
The Global Economy

Monetary Policy

Roadmap

- In the News
- PS 3 Comments: Interpreting Regressions
- Monetary Policy

Using and Interpreting Regressions

- R^2 – “goodness of fit” measure
 - Share of variance of dependent variable explained by regression
- Standard error of regression
 - If errors are normally distributed, provides a confidence interval around fitted or forecast value (one-SD bandwidth = 68%; two-SD bandwidth = 95%)
- Coefficients
 - Sensitivity of dependent variable to independent variables; used in calculating forecast based on observed independent variables
- Standard error of coefficient
 - If errors are normally distributed, provides a confidence interval around coefficient (one-SD bandwidth = 68%; two-SD bandwidth = 95%)
- t-statistic
 - Measures ratio of coefficient to its standard error; tests hypothesis that coefficient is different from zero (95% confidence interval when $t > 1.96$)

Advertisement

- Monetary policy, banks, and central banks
 - Spring 2012, ECON-GB.2333.20
 - MW 10:30am-11:50am

Intro: big questions

- What should central banks do?
 - Control inflation?
 - Control exchange rates?
 - Control output?
- What can central banks do?
 - How does policy respond to demand shocks?
 - How does policy respond to supply shocks?

Intro: tools

- AS/AD
 - Trace out impact of shocks to the economy
 - Analyze the impact of policy
- The reserve market
 - How/where the Fed controls an interest rate
- Taylor rule: a model of the central bank
 - Connects output, inflation, and interest rates
 - A model of “conventional” monetary policy

What should central banks do?

- US Federal Reserve
- Federal Reserve Act (1913)
 - The Federal Reserve System and the Federal Open Market Committee should seek “to promote effectively the goals of **maximum employment, stable prices, and moderate long-term interest rates.**”
 - Usually described as Fed’s “dual mandate”

What should central banks do?

- European Central Bank (ECB)
- Treaty of Maastricht (1992) :
 - “The **primary objective of [monetary policy] shall be to maintain price stability.** ”
 - “Without prejudice to the objective of price stability, the ECB shall support the general economic policies in the Community with a view to contributing to the achievement of ... a high level of employment and sustainable and non-inflationary growth.”
 - Usually described as ECB’s “hierarchical mandate”

Review: money supply mechanics

- Increase the money supply
 - Buy Treasury bills for dollars
 - Lower short-term interest rates
 - Expectations of future action influences long-term interest rates
- Decrease the money supply
 - Sell Treasury bills for dollars
 - Increase short-term interest rates
 - Expectations of future action influences long-term interest rates

How does monetary policy affect demand?

- Higher *real* interest rates affect AD through
 - Business investment
 - Higher borrowing costs decrease investment
 - Residential investment
 - Higher mortgage rates decrease home building/buying
 - Consumption
 - Higher borrowing costs imply less borrowing for consumption
 - Higher returns on savings imply more saving, less present consumption
 - Lower returns on assets (discount at higher rate) implies a negative wealth effect; lowers consumption
 - Lower asset values decrease value of collateral; lowers borrowing capacity

How does monetary policy affect demand?

- Transmission through asset prices
 - Equity prices and credit spreads
 - House prices
 - Exchange rate
 - Collateral value (borrowing capacity)

Aside: the real interest rate

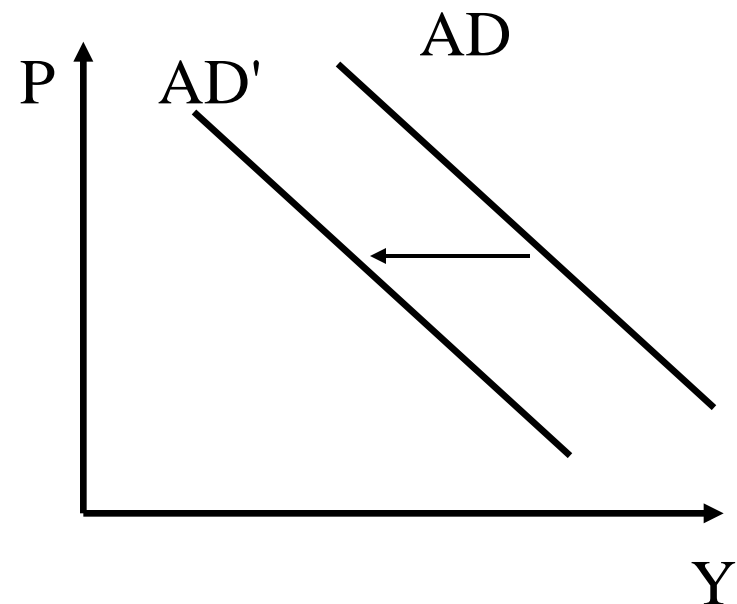
- Nominal interest rate
 - Yield measured in dollars
- Real interest rate
 - Yield measured in “goods”

$$i = r + \pi^e$$

- The nominal rate, i , is the real rate, r , plus the expected rate of inflation, π^e
- Similar concept to the real wage: measure prices in terms of goods, not dollar bills
- Key role of *expectations*!
- **Real, not nominal, rates matter for spending decisions!**

How does monetary policy affect demand?

- We draw AD holding fixed everything (including the real interest rate) but prices
- When the real interest rate changes, AD shifts
- A higher real interest rate shifts AD to the left



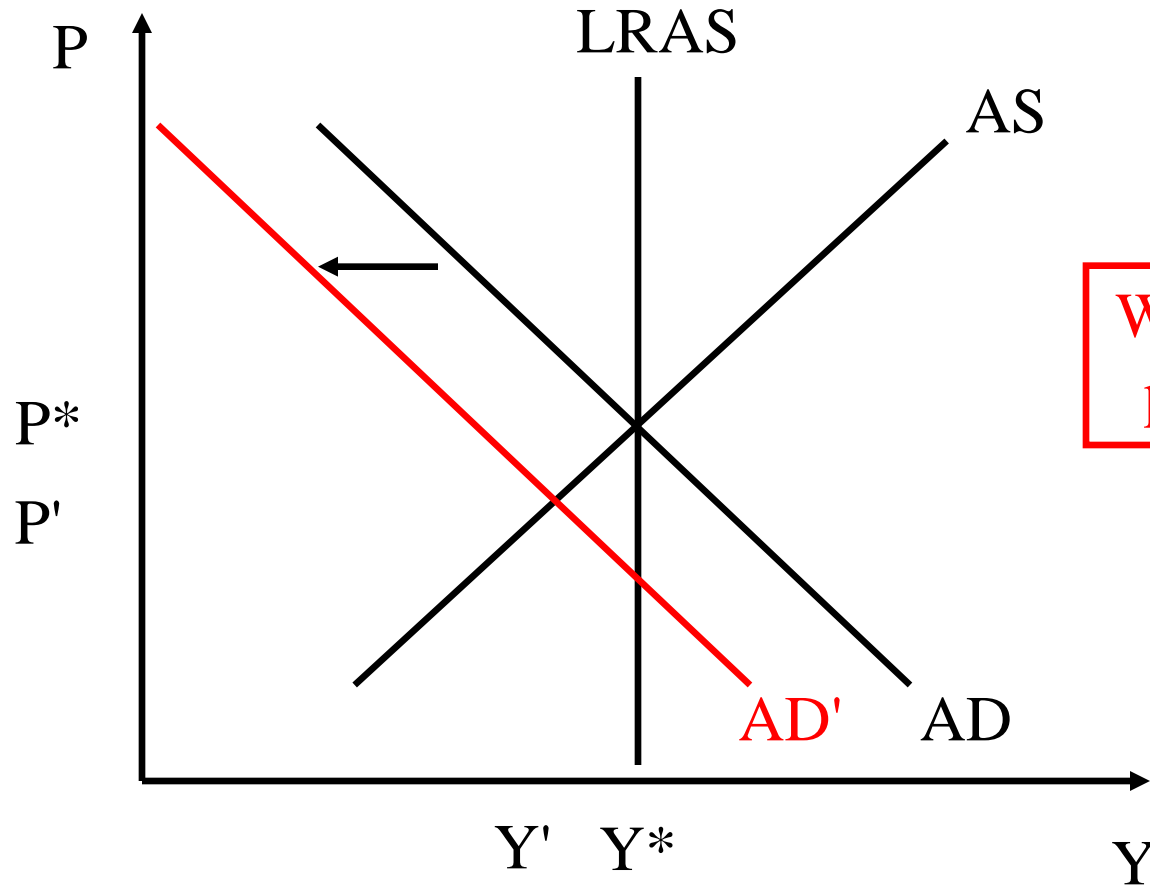
What should central banks do?

- What are our goals?
 - Low, predictable, inflation (stable prices)
 - Output near “potential output” Y^*
- How should we respond to demand shocks?
- How should we respond to supply shocks?
- Tool: change interest rates (money supply) to move AD

Aggregate supply and demand

- What's an example of an adverse demand shock?
- What is its impact?
- How should we respond?

Adverse demand shock

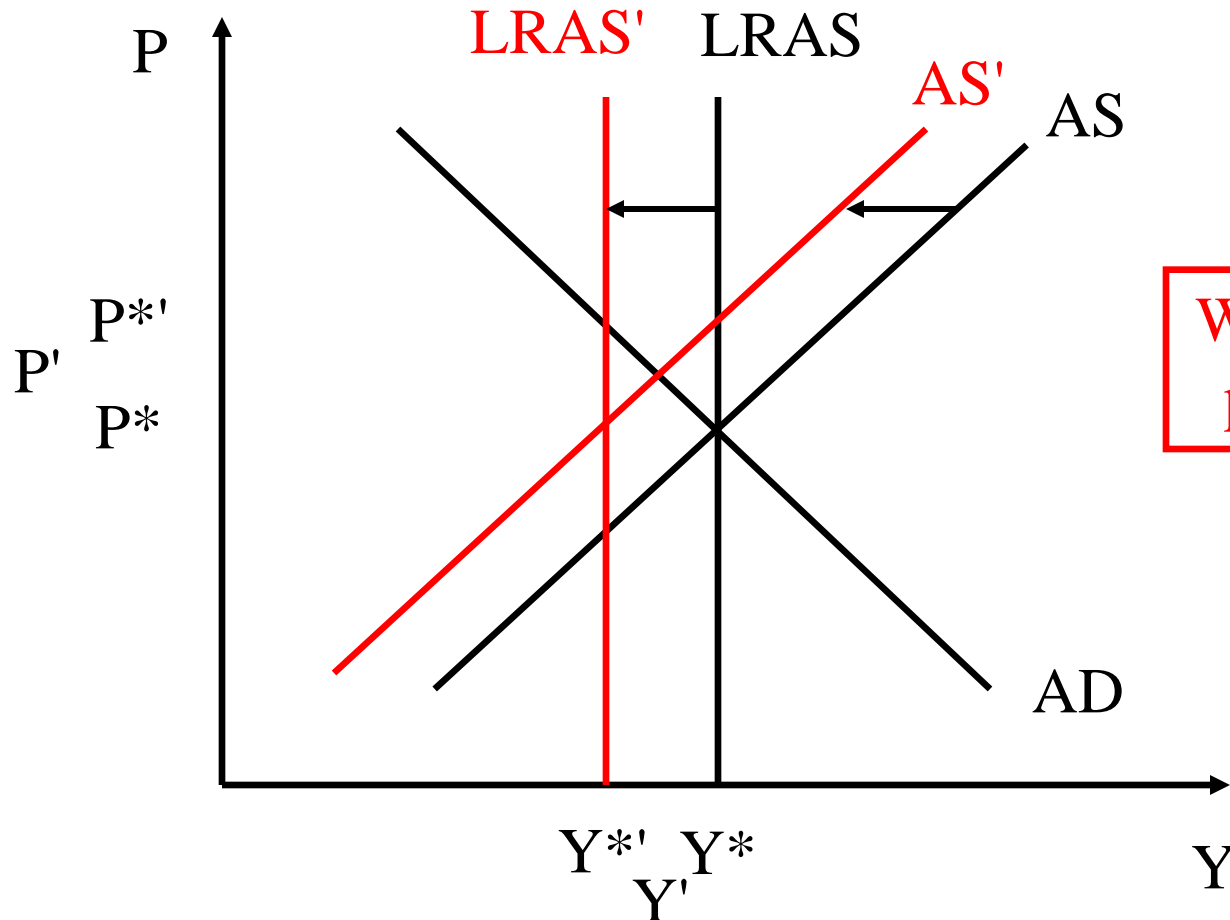


What should
policy do?

Aggregate supply and demand

- What's an example of an adverse supply shock?
- What is its impact?
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Adverse supply shock



What should
policy do?

Summary: monetary policy + AS/AD

- How should we respond to demand shocks?
 - *Resist* demand shocks
- How should we respond to supply shocks?
 - *Accommodate* supply shocks
- Or
 - Do nothing: how do you know it is a supply shock? A demand shock?

The policy mechanism

- In response to a shock:
 - Change the supply of reserves to banks
 - Which changes interest rates
 - Which shifts AD
 - Which impacts prices, output
- Conventional monetary policy works through interest rates. How does the central bank influence interest rates?

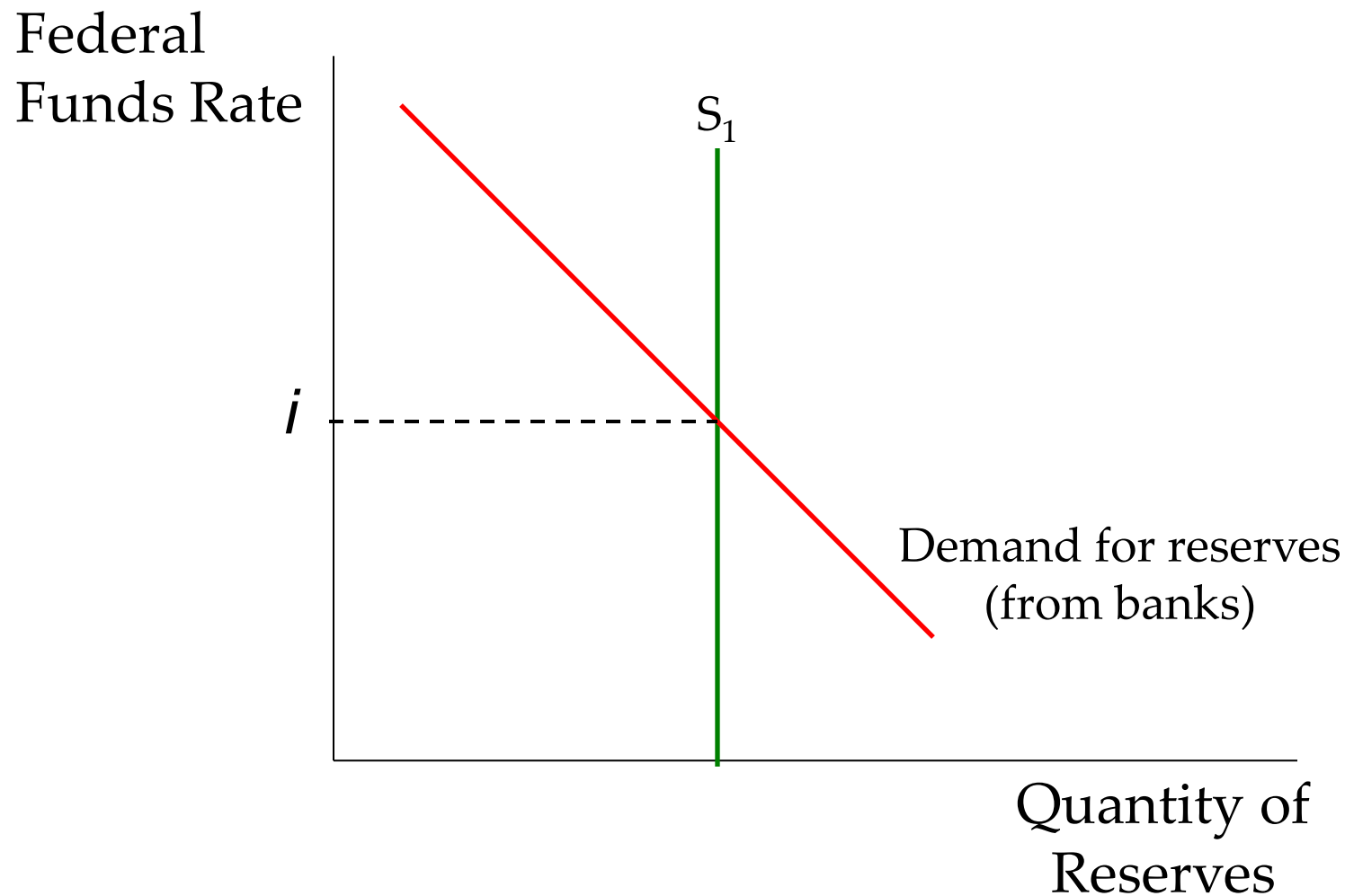
Central banking goals

- Reminder: What are our goals?
 - Low, predictable, inflation (stable prices)
 - Output near “potential output” Y^*
- How does the Fed try to achieve these goals?
- By managing interest rates
 - Directly manages the overnight rate paid on reserves
 - Indirectly manages longer term rates

Recap: the market for reserves

- Fed buys and sells securities to provide *reserves* to the banking system
 - Fed is monopoly supplier of aggregate reserves to banks
 - Banks hold a portion of deposits as reserves with the Fed (the Fed is the bank for banks)
 - At the end of the day, if a bank is low on reserves, it borrows from a bank with excess reserves.
 - This interbank lending market keeps banks from having *collectively* to hold a lot of reserves to guard against a shortfall
 - The rate at which these overnight loans are made is the **federal funds rate**

The market for reserves



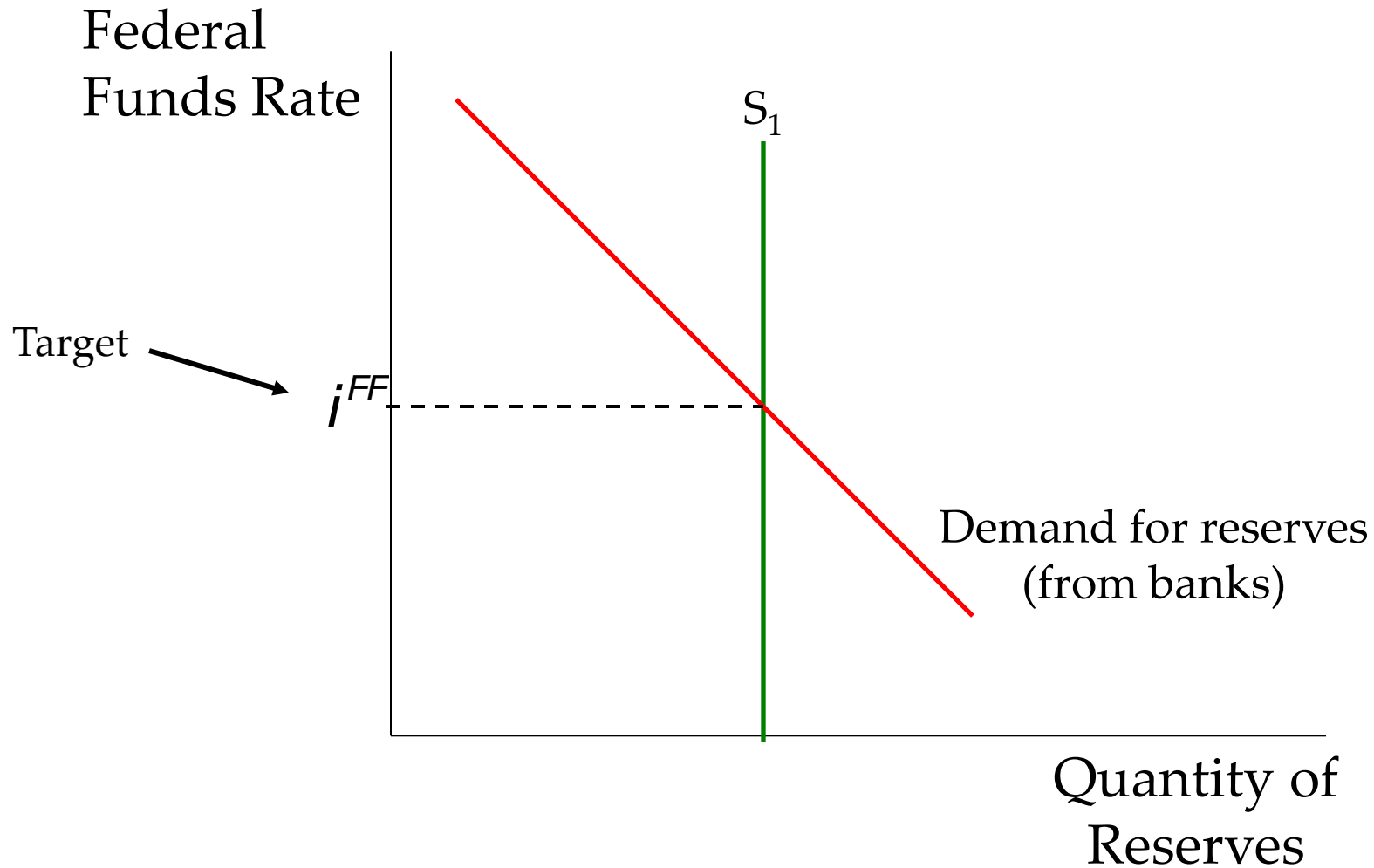
Managing the interest rate

- The Federal Open Market Committee sets a target for the federal funds rate
 - FFR: rate charged on overnight loans between banks
- The trading desk of the NY Fed uses open market operations to nudge the rate close to the target
 - Inject money: buy securities from banks for “money”
 - Extract money: sell securities to banks for “money”

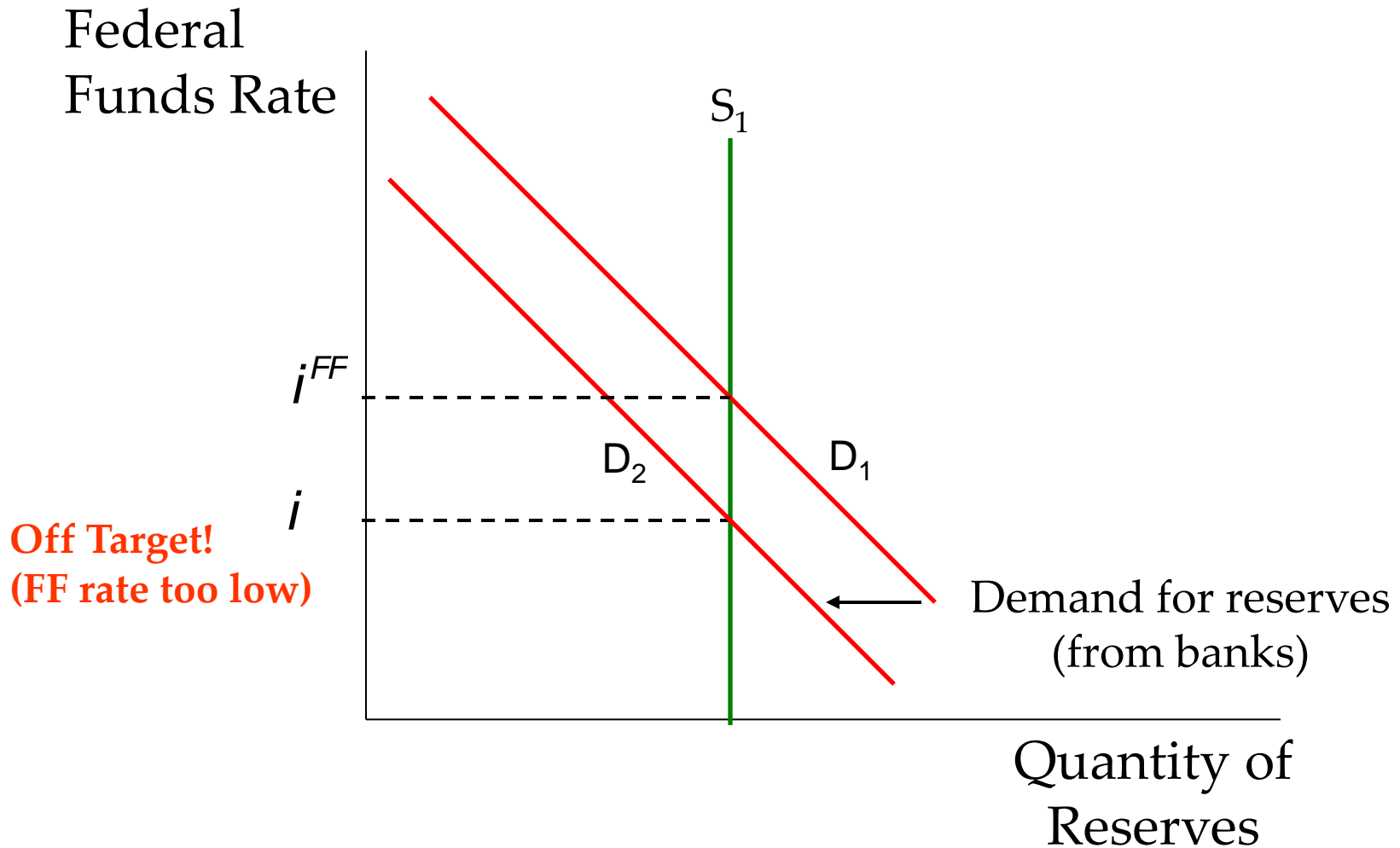
Policy tool vs target

- FOMC chooses a federal funds rate
- But, the federal funds rate is not perfectly implemented! It is a *target*.
- Rather than “legislate” the federal funds rate, the Fed buys and sells securities in the open market to try and hit its federal funds rate target
 - Fed controls the supply of reserves
 - Increase or decrease the supply to hit the target federal funds rate

Hitting target rate



Movements in reserve demand

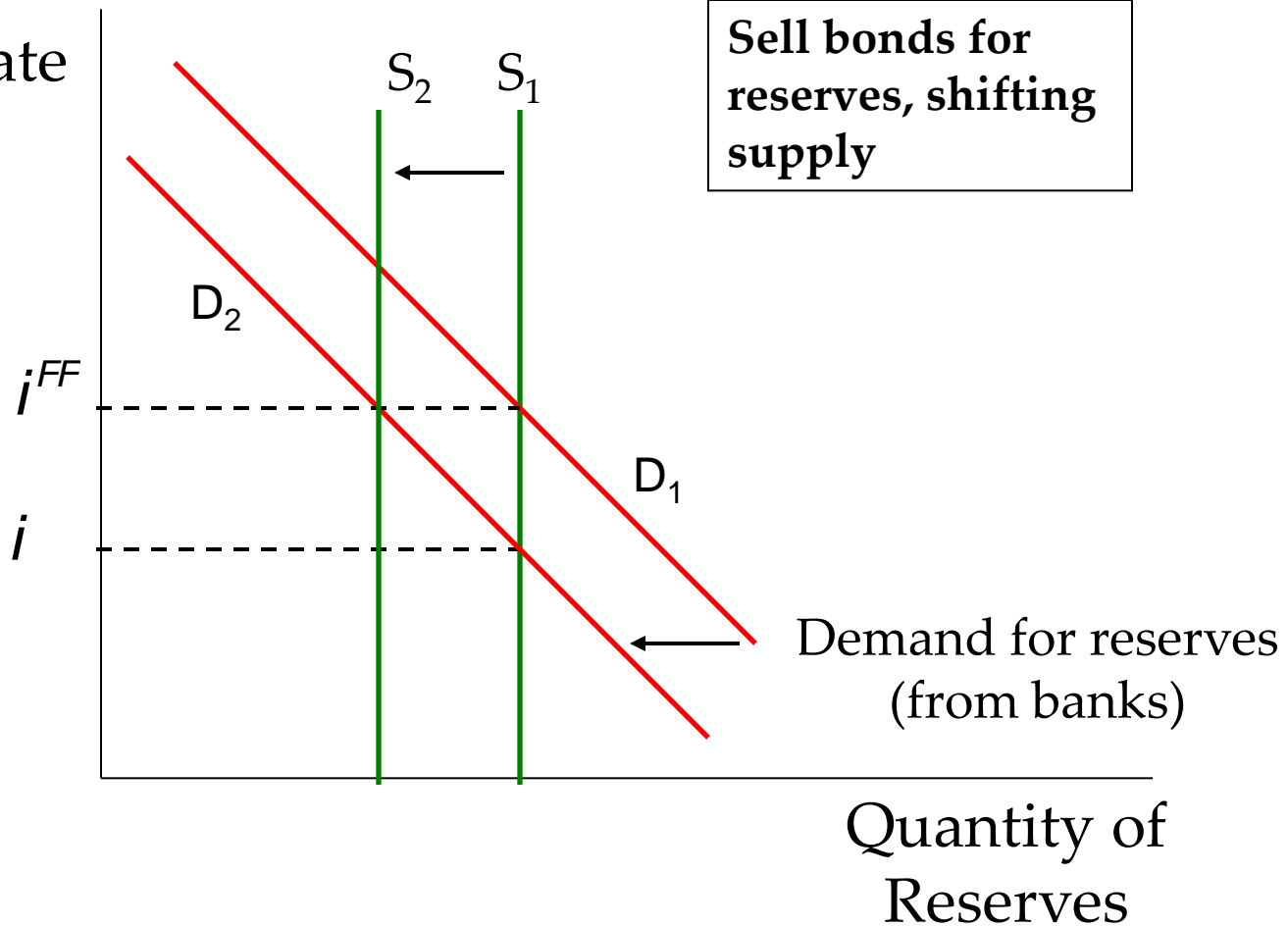


Movements in reserve demand

Federal
Funds Rate

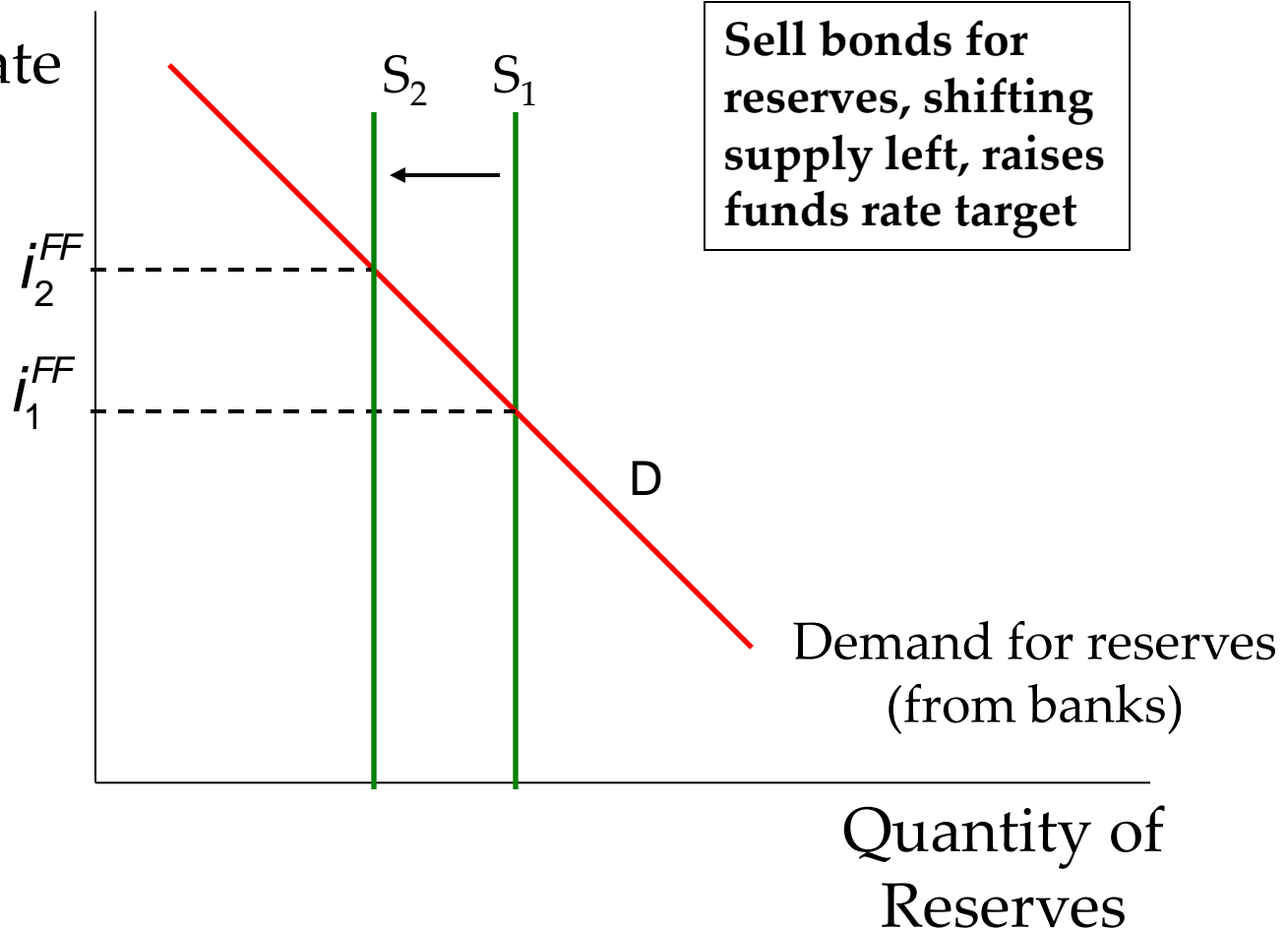
Sell bonds for
reserves, shifting
supply

Back to target!



Raising the Federal Funds Rate

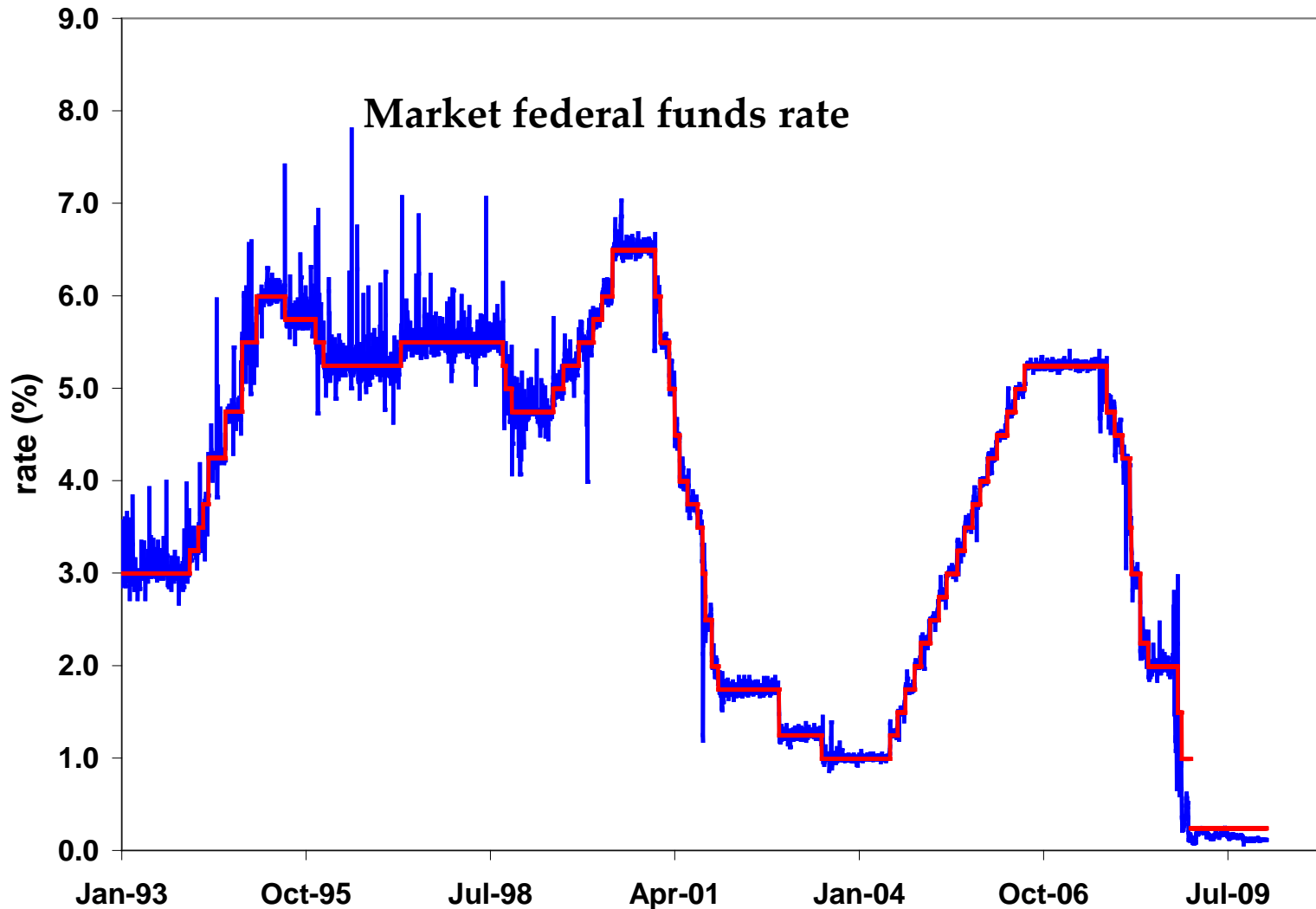
Federal
Funds Rate



Hitting the target federal funds rate

- Open market operations change the supply of reserves to banks to keep the market federal funds rate close to the target
- Decreasing the supply of reserves raises interest rates, lowers the money supply
- Increasing the supply of reserves lowers interest rates, increases the money supply
- Demand for reserves is constantly fluctuating
 - How easy is it to hit the target?

Hitting the target federal funds rate



Long term interest rates: managing expectations

- The Fed directly controls a very short term rate
 - But, the overnight rate, per se, doesn't shift AD
 - Long rates and other asset prices matter more than short rates
- How can the central bank affect long term rates?
 - Long term rates (and long-term assets generally) reflect expectations about future short term rates
- Correct market expectations make policy **more effective**.

Long term interest rates: managing expectations

- Old CB approach: “Never explain, never excuse”
 - Fear of diminished “operational flexibility”
 - Announcement requirement could impede policy
- New approach: Talking about policy is part of making policy (guide expectations).
 - Similar to a firm giving “guidance” to analysts and shareholders
- Bernanke (2004):

“If effective communication can help financial markets develop more accurate expectations of the likely course of the funds rate, policy will be more effective.”

Why not use a rule?

- If stable expectations are important
 - Announce a rule the central bank will follow
 - Predictable, stable, hard to secretly deviate
- US Federal Reserve
 - Rule doesn't allow for necessary discretion
 - Yet, Fed still acts much like it follows a rule
 - Call it “rule-like” behavior

Modeling Ben Bernanke

- Taylor Rule: relate prices and output to central bank policy

$$i_t^{FF} = r^{FF} + \pi_t + a_1(\pi_t - \tilde{\pi}) + a_2(y_t - y_t^*)$$

- i_t^{FF} is the federal funds rate set by the Fed
- r^{FF} is the real interest rate consistent with long run
- π_t is the current inflation rate
- $\tilde{\pi}$ is the target inflation rate
- y_t is current output
- y_t^* is long-run output

How much inflation is OK?

- Either informally, or formally, central banks have values for growth and inflation that are “comfortable”
 - US “mandate-consistent inflation rate”: about 2%
 - Output: close to long-run or “potential” output
- These values differ across central banks
- Central banks also differ on how much they are willing to deviate from inflation or output goals in the short run

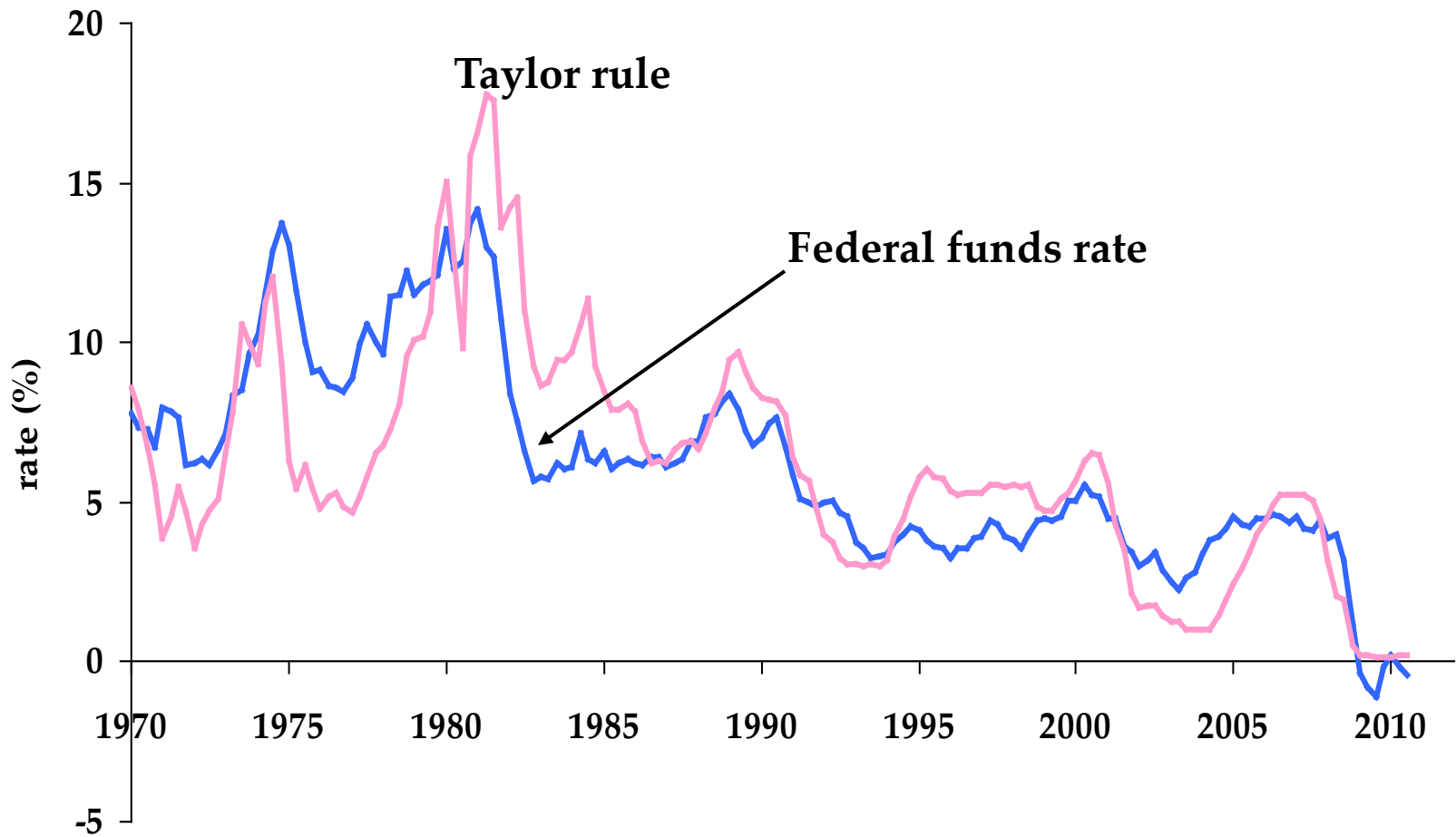
Taylor rule

- Use historical data to find a_1 , a_2 with a regression

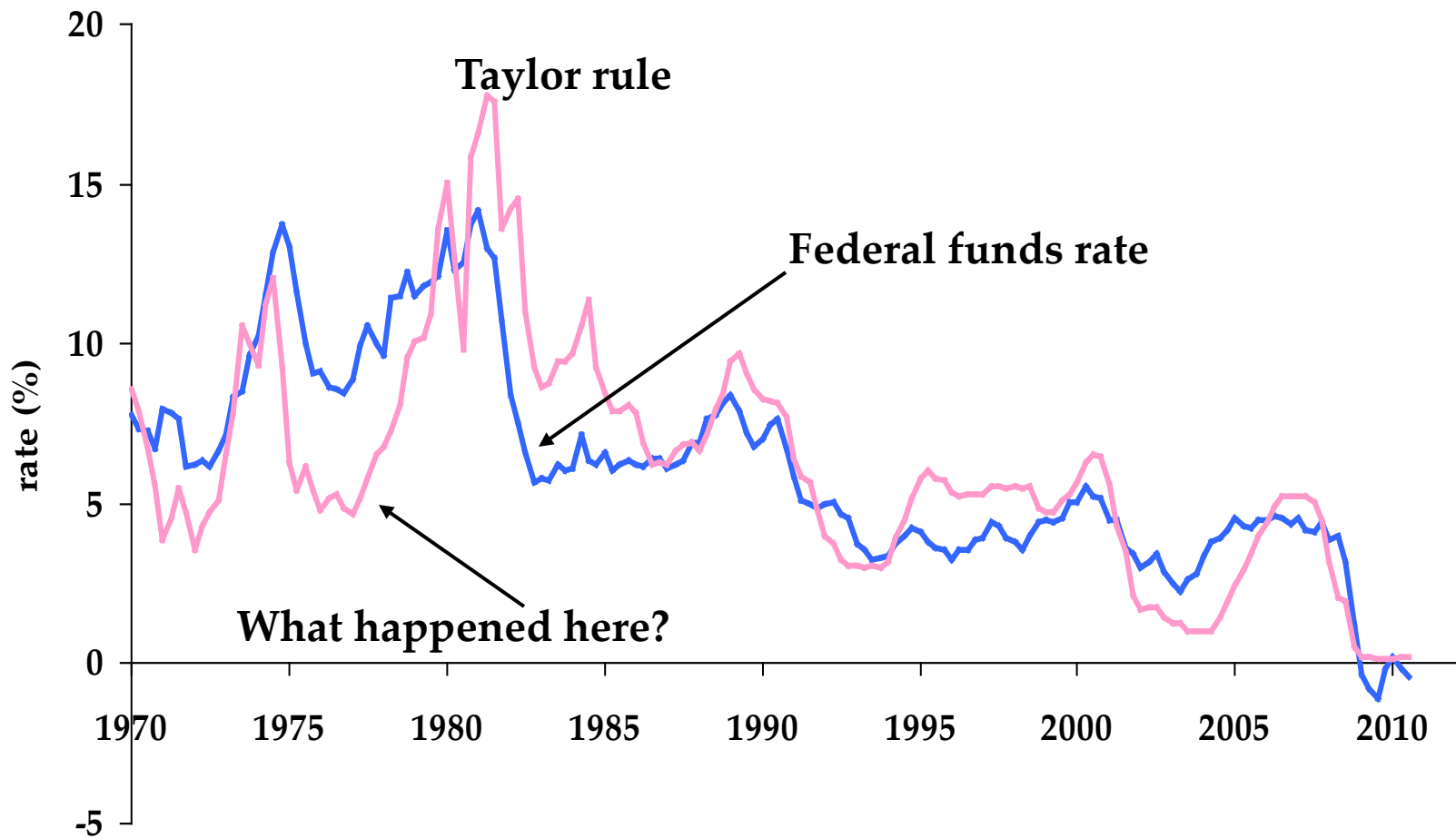
$$i_t^{FF} = 2 + \pi_t + 0.5(\pi_t - 2) + 0.5(y_t - y_t^*)$$

- What does a bond trader expect if
 - Inflation is 1%, output at potential?
 - Growth accelerates by 1%, inflation at target?

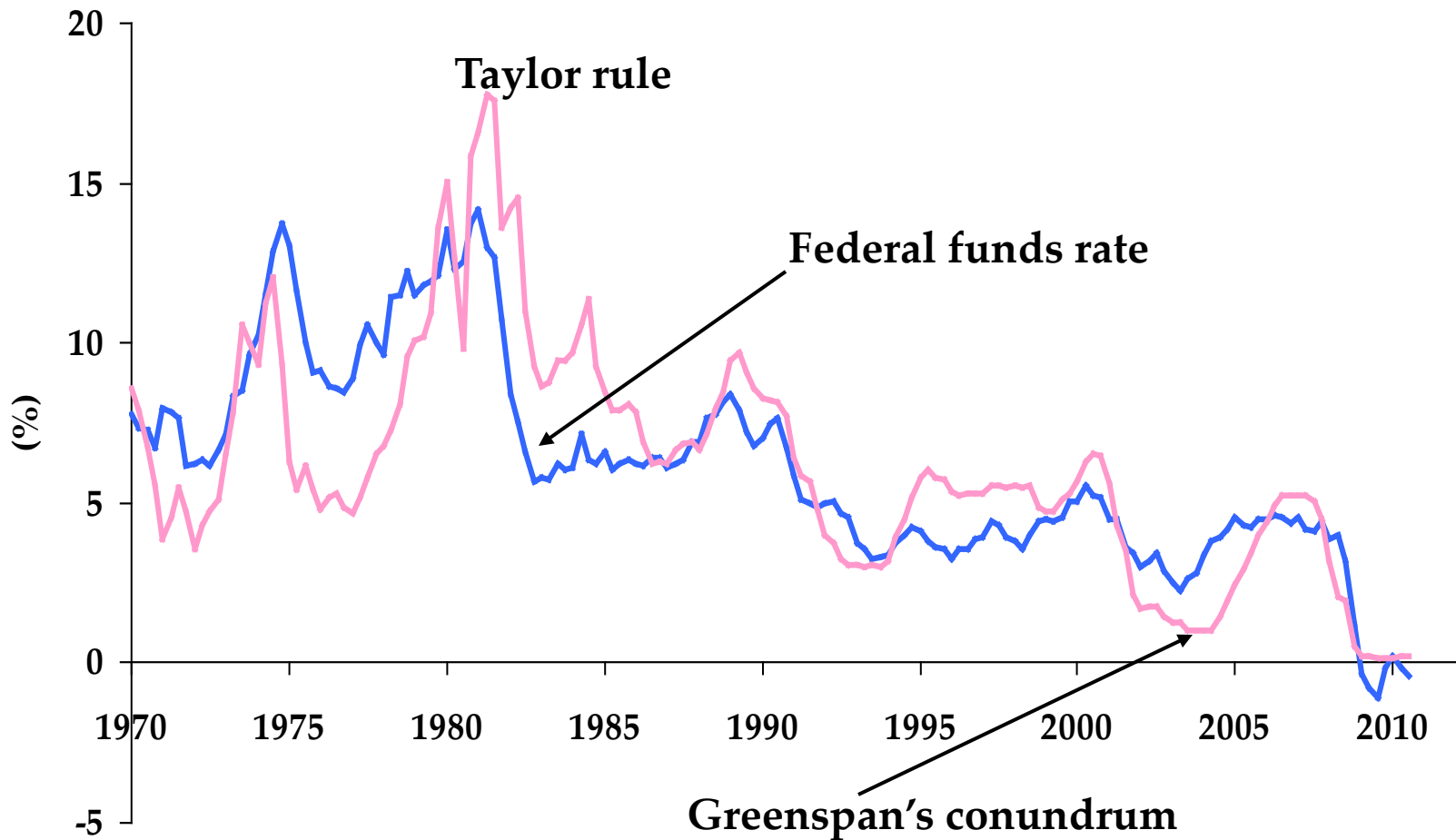
Taylor rule



Taylor rule: 1970s



Taylor rule: 2002-05



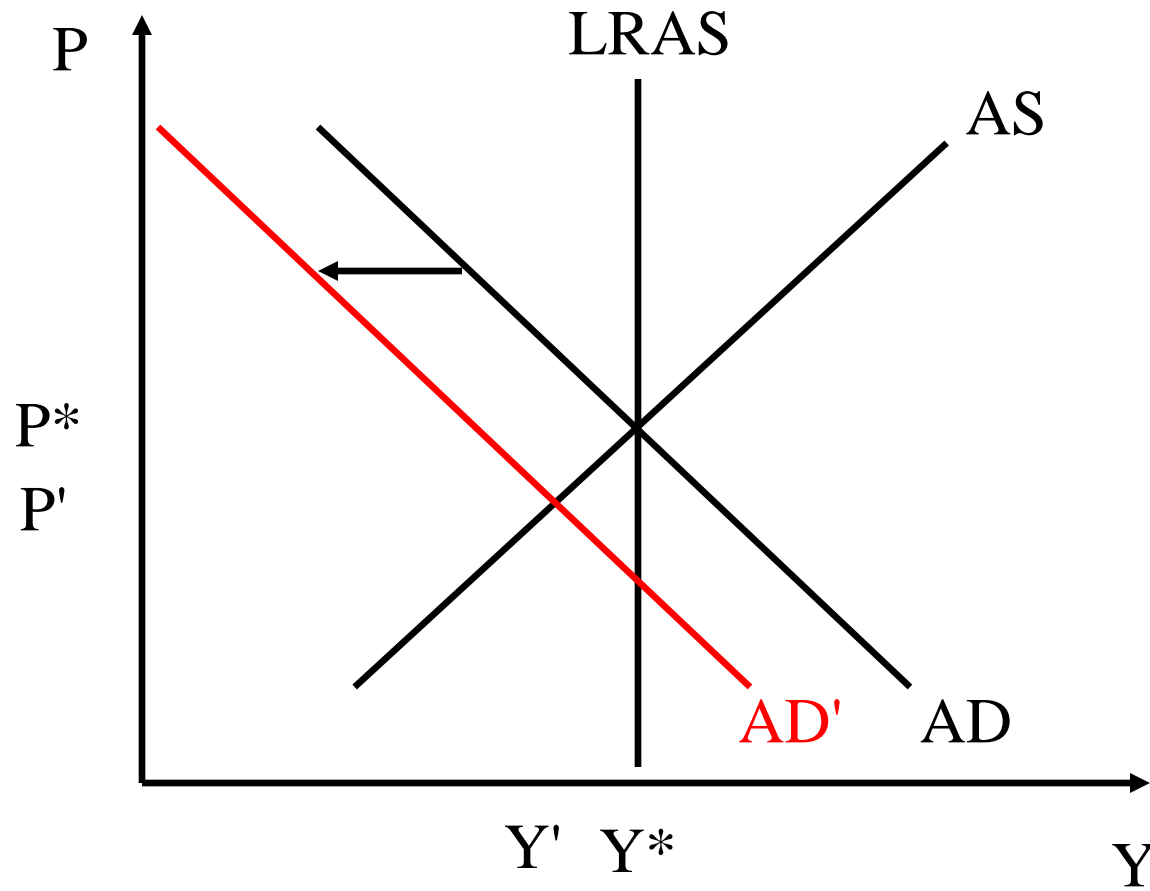
Taylor rule: interpreting the past

- 1970s
 - Interest rate too low, try to end recessions
 - Inflation trended higher
- 1985-2006
 - Great Moderation
- 2002-2005
 - Low rate: avoid deflation after tech crash and 9/11
 - Aggravates the housing bubble?
- 2008-2010
 - Nominal interest rate should be negative!
 - Need unconventional policy: more on that later

Putting it all together

- How does the interest rate respond to an adverse demand shock?
 - Use the Taylor Rule
- What does the Fed do to change interest rates?
 - How is the market for reserves changed?
 - What happens to the money supply?
- What is the impact of the Fed's actions on the economy?
 - Use AS/AD analysis
- What about a positive demand shock?

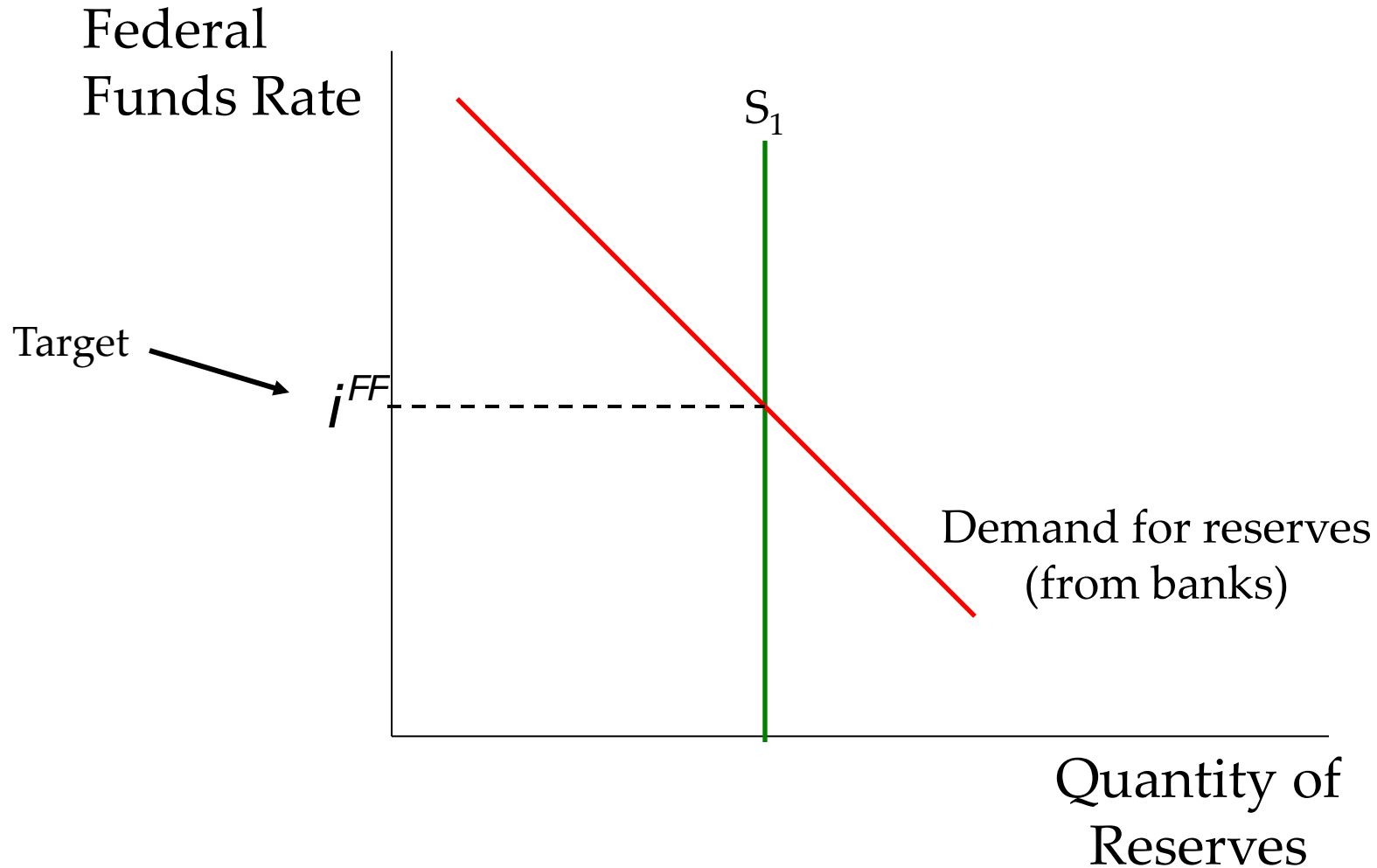
Adverse demand shock: AS/AD



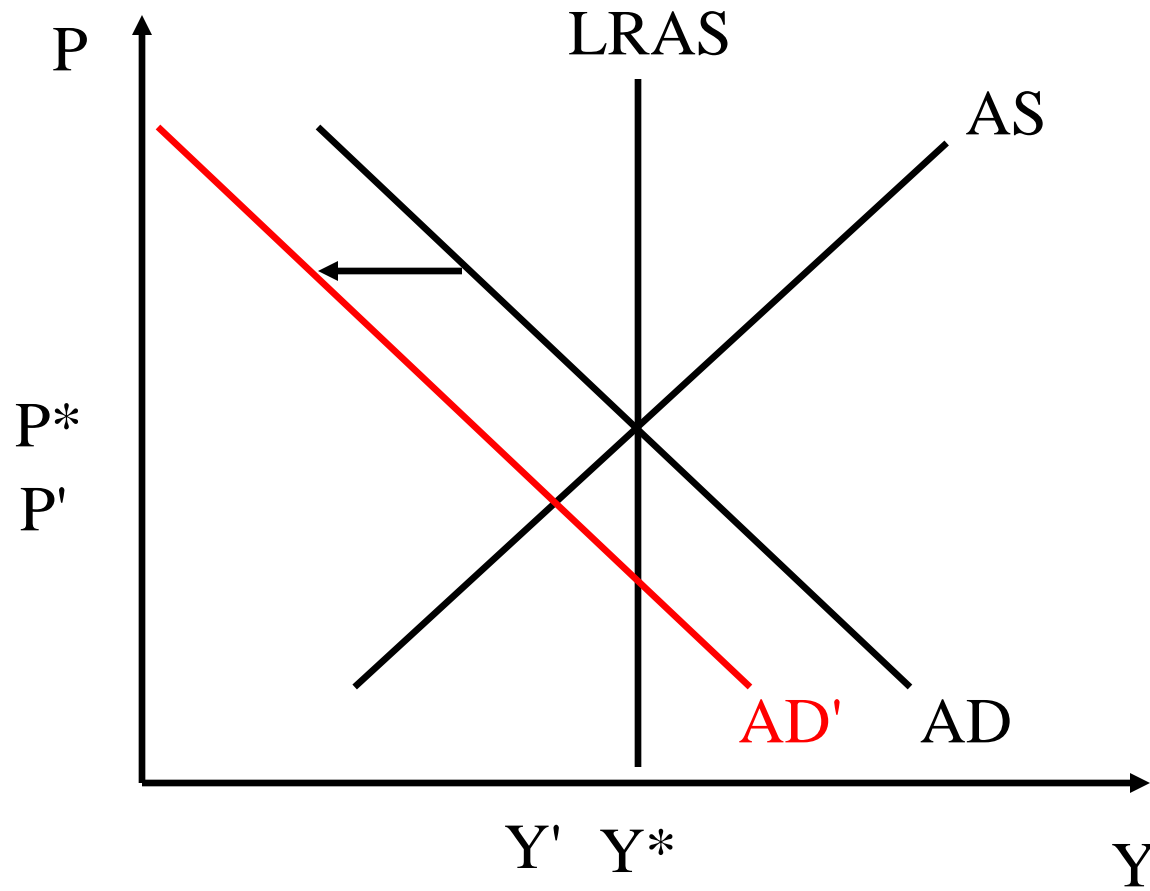
Adverse demand shock: Taylor rule

$$i_t^{FF} = 2 + \pi_t + 0.5(\pi_t - 2) + 0.5(y_t - y_t^*)$$

Adverse demand shock: market for reserves



Adverse demand shock: AS/AD



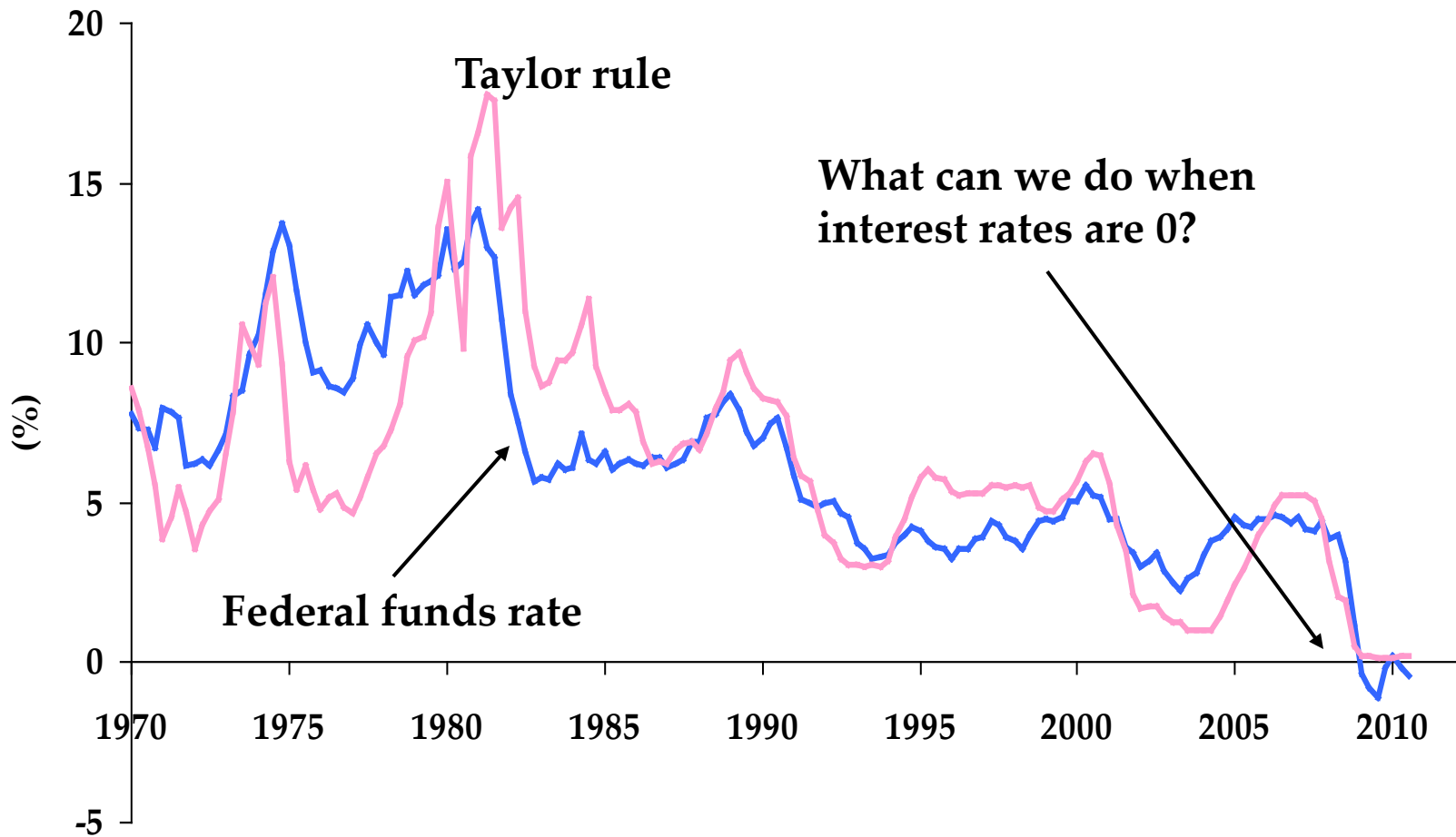
Summary: conventional policy

- The Fed manages the interest rate that banks charge for overnight loans: the federal funds rate
 - Open market operations consist of buying and selling treasury bills to increase or decrease the supply of reserves to this market
- The Fed manages longer term rates through expectations
 - Greater transparency in policy makes policy more effective
- As the Fed has improved its ability to conduct policy, business cycle volatility has fallen
 - Well, except recently...

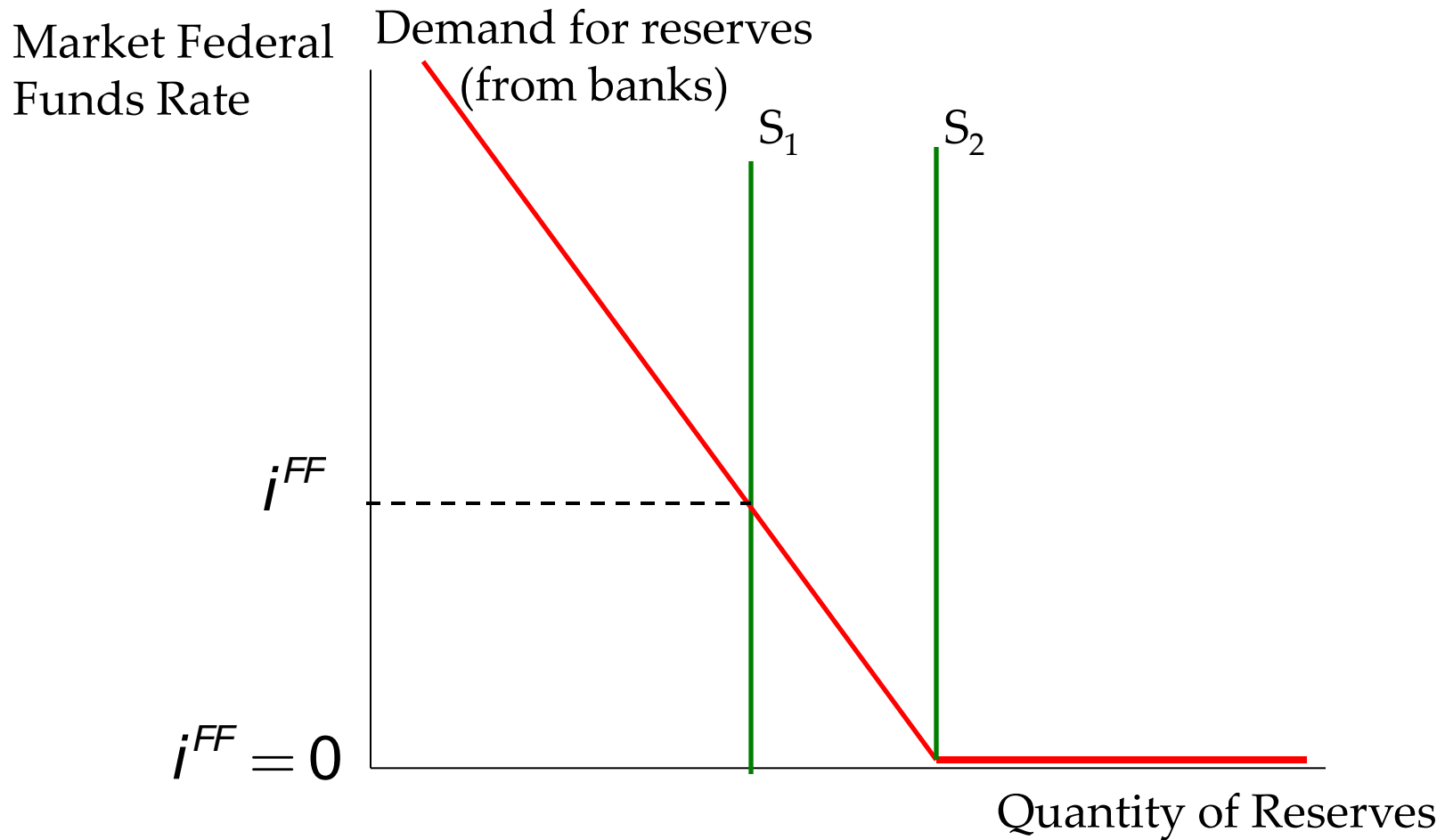
Unconventional policy

- What happens when the conventional policy instrument (i.e. the federal funds rate) can not be lowered further?
- Interest rates cannot go below 0
 - Banks would rather hold reserves than make loans at a negative interest rate
 - Econ-speak: “the zero lower bound”

Unconventional policy



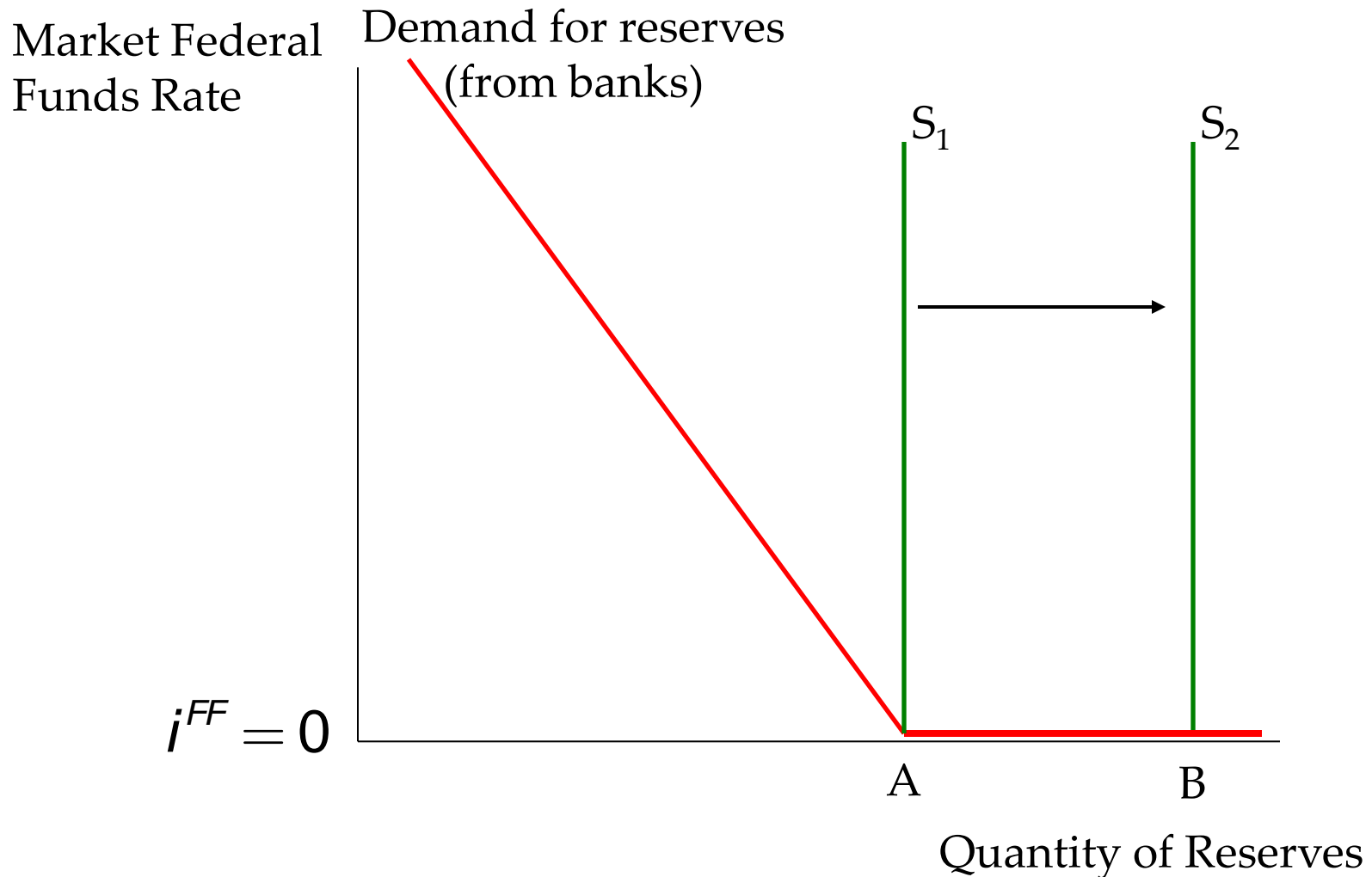
The zero lower bound on interest rates



Zero lower bound on nominal interest rates

- Nominal interest rates cannot go below zero
 - Banks, firms, people, *would rather hold cash*.
- There is a level of reserve supply for which the federal funds rate is zero
- The Fed can increase reserves to banks past this level without having any impact on the federal funds rate
 - This is **Quantitative Easing**
 - The difference between A and B on the following graph is the amount of quantitative easing.

Quantitative easing



QE vs CE

Impact on the Fed's Balance Sheet

Quantitative Easing

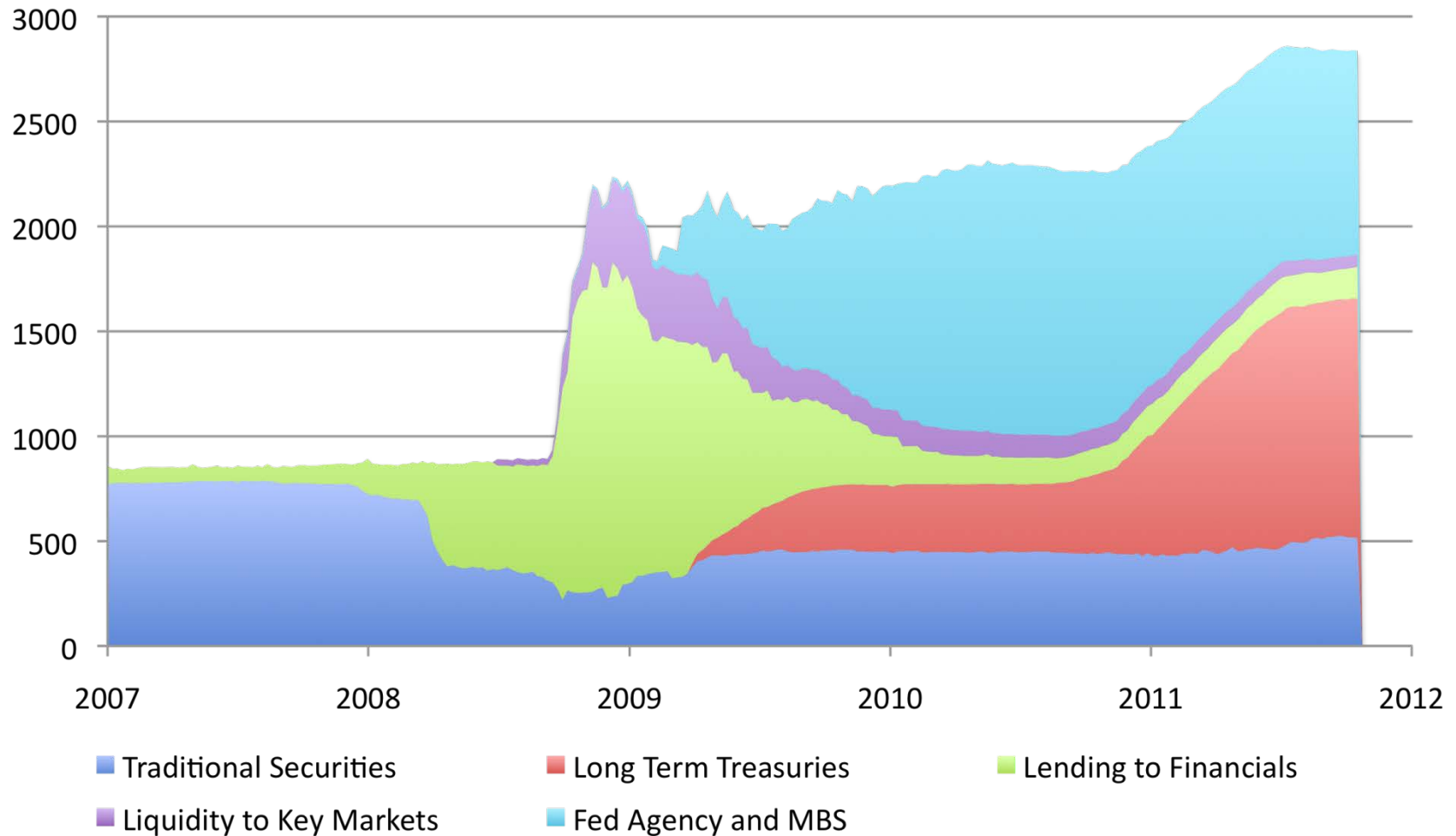
Assets	Liabilities
Treasury bonds (+\$1 billion)	Reserves (+\$1 billion)

Credit Easing

Assets	Liabilities
3-month Treasury bills (−\$1 billion) Mortgage-backed securities (+\$1 billion)	

Unconventional Monetary Policy

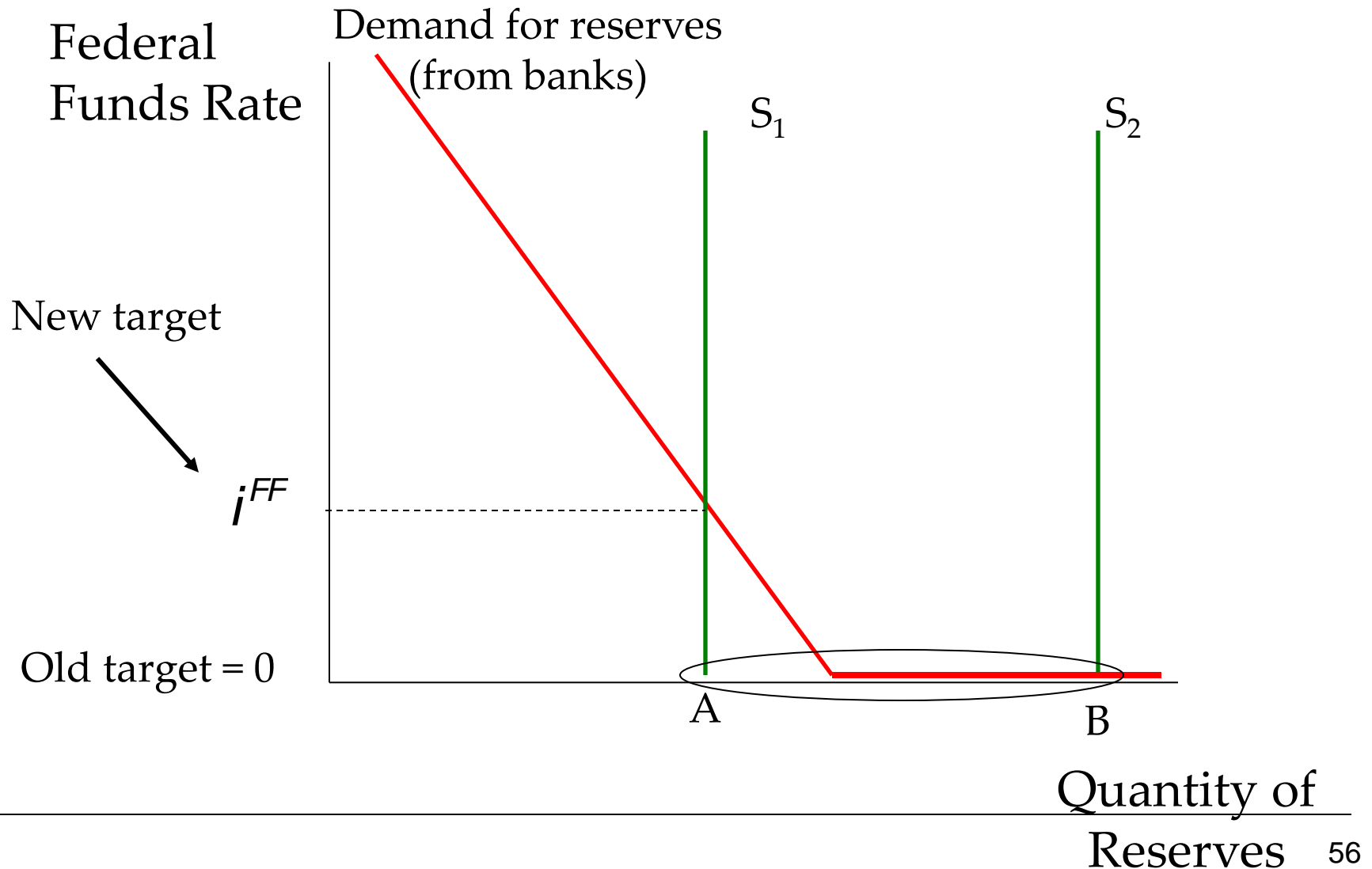
Billions of Dollars



Exiting QE

- Suppose
 - Output starts growing
 - Inflation starts rising
- How do we exit QE?
 - Need to start increasing FF target rate
- Sell all of the assets acquired during QE?
 - All at once? What happens to asset prices?
- Use another unconventional policy
 - Pay interest on reserves

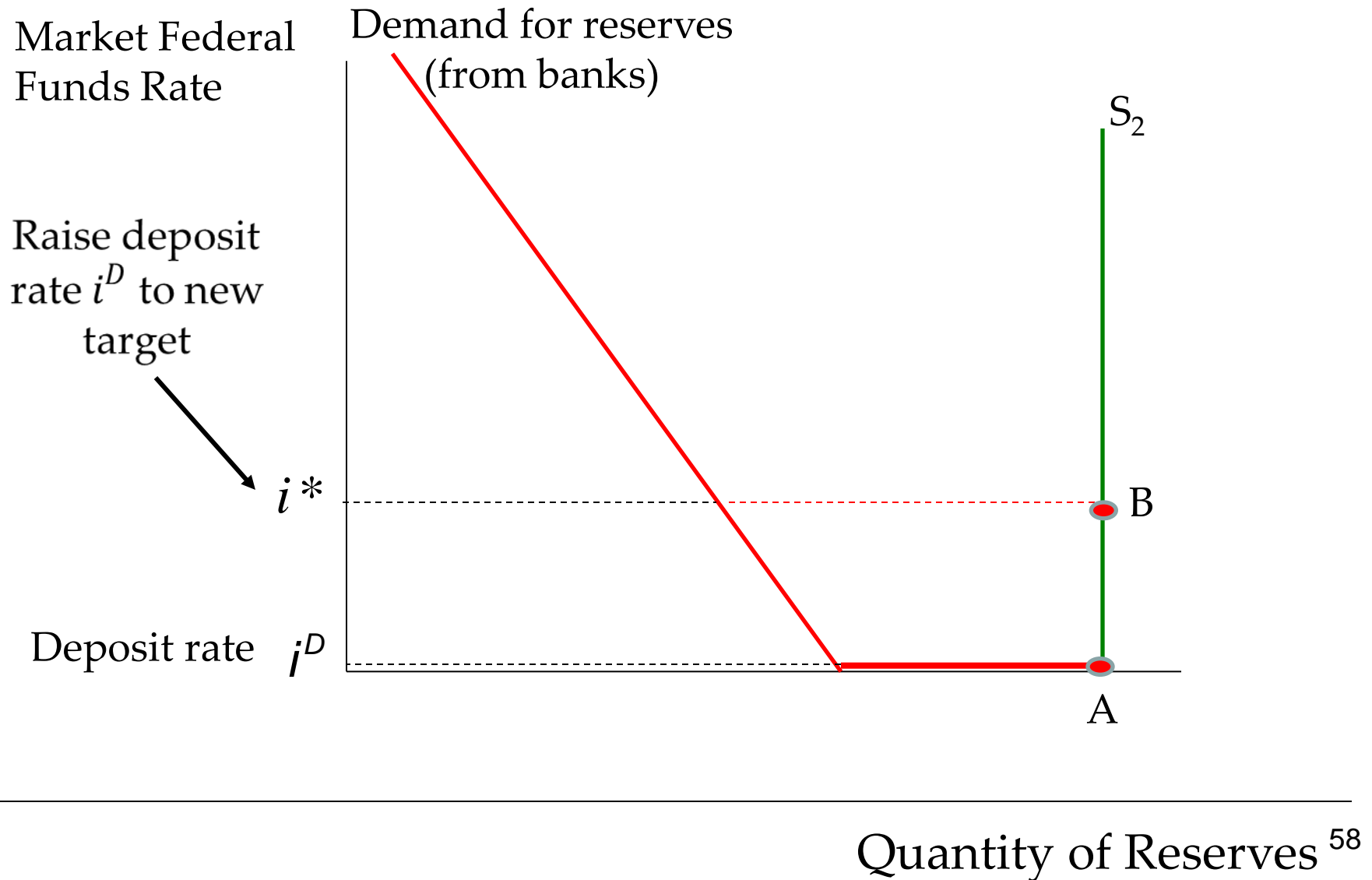
Exiting quantitative easing



Exiting QE

- Another unconventional policy
 - Pay interest on reserves
 - New Fed policy tool (part of TARP: Oct 2008)
- Demand for reserves becomes kinked at the deposit rate
 - Banks will not make a loan at less than the riskless reserve deposit rate (imagine paying interest on cash)
- Disconnects reserves and federal funds rate
 - Interest rates increase, even though quantities have not decreased
 - Give Fed time to slowly unwind balance sheet

Exiting quantitative easing



Monetary policy summary

- Monetary policy affects
 - Inflation
 - Output in the short run
- Central banks change the money supply with purchases and sales of government bonds
- In theory, central banks should resist demand shocks and accommodate supply shocks
 - **If you can tell them apart!**

Conventional monetary policy summary

- Monetary policy has
 - Long-run impact on prices/inflation
- Most central banks focus on short-term interest rates
 - Increase in rate implies fall in money
- Taylor rule ties interest rate to inflation and output
 - Policy is predictable
 - Strong output growth and high inflation trigger increases in interest rates
 - Long-term rates depend on expectations of future inflation and output

Unconventional monetary policy summary

- At the “zero lower bound” managing the federal funds rate isn’t an option
 - Nominal interest rates can’t go significantly below 0
- Quantitative easing is increasing the quantity of reserves past the amount necessary to hit the target federal funds rate (usually zero when QE is used)
- Credit easing alters the mix of the Fed’s balance sheet toward riskier, less liquid assets
- Mechanisms to exit quantitative easing
 - Sell all the assets accumulated: may not be feasible
 - Pay interest on reserves