



Lecture 8

Stabilizing the Economy: Monetary Policy (Part II)

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Lecture Outline (Part 1)

- ▶ What is money?
 - ▶ How to measure quantity of money?
- ▶ Money supply
 - ▶ Jointly determined by actions of:
 - Commercial banks
 - Depositors
 - Central bank
 - How does central bank control money supply?
- ▶ Money supply and inflation in the long run

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Lecture Outline (Part 2)

- ▶ Money demand
- ▶ Money market
 - ▶ Money demand and money supply
- ▶ How does central bank control interest rate?
- ▶ How does interest rate affect the economy?
- ▶ Monetary policy

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Money Demand

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Money Demand

- ▶ The **demand for money** is the amount of wealth held in the form of money
- ▶ In a highly simplified world, you can hold your wealth in
 1. Money
 - No interest
 - Ease in making payment
 2. Bonds
 - Earn interest
 - Difficult in making payment

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Money Demand

- ▶ How much money should an individual hold?
 - ▶ Cost-Benefit Principle: people will balance the marginal cost of holding money versus the marginal benefit
- ▶ The **benefit** of holding money is its usefulness in making transactions
 - ▶ MB of holding money is higher when a individual's income is higher
 - ▶ MB of holding money is lower for an individual living in a society that has greater technological and financial sophistication

- ▶ The **cost** of holding money is the interest foregone
 - ▶ Most forms of money pay little or no interest
 - Assume nominal i/r on money is 0
 - ▶ Alternative assets such as bonds have a positive nominal interest rate
- ▶ The higher the nominal interest rate, the smaller the quantity of money demanded
- ▶ Business demand for money is similar to individuals'

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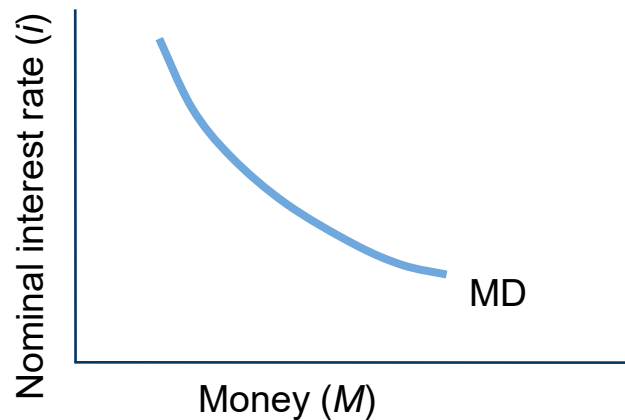
Money Demand

- ▶ Demand for money depends on:
 - ▶ Nominal interest rate (i)
 - The higher the interest rate, the lower the quantity of money demanded
 - ▶ Real income or output (Y)
 - The higher the level of income, the greater the quantity of money demanded
 - ▶ The price level (P)
 - The higher the price level, the greater the quantity of money demanded

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Money Demand Curve

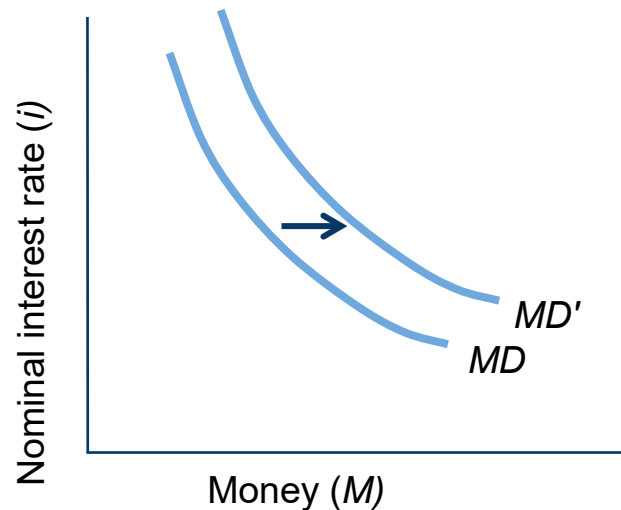
- ▶ The **money demand curve** shows the relationship between the aggregate quantity of money demanded (M) and the nominal interest rate (i)
- ▶ An increase in nominal interest rate increases the opportunity cost of holding money
- ▶ Negative slope



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Money Demand Curve

- ▶ Changes in factors other than the nominal i/r cause a shift in the money demand curve
- ▶ A change in demand for money can result from anything that affects the cost or benefit of holding money
 - ▶ Increase in output
 - ▶ Higher price levels
 - ▶ Technological and financial advances
 - ▶ Foreign demand for dollars





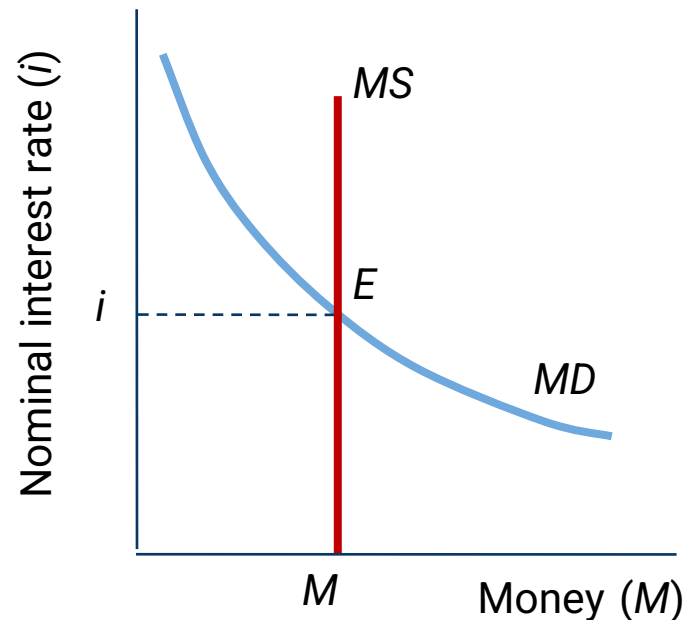
Money Market



**is where
money demand and
money supply
come together**

Money Market

- ▶ Since the Fed controls the money supply, MS curve is drawn as a vertical line
- ▶ Money supply and demand determine the interest rate
- ▶ Equilibrium is at E
- ▶ i is the equilibrium nominal interest rate






How does the Fed Control Interest Rates?

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Fed Controls the Nominal Interest Rate

- ▶ Fed policy is stated in terms of target interest rates


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FEDERAL RESERVE

Fed hikes its benchmark interest rate by 0.75 percentage point, the biggest increase since 1994



PUBLISHED WED, JUN 15 2022-2:00 PM EDT | UPDATED THU, JUN 16 2022-7:32 AM EDT

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KEY POINTS

- The Federal Reserve raised its benchmark interest rates three-quarters of a percentage point in its most aggressive hike since 1994.
- According to the “dot plot” of individual members’ expectations, the Fed’s benchmark rate will end the year at 3.4%, an upward revision of 1.5 percentage points from the March estimate.
- Officials also significantly cut their outlook for 2022 economic growth, now anticipating just a 1.7% gain in GDP, down from 2.8% from March.

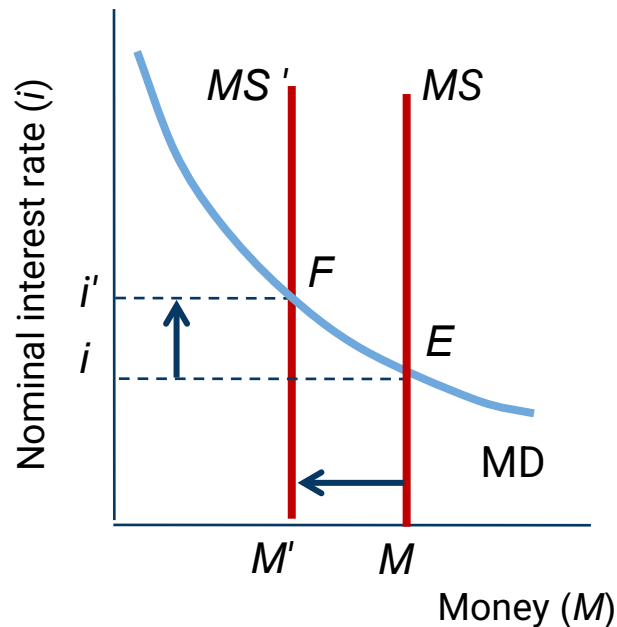
 **In Plain Sight** 
UP NEXT | **Shepard Smith** 04:00 ET

Fed Controls the Nominal Interest Rate

- ▶ Fed policy is stated in terms of target interest rates
 - ▶ The tool they use is the supply of money
 - ▶ The Fed increases/decreases money supply to achieve its desired interest rate
- ▶ The Fed cannot set interest rate and money supply independently
 - ▶ A particular interest rate implies a particular size of money supply, and vice versa

Fed Controls the Nominal Interest Rate

- ▶ Initial equilibrium at E
- ▶ To increase interest rate, Fed decreases the money supply to MS'
 - ▶ New equilibrium at F
 - ▶ Interest rate increases to i'
- ▶ To decrease interest rate, Fed increases the money supply



Fed Controls the Nominal Interest Rate

- ▶ Fed policy is announced in terms of interest rates because
 - ▶ Public is not familiar with the size of money supply
 - ▶ Main effects of monetary policy on the economy work through interest rates
 - ▶ Interest rates are easier to monitor than money supply

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Federal Funds Rate



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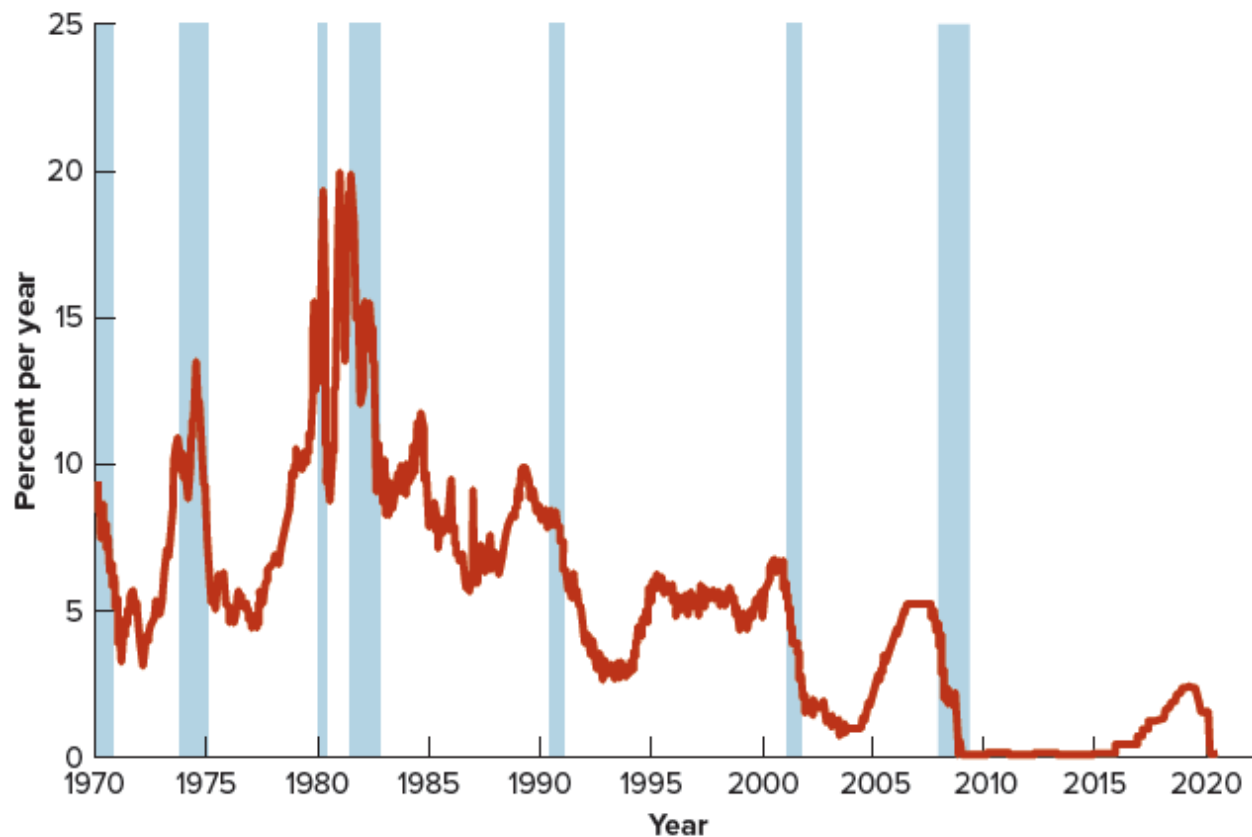
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Federal Funds Rate

- ▶ The **federal funds rate** is the rate commercial banks charge each other on short-term (usually overnight) loans
 - ▶ Banks borrow from each other if they have insufficient funds
 - ▶ Market determined rate
 - ▶ Targeted by the Fed
- ▶ To decrease the federal funds rate the Fed conducts open market purchases
 - ▶ Reserves increase
- ▶ Interest rates tend to move together

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Federal Funds Rate, 1970-2020



Can The Fed Control The Real Interest Rate?

- ▶ Fed controls the money supply to control the **nominal interest rate, i**
- ▶ Investment and saving decisions are based on the **real interest rate, r**
- ▶ Fed has some control over the real interest rate:
 - $r = i - \pi$, where π is the rate of inflation
 - ▶ The Fed has good control over i
 - ▶ Inflation changes relatively slowly
 - ▶ Changes in nominal rates become changes in real rates

Controls over the Money Supply

- ▶ Money supply is determined by:

$$MS = \text{Currency} + \frac{\text{Bank Reserves}}{\text{Reserve-Deposit Ratio}}$$

- ▶ The Fed can affect money supply by affecting:
 - ▶ Bank reserves
 - Open-market operations
 - Discount window lending
 - ▶ Reserve requirement
 - Minimum values of the ratio of bank deposits that must be held in reserves

Excess Reserves: The Norm since 2008

- ▶ Reserve requirements do not prevent banks from maintaining reserve-deposit ratios that are well above that minimum level.
- ▶ Excess reserves: Bank reserves in excess of the reserve requirements set by the central bank.
- ▶ As a result, the money supply may not change even if the fed changes the supply of reserves

Zero Lower Bound

- ▶ In Dec 2008, the Fed reduced the targeted fed funds rate to 0 to $\frac{1}{4}$ percent
 - ▶ **Zero lower bound:** a level, close to zero, below which the Fed cannot further reduce short-term interest rates
- ▶ Fed funds rate remained effectively zero in years after Dec 2008, but other interest rates remained significantly above zero

Additional Controls over the Money Supply

- ▶ **Quantitative Easing (QE):** an expansionary monetary policy in which a central bank buy long-term financial assets, thereby lowering longer-term interest rates while increasing money supply
- ▶ **Forward Guidance:** central bank provides indications of its future monetary-policy path so as to influence markets' expectation
- ▶ **Interest on Reserves:** an increase in the interest rates on reserves will lead to an increase fed funds rate

How does Interest Rate Affect the Economy?

Planned Spending and Real Interest Rate

- ▶ Planned aggregate expenditure has components that are affected by r
 - ▶ Saving decisions of households
 - More saving at higher real interest rates
 - Higher saving means less consumption
 - ▶ Investment by firms
 - Higher interest rates mean less investment
 - Investments are made if the cost of borrowing is less than the return on the investment
- ▶ Consumption spending and planned investment spending decrease when the interest rate increases

Interest Rate in the Keynesian Model – An Example

- ▶ Components of aggregate spending are
$$C = 640 + 0.8(Y - T) - 400r$$
$$I^P = 250 - 600r$$
$$G = 300$$
$$NX = 20$$
$$T = 250$$
- ▶ If r increases from 0.04 to 0.05 (that is, from 4% to 5%)
 - ▶ Consumption decreases by $400 \times 0.01 = 4$
 - ▶ Planned investment decreases by $600 \times 0.01 = 6$
- ▶ A one percentage point increase in r reduces planned spending by 10, before multiplier is considered

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Planned Aggregate Expenditure

$$PAE = C + I^P + G + NX$$

$$PAE = 640 + 0.8(Y - 250) - 400r + 250 - 600r + 300 + 20$$

$$PAE = 1,010 - 1,000r + 0.8Y$$

- ▶ In this example, planned aggregate expenditure depends on both the real interest rate and the level of output
- ▶ Equilibrium output can only be found once we know the value of r

Planned Aggregate Expenditure

$$PAE = 1,010 - 1,000r + 0.8Y$$

- ▶ Suppose the real interest rate is 5%, or 0.05
- ▶ Planned aggregate expenditure becomes

$$PAE = 1,010 - 1,000(0.05) + 0.8Y$$

$$PAE = 960 + 0.8Y$$

- ▶ Short-run equilibrium output is $PAE = Y$

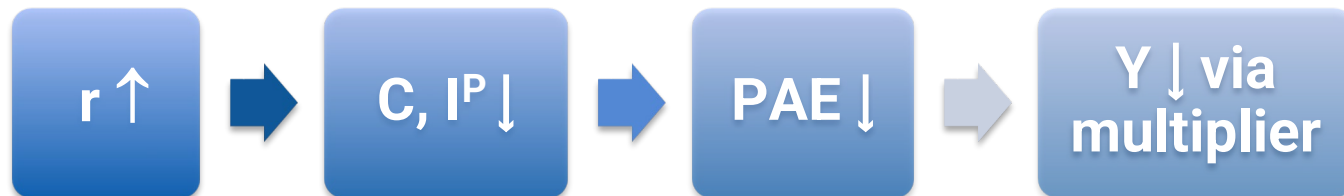
$$Y = 960 + 0.8Y$$

$$0.2Y = 960$$

$$Y = \$4,800$$

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Monetary Policy

Recessionary GapExpansionary Gap

The Fed Fights Recession

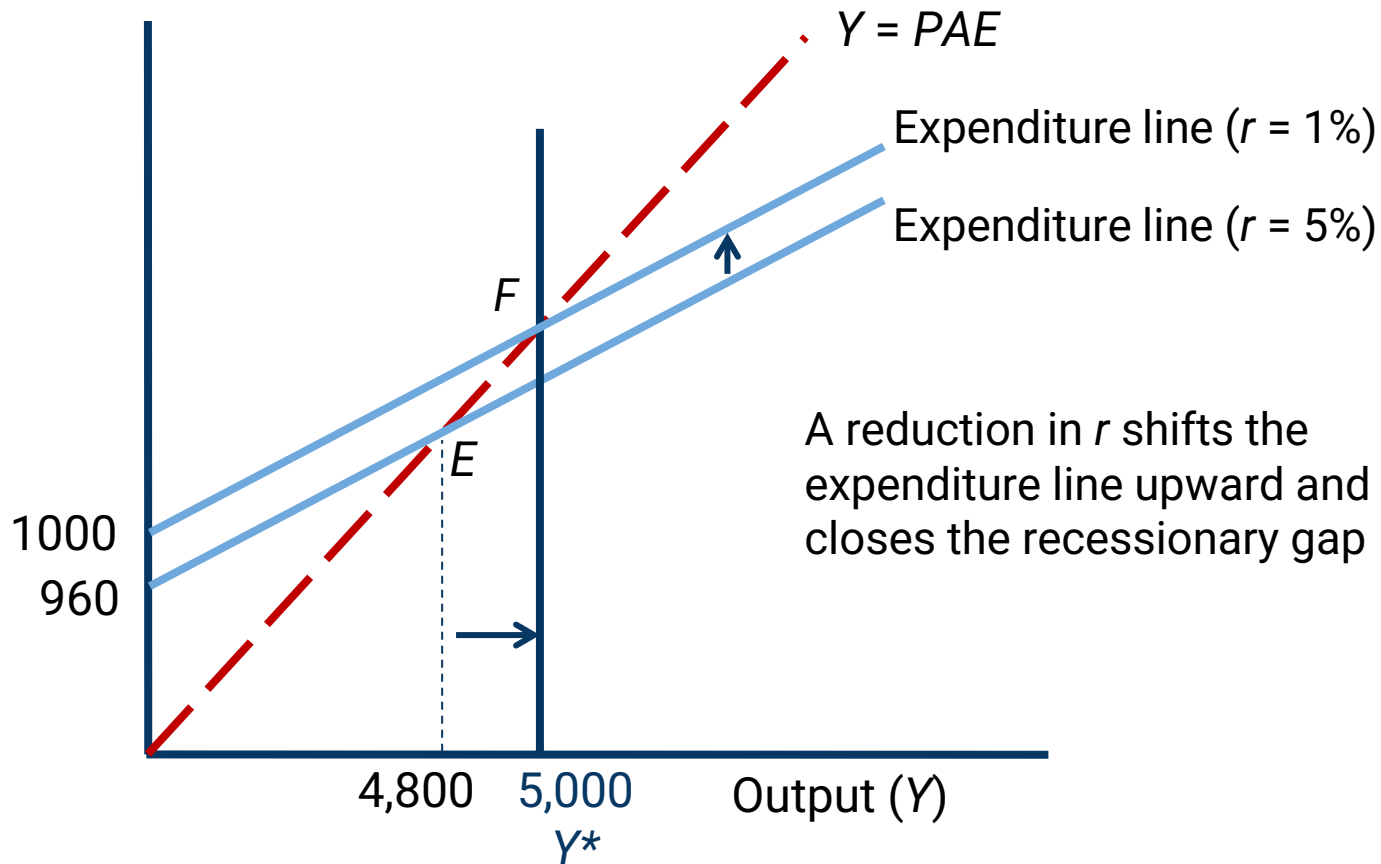
- ▶ To close recessionary gaps
 - ▶ The Fed lowers interest rates
 - ▶ Increase consumption spending and planned investment spending
 - ▶ Increase planned aggregate expenditure
 - ▶ Increase equilibrium output

The Fed Fights Recession

- ▶ $PAE = 1,010 - 1,000r + 0.8Y$
- ▶ Real interest rate, r , is 5%
 - ▶ $PAE = 960 + 0.8Y$
 - ▶ SR equilibrium output is \$4,800
- ▶ Potential output is \$5,000
 - ▶ Recessionary gap is \$200
- ▶ Multiplier is 5
- ▶ Monetary policy can be used to increase PAE
 - ▶ Change in spending required is $200/5 = 40$
 - ▶ $1,000(\Delta r) = 40$
 - ▶ $\Delta r = 40/1,000 = 0.04$
- ▶ The Fed should decrease the real interest rate to 1%
 - ▶ $PAE = 1,010 - 1,000r + 0.8Y = 1000 + 0.8Y$

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The Fed Fights Recession



Fed's Response to recession and 9/11

- ▶ U.S. economy began slowing in late 2000
- ▶ In late 2000, fed funds rate was 6.5%
 - ▶ January 2001, the Fed cut the rate to 6.0%
 - ▶ More rate cuts followed
 - ▶ July 2001, the rate was below 4%
- ▶ 9/11 terrorist attack led to contraction in travel, financial, and other industries
 - ▶ The Fed temporarily lowered the rate to 1.25% in the week following the attack
 - ▶ In the aftermath, the Fed grew concerned that consumers would decrease spending
 - Interest rate was 2.0% in November 2001; 4.5 percentage points lower than a year before
- ▶ Combination of tax cuts and aggressive monetary policy helped keep the 2001 recession shallow and short

The Fed Fights Inflation

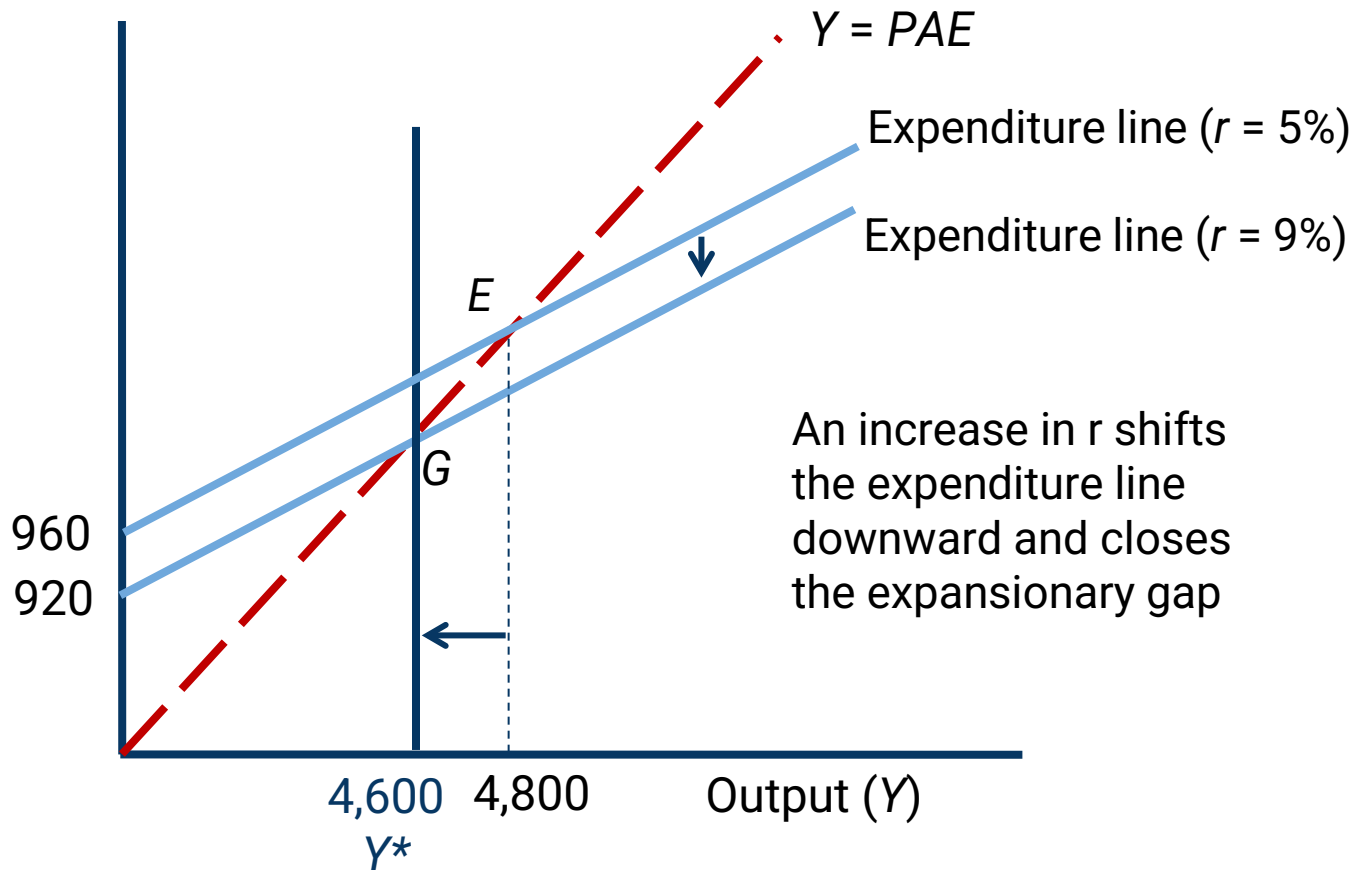
- ▶ Expansionary gap can lead to inflation
- ▶ To close expansionary gaps
 - ▶ The Fed raises interest rates
 - ▶ Decrease consumption spending and planned investment spending
 - ▶ Decrease planned aggregate expenditure
 - ▶ Decrease equilibrium output

The Fed Fights Inflation

- ▶ $PAE = 1,010 - 1,000r + 0.8Y$
- ▶ Real interest rate, r , is 5%
 - ▶ $PAE = 960 + 0.8Y$
 - ▶ SR equilibrium output is \$4,800
- ▶ Potential output is \$4,600
 - ▶ Expansionary gap is \$200
- ▶ Multiplier is 5
- ▶ Monetary policy can be used to decrease PAE
 - ▶ Change in spending required is $200/5 = 40$
 - ▶ $1,000 (\Delta r) = 40$
 - ▶ $\Delta r = 40/1,000 = 0.04$
- ▶ The Fed should increase the real interest rate to 9%
 - ▶ $PAE = 1,010 - 1,000r + 0.8Y = 920 + 0.8Y$

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The Fed Fights Inflation



Interest Rates Increase in 2004 - 2006

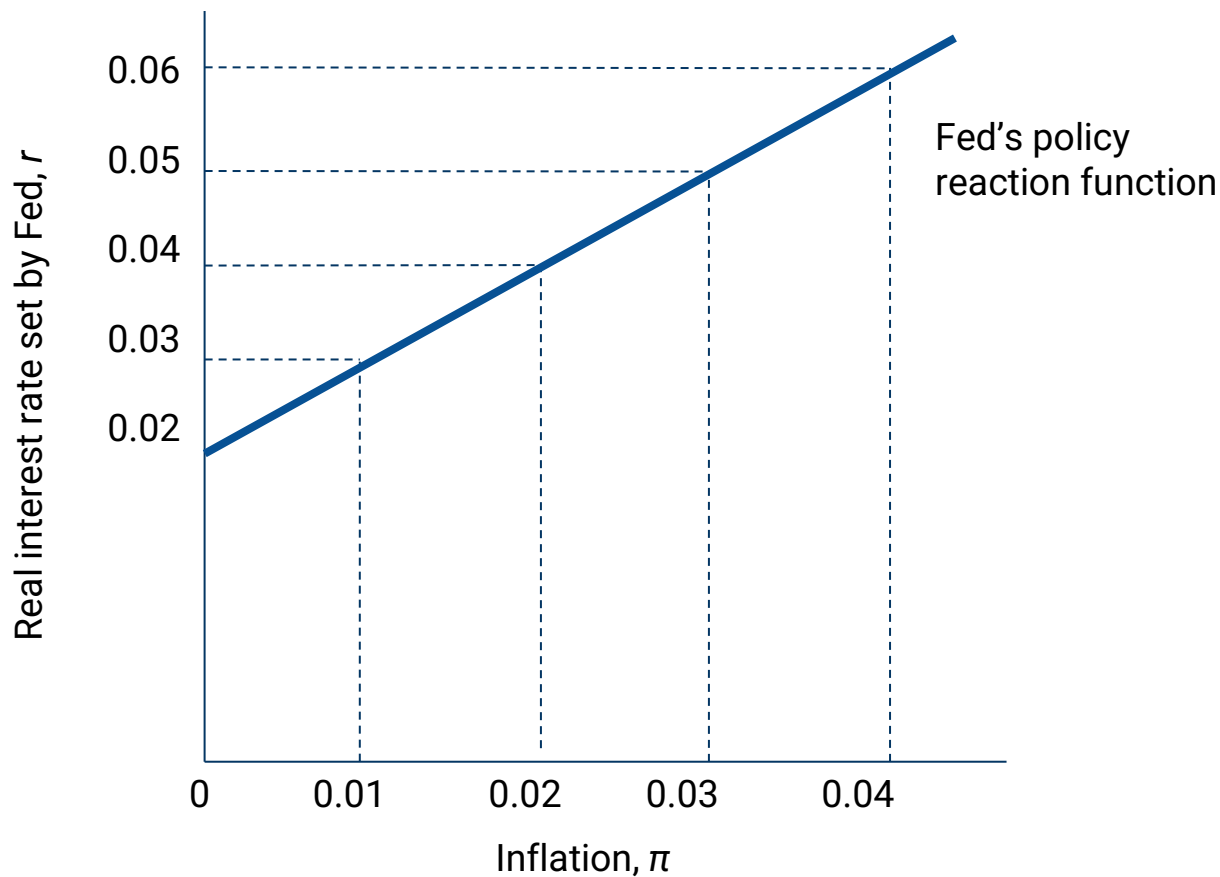
- ▶ Fed funds rate was 1.0% in June 2003
- ▶ GDP growth rate was nearly 6% in 2nd half of 2003, and nearly 4% in 2004
 - ▶ Unemployment had fallen to 5.6% in June 2004
 - ▶ Inflation began to rise in 2004, mainly due to oil prices
- ▶ Fed began tightening in June 2004 to prevent emergence of inflationary gap
 - ▶ Fed funds rate increased from 1.0% to 1.25% in June 2004
 - ▶ The Fed raised interest rates 17 times in a row between 2004 and 2006
 - ▶ The rate was 5.25% in June 2006

The Fed's Policy Reaction Function

- ▶ **Policy reaction function** describes how the action a policymaker takes depends on the state of the economy
- ▶ **Taylor Rule:**
$$r = 0.01 + 0.5 \left(\frac{Y - Y^*}{Y^*} \right) + 0.5\pi$$
 - ▶ r is the real interest rate set by the Fed
 - ▶ $Y - Y^*$ is the current output gap
 - ▶ $(Y - Y^*)/Y^*$ is the output gap relative to potential output
 - ▶ π is the inflation rate expressed as a decimal
- ▶ The Fed responds to both output gaps and the rate of inflation

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An Example of a Fed Policy Reaction Function



THANKS!

Any questions?

You can find me at

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