Chapter 12: Aggregate Demand II – Applying the *IS-LM* Model

Context

- Chapter 10 introduced the model of aggregate demand and supply.
- Chapter 11 developed the *IS-LM* model, the basis of the aggregate demand curve.
- In Chapter 12, we will use the *IS-LM* model to
  - see how policies and shocks affect income and the interest rate in the short run when prices are fixed
  - derive the aggregate demand curve
  - explore various explanations for the Great Depression

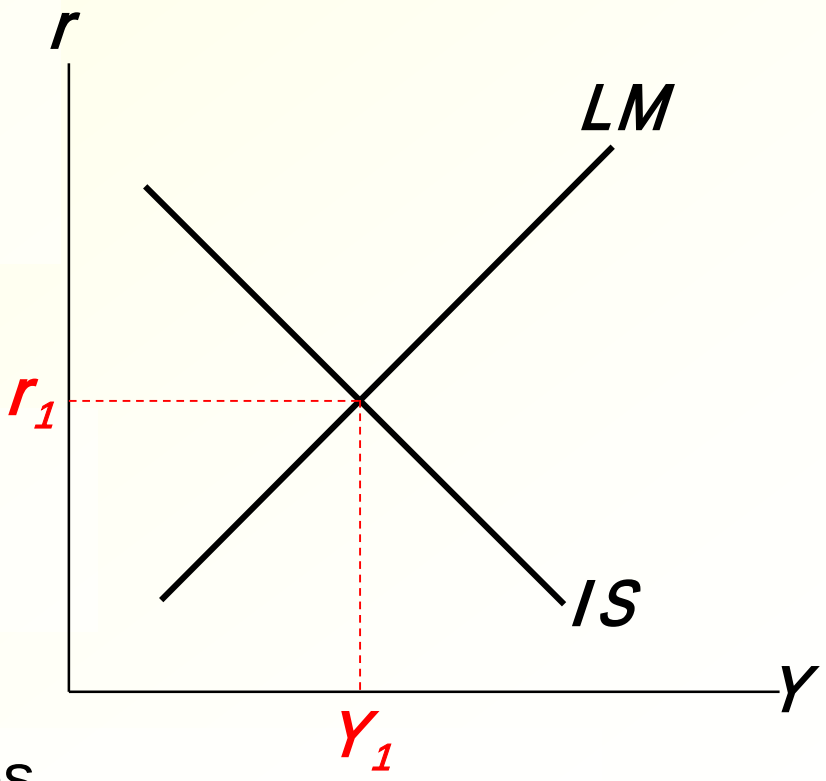
Equilibrium in the *IS-LM* Model

The *IS* curve represents equilibrium in the goods market.

$$Y = C(Y - \bar{T}) + I(r) + \bar{G}$$

The *LM* curve represents money market equilibrium.

$$\bar{M}/\bar{P} = L(r, Y)$$



The intersection determines the unique combination of ***Y*** and ***r*** that satisfies equilibrium in both markets.

Policy analysis with the *IS-LM* Model

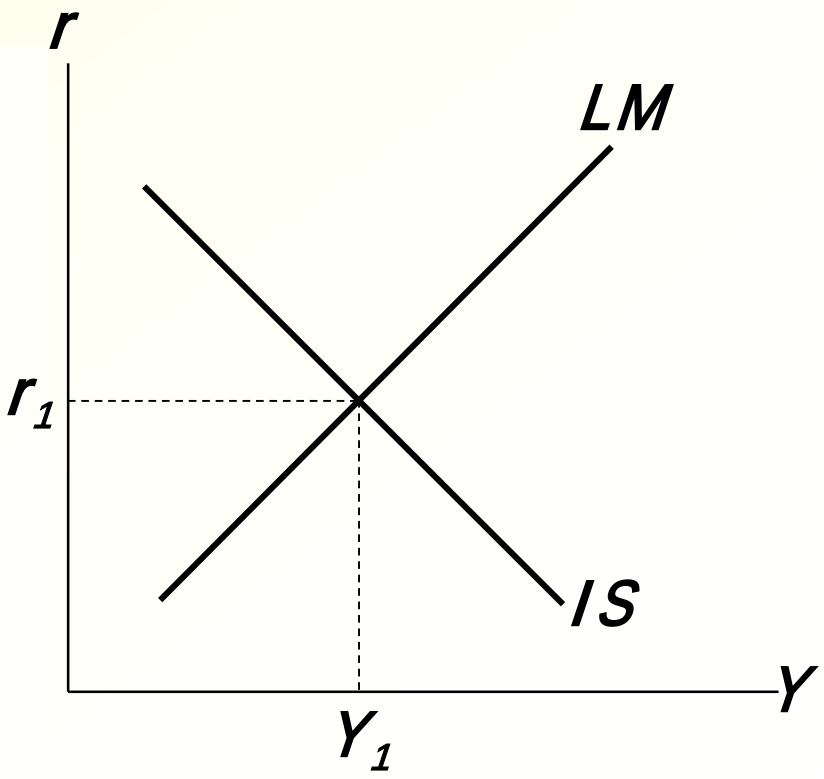
$$Y = C(Y - \bar{T}) + I(r) + \bar{G}$$

$$\bar{M}/\bar{P} = L(r, Y)$$

Policymakers can affect macroeconomic variables with

- fiscal policy: ***G*** and/or ***T***
- monetary policy: ***M***

We can use the *IS-LM* model to analyze the effects of these policies.



An increase in government purchases

1. *IS* curve shifts right

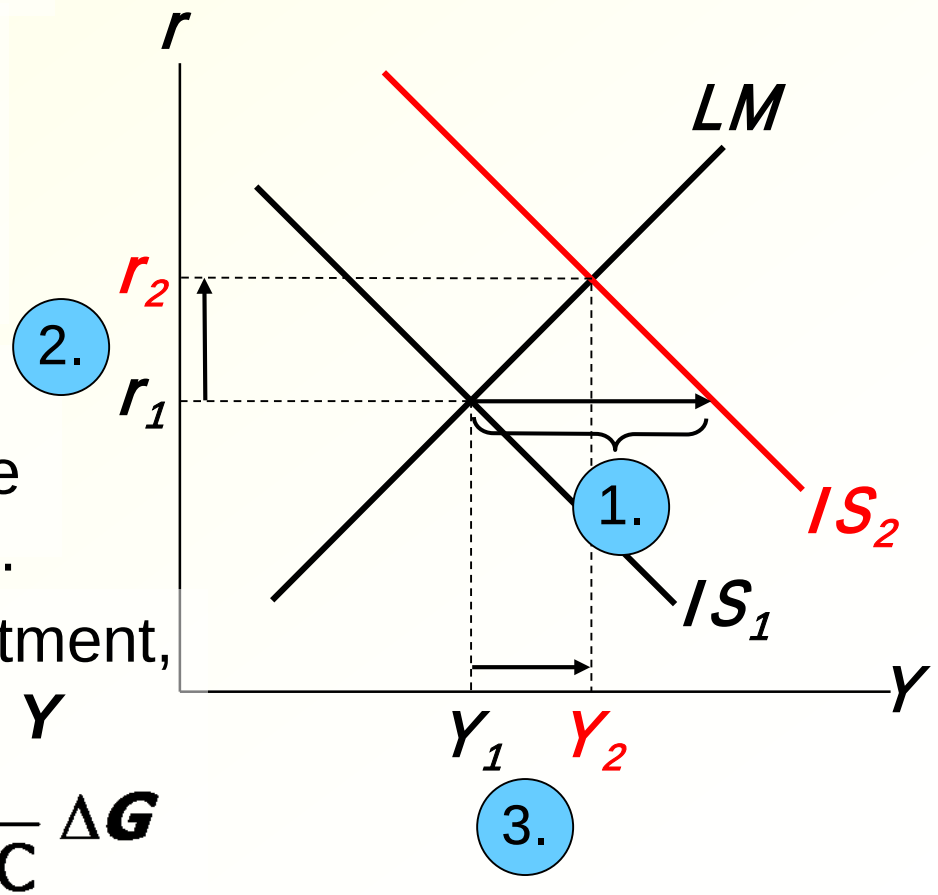
   by $\frac{1}{1-MPC}\Delta G$

   causing output & income to rise.

2. This raises money demand, causing the interest rate to rise…

3. …which reduces investment, so the final increase in Y

   is smaller than $\frac{1}{1-MPC}\Delta G$



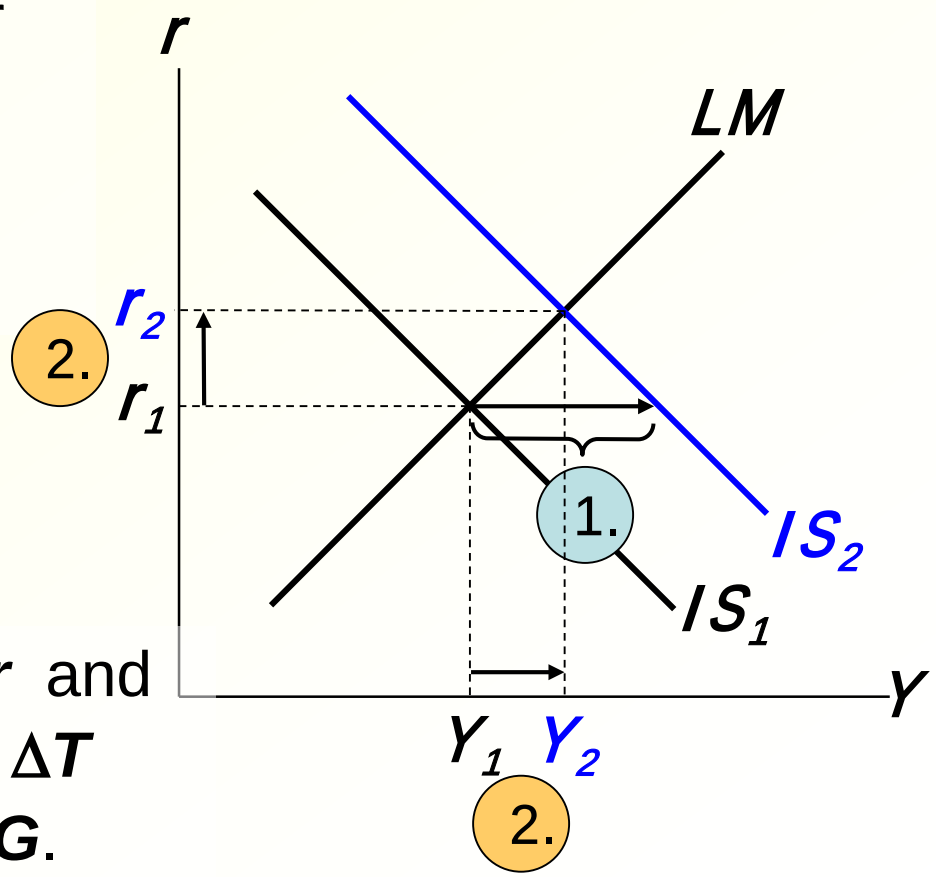
A tax cut

Because consumers save (1–MPC) of the tax cut, the initial boost in spending is smaller for ΔT than for an equal ΔG…

and the *IS* curve shifts by

1. $\dfrac{-\text{MPC}}{1-\text{MPC}}\,\Delta T$

2. …so the effects on r and Y are smaller for a ΔT than for an equal ΔG.

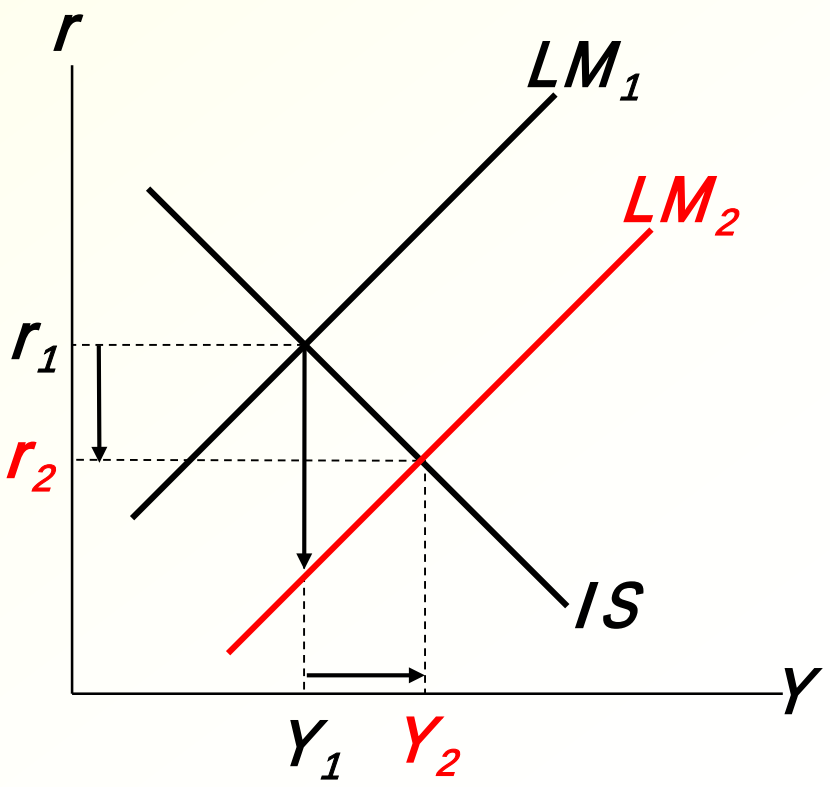


Monetary Policy: an increase in *M*

1. $\Delta M > 0$ shifts the *LM* curve down (or to the right)

2. …causing the interest rate to fall

3. …which increases investment, causing output & income to rise.



Interaction between monetary & fiscal policy

- Model:
  monetary & fiscal policy variables
  (***M***, ***G*** and ***T***) are exogenous
- Real world:
  Monetary policymakers may adjust ***M***
  in response to changes in fiscal policy,
  or vice versa.
- Such interaction may alter the impact of the original policy change.

The central bank's response to $\Delta G > 0$

- Suppose the government increases ***G***.
- Possible central bank responses:
  1. hold ***M*** constant
  2. hold ***r*** constant
  3. hold ***Y*** constant
- In each case, the effects of the ΔG are different:

Response 1: hold *M* constant

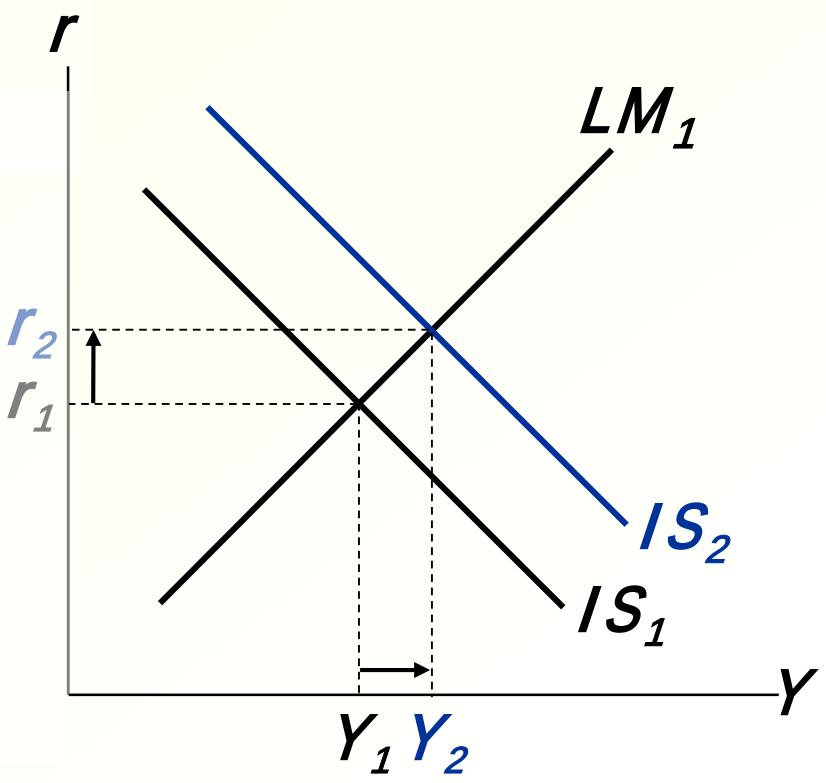
If the government raises ***G***, the *IS* curve shifts right

If the central bank holds ***M*** constant, then *LM* curve doesn't shift.

Results:

$$\Delta Y = Y_2 - Y_1$$

$$\Delta r = r_2 - r_1$$



Response 2: hold *r* constant

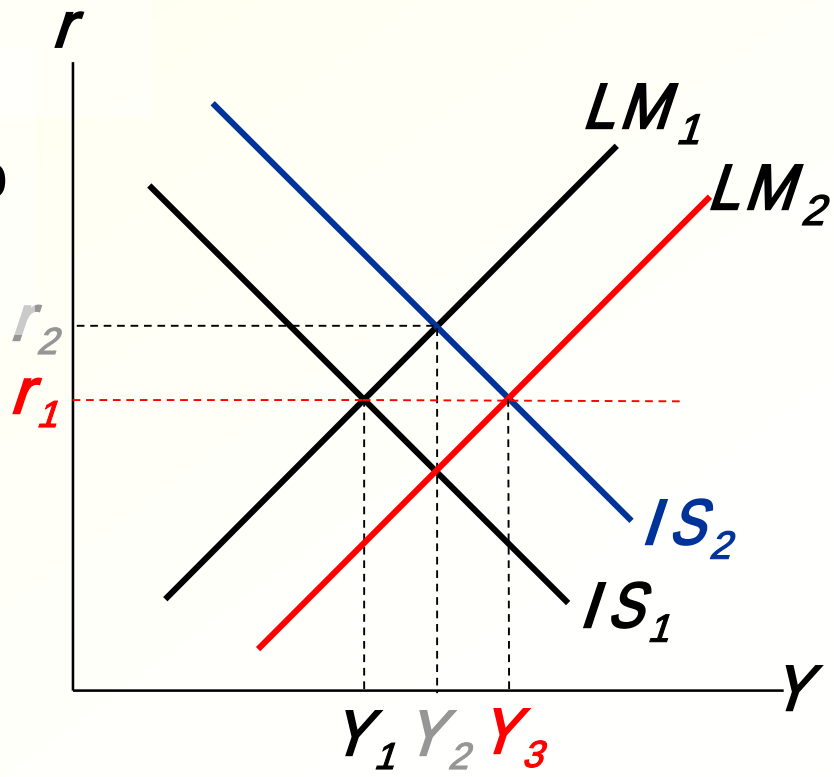
If the government raises ***G***, the *IS* curve shifts right.

To keep ***r*** constant, the central bank increases ***M*** to shift *LM* curve right.

Results:

$$\Delta \boldsymbol{Y} = \boldsymbol{Y}_3 - \boldsymbol{Y}_1$$

$$\Delta \boldsymbol{r} = 0$$



Response 3: hold *Y* constant

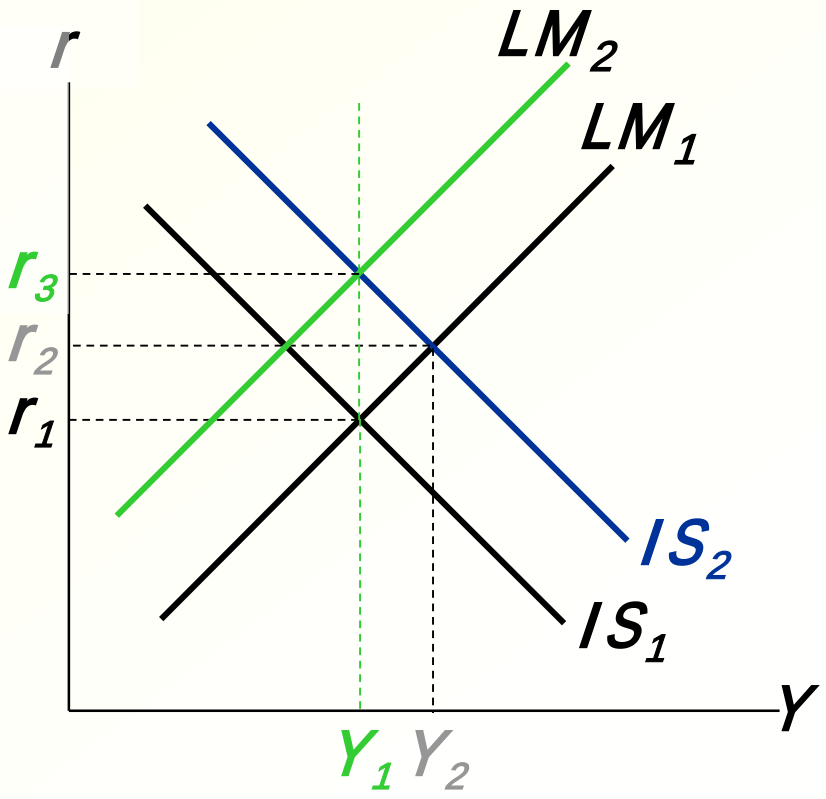
If the government raises ***G***, the *IS* curve shifts right.

To keep ***Y*** constant, the central bank reduces ***M*** to shift *LM* curve left.

Results:

$$\Delta Y = 0$$

$$\Delta r = r_3 - r_1$$



Shocks in the *IS-LM* Model

***IS* shocks**: exogenous changes in the demand for goods & services.

Examples:

- stock market boom or crash
  $\Rightarrow$ change in households' wealth
  $\Rightarrow \Delta C$
- change in business or consumer confidence or expectations
  $\Rightarrow \Delta I$ and/or ΔC

Shocks in the *IS-LM* Model

***LM* shocks**: exogenous changes in the demand for money.

Examples:

- a wave of credit card fraud increases demand for money
- more ATMs or the Internet reduce money demand

NOW YOU TRY

Analyze shocks with the *IS-LM* model

Use the *IS-LM* model to analyze the effects of

1. a housing market crash that reduces consumers' wealth
2. consumers using cash in transactions more frequently in response to an increase in identity theft

For each shock,

a. use the *IS-LM* diagram to determine the effects on ***Y*** and ***r*.**
b. figure out what happens to ***C***, ***I***, and the unemployment rate.

ANSWERS, PART 1

Housing market crash

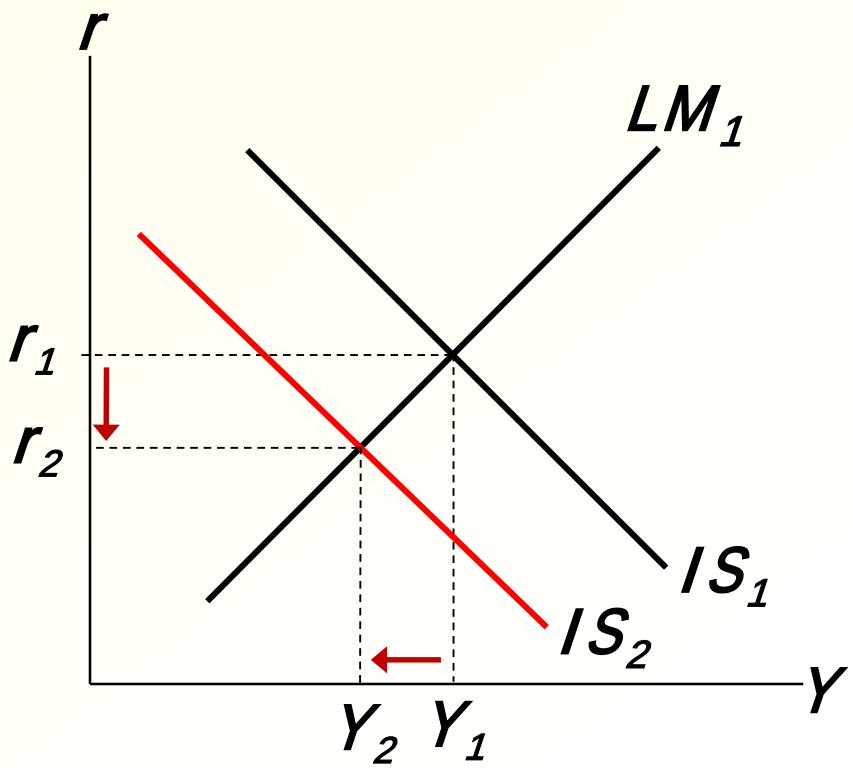
IS shifts left, causing

r and ***Y*** to fall.

C falls due to lower wealth and lower income,

I rises because ***r*** is lower

u rises because ***Y*** is lower (Okun's law)



ANSWERS, PART 2

Increase in money demand

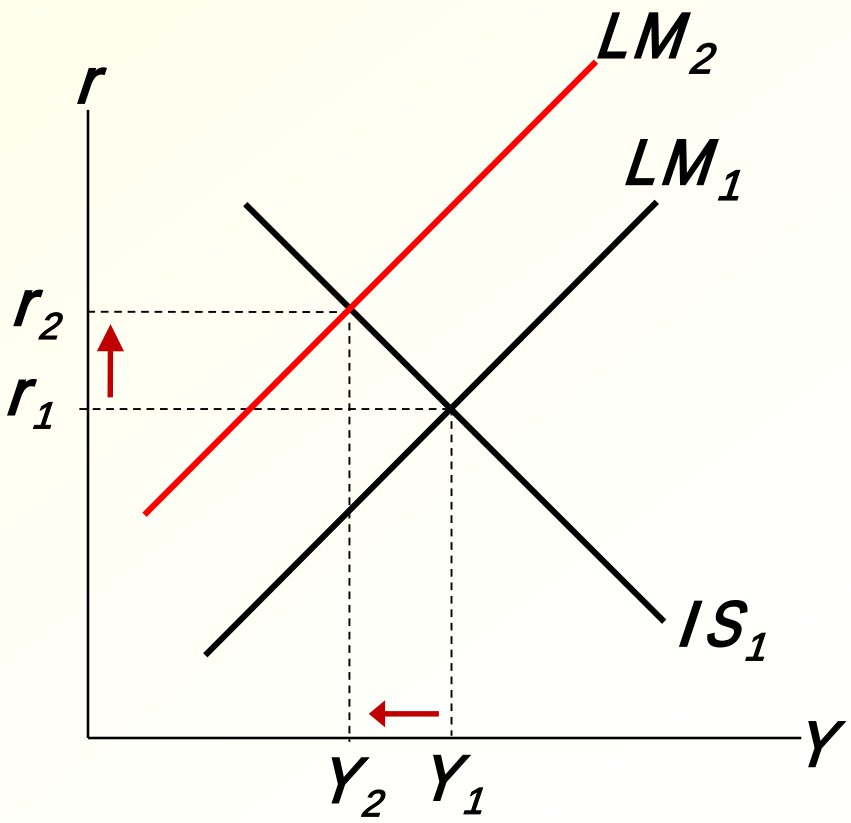
LM shifts left, causing

r to rise and ***Y*** to fall.

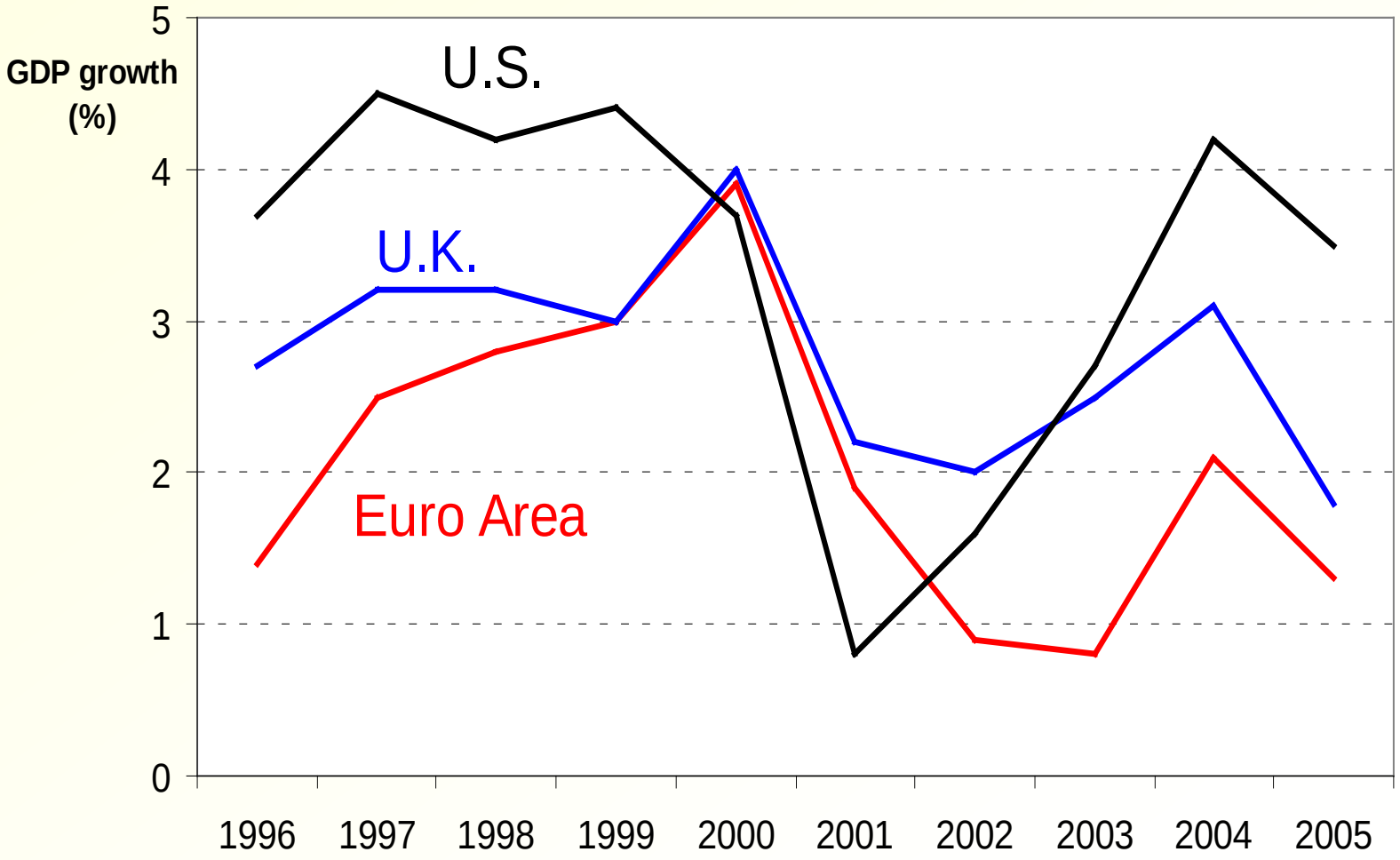
C falls due to lower income,

I falls because ***r*** is higher

u rises because ***Y*** is lower (Okun's law)



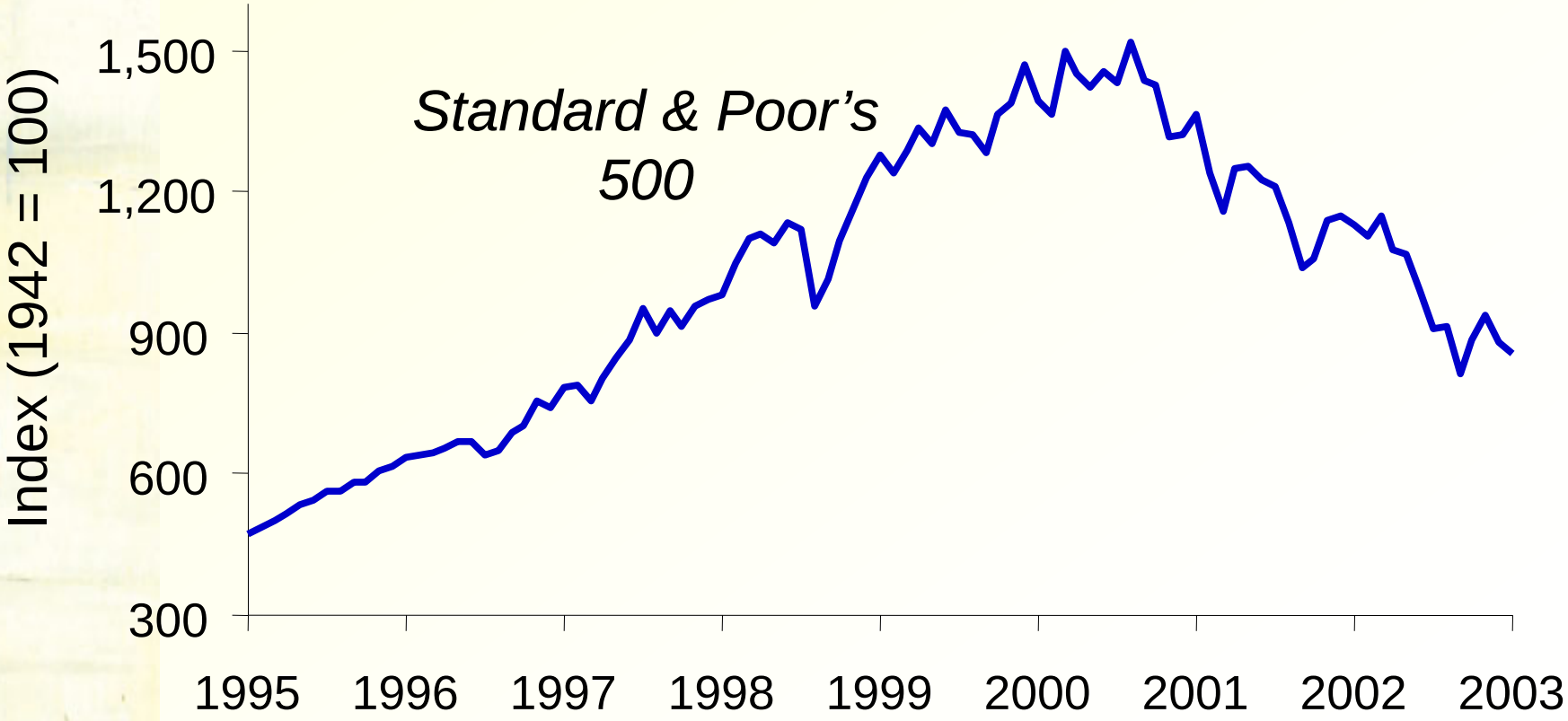
CASE STUDY:
The economic slowdown of 2001



CASE STUDY:

The U.S. recession of 2001

Causes: 1) Stock market decline → ↓***C***



CASE STUDY:

The U.S. recession of 2001

Causes: 2) 9/11

- increased uncertainty
- fall in consumer & business confidence
- result: lower spending, *IS* curve shifted left

Causes: 3) Corporate accounting scandals

- Enron, WorldCom, *etc*.
- reduced stock prices, discouraged investment

CASE STUDY:

The U.S. recession of 2001

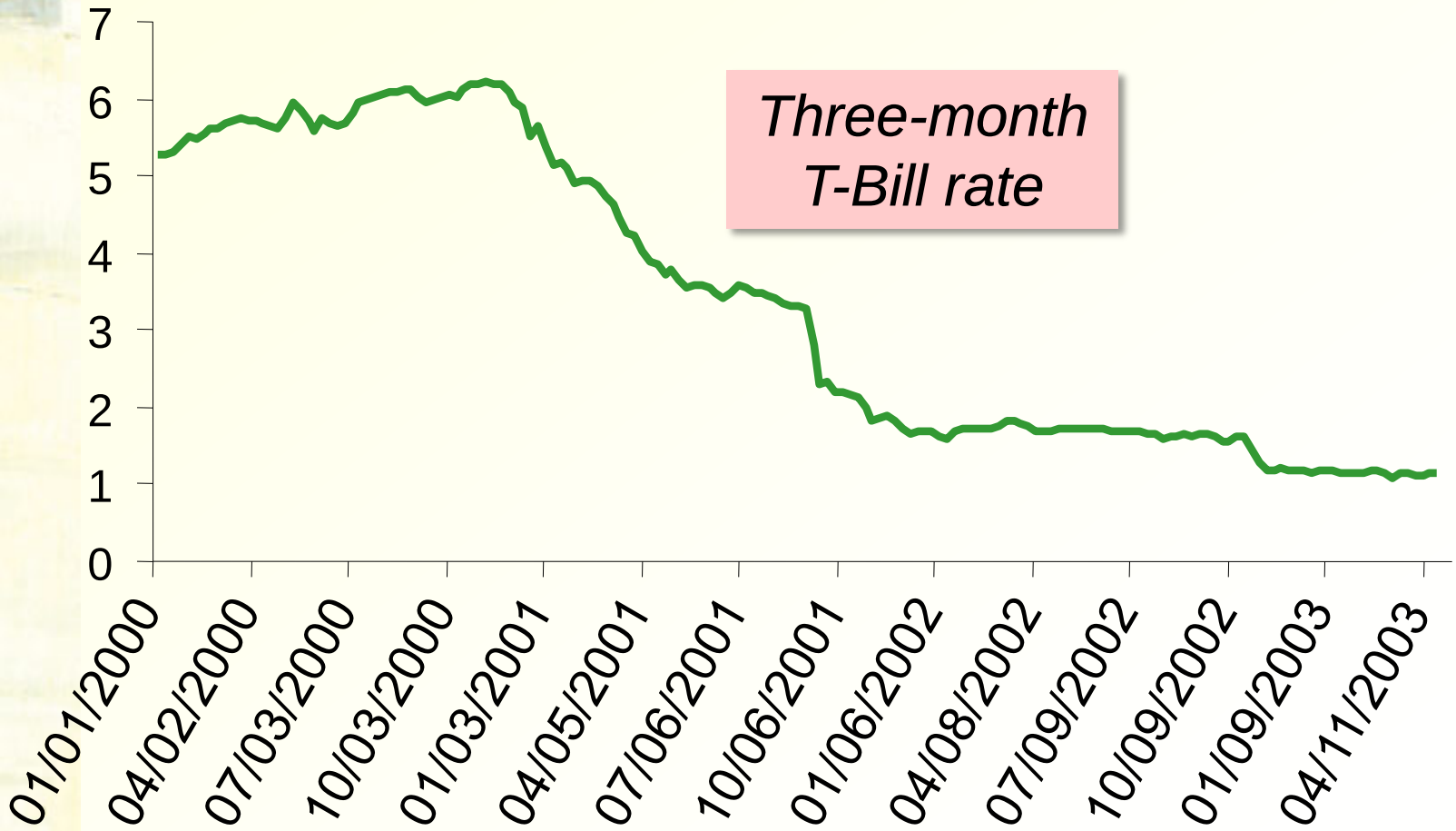
Fiscal policy response: shifted *IS* curve right

- tax cuts in 2001 and 2003
- spending increases
  - airline industry bailout
  - NYC reconstruction
  - Afghanistan war

CASE STUDY:

The U.S. recession of 2001

Monetary policy response: shifted *LM* curve right



What is the central bank's policy instrument?

What the newspapers say:
"the central bank lowered interest rates by one-quarter point today"

What actually happened:
The central bank conducted expansionary monetary policy to shift the *LM* curve to the right until the interest rate fell 0.25 points.

The central bank targets the short-term interest rate:
it announces a target value,
and uses monetary policy to shift the LM curve as needed to attain its target rate.

What is the central bank's policy instrument?

Why does the central bank target interest rates
instead of the money supply?

1) They are easier to measure than the money supply
2) The central bank might believe that *LM* shocks are more prevalent than *IS* shocks. If so, then targeting the interest rate stabilizes income better than targeting the money supply.

IS-LM and Aggregate Demand

- So far, we've been using the *IS-LM* model to analyze the short run, when the price level is assumed fixed.
- However, a change in ***P*** would shift the *LM* curve and therefore affect ***Y***.
- The **aggregate demand curve** (*introduced in chap. 10*) captures this relationship between ***P*** and ***Y***

Deriving the *AD* curve

Intuition for slope of *AD* curve:

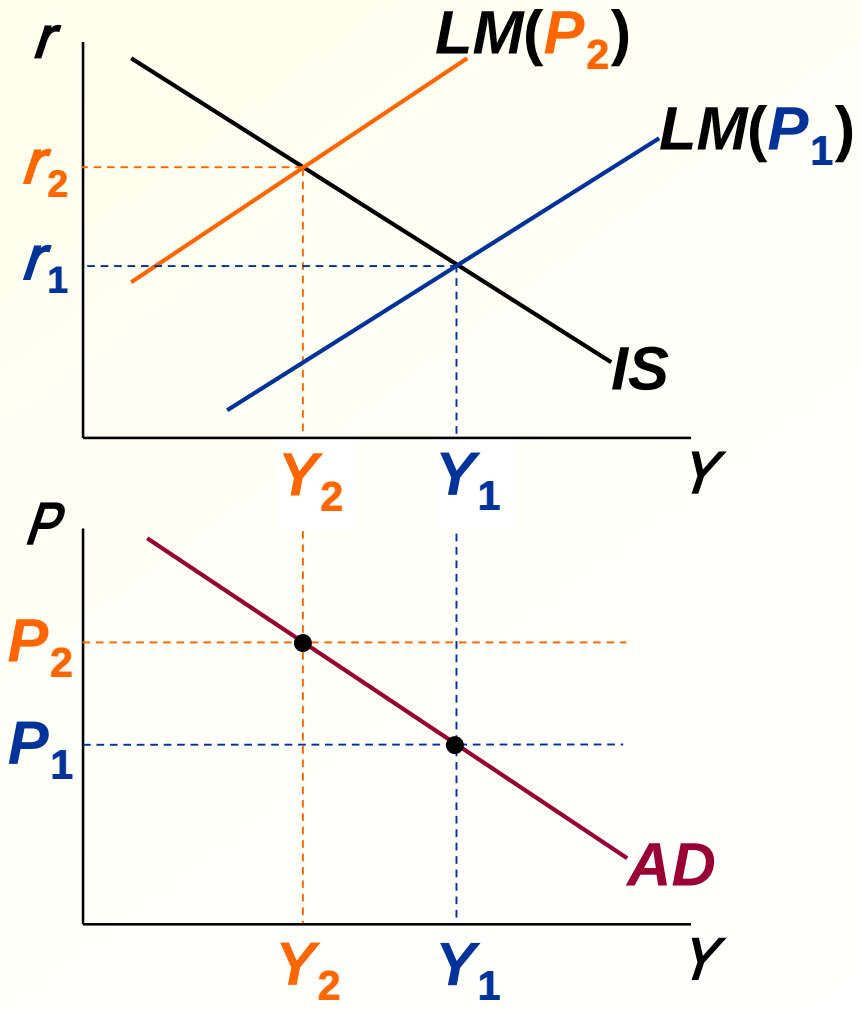
$\uparrow P \Rightarrow \downarrow (M/P)$

$\Rightarrow$ *LM* shifts left

$\Rightarrow \uparrow r$

$\Rightarrow \downarrow I$

$\Rightarrow \downarrow Y$



Monetary policy and the *AD* curve

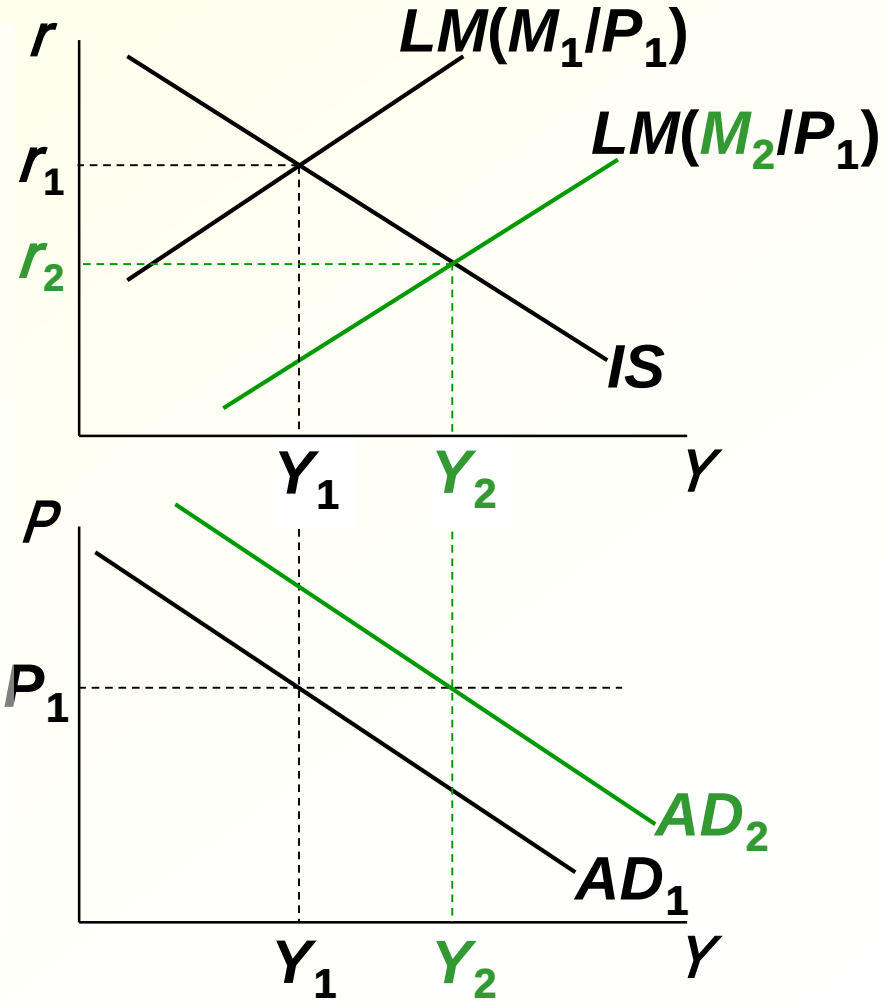
The central bank can increase aggregate demand:

$\uparrow M \Rightarrow LM$ shifts right

$\Rightarrow \downarrow r$

$\Rightarrow \uparrow I$

$\Rightarrow \uparrow Y$ at each value of P



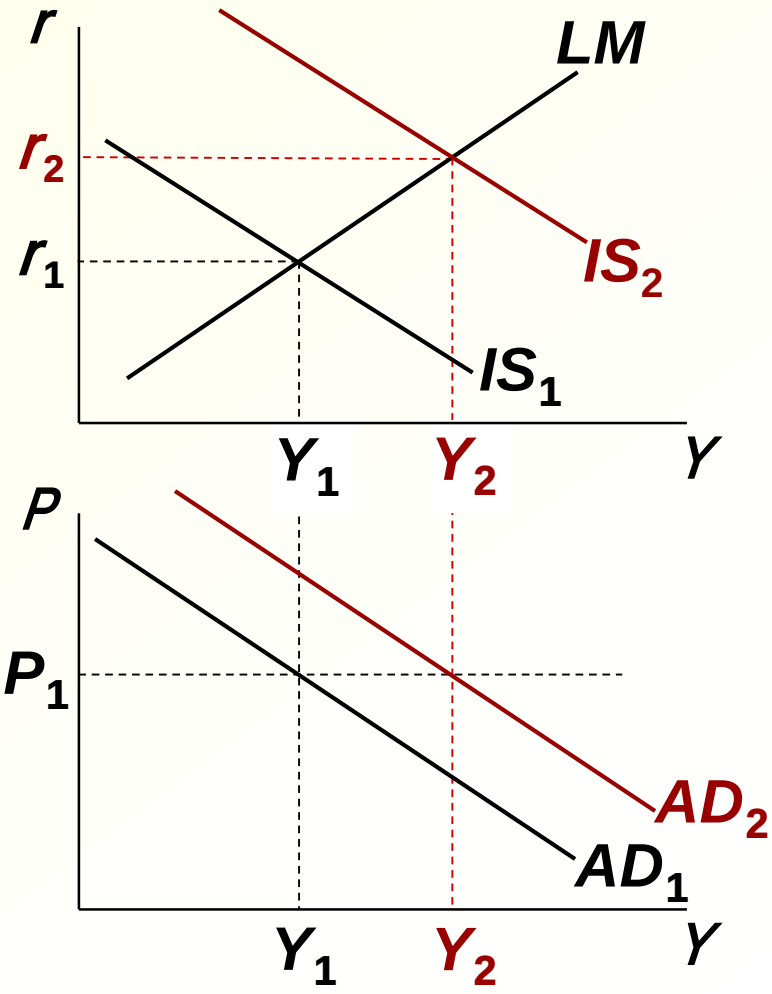
Fiscal policy and the *AD* curve

Expansionary fiscal policy ($\uparrow G$ and/or $\downarrow T$) increases agg. demand:

$\downarrow T \Rightarrow \uparrow C$

$\Rightarrow$ IS shifts right

$\Rightarrow \uparrow Y$ at each value of P



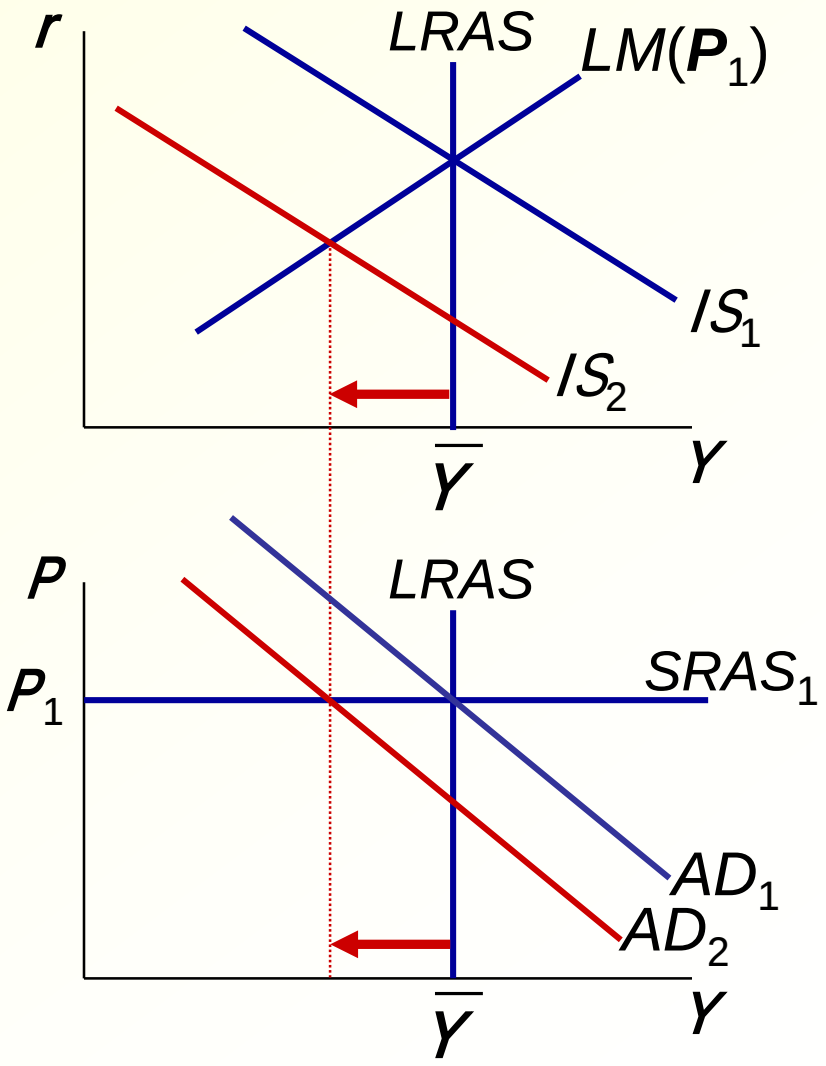
IS-LM and *AD-AS* in the short run & long run

Recall from Chapter 10: The force that moves the economy from the short run to the long run is the gradual adjustment of prices.

In the short-run equilibrium, if	then over time, the price level will
$Y > \bar{Y}$	rise
$Y < \bar{Y}$	fall
$Y = \bar{Y}$	remain constant

The SR and LR effects of an *IS* shock

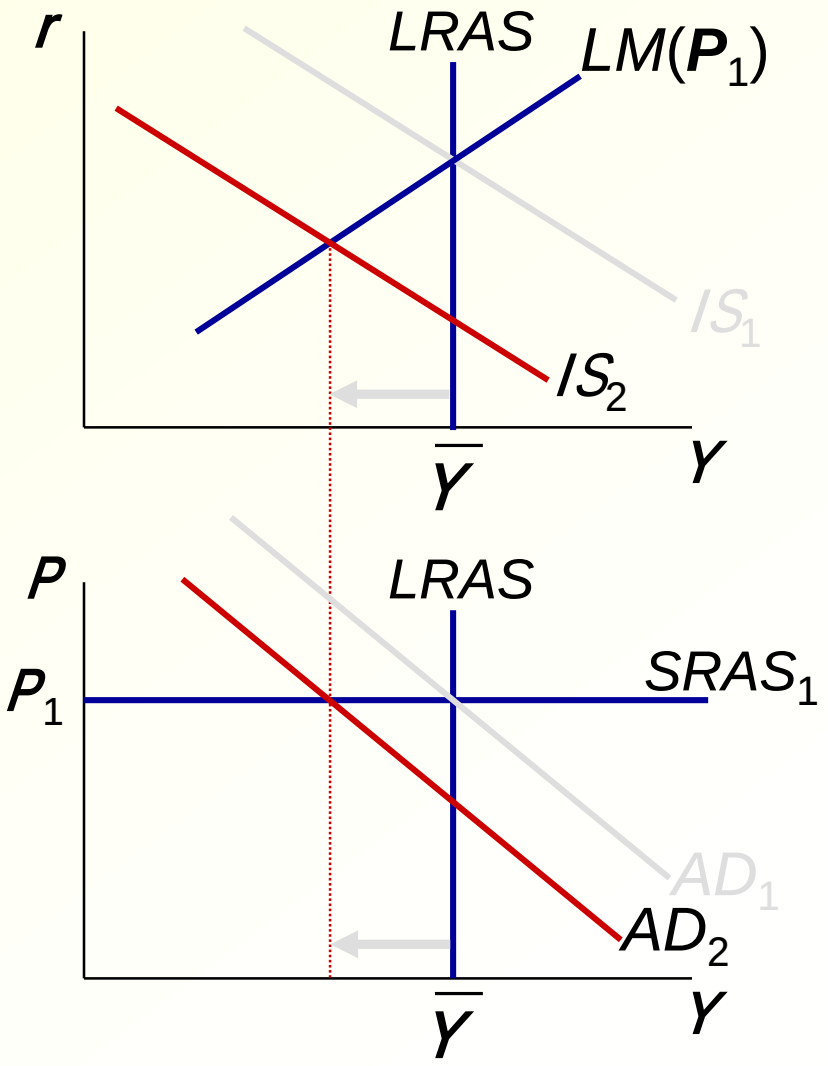
A negative *IS* shock shifts *IS* and *AD* left, causing ***Y*** to fall.



The SR and LR effects of an *IS* shock

In the new short-run equilibrium,

$$Y < \overline{Y}$$

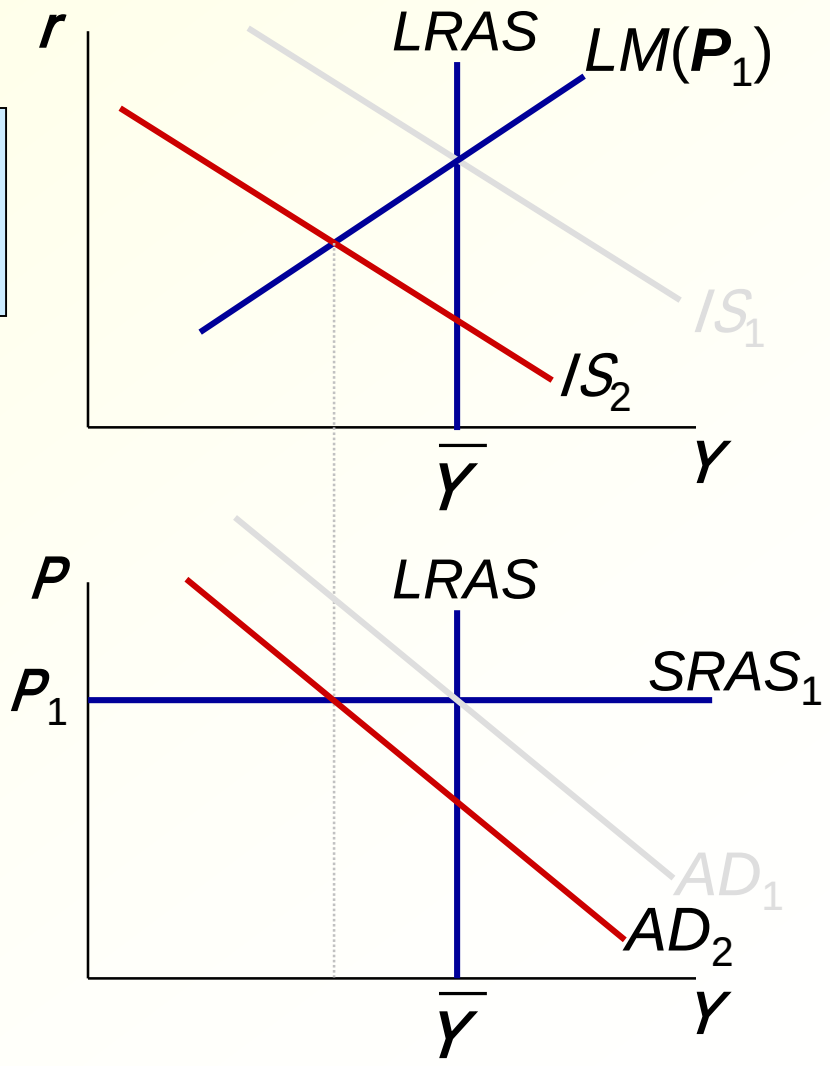


The SR and LR effects of an *IS* shock

In the new short-run equilibrium, $Y < \bar{Y}$

Over time,
P **gradually falls, which causes**

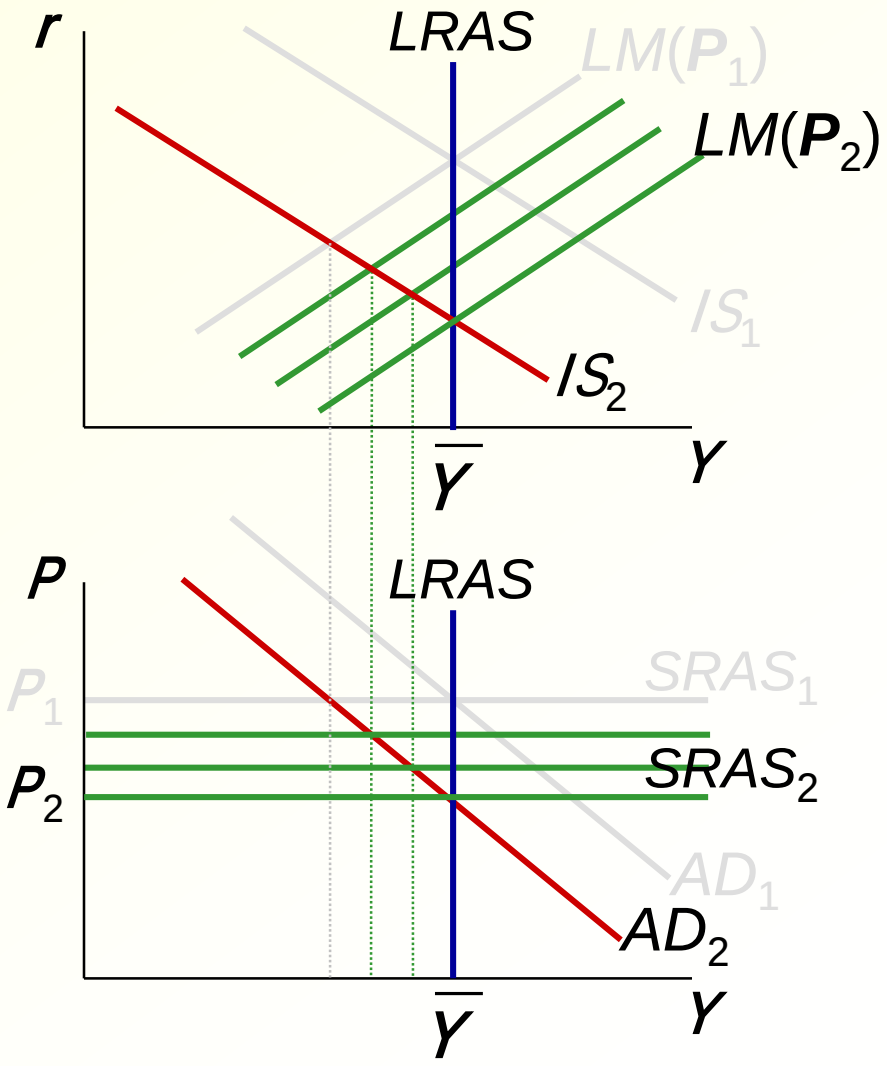
- ***SRAS*** **to move down**
- ***M/P*** **to increase, which causes *LM* to move down**



The SR and LR effects of an *IS* shock

Over time, *P* gradually falls, which causes

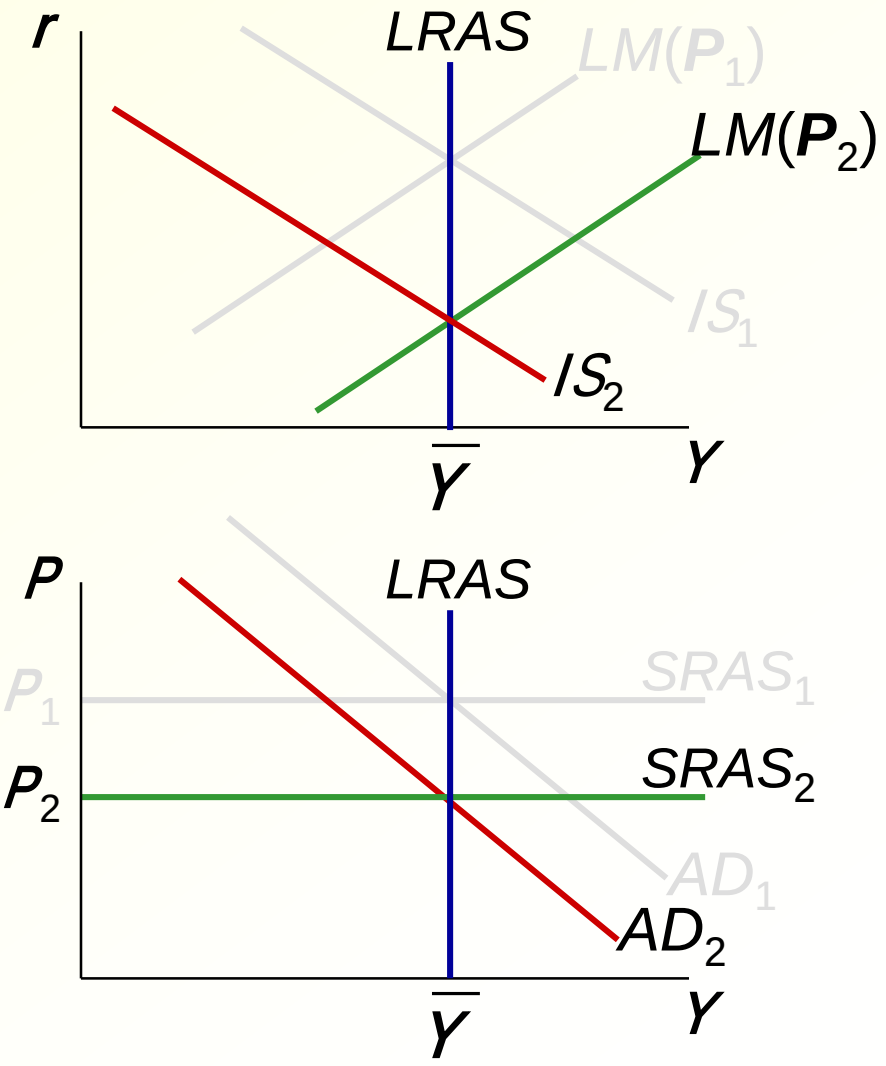
- ***SRAS*** **to move down**
- ***M/P*** **to increase, which causes *LM* to move down**



The SR and LR effects of an *IS* shock

This process continues until economy reaches a long-run equilibrium with

$$Y = \overline{Y}$$



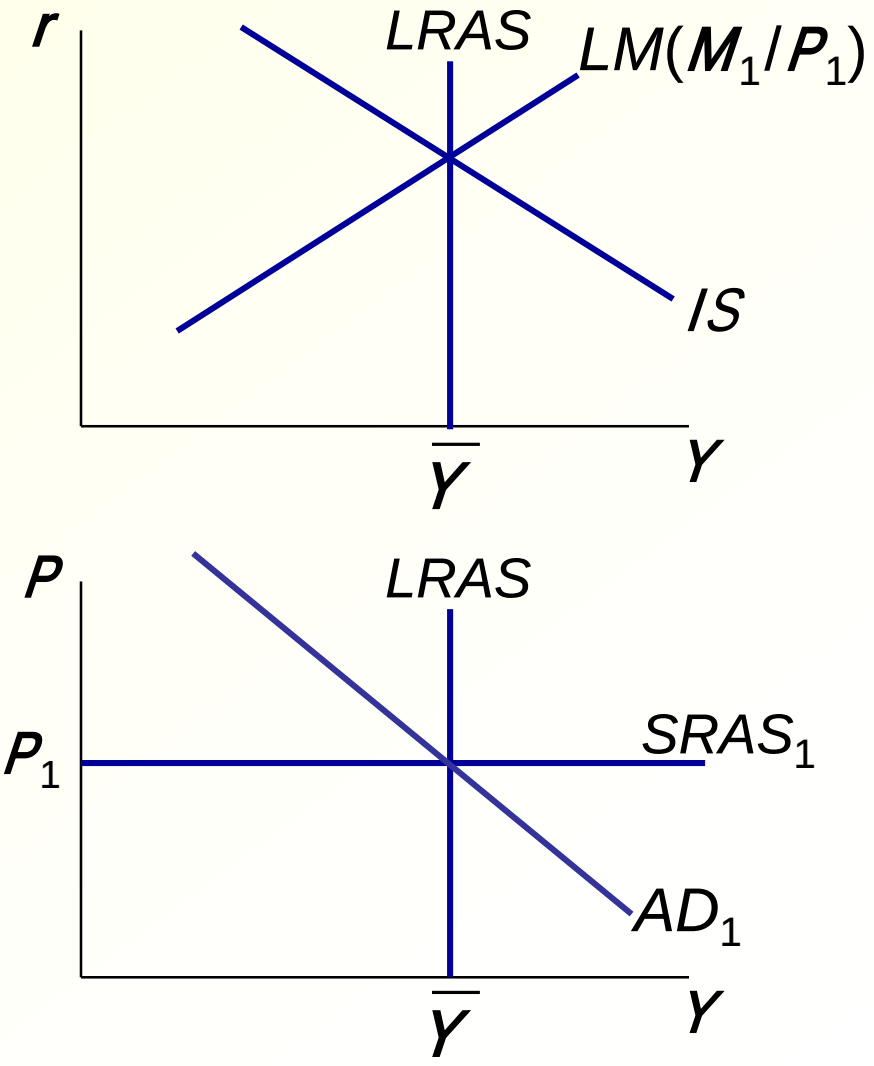
EXERCISE:
Analyze SR & LR effects of ΔM

a. Draw the *IS-LM* and *AD-AS* diagrams as shown here.

b. Suppose central bank increases ***M***. Show the short-run effects on your graphs.

c. Show what happens in the transition from the short run to the long run.

d. How do the new long-run equilibrium values of the endogenous variables compare to their initial values?

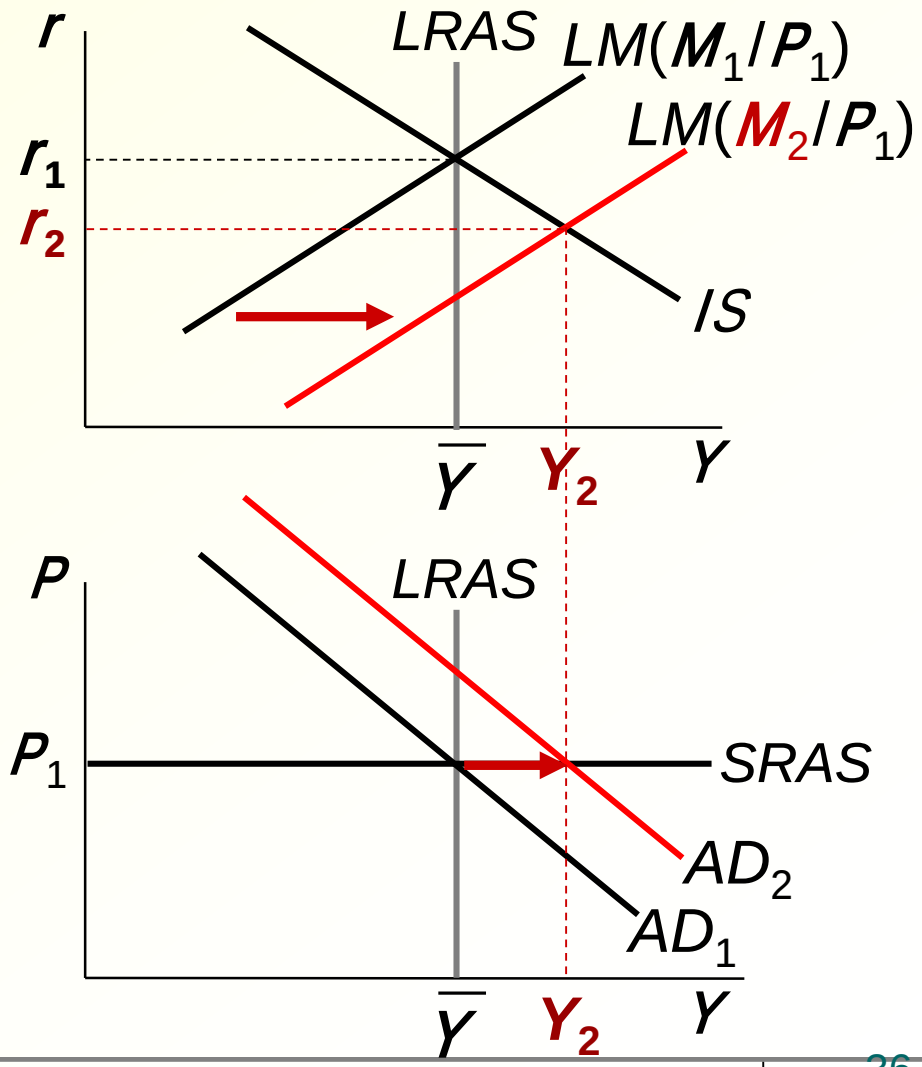


ANSWERS, PART 1

Short-run effects of ΔM

LM and *AD* shift right.

r falls, ***Y*** rises above $\overline{Y}$

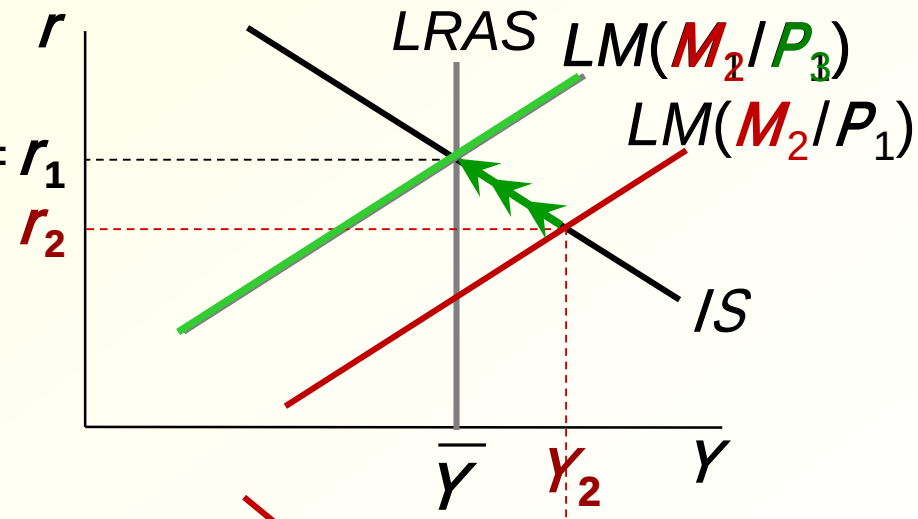


ANSWERS, PART 2

Transition from short run to long run

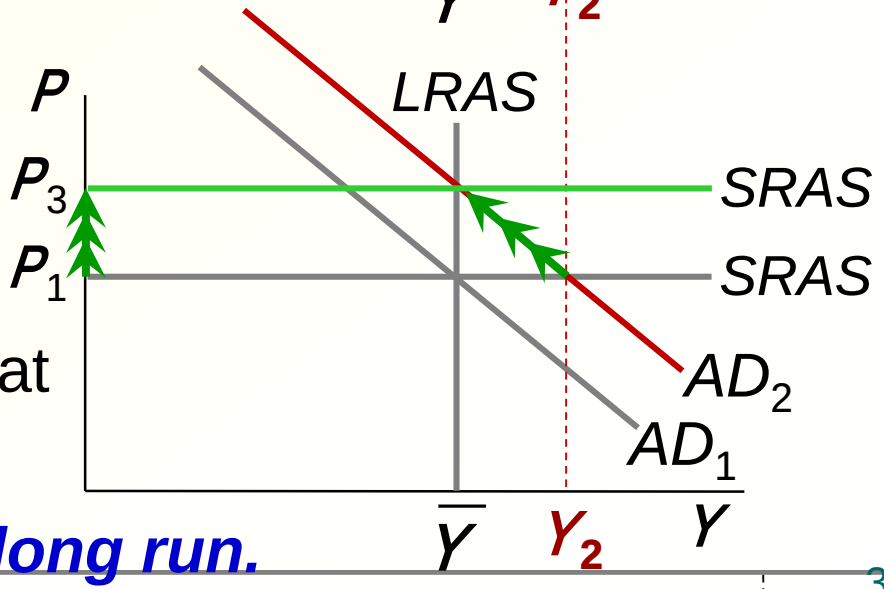
Over time,

- ***P*** rises
- *SRAS* moves upward
- ***M***/***P*** falls
- *LM* moves leftward



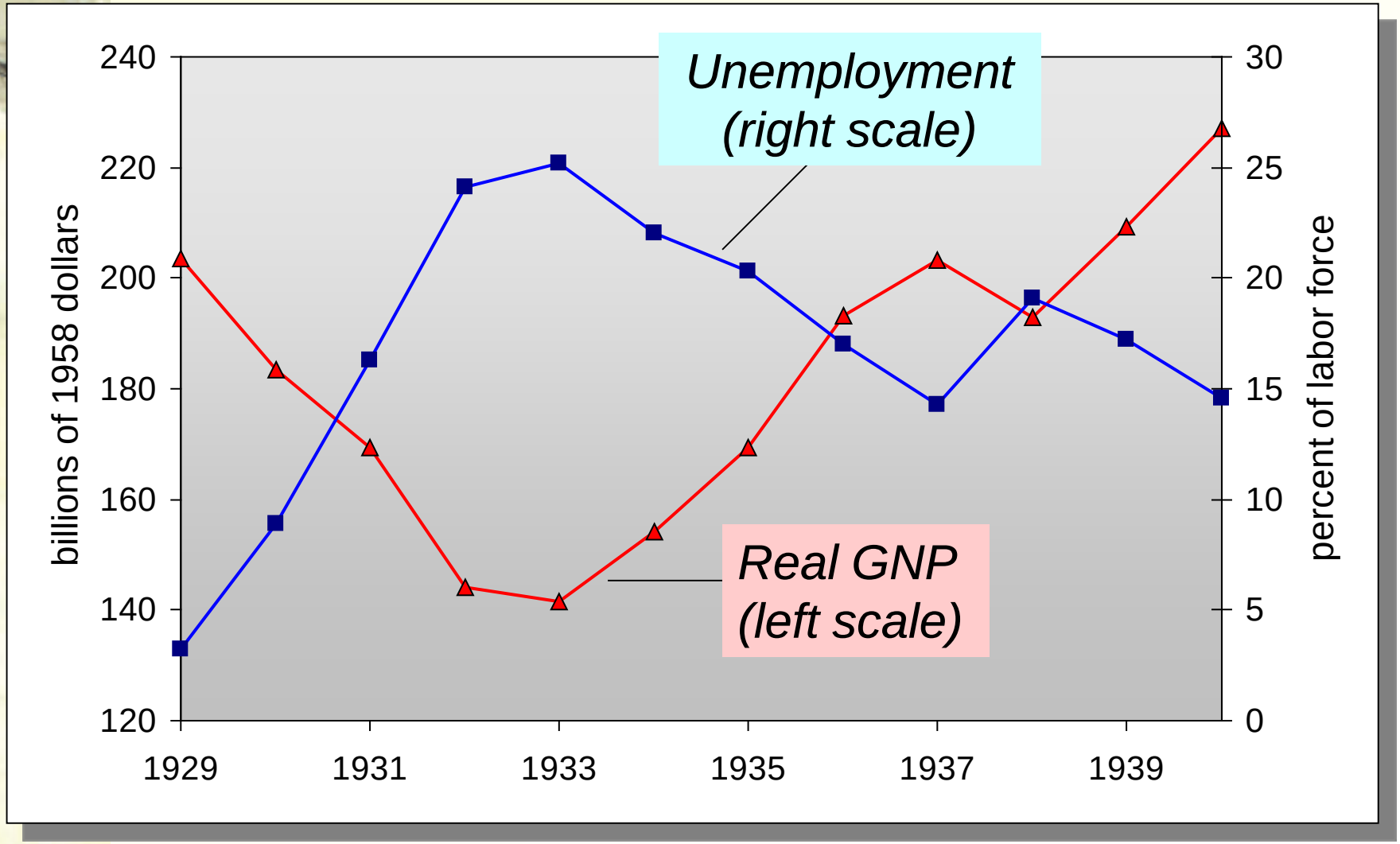
New long-run eq'm

- ***P*** higher
- all *real* variables back at their initial values



Money is neutral in the long run.

The Great Depression (U.S.)



The Spending Hypothesis (支出假说）: *Shocks to the IS Curve*

- asserts that the Depression was largely due to an exogenous fall in the demand for goods & services - a leftward shift of the *IS* curve
- evidence:
  output and interest rates both fell, which is what a leftward *IS* shift would cause

The Spending Hypothesis: *Reasons for the IS shift*

1. Stock market crash $\Rightarrow$ exogenous $\downarrow \boldsymbol{C}$
   - Oct-Dec 1929: S&P 500 fell 17%
   - Oct 1929-Dec 1933: S&P 500 fell 71%
2. Drop in investment
   - "correction" after overbuilding in the 1920s
   - widespread bank failures made it harder to obtain financing for investment
3. Contractionary fiscal policy
   - in the face of falling tax revenues and increasing deficits, politicians raised tax rates and cut spending

The Money Hypothesis: *A Shock to the LM Curve*

- asserts that the Depression was largely due to huge fall in the money supply
- evidence:
  M1 fell 25% during 1929-33.

But, two problems with this hypothesis:

1. ***P*** fell even more, so ***M/P*** actually rose slightly during 1929-31.
2. nominal interest rates fell, which is the opposite of what would result from a leftward *LM* shift.

The Money Hypothesis Again: *The Effects of Falling Prices*

- asserts that the severity of the Depression was due to a large deflation:

  P fell 25% during 1929-33.

- This deflation was probably caused by the fall in ***M***, so perhaps money played an important role after all.

- In what ways does a deflation affect the economy?

The Money Hypothesis Again: *The Effects of Falling Prices*

The **stabilizing** effects of deflation:

- $\downarrow P \Rightarrow \uparrow(M/P) \Rightarrow LM$ shifts right $\Rightarrow \uparrow Y$
- **Pigou effect (庇古效应）**:

  $\downarrow P \Rightarrow \uparrow(M/P)$

  $\Rightarrow$ consumers' wealth $\uparrow$

  $\Rightarrow \uparrow C$

  $\Rightarrow IS$ shifts right

  $\Rightarrow \uparrow Y$

The Money Hypothesis Again: *The Effects of Falling Prices*

The **destabilizing** effects of unexpected deflation:

debt-deflation theory

↓***P*** (if unexpected)

- ⇒ transfers purchasing power from borrowers to lenders
- ⇒ borrowers spend less, lenders spend more
- ⇒ if borrowers' propensity to spend is larger than lenders, then aggregate spending falls, the *IS* curve shifts left, and ***Y*** **falls**

The Money Hypothesis Again: *The Effects of Falling Prices*

The destabilizing effects of <u>expected</u> deflation:

$\downarrow \pi^e$

$\Rightarrow$ $\boldsymbol{r} \uparrow$ for each value of $\boldsymbol{i}$

$\Rightarrow$ $\boldsymbol{I} \downarrow$ because $\boldsymbol{I} = \boldsymbol{I}(\boldsymbol{r})$

$\Rightarrow$ planned expenditure & agg. demand $\downarrow$

$\Rightarrow$ income & output $\downarrow$

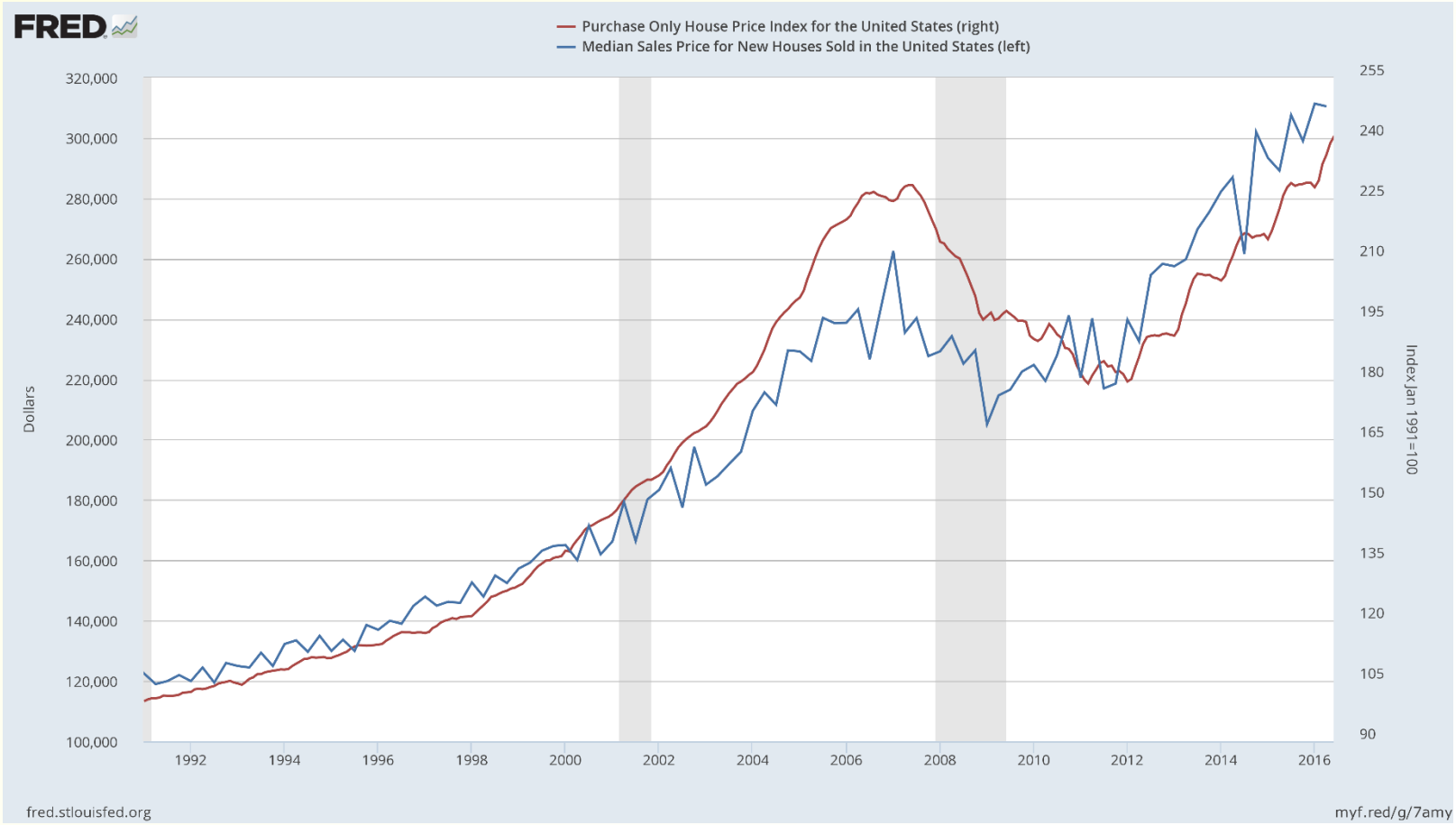
Why another Great Depression is unlikely

- Policymakers (or their advisors) have learned more about macroeconomics:
  - Central banks would probably not let ***M*** fall as much during a contraction.
  - Fiscal policymakers know better than to raise taxes or cut spending during a contraction.
- Deposit insurance schemes makes widespread bank failures very unlikely.
- **Automatic stabilizers** make fiscal policy expansionary during an economic downturn. People pay less taxes automatically if their income falls.

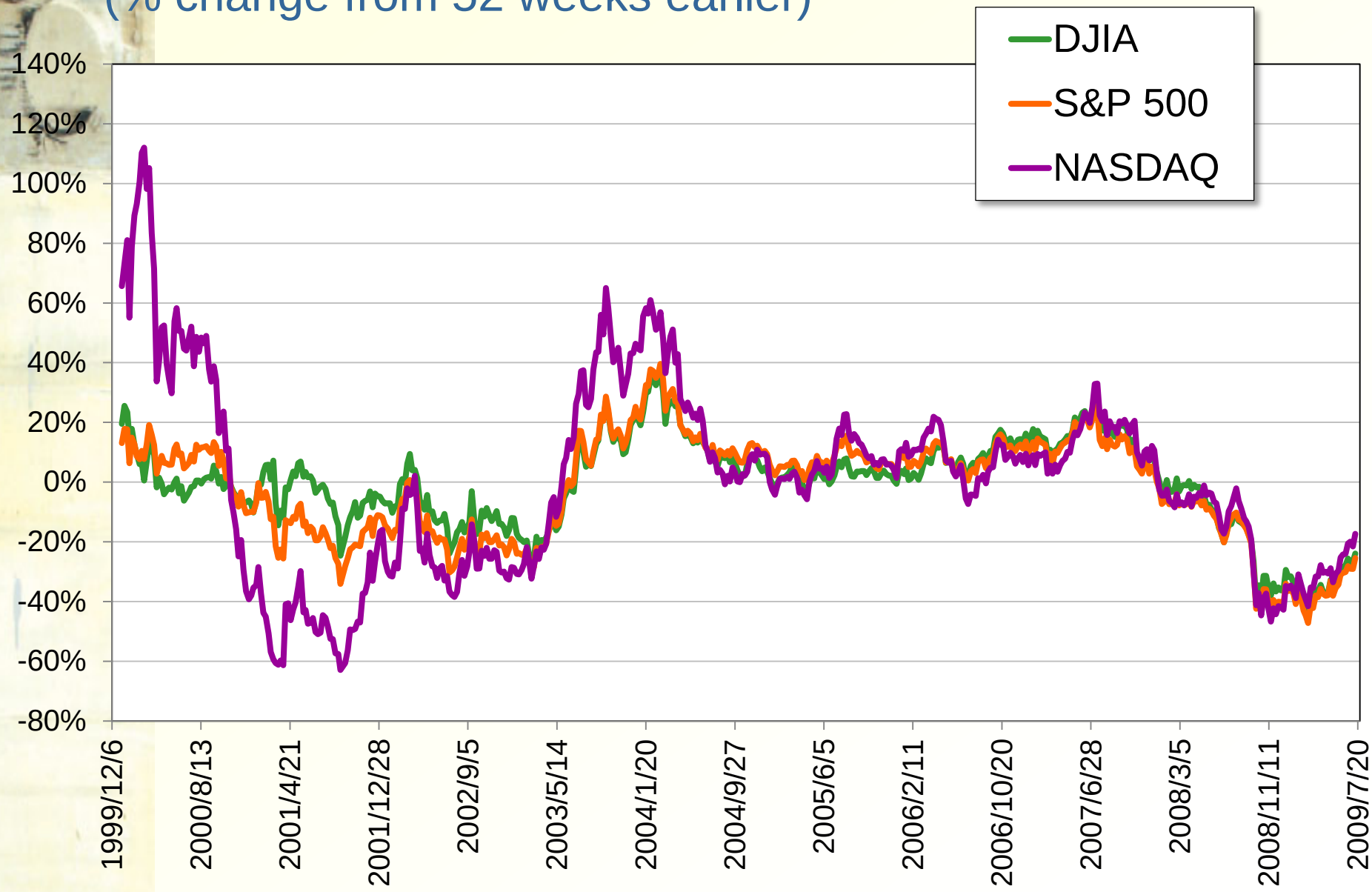
CASE STUDY
The 2008–09 financial crisis & recession

- 2009: Real GDP fell, u-rate approached 10%
- Important factors in the crisis:
  - early 2000s Federal Reserve interest rate policy
  - subprime mortgage crisis
  - bursting of house price bubble,
    rising foreclosure rates
  - falling stock prices
  - failing financial institutions
  - declining consumer confidence, drop in spending
    on consumer durables and investment goods

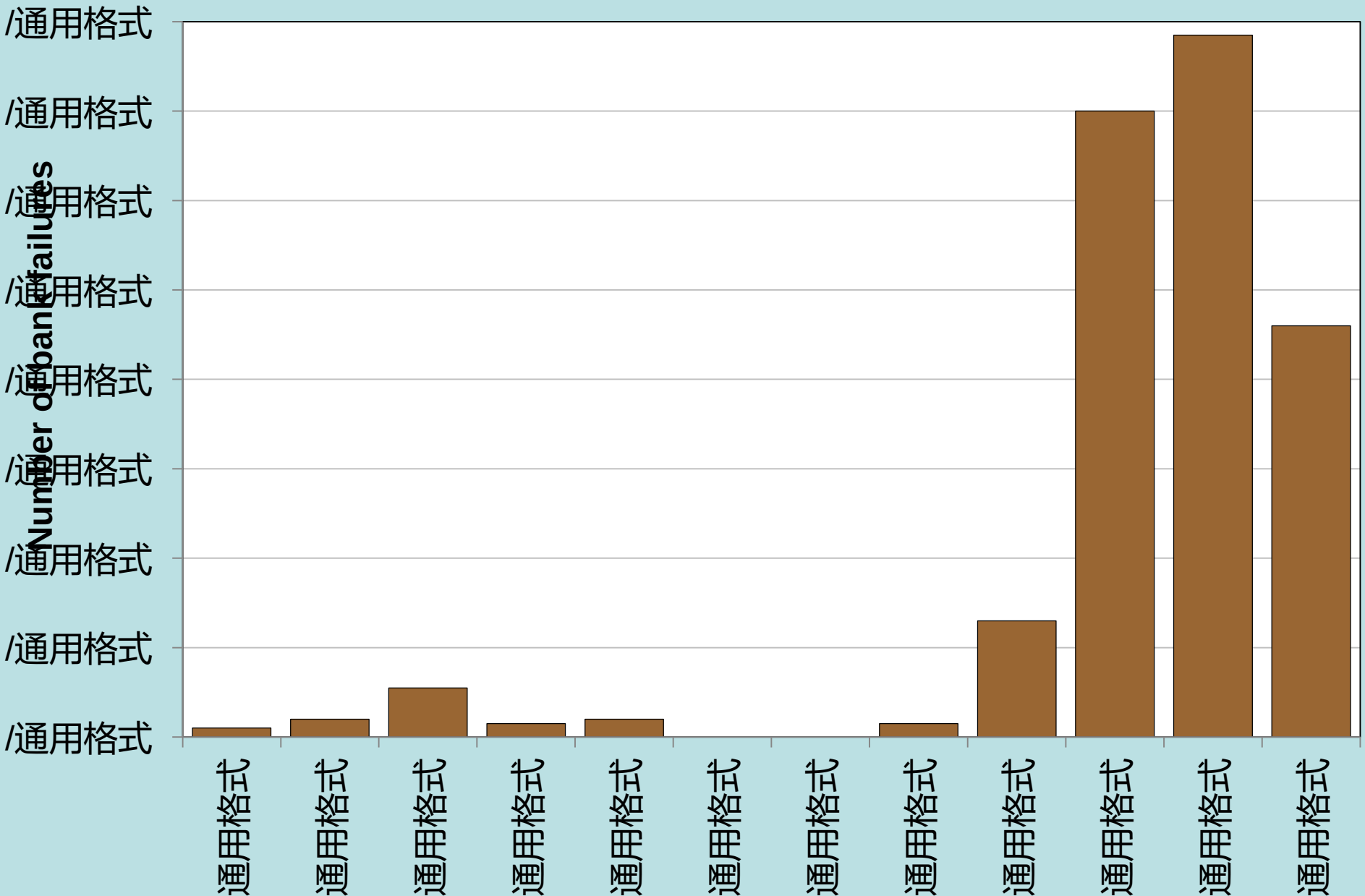
US housing prices



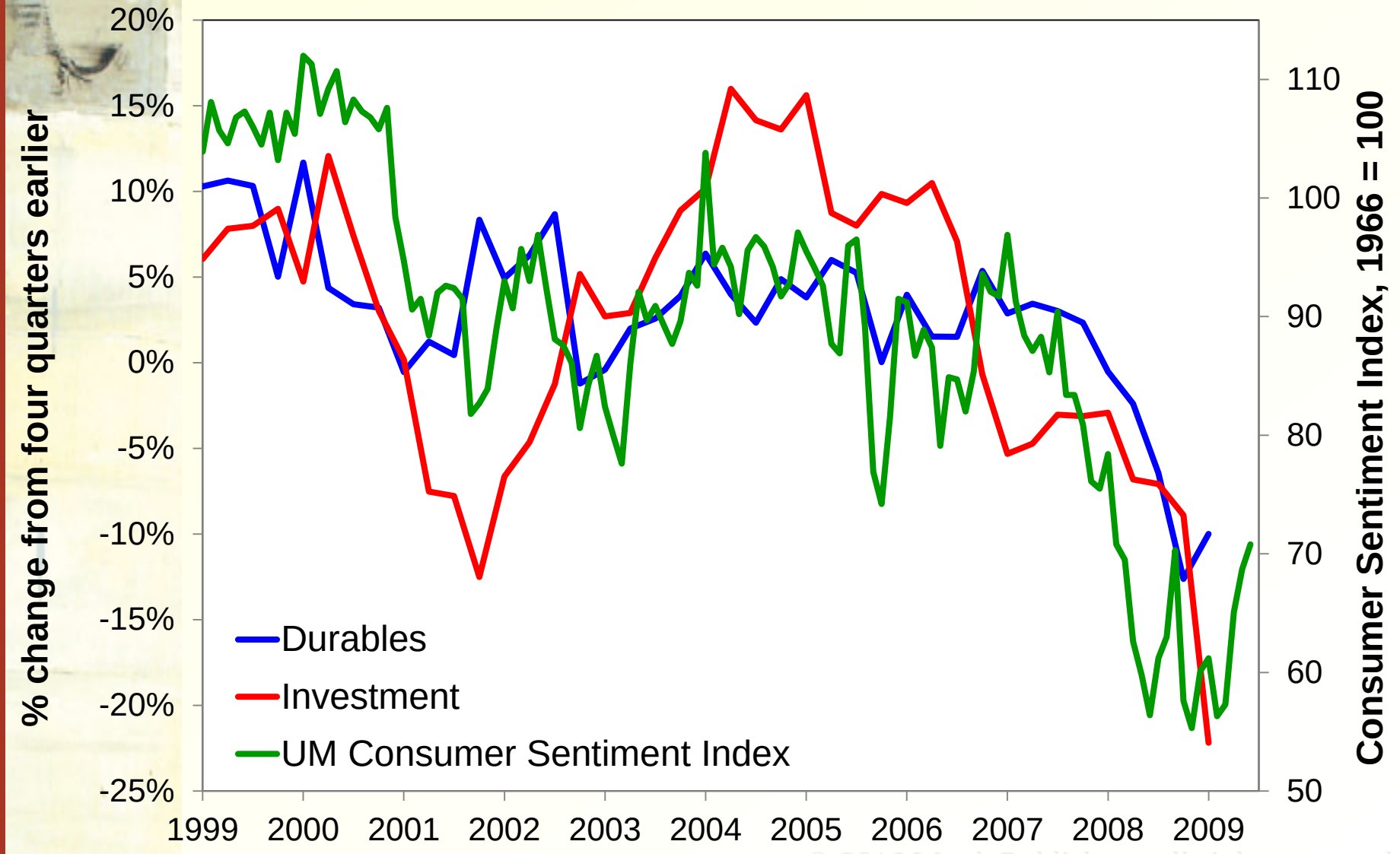
Major U.S. stock indexes
(% change from 52 weeks earlier)



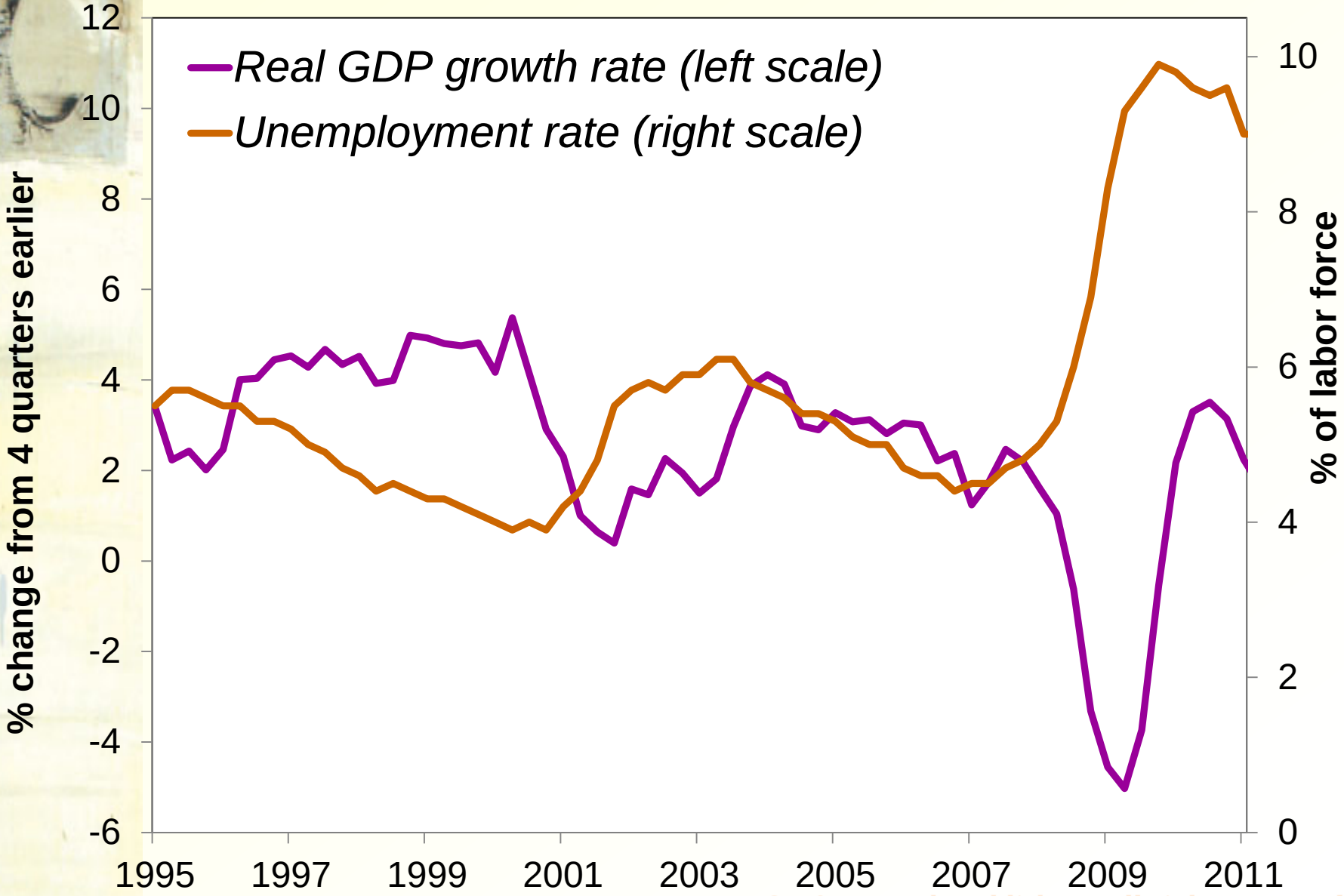
U.S. bank failures by year, 2000–2011



Consumer sentiment and growth in consumer durables and investment spending



Real GDP growth and unemployment



The 2008–09 financial crisis

- 收入并不稳定甚至根本没有收入的人，他们怎么买房呢?因为信用等级达不到标准，他们就被定义为次级贷款者。
- 在房价上涨预期和贷款公司许下的优惠贷款利率的诱惑下，他们选择了贷款买房。
- 贷款公司找到投行，通过发行和销售CDO（Collateralized Debt Obligation，债务抵押债券)，让债券的持有人来分担房屋贷款的风险。
- 投行又怎样卖出高风险的普通CDO呢？于是投行找到了对冲基金。

The 2008–09 financial crisis

- 对冲基金在世界范围内找利率最低的银行借来钱，然后大举买入这部分普通CDO债券。
- 对冲基金又把手里的CDO债券抵押给银行，换得数倍的贷款，然后继续追着投行买普通 CDO。
- 2001年末，美国的房地产一路飙升。于是贷款公司、投行、银行、对冲基金人人都赚钱，
- 投行除了继续买对冲基金之外，他们又想出了一个新产品，就叫CDS (Credit Default Swap，信用违约互换) 。每年从CDO里面拿出一部分钱作为保金，白送给保险公司，但是将来出了风险，大家一起承担。

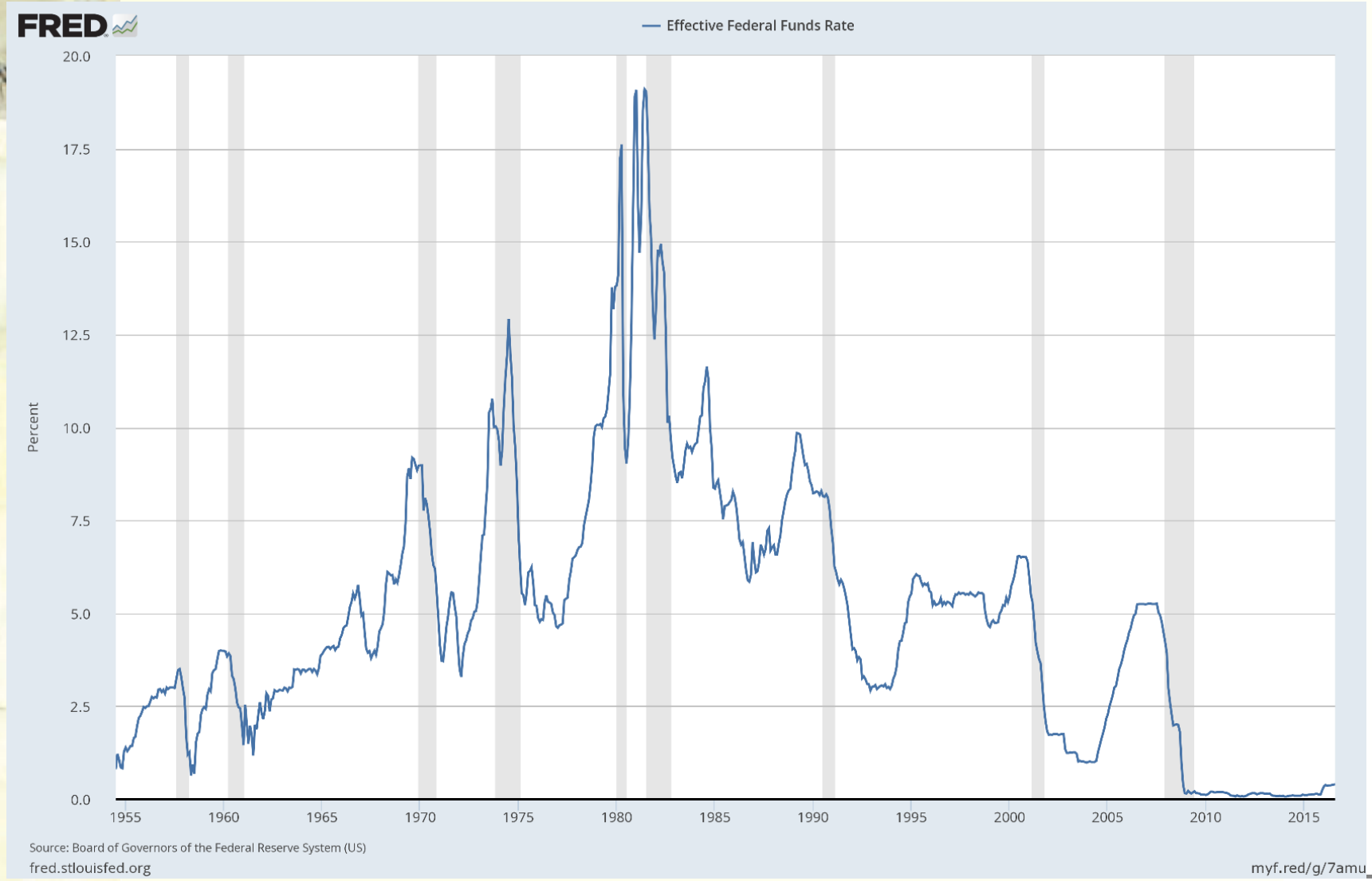
The 2008–09 financial crisis

- 时间走到了2006年年底，风光了整整5年的美国房地产终于从顶峰重重摔了下来，这条食物链也终于开始断裂。因为房价下跌，优惠贷款利率的时限到了之后，先是普通民众无法偿还贷款，然后贷款公司倒闭，对冲基金大幅亏损，继而连累保险公司和贷款的银行，同时投资对冲基金的各大投行也纷纷亏损，然后股市大跌，民众普遍亏钱，无法偿还房贷的民众继续增多……最终，美国次贷危机爆发。

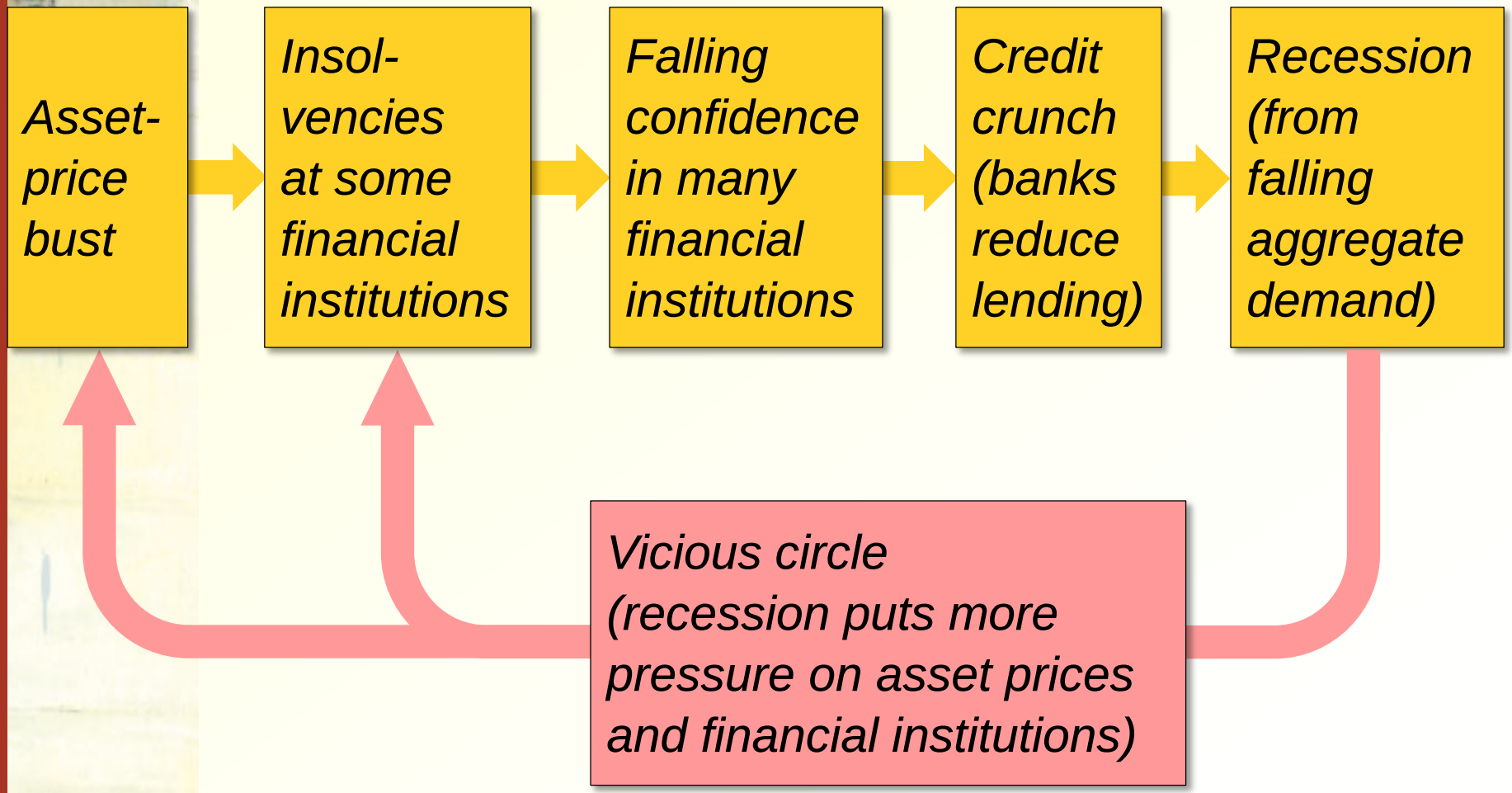
The recent financial crisis

- But, why did real estate price fall?
  - The Fed increases interest rate.

Federal Funds Rate



The Anatomy of a Financial Crisis



Common Features of Financial Crisis

- asset-price booms and busts
- insolvencies at financial institutions
- falling confidence
- credit crunch（信用紧缩）
- recession
- a vicious circle

Who should be blamed for the financial crisis of 2008–2009?

Possible culprits include:

- The Federal Reserve
- Home buyers
- Mortgage brokers
- Investment banks
- Rating agencies
- Regulators
- Government policymakers

All of them likely deserve a share of the blame.

POLICY RESPONSES TO A CRISIS

1. Conventional monetary policy

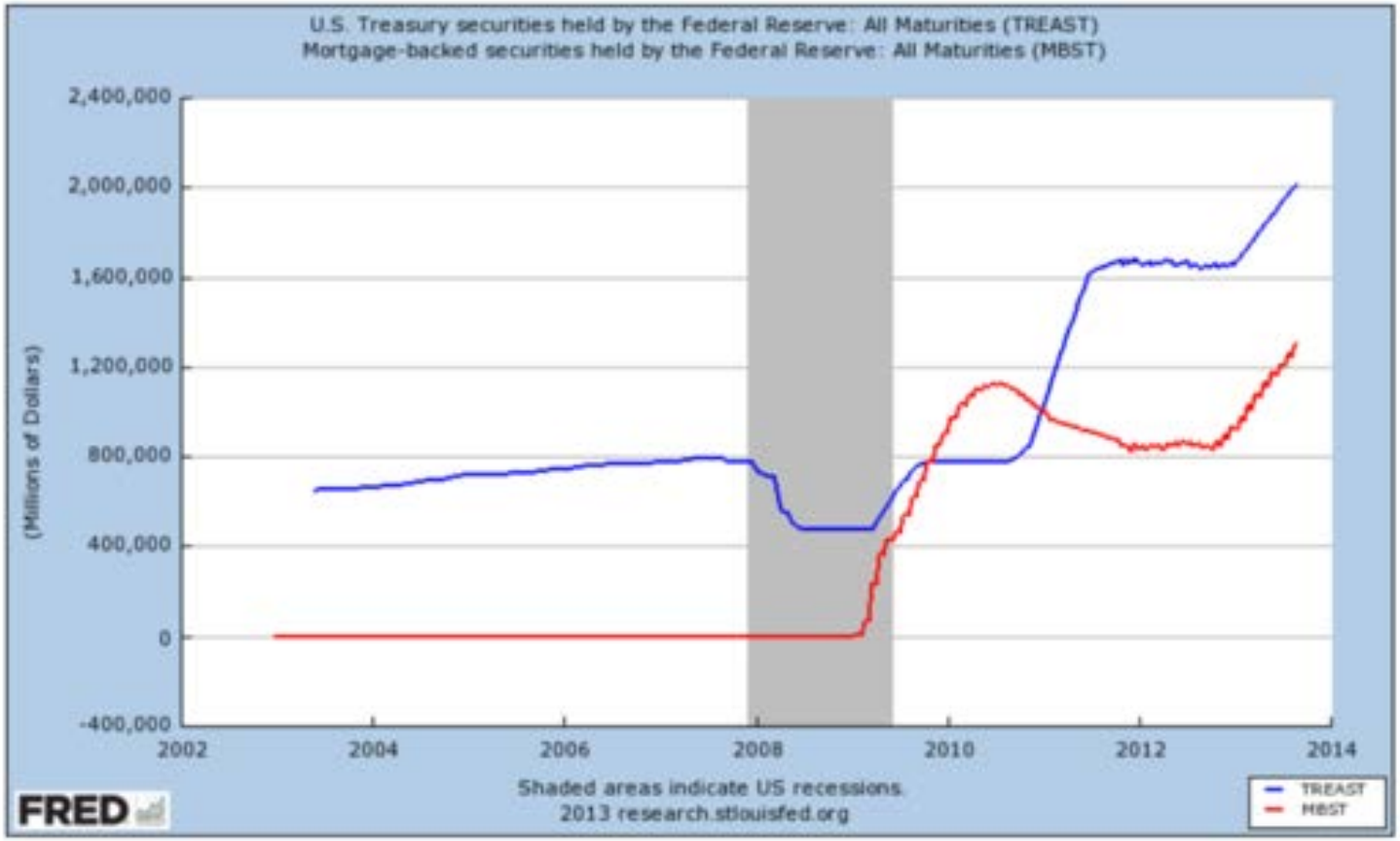
- The central bank can expand the money supply to lower interest rates and encourage spending.

The Fed reduced the federal funds rate to nearly zero by 12/2008, yet this was insufficient.

(Recall the liquidity trap *from Chap.12.)*

POLICY RESPONSES TO A CRISIS
Quantitative Easing

U.S. Federal Reserve: Treasury and Mortgage-Backed Securities Held



POLICY RESPONSES TO A CRISIS

2. Conventional fiscal policy

- The government can increase spending and cut taxes.

Fiscal policymakers enacted stimulus of $168 billion in 2008 and $787 billion in 2009.

But the large and growing government debt sharply limited further stimulus measures.

POLICY RESPONSES TO A CRISIS

3. Lender of last resort

- Runs on banks can create a **liquidity crisis**, in which solvent banks have insufficient funds to satisfy depositors' withdrawals.
- The central bank can make direct loans to these banks, acting as a **lender of last resort**.

*In 2008–2009, the Fed acted as lender of last resort to many banks and to **shadow banks**, which perform many of the same functions as banks and were experiencing similar problems.*

POLICY RESPONSES TO A CRISIS

4. Injections of govt funds

- The govt can use public funds to prop up the financial system:
  - Give funds to those who have experienced losses (*e.g.*, Federal Deposit Insurance)
  - Make risky loans (*e.g.*, loans to AIG in 2008)
  - Inject capital into ailing institutions, taking an ownership stake (*e.g.*, TARP)
- Using public funds to prop up ailing institutions is controversial and may increase moral hazard.
- Homeowner assistance

Chapter summary

1. *IS-LM* model
   - a theory of aggregate demand
   - exogenous: ***M***, ***G***, ***T***, ***P*** exogenous in short run, ***Y*** in long run
   - endogenous: ***r***, ***Y*** endogenous in short run, ***P*** in long run

Chapter summary

2. AD curve

- shows relation between ***P*** and the *IS-LM* model's equilibrium ***Y***.
- negative slope because
  $\uparrow \boldsymbol{P} \Rightarrow \downarrow(\boldsymbol{M/P}) \Rightarrow \uparrow \boldsymbol{r} \Rightarrow \downarrow \boldsymbol{I} \Rightarrow \downarrow \boldsymbol{Y}$
- expansionary fiscal policy shifts *IS* curve right, raises income, and shifts *AD* curve right
- expansionary monetary policy shifts *LM* curve right, raises income, and shifts *AD* curve right
- *IS* or *LM* shocks shift the *AD* curve