INFLATION AND THE BEHAVIOR OF THE FEDERAL RESERVE

I. QUICK REVIEW: MONETARY POLICY AND THE REAL INTEREST RATE
   A. How the central bank can change the real interest rate
   B. How a change in the real interest rate changes output

II. 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

III. INFLATION, MONETARY POLICY, AND THE RETURN OF THE ECONOMY TO POTENTIAL: KEY IDEAS

IV. THE BEHAVIOR OF INFLATION
   A. Nominal rigidities and the behavior of inflation in the short run
   B. How inflation changes over time
      1. When $Y > Y^*$, inflation will gradually rise
      2. When $Y < Y^*$, inflation will gradually fall
      3. When $Y = Y^*$, inflation tends to remain the same

V. HOW MONETARY POLICY RESPONDS TO INFLATION
   A. Why the Fed cares about inflation
   B. How the Fed keeps inflation under control
   C. The Fed’s reaction function
   D. Examples

VI. HOW THE ECONOMY RETURNS TO POTENTIAL
   A. The dynamics of the economy: moving toward potential output
   B. Long-run equilibrium
LECTURE 23
Inflation and the Behavior of the Federal Reserve

April 23, 2019
I. Quick Review: Monetary Policy and the Real Interest Rate
The Market for Money
The Fed’s Ability to Influence the Real Interest Rate—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 \( i \), it changes \( r \).
A Decrease in the Money Supply

The Fed sells bonds.

The Fed sells bonds.
The Real Interest Rate and Planned Aggregate Expenditure (PAE)

Recall: \( \text{PAE} = C + I_p + G + NX \).

- \( I_p \) is lower when \( r \) is higher.
- Saving is higher when \( r \) is higher, so \( C \) is lower when \( r \) is higher.
- We will see next week that \( NX \) is lower when \( r \) is higher.
- We take \( G \) as given.

Conclusion: An increase in \( r \) reduces \( \text{PAE} \) at a given \( Y \).
An Increase in the Real Interest Rate

\[ Y = PAE \]

\[ Y = PAE_1 \]

\[ Y = PAE_2 \]

\[ Y_2 \]

\[ Y^* \]
II. 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 extensively this week (the Fed’s concern with inflation).
- A mistake.
  - We discussed this last time (monetary policy in the Great Depression).
House Prices, 1987–2015

Case-Shiller House Price Index, January 2000 = 100

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 eventually, a full-fledged financial crisis.
What Happened to PAE in 2008?

• **Decline in investment (particularly in housing)**
  
  • Housing bust reduced expected future $\text{MRP}_K$ of housing (which is a kind of capital).
  
  • Financial crisis hurt animal spirits and made it hard for firms to get credit.

• **Decline in consumption**
  
  • Housing bust and stock market decline destroyed wealth.
  
  • Financial crisis hurt consumer confidence and made it hard for households to get credit.
Effect of the Housing Bust and Financial Crisis on Output

Source: U.S. Bureau of Labor Statistics
How the Fed Lowers Interest Rates

The Fed prints money and uses it to buy bonds.
The Federal Funds Rate, 2006–2008
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

Source: World Wealth and Income Database; data are for mid-year.
Industrial Production Early in the Great Depression and the Great Recession

Index, July 1929 or July 2008 = 100

Months after Base Month (July 1929 or July 2008)

Source: FRED.
Real GDP in the Great Depression and the Great Recession

Source: FRED.
III. Inflation, Monetary Policy, and the Return of the Economy to Potential: Key Ideas
Key Idea #1: 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.
Key Idea #2: Monetary policy responds to inflation.

- When inflation rises, the Fed raises nominal and real interest rates.
- When inflation falls, the Fed lowers nominal and real interest rates.
- When inflation is steady, the Fed holds nominal and real interest rates steady.
Key Idea #3: The Fed’s response to inflation feeds back to the economy.

- Changes in $r$ change planned aggregate expenditure (the PAE line).
- The shifts of the PAE line change output.
Key Idea #4: The economy is in long-run equilibrium when output is equal to potential.

- If $Y$ is not equal to $Y^*$, inflation is changing, and so $r$ is changing, and so $Y$ is changing: the economy is not in long-run equilibrium.

- If $Y$ is equal to $Y^*$, inflation is steady, and so $r$ is steady, and so $Y$ is steady: the economy is in long-run equilibrium.
Key Idea #5: The $r$ in the long-run equilibrium we have just described is the same as the $r^*$ from our long-run saving and investment diagram.
IV. 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.
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

Source: Bureau of Economic Analysis.
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.
Key Idea #1: 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.
V. HOW MONETARY POLICY Responds to Inflation
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.
  • When output is below potential, then over time, inflation falls.
• When inflation is low, the central bank lowers the real interest rate, and the process works in reverse.
The Central Bank’s Reaction Function

• The reaction function describes how the central bank’s choice of the real interest rate depends on economic variables.

• The Fed’s reaction function: It raises the real interest rate when inflation rises, and reduces the real interest rate when inflation falls.

• The motivation for the reaction function is to keep inflation from getting too low or too high.
The Fed’s Reaction Function

\[ r = \pi \]

Reaction function
Inflation and the Federal Funds Rate, 2002–2006

Source: FRED.
An Upward Shift of the Reaction Function
A Shift in the Reaction Function
(a change in $r$ at a given level of $\pi$)

• Reflects concerns other than inflation.

• Or—as we’ll see next time—a change in the Fed’s target rate of inflation.
Different Possible Fed Responses to Inflation

The Fed fights \( \pi \) aggressively

The Fed fights \( \pi \) mildly

Reaction function

\[ r \]

\[ \pi \]
The Steepness of the Reaction Function (How Much the Fed Changes r When Inflation Changes)

- Reflects how aggressively the Fed responds to inflation.
Key Idea #2: Monetary policy responds to inflation.

- When inflation rises, the Fed raises nominal and real interest rates.
- When inflation falls, the Fed lowers nominal and real interest rates.
- When inflation is steady, the Fed holds nominal and real interest rates steady.
VI. HOW THE ECONOMY RETURNS TO POTENTIAL
The Fed’s response to inflation feeds back to the economy: An initial situation:

Graph showing the relationship between PAE and Y with lines Y = PAE and PAE₁.
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 $Y$. 
As the Fed lowers r as inflation falls, the PAE line shifts up.
Key Idea #3: The Fed’s response to inflation feeds back to the economy.

• Changes in r change planned aggregate expenditure (the PAE line).

• The shifts of the PAE line change output.
Reaching Long-Run Equilibrium

• As long as \( Y \neq Y^* \), 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.
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 \( \pi, r, \) 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 \( Y^* \).
Key Idea #4: The economy is in long-run equilibrium when output is equal to potential.

- If $Y$ is not equal to $Y^*$, inflation is changing, and so $r$ is changing, and so $Y$ is changing: the economy is not in long-run equilibrium.

- If $Y$ is equal to $Y^*$, inflation is steady, and so $r$ is steady, and so $Y$ is steady: 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.