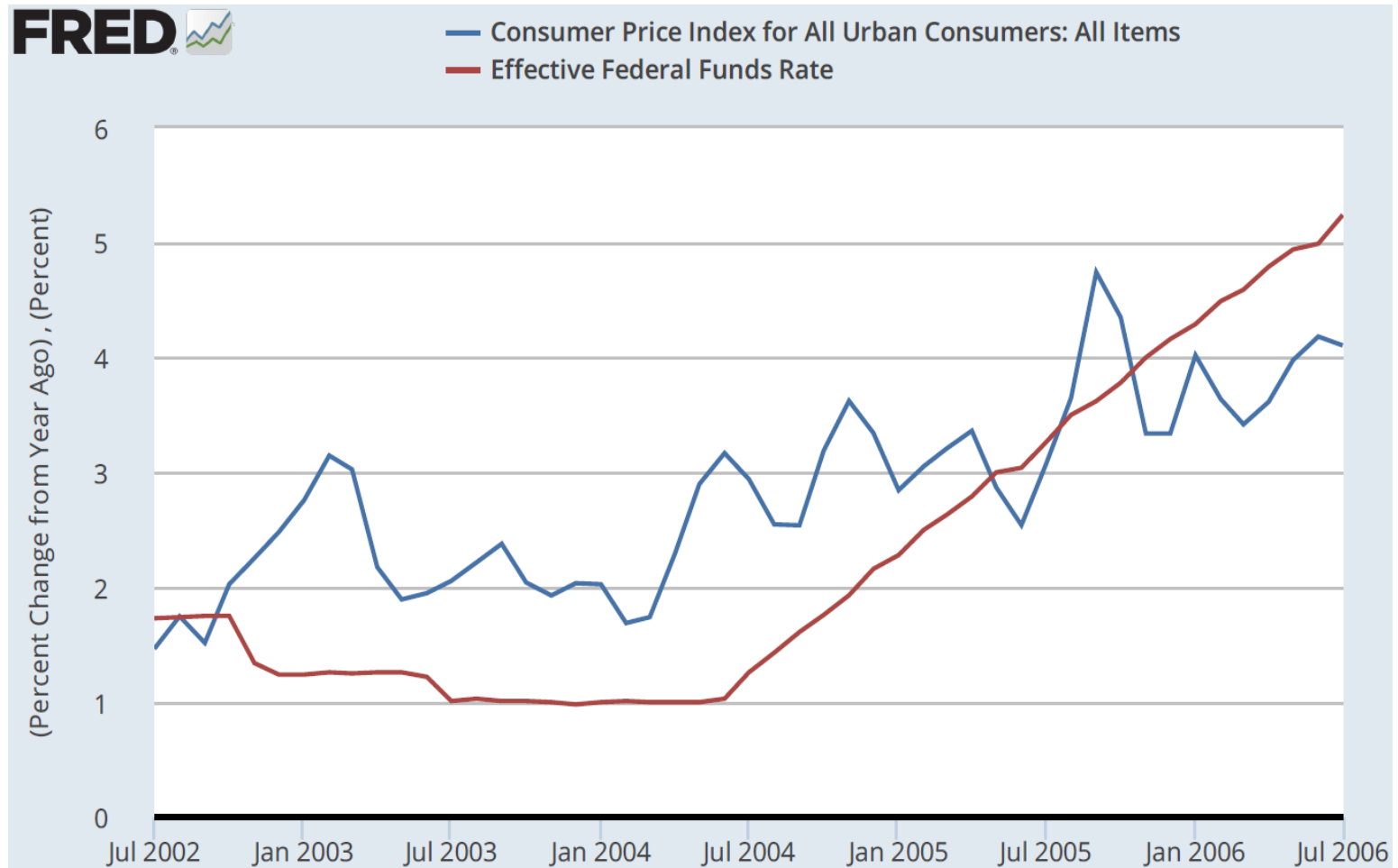
The Central Bank's Reaction Function

- We call the fact that the Fed raises the real interest rate when inflation rises, and reduces the real interest rate when inflation falls, its "reaction function."

- The motivation for the reaction function is to keep inflation from getting too low or too high.
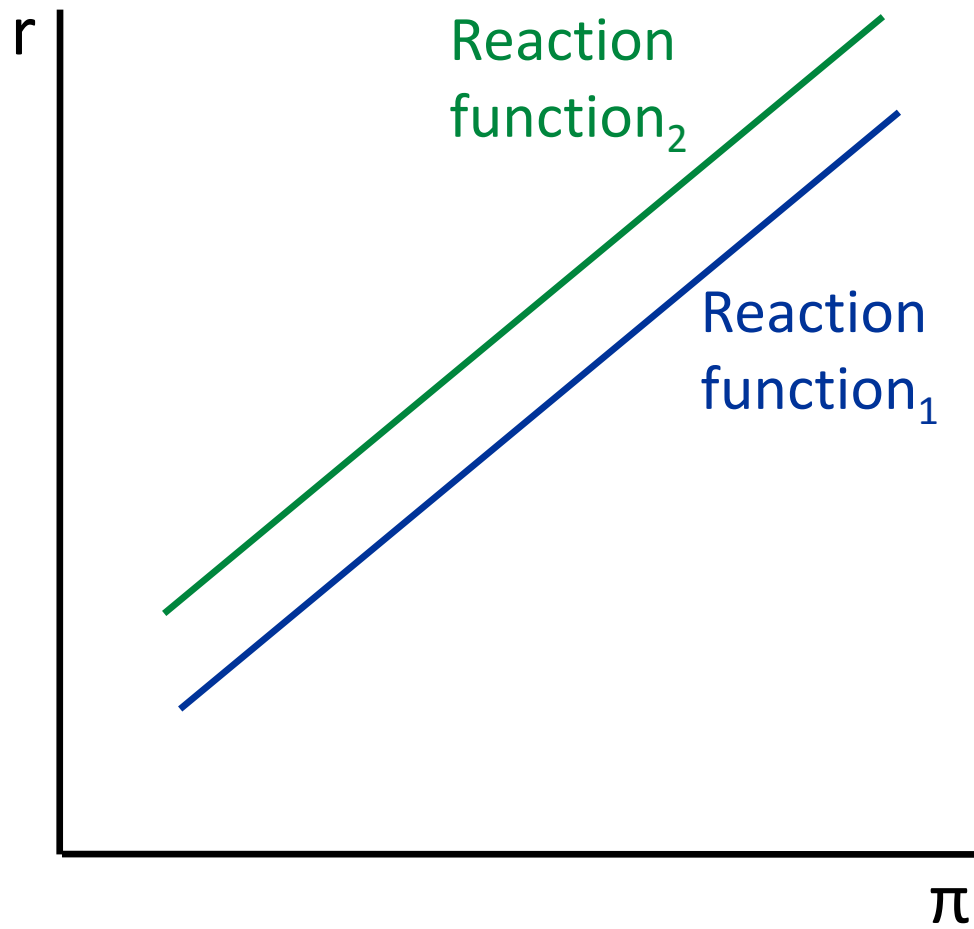
The Fed's Reaction Function
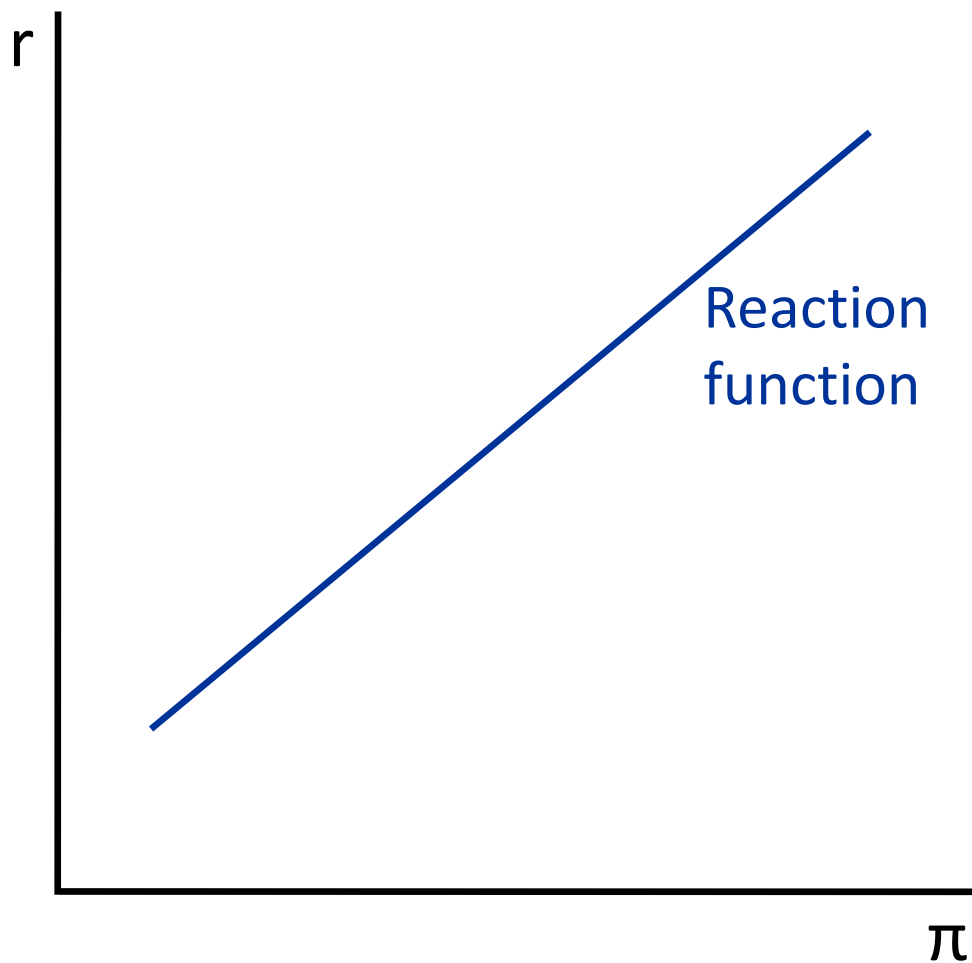
# Inflation and the Federal Funds Rate, 2002–2006

Source: FRED.

An Upward Shift of the Reaction Function

How the Economy Gets to Long-Run Equilibrium: Overview

- Over time, inflation responds to the difference between actual and potential output.

- The central bank responds to inflation by changing the real interest rate.

- The central bank's response to inflation feeds back to the economy.

Getting to long-run equilibrium: An initial situation
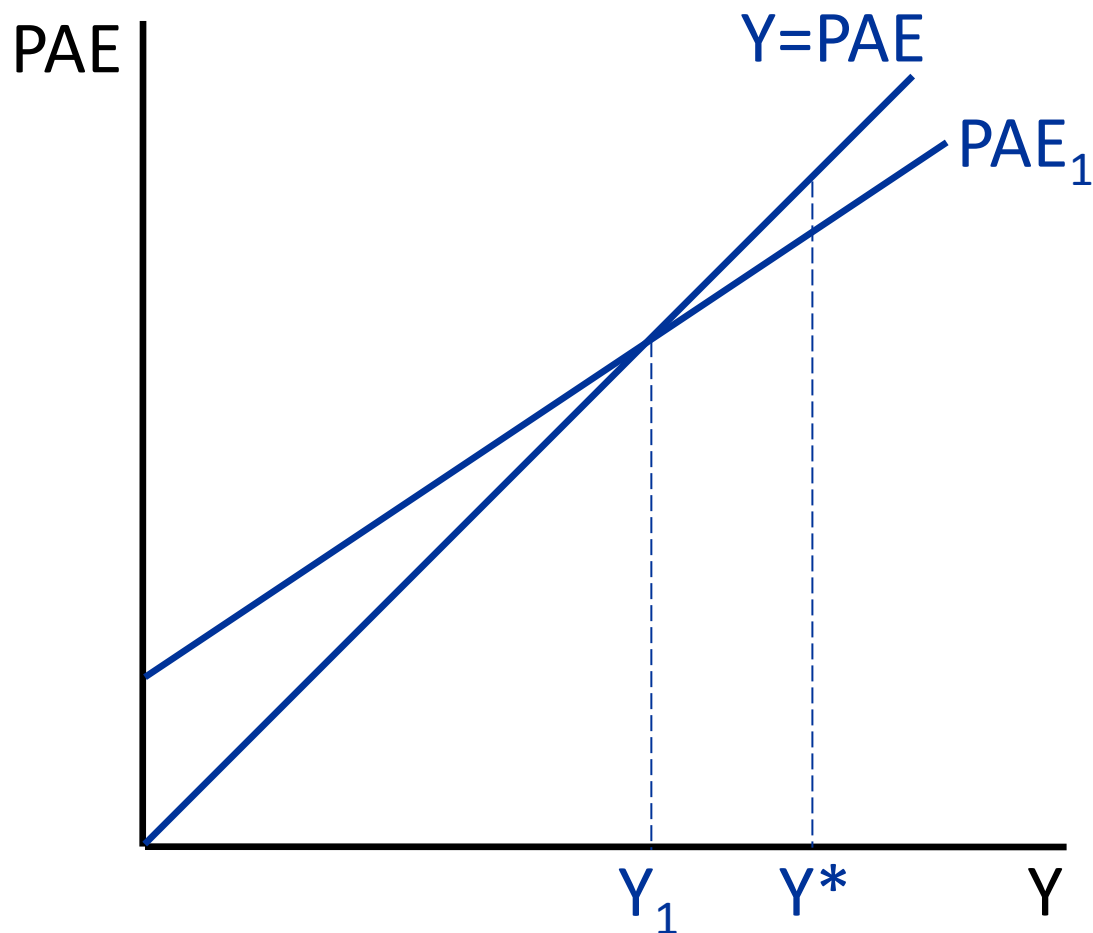
What Happens over Time?

- If Y_1 is not equal to Y*, after a while inflation starts to change.

- In our example, Y_1 < Y*, so inflation falls.

- As inflation falls, the Fed, following its reaction function, lowers r.

- The reductions in r increase C at a given Y and increase I^p, and so shift the PAE line up and raise Y.

Moving toward Y*
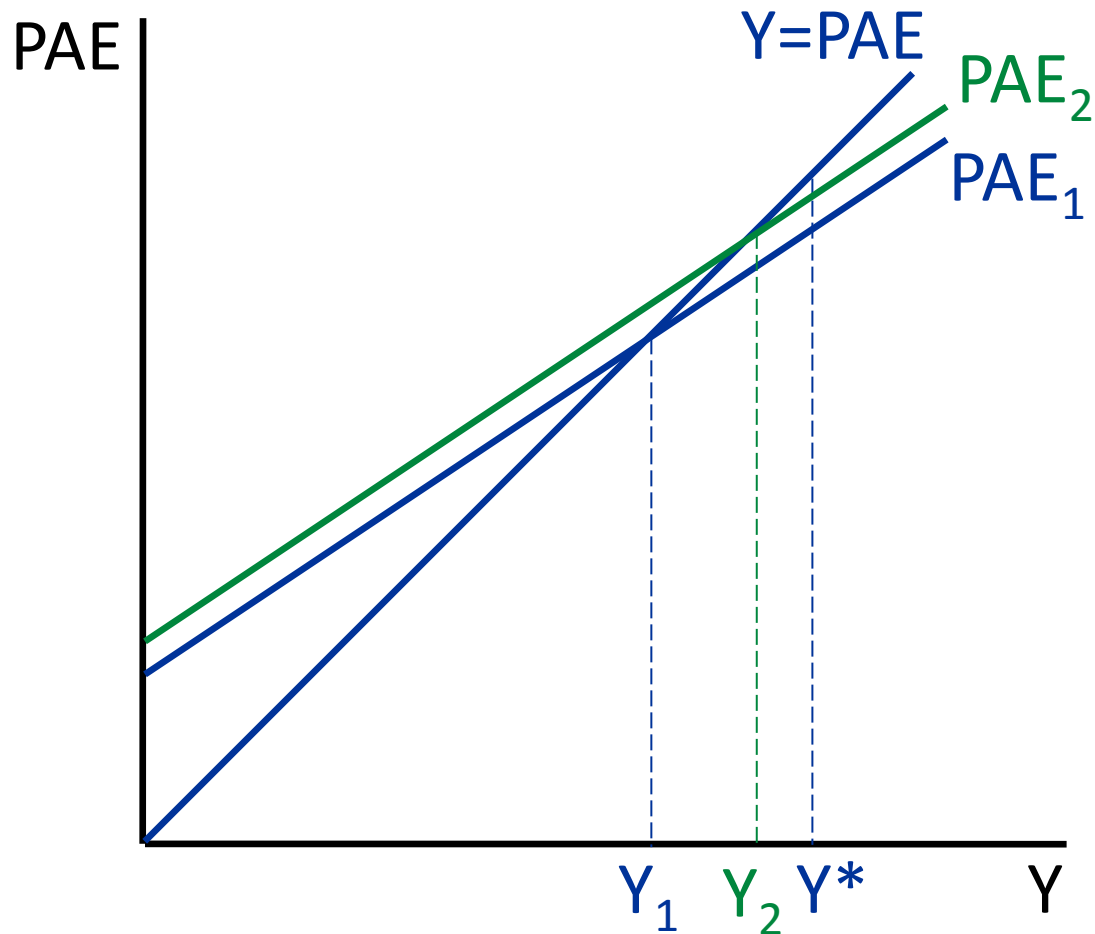
As the Fed lowers r as inflation falls, the PAE line shifts up.

Reaching Long-Run Equilibrium

- As long as Y ≠ Y*, inflation continues to change, so the Fed continues to change r, and so Y continues to change: the economy is not in long-run equilibrium.

- In our example, Y < Y*, so inflation continues to fall, so the Fed continues to lower r, so the PAE continues to shift up, so Y continues to rise.

- The process continues until Y = Y*. That is when the economy is in long-run equilibrium.

- Note: For simplicity, we ignore the fact the Y* is growing during this process.

Reaching Long-Run Equilibrium
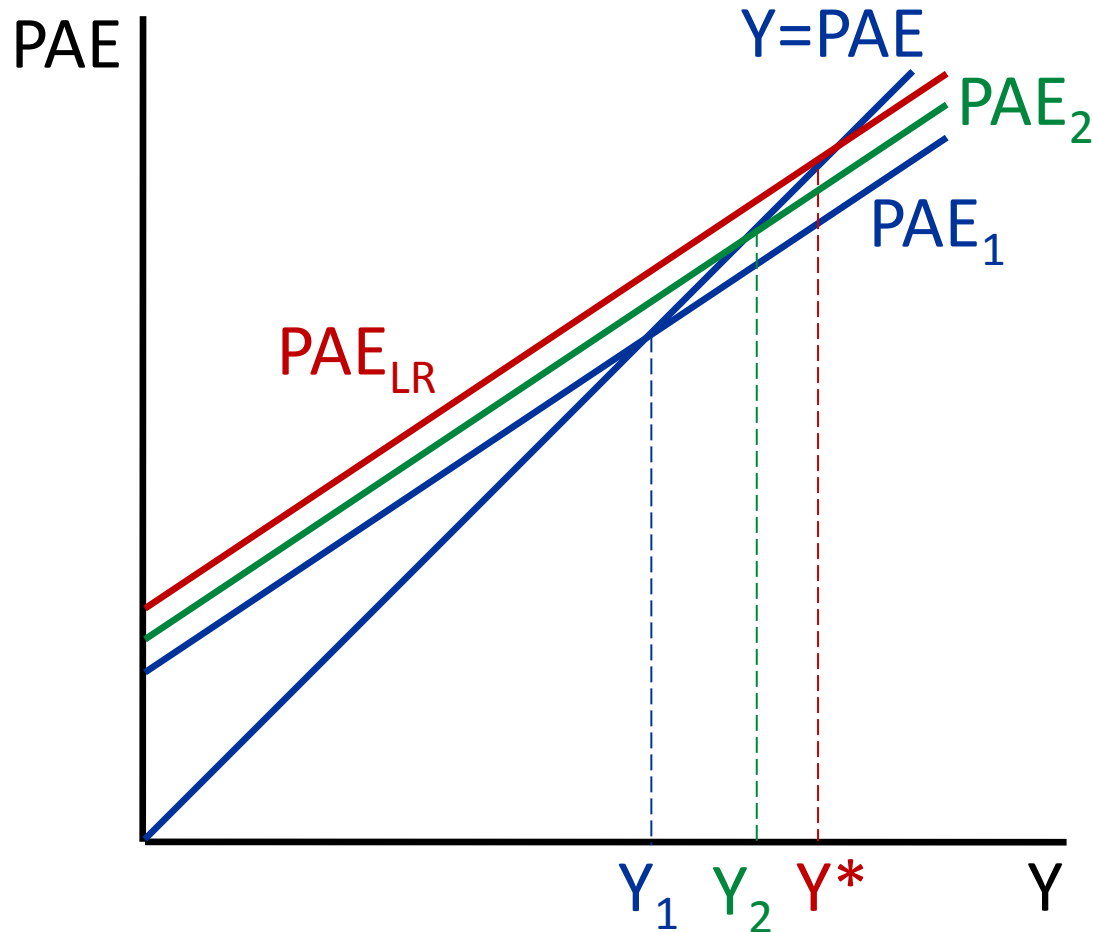
The economy is in long-run equilibrium when the PAE line intersects the 45 degree line at Y=Y*.

Long-Run Equilibrium

- When Y = Y*, there is no force acting to change inflation, and so π, r, the PAE line, and Y all stay the same—until some shock hits the economy.

- Notice that in the adjustment process, the PAE line moves (because of movements in inflation changing the Fed's choice of the real interest rate) until it crosses the 45 degree line at Y*.

Getting to Long-Run Equilibrium: Summary

- If $Y \neq Y^*$, over time, inflation changes.

- When inflation changes, the Fed changes the real interest rate.

- The changes in r shift the PAE line, and so change Y.

- The process continues until $Y = Y^*$ (and $r = r^*$).

- At that point, the economy is in long-run equilibrium.

The Timing of the Return to Potential

- The short run (little noticeable change in inflation): perhaps 6 months to a year.

- The time it takes to get essentially all the way back to potential:

    - Usually 3–5 years.

    - But, sometimes substantially longer.

V. Example: The Short-Run and Long-Run Effects of a Tax Cut

The Development We Want to Analyze

- The economy starts in long-run equilibrium.

- There is then a permanent cut in taxes, T.

- As always when we change T (unless we explicitly say otherwise), we are holding G fixed.

The Short Run
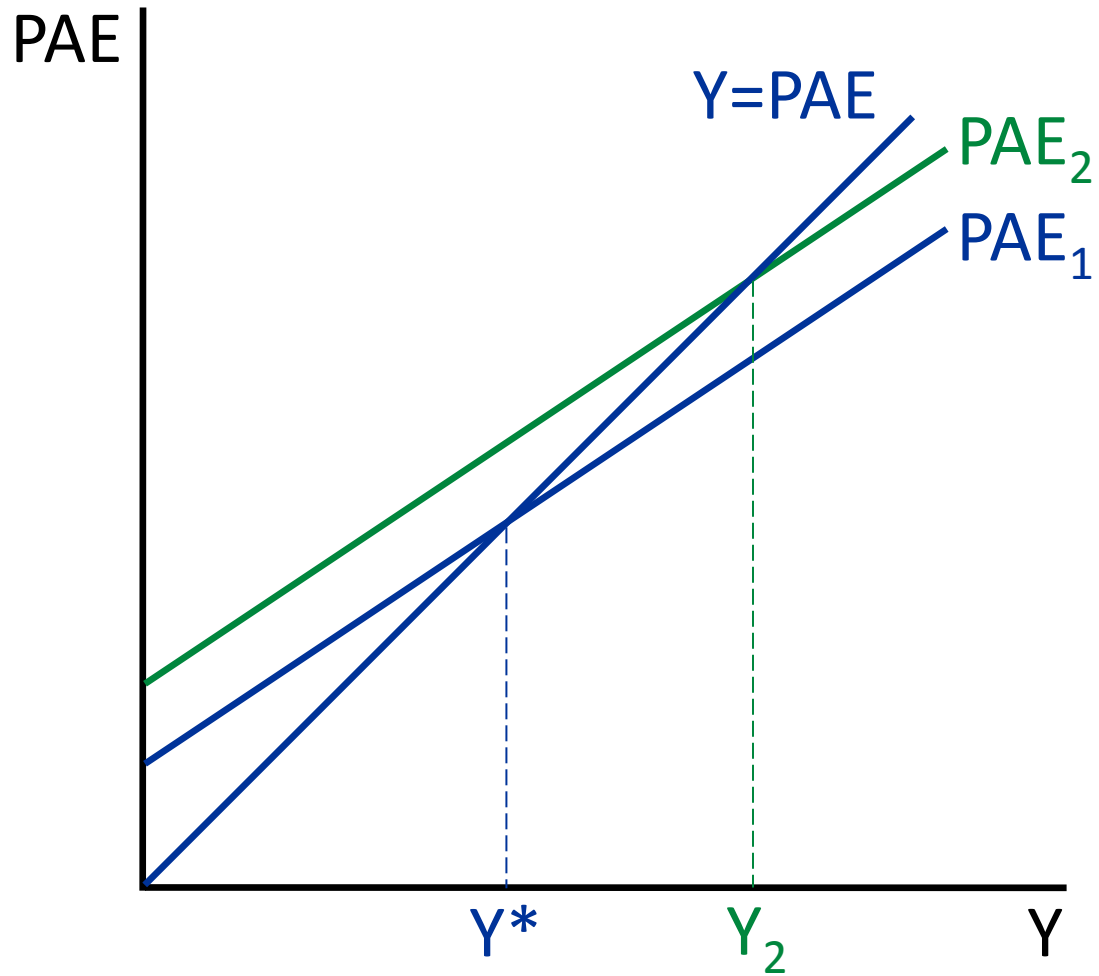
The Short-Run Effects

- The PAE line shifts up.

- Y rises (by more than the amount of the upward shift in PAE, because of the multiplier).

- Inflation does not change (nominal rigidity).

- So r does not change (the Fed's reaction function).

Returning to Potential Output

- Y > Y*, so after a while inflation starts to rise.

- As inflation rises, the Fed, following its reaction function, raises r.

- The increases in r shift the PAE line down and lower Y.

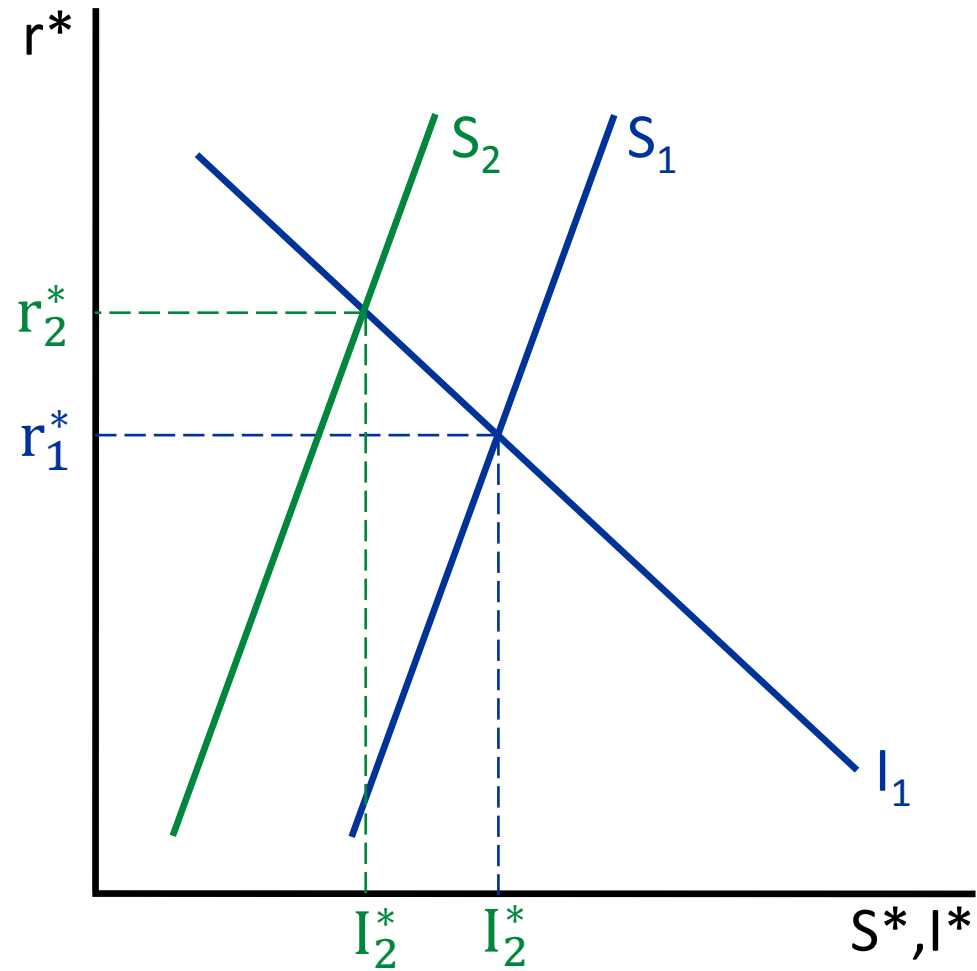- The process continues until we are back at Y*.

Returning to Potential Output
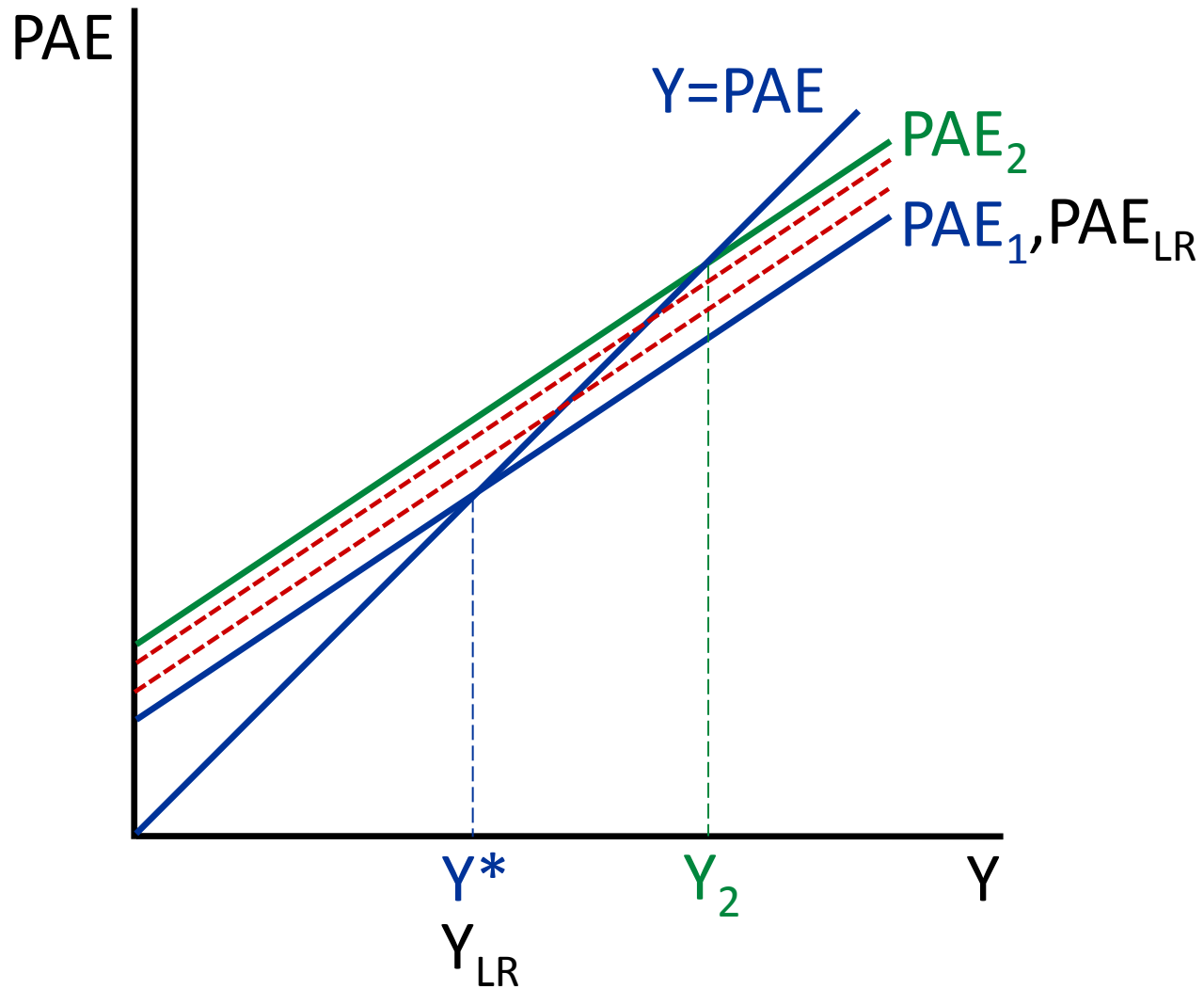
The economy is in its new long-run equilibrium when Y is back to Y*.

The Long-Run Effects

- Y is back at Y*.

- What about r, I, and C in the long run?

S, I, and r in the Long Run

The tax cut raises r and lowers I in the long run.

The Long-Run Effects

- Y is back at Y*.

- What about r, I, and C in the long run?

- The long-run saving and investment diagram shows that r is higher in the long run.

- Since I is a decreasing function of r, it is lower in the long run.

- Since Y = C + I + G, and Y and G are unchanged and I is lower, C is higher.

- So: The tax cut has changed the composition of output.