

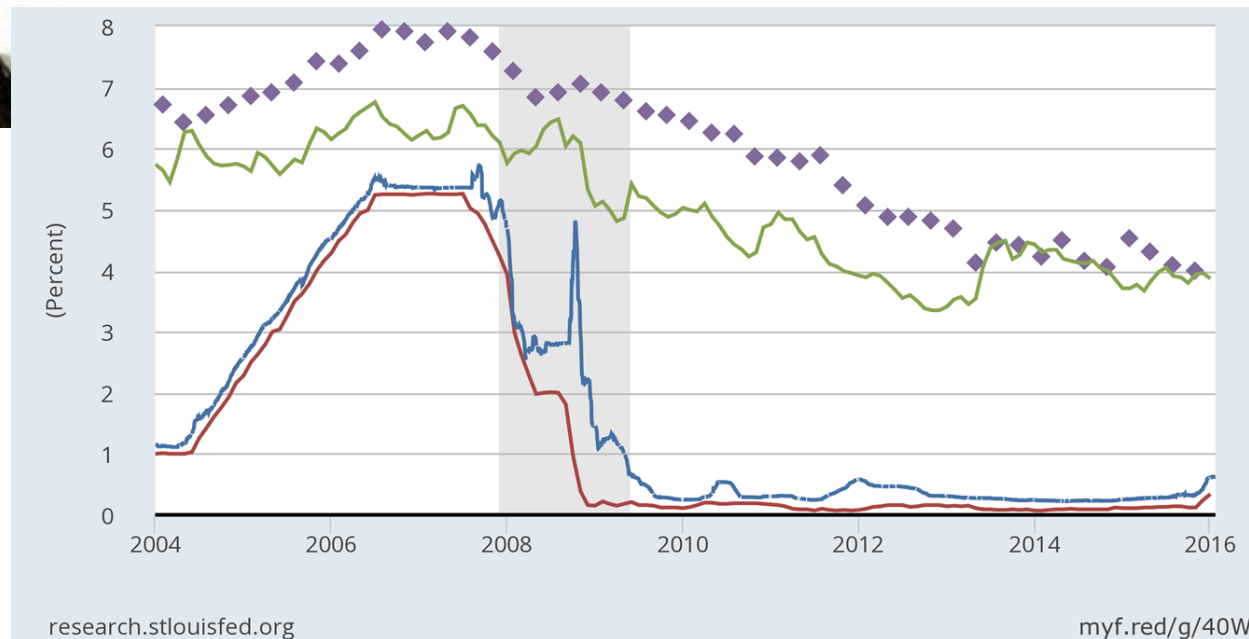


Goldman
Sachs



Crisis, Recession and Monetary Policy

EC1101E Macro Lecture 5



Agenda

1 Financial Crisis 2007-8

2 The money market

3 Interaction between goods market and money market

4 Monetary Policy

5 Unconventional Monetary Policy

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1 Financial Crisis 2007-8

- Financial innovations
- Financial crisis and aftermath

2 The money market

3 Interaction between goods market and money market

4 Monetary Policy

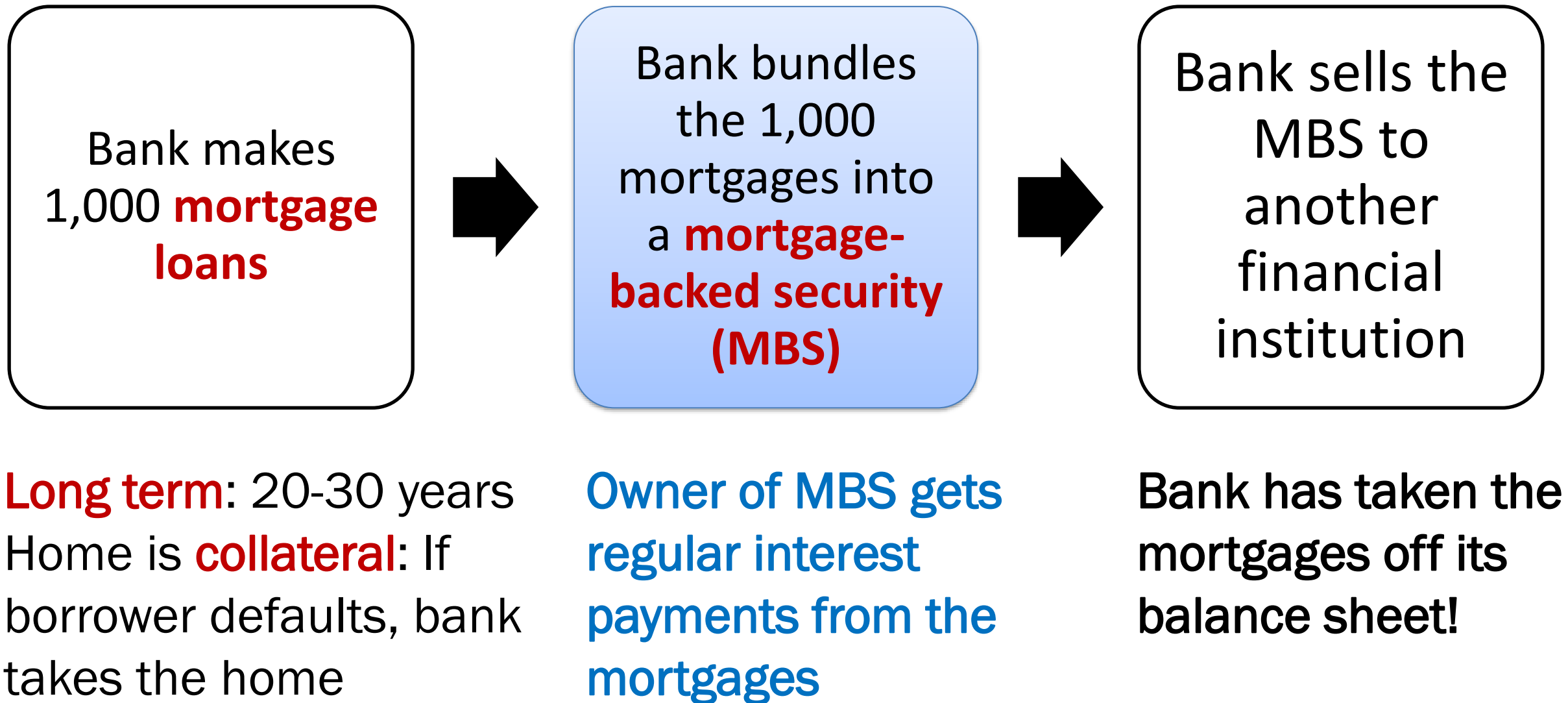
5 Unconventional Monetary Policy

Financial Innovations

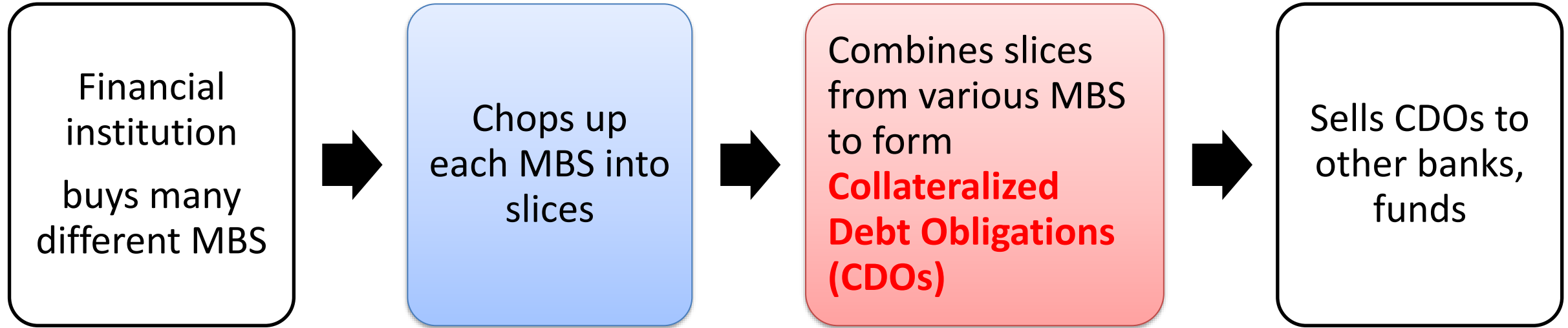
Seeds for the Crisis were planted from the 1970s onwards, with a spate of **financial innovations**

- New types of securities
- New ways to borrow short term
- New ways to insure against falling asset values
- Increased importance of **non-bank financial institution (NBFI)**

Securitization: turning loans into debt securities



“Slicing and Dicing”



A mixture of

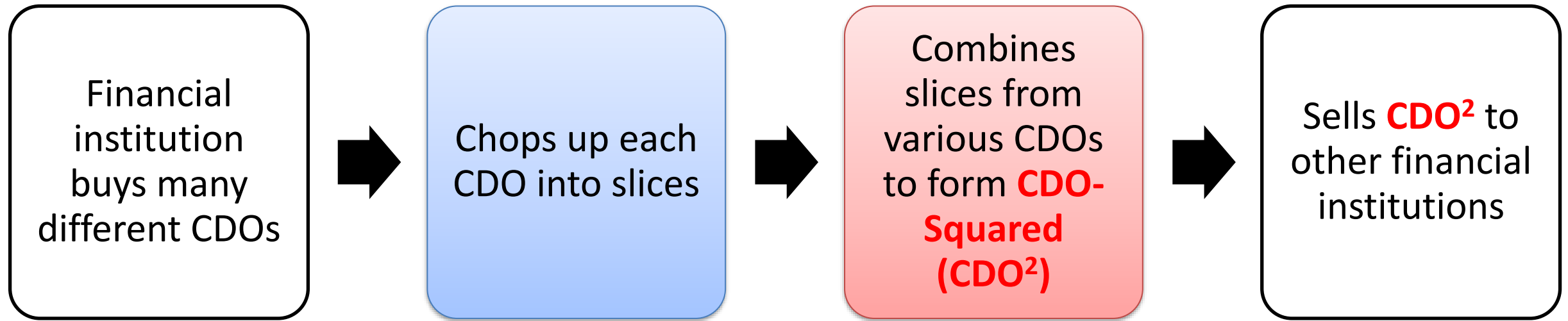
- High risk “subprime”
- Low risk “prime”
- From a particular city

Aim is to create a security that

- pays high interest
- Has low risk due to **diversification**

Owner of CDO gets regular interest payments from the MBS slices

More “Slicing and Dicing”



MBS, CDO's were judged to be safe (rated 'AAA' by rating agencies like Moodys, S&P, Fitch)

A new way to borrow short term

E.g., A 7-day **Repurchase agreement (repo)**



This repo is
essentially a **7-day**
loan with \$1m
interest

Enrichment: **repo** for
Deutschbank is also
called **reverse repo**
for Citibank

Collateral for repos

The security acts as **collateral**: if Deutschebank defaults (i.e. doesn't buy back the security 7 days later), Citibank keeps the security

- Lenders prefer **liquid** and **safe** assets as collateral in repos
- **Short term govt securities** are considered very good collateral

MBS, CDO's were also widely used as collateral before 2008 because they were judged to be safe, and the markets for them were deep, making them liquid

Insuring against default and securities losing value

CDOs in the repo are currently valued at \$10m

If the value falls to \$8m or less, Deutschbank may default!

Citibank approaches **American Insurance Group (AIG)** to do the following

**Credit
Default
Swap (CDS)**

Citibank pays
AIG \$10,000

If the CDOs' value falls to
\$8m, **AIG pays Citibank**
\$11m – \$8m = \$3m

AIG sold CDS that covered over \$400 *billion* of MBSs, CDOs and other securities

Shadow banking

Shadow banks are NBFIs that take on **short term liabilities** (such as repos) to purchase **long term assets** (such as MBS's, CDOs)

- E.g. hedge funds, mutual funds, subsidiaries and divisions of commercial banks
- Most prominent were the New York-based **investment banks**: [Goldman Sachs](#), [Morgan Stanley](#), [Merrill Lynch](#), [Lehman Bros](#), [Bear Stearns](#)

Shadow banks are **highly leveraged**

- In 2007, Lehman Bros' leverage ratio > 30
- Thus, even a 4% fall in asset values would put it into insolvency

Active Learning: Shadow Banks and Traditional Banks

Each box contains a characteristic of Shadow Banks. Place each box on the appropriate side.

Similar to Traditional Banks

Different from Traditional Banks

Insurance is
not provided
by government

Liabilities are
short term

Lightly or not
regulated

Has no lender
of last resort

Highly
leveraged

Assets are long
term

Financial crisis and aftermath

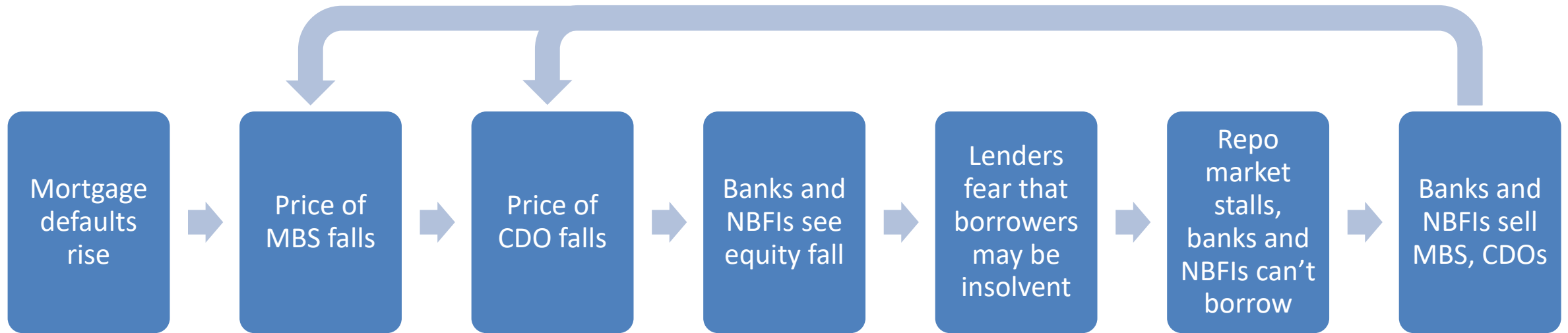
US nationwide housing market downturn → rising mortgage defaults (especially 'sub-prime') → prices of MBS's, CDOs fell drastically in 2007

Lenders, fearing that borrowers are insolvent, became less willing to enter into repos, and to accept these securities as collateral

Fearing insolvency, banks and NBFI's tried to **deleverage** i.e. sell assets to pay off liabilities

- Deleveraging works if just a few firms do it
- But when all sell at the same time, prices of MBS's, CDOs fall further → all become even closer to insolvency!

“Positive” Feedback Loop



Financial Crisis 2007-8

Bear Stearns collapsed in Mar 2008, but the Federal Reserve (**the Fed**) arranged restructuring and sale

Lehman Bros failed in Sep 2008, without Fed intervention, and brought on panic in repo market

- Solvency of many major financial institutions came under suspicion
- Worldwide impact, as major international financial institutions had also purchased MBS, CDOs, and borrowed in repo markets

AIG could not cover the CDS it had sold, and also collapsed

Actions by Fed and Treasury to restore financial stability (I)

Persuaded healthier financial institutions to buy troubled ones

- JP Morgan Chase was persuaded to buy Bear Stearns
- Bank of America was persuaded not to renege on buying Merrill Lynch

Bought securities to raise asset prices

- Fed bought large quantities of MBS
- Fed also bought commercial bonds

Actions by Fed and US govt to restore financial stability (II)

Gave NBFI's access to emergency Fed loans

- Goldman Sachs and Morgan Stanley were 'converted' into banks to qualify for the Fed's discount loans

Injected equity into troubled financial intermediaries

- US Treasury took over ownership of AIG, paid off its liabilities
- US Treasury became part owner of Citigroup, JP Morgan Chase, Goldman Sachs

Aftermath: lingering questions

What to do with
FI's that are too big
to fail?

How to ensure
bank's employees
don't take
excessive risk?

How to regulate
shadow banking?

Are financial crises
inevitable?
Predictable?

More recently: shadow banking in China

China's **shadow banking industry** has grown rapidly since 2000

- **Wealth management products** sold to savers by banks using subsidiaries (so that bank balance sheets do not include them)
- **Entrusted loans**: loans between two companies with banks as agent for lender
- **Trust companies**: firms that sell securities to investors to buy risky, high interest assets

Chinese authorities have increasingly **imposed regulations** on the sector, resulting in **shrinking of assets held** from RMB100 trillion in 2017 to RMB85 trillion in 2019

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The Money Market

We incorporate money, financial assets, and the interest rate into the Keynesian model

Simplifying assumption: **only 2 financial assets** that people can hold their wealth in

- **Bonds**: pays interest; not used for transactions; risky
- **Money**: no interest ; used for transactions ; safe

Simplifying assumption: **inflation rate is fixed**, i.e. nominal and real interest rates move together

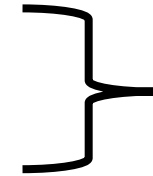
Money Demand

Money Demand refers to the amount of wealth households choose to hold as money

People want to hold more money if

(1) the **(nominal) interest rate** falls

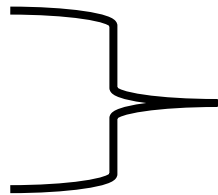
- *opportunity cost* of holding money falls



Asset demand for money

(2) the **Price Level** rises

(3) **Output** rises



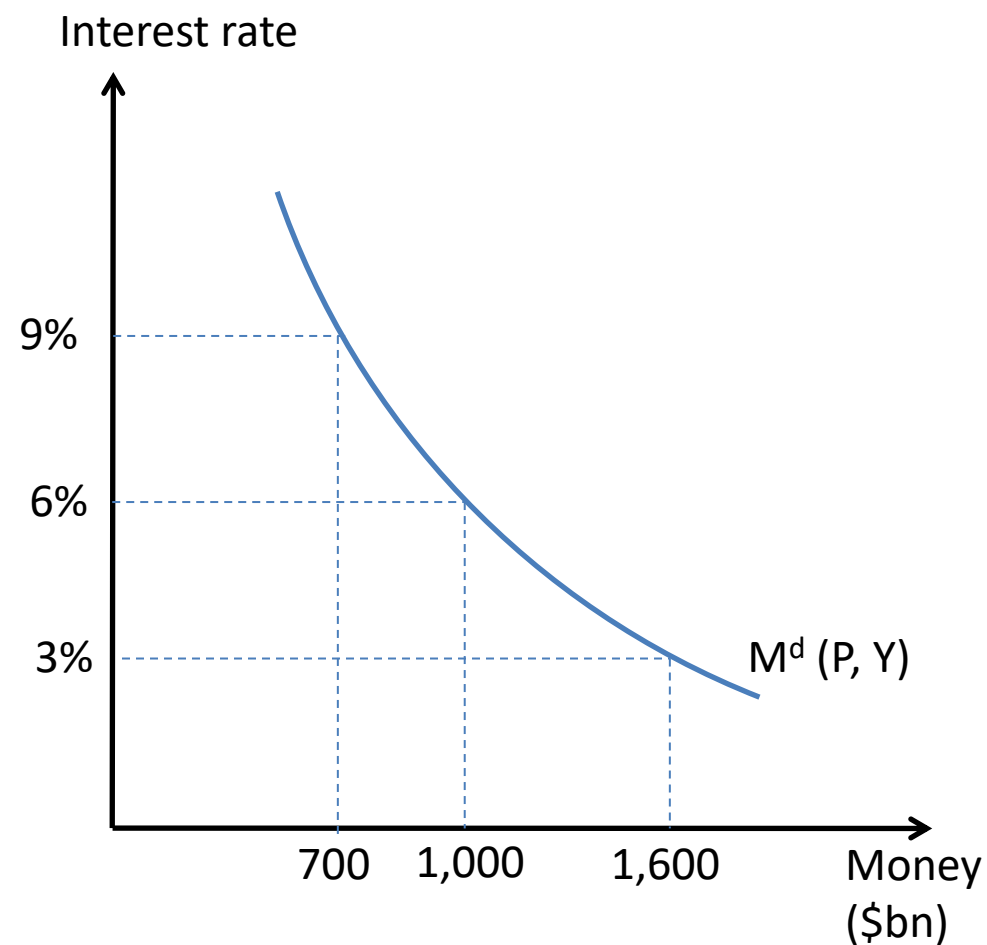
Transactions demand for money

Money Demand Curve (M^d)

Graph the money demand function against interest rate

Change in interest rate → **movement along** M^d

Change in P or Y → **shift** in M^d



Money Supply: recall from Macro 4

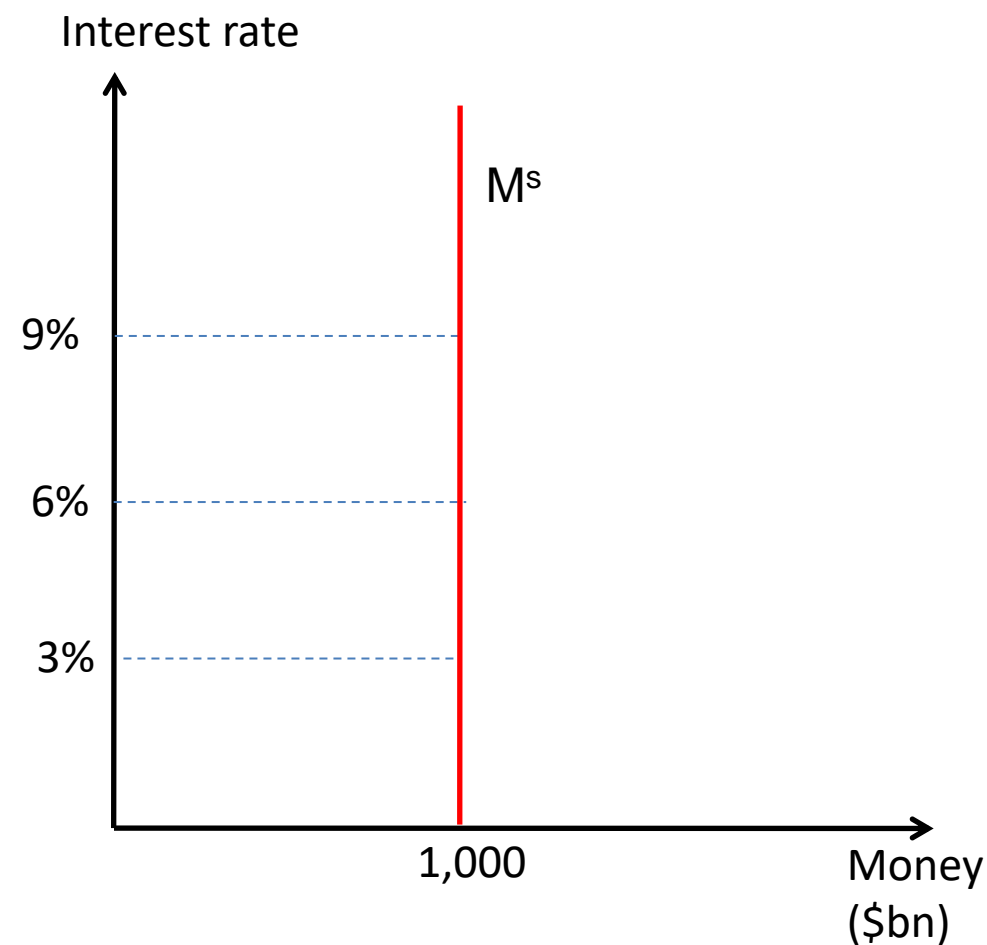
Instrument	Increase M^S	Reduce M^S
Required reserve ratio (RRR)	Reduce RRR	Raise RRR
Open market operations	Create reserves, buy securities	Sell securities, destroy reserves
Discount rate	Reduce Discount Rate	Raise Discount Rate
Interest rate paid on reserves (IOR)	Reduce IOR	Raise IOR

Money Supply Curve (M^s)

We assume that the Central Bank has complete control of the quantity of money

- Vertical supply curve

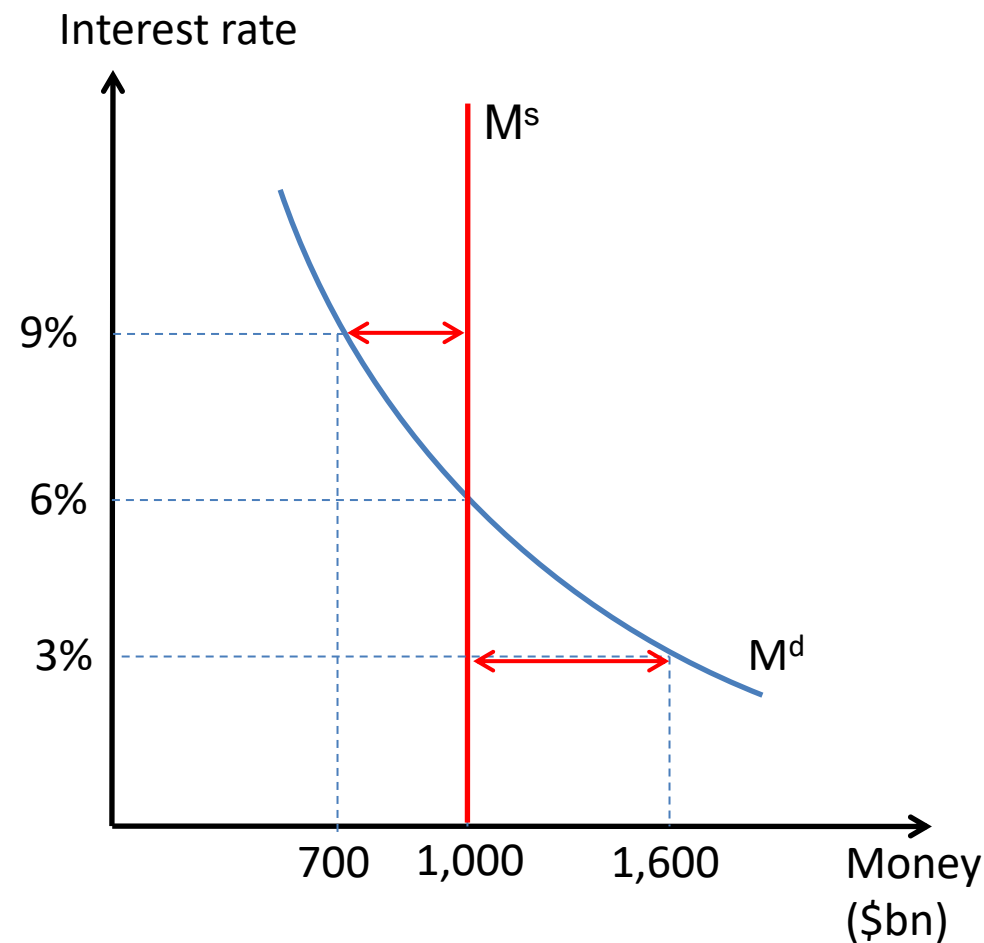
Money supply curve shifts when Central Bank decides to change the quantity of money



Equilibrium in the Money Market

In this economy, people are holding \$1,000bn of money

- At 9%, **excess supply**
- At 3%, **excess demand**
- At 6%, **equilibrium**



How does the money market clear?

If interest rate is at 9%, above equilibrium level ...

Excess supply of money

people would rather
hold less money

Is
mirrored
by

Excess demand for bonds

people would rather
hold more bonds

With excess demand, bond price will \uparrow in the bond market

As Bond price \uparrow , interest rate \downarrow

Interest rate \downarrow until people are satisfied with holding \$1,000bn of money

Active Learning: Bond price and the Interest rate

Consider a simple bond: a promise by bond issuer to pay bondholder \$1,000 in one year's time

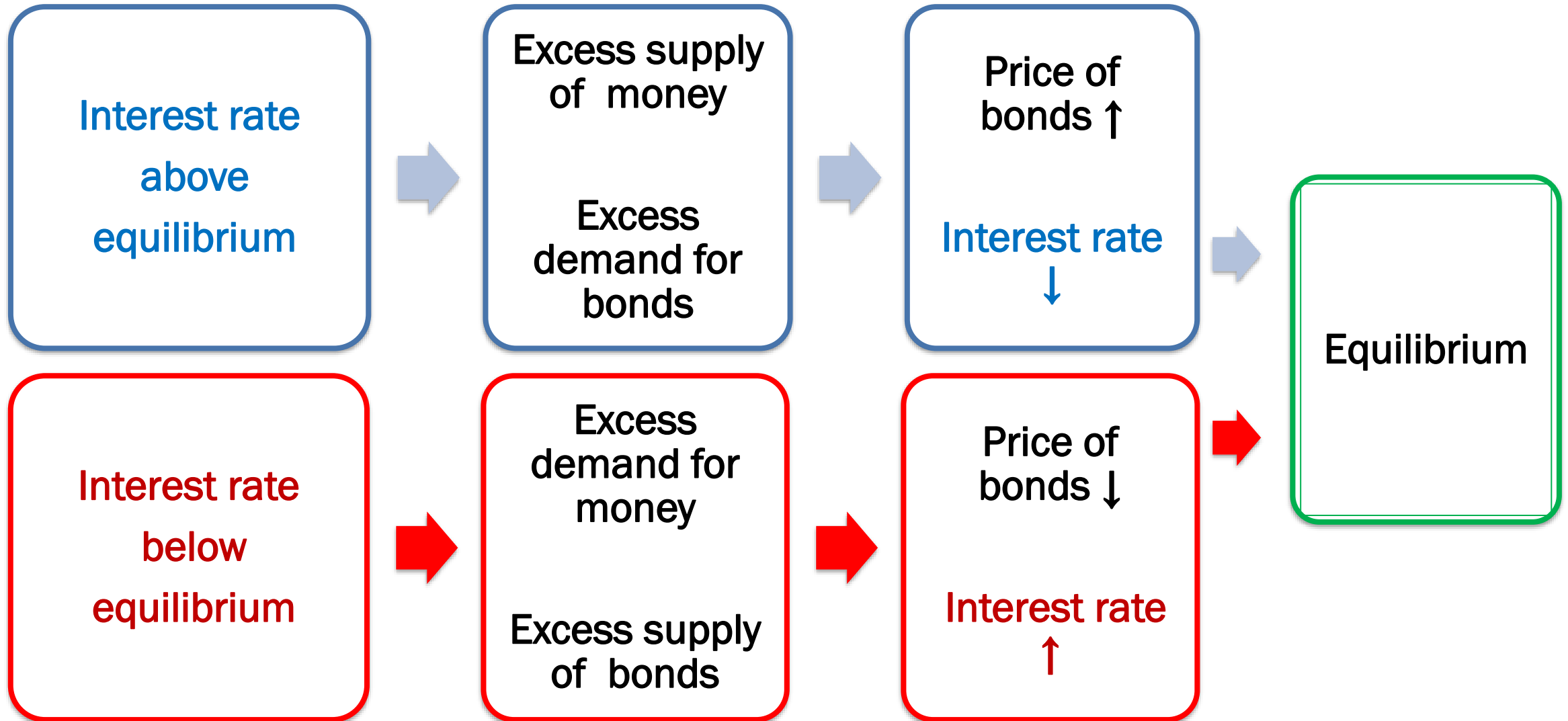
If bond price is \$800

- Buying the bond and holding it to maturity earns you \$_____
- Interest rate is $\$ ____ / \$800 = _____\%$

If bond price is \$900

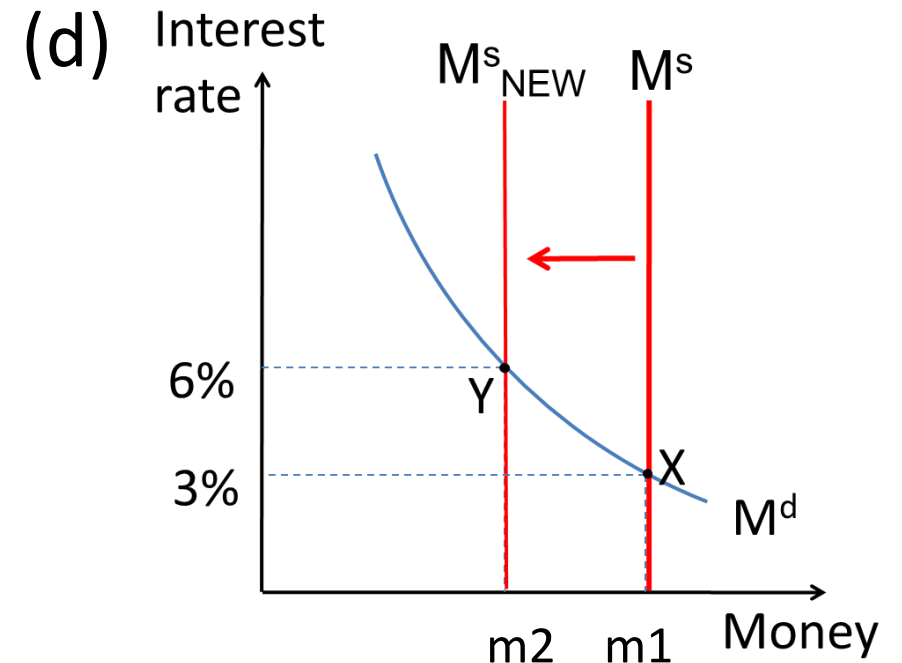
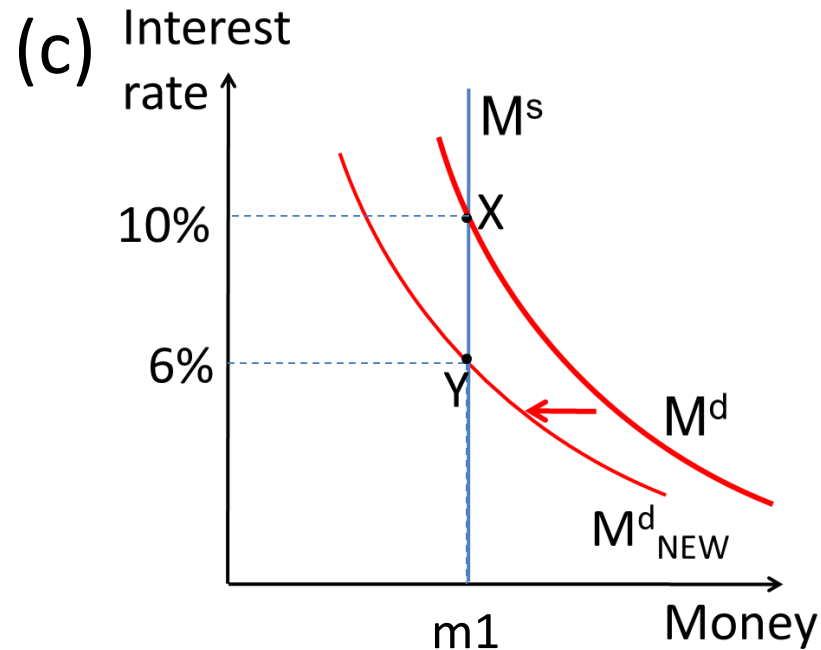
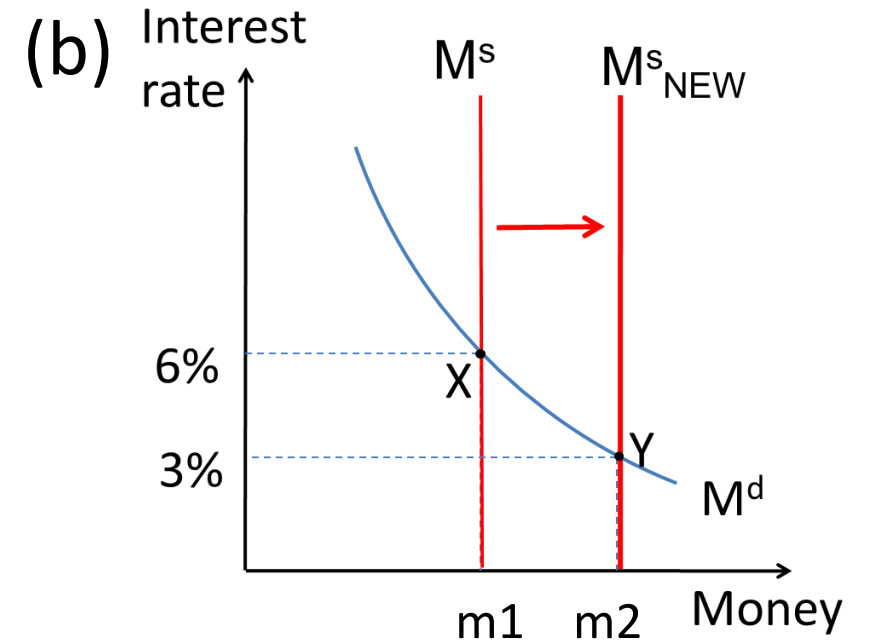
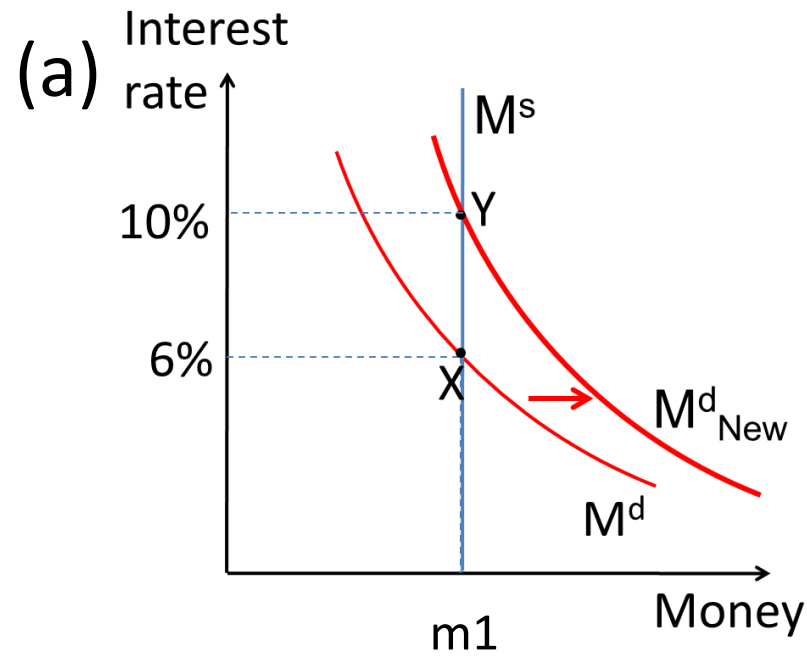
- Buying the bond and holding it to maturity earns you \$_____
- Interest rate is $\$ ____ / \$900 = _____\%$

Summary: How does the money market clear?



Active Learning: Open Market Purchases

Choose the diagram that shows the Central Bank making open market purchases.



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Interaction between goods market and money market

We re-introduce the interest rate to the Keynesian model from Macro 3

- Other things equal, if r rises, I^P and $a \rightarrow$ **if r rises, AE falls**
- **By implication, if r rises, Y^* falls**

We incorporate the money market into the Keynesian model

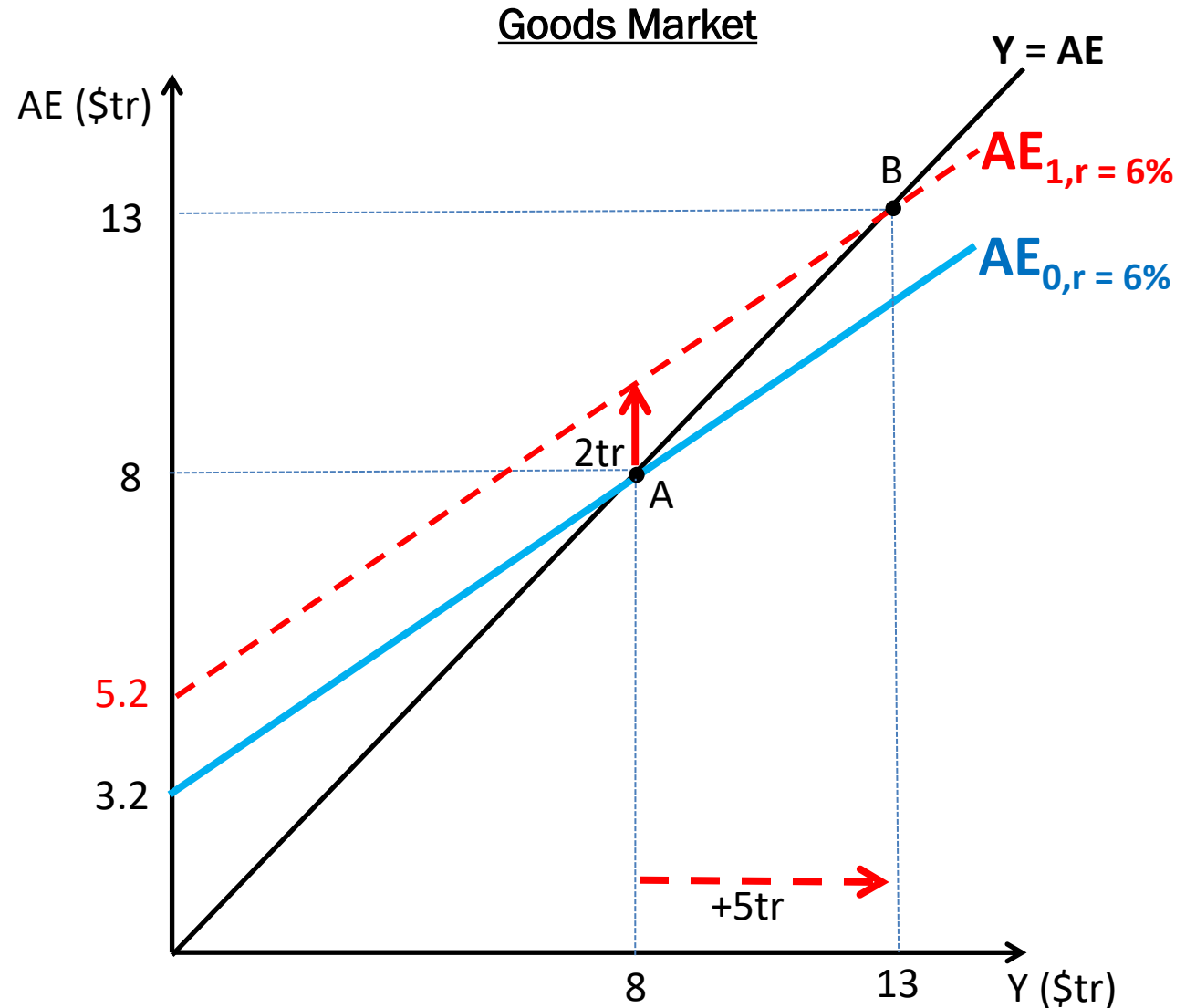
- Other things equal, **if Y rises, money demand rises**
- **By implication, if Y rises, r rises**

Using a familiar example

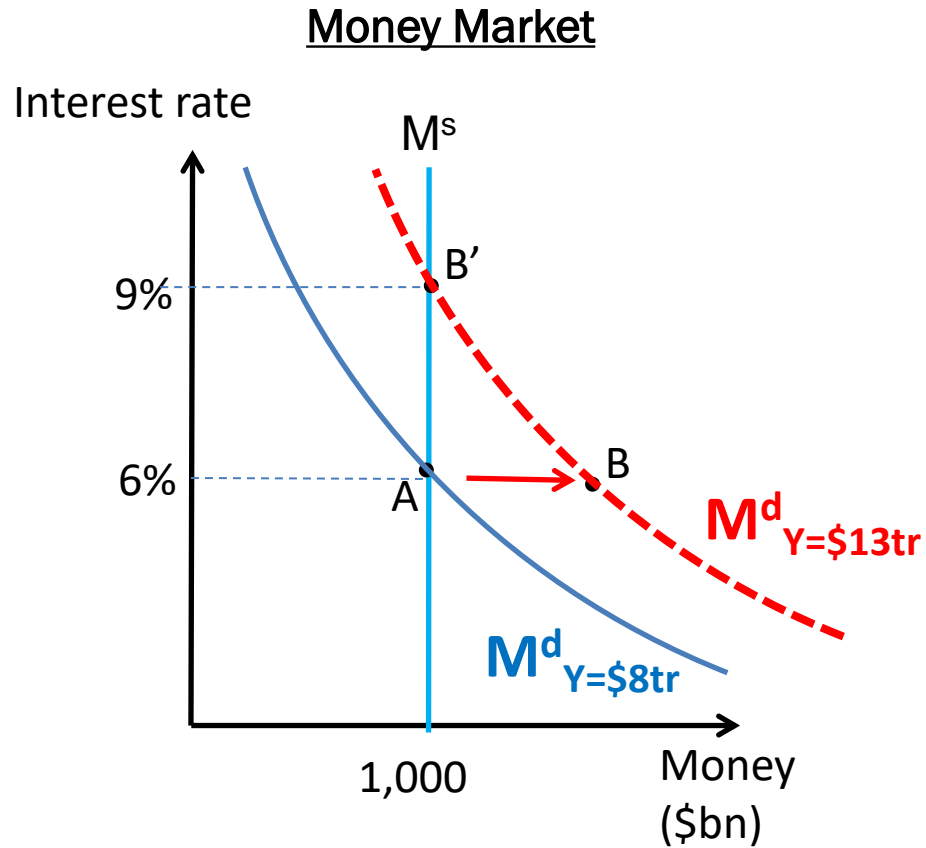
Recall Keynesian
Model example with
 $MPC = 0.6$

+\$2 trillion demand
shock \rightarrow +\$5 trillion
rise in Y^*

Interest rate is
currently 6 percent



The money market reacts



Initially at A, M^d curve is based on \$8tr income

$\uparrow Y^*$ to \$13tr \rightarrow **The money market reacts** $\rightarrow M^d$ shifts right

Equilibrium interest rate \uparrow to 9%

Further interaction!

The money market reacts!

$\uparrow Y^* \rightarrow \uparrow M^d \rightarrow \uparrow \text{interest rate} \dots$

In turn, the goods market reacts!

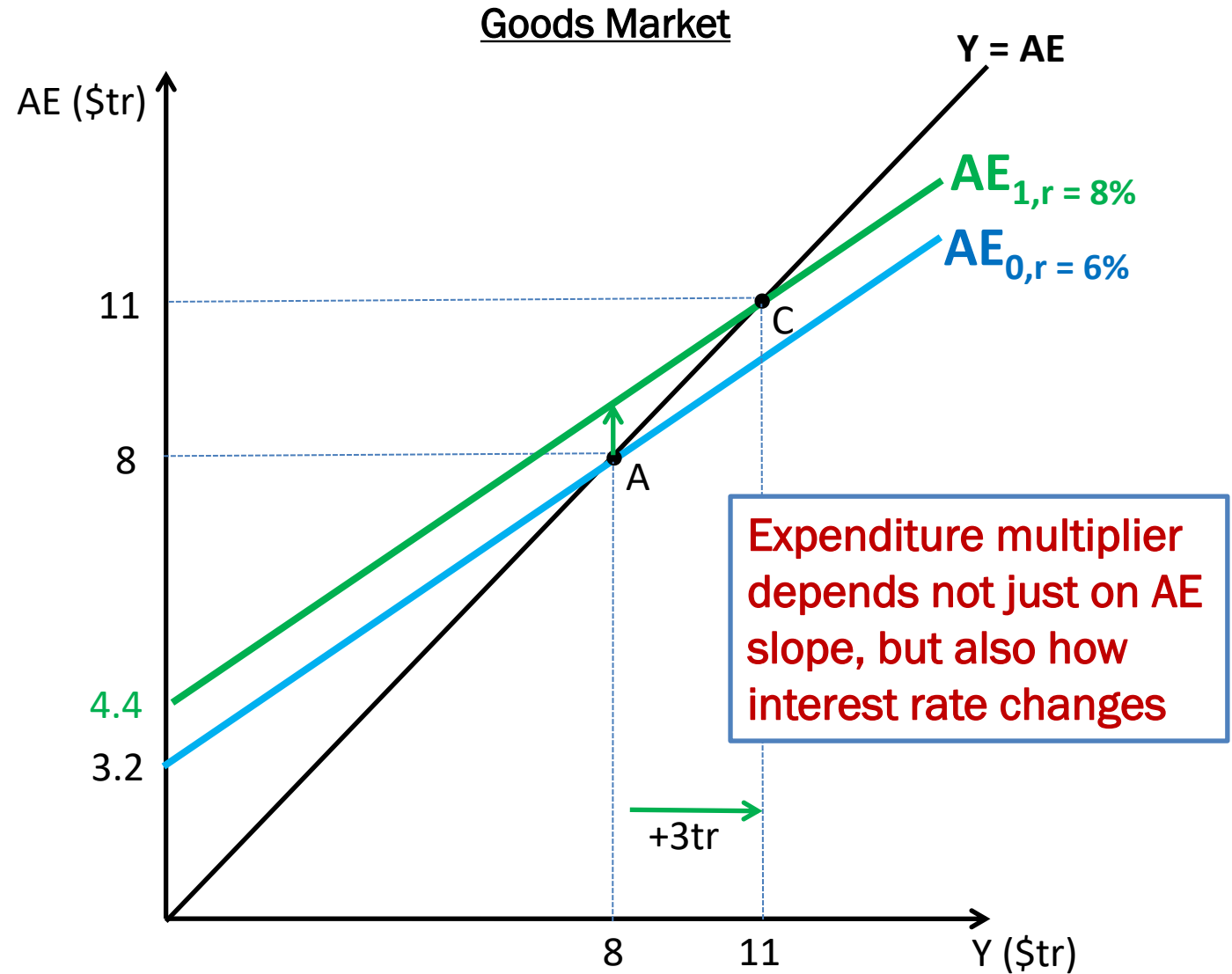
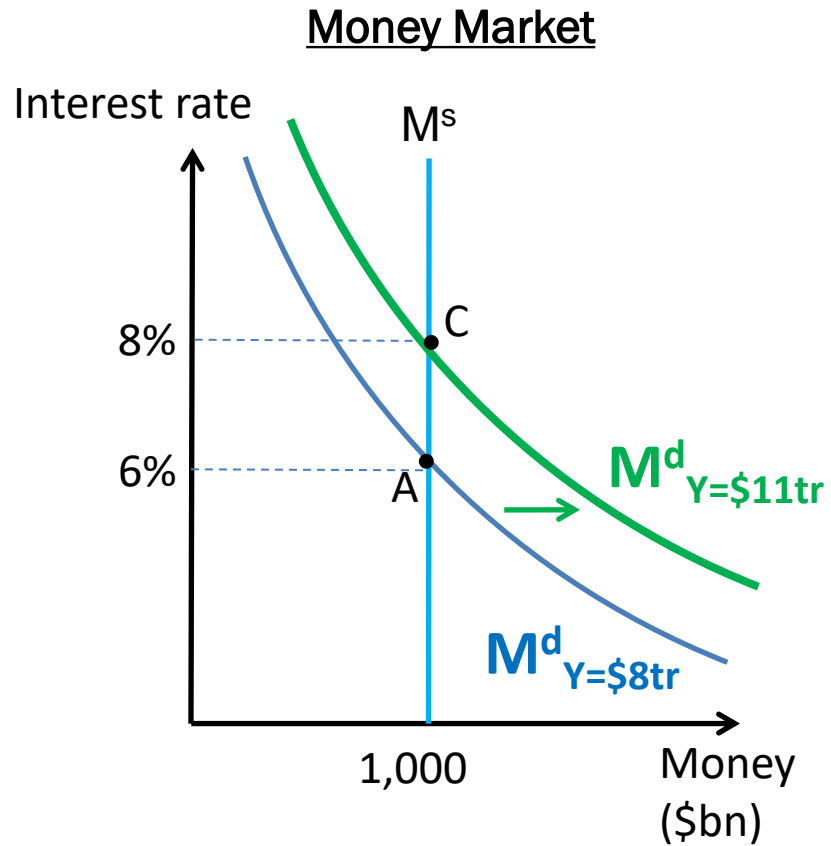
$\uparrow \text{interest rate} \rightarrow \downarrow I^P, a \rightarrow \downarrow AE \rightarrow \downarrow Y^*$

In turn, the money market reacts!

$\downarrow Y^* \rightarrow \downarrow M^d \rightarrow \downarrow \text{interest rate} \dots \text{and so on}$

Eventually, **both markets reach equilibrium** at some intermediate value of Y^* (e.g. \$11 tr) and some intermediate value of interest rate (e.g. 8%)

Equilibrium in both markets with +\$2 trillion demand shock



The return of crowding out

Because of the interaction between goods market and money market, **crowding out** is now present in the Keynesian Model

Crowding out isn't 100 percent in the Keynesian Model with the money market incorporated

But crowding out **reduces the size** of the expenditure multiplier

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Monetary Policy

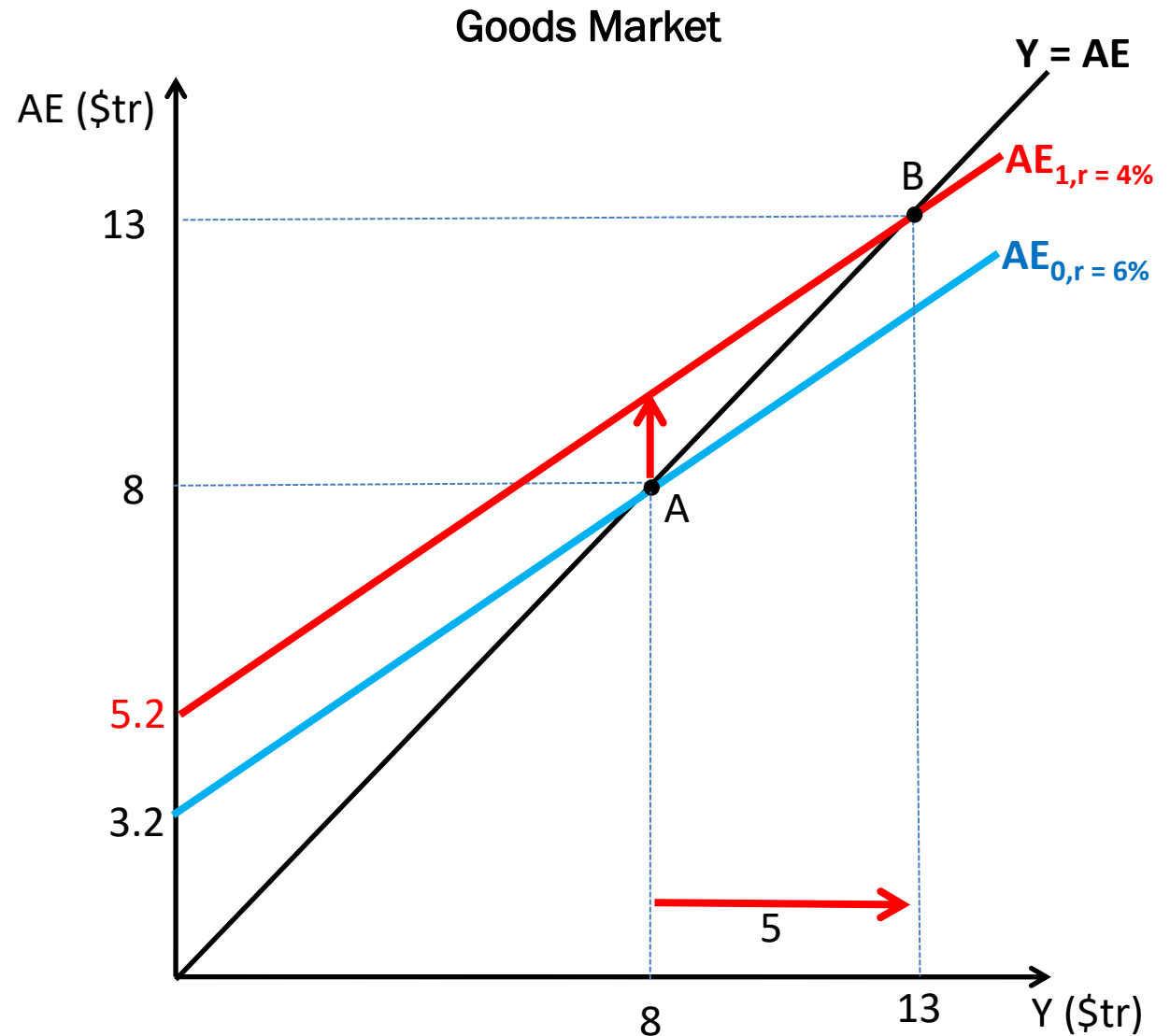
Monetary policy = central bank's actions and communications to manage the money supply to influence economic activity

For most central banks, the tools of monetary policy are used to target the **interest rate**

Monetary Policy affects Y^*

Suppose the Central Bank wants to move the economy from A to B

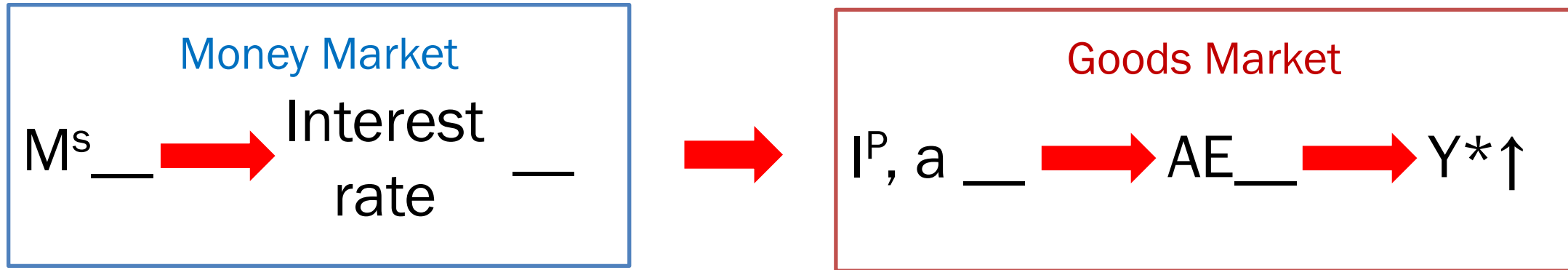
It can do so **by increasing the money supply** sufficiently to reduce the interest rate from 6% to 4%



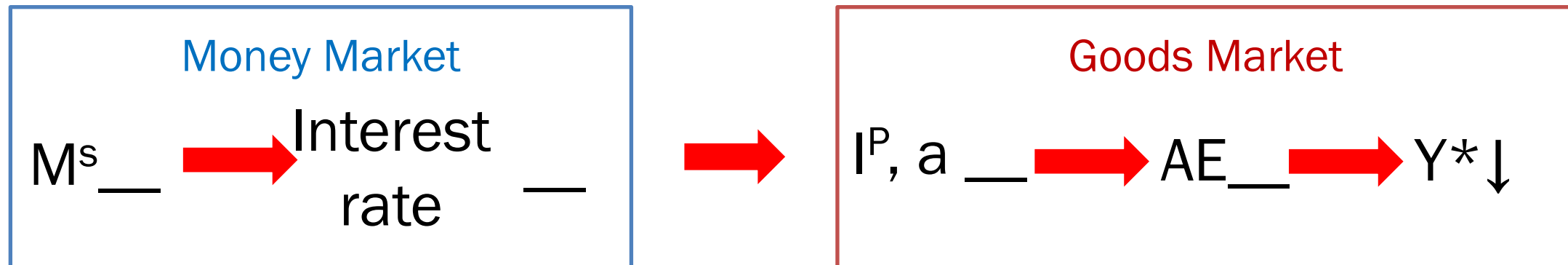
Active Learning: Expansionary versus Contractionary monetary policy

Fill in the blanks with \uparrow or \downarrow arrows

Expansionary monetary policy aims to $\uparrow Y^*$



Contractionary monetary policy aims to $\downarrow Y^*$



Countercyclical Monetary Policy

For countercyclical purposes

- If $Y^* < Y_{FE}$, use **expansionary** monetary policy
- If $Y^* > Y_{FE}$, use **contractionary** monetary policy

Compared to fiscal policy, monetary policy is **faster to enact** and **easier to reverse**

Monetary policy can have a strong influence over the effectiveness of fiscal policy in affecting spending

Monetary Policy affects Fiscal Policy

An expansionary fiscal policy leads to a rise in the interest rate → the resultant **crowding out** reduces the policy impact

If Central Bank wants to **accommodate** the expansionary fiscal policy, it can eliminate crowding out by **preventing the interest rate from rising**

If Central Bank wants to **neutralize** the expansionary fiscal policy, it can **raise the interest rate further**

Central bank independence

President Trump: 'My biggest threat is the Fed'

By Danielle Wiener-Bronner, [CNN Business](#)

Updated 0051 GMT (0851 HKT) October 17, 2018



In a clip released by Fox Business on Tuesday, the president said in an interview the central bank is his "biggest threat." Trump has been critical of Federal Reserve Chair Jerome Powell, who he appointed last year.

"The Fed is raising rates too fast and it's independent so I don't speak to [him]," Trump told Fox Business journalist Trish Regan.

[CNN, October 17, 2018](#)

Conventional monetary policy in practice

In practice, there isn't a single interest rate in the economy

Central banks choose to target one short-term interest rate

- The Fed targets the **Fed Funds Rate** (FFR) = rate at which banks lend reserves to one another overnight

This interbank rate acts as the **benchmark for other interest rates**

- Other assets pay higher rates, due to being longer-term and higher risk, thus earning **term premiums** and **risk premiums**.
- Difference (**spread**) between these rates and the FFR is usually stable
- When Fed changes the FFR, other rates tend to move in tandem

Relationship between three rates

Banks will not lend reserves to other banks if $IOR > \text{interbank rate}$
Thus, IOR is the floor for the FFR

IOR

Interest rate paid on reserves

Fed Funds Rate

Interest rate in the interbank market for reserves

Fed can use open market operations to affect the interbank rate

Discount rate

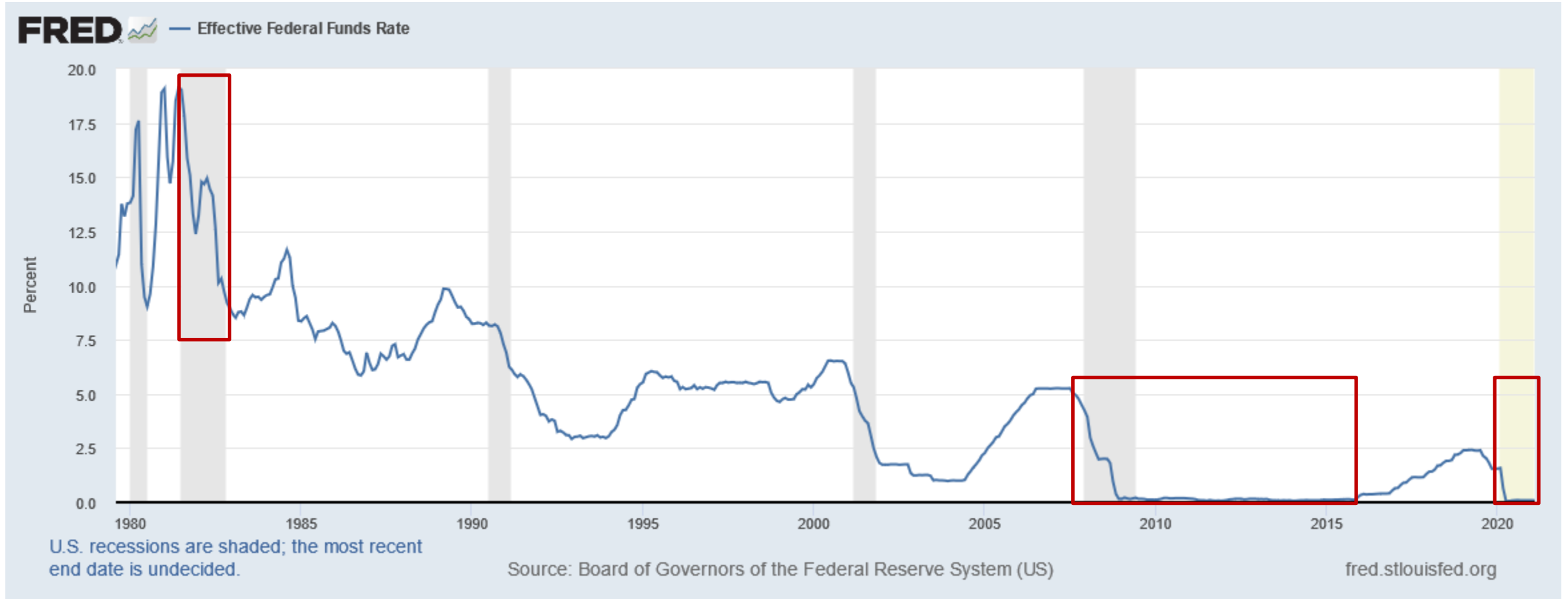
Interest rate charged by central bank for lending reserves

Banks will not borrow reserves from other banks if discount rate $< \text{interbank rate}$
Thus, discount rate is the ceiling for the FFR

The target interest rate for major central banks

Central Bank	Target rate	Description
US Federal Reserve	Fed Funds Rate	Rate at which banks lend reserves to one another overnight
Bank of Japan	Mutan Rate	Rate at which banks lend reserves to one another overnight
European Central Bank	Rate on Deposit Facility	Rate at which ECB pays on reserves
	Rate on lending facility	Rate at which ECB lends reserves
Bank of England	Base Rate	Rate at which Bank of England lends reserves to banks overnight
Riksbank (Sweden)	7-day Repo rate	Rate at which banks borrow or deposit funds with Central Bank for 7 days

Fed Funds Rate, 1979 Aug to 2021 Feb



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Unconventional Monetary Policy

Early 2006

Fed raised
FFR to 5
percent

Mar 2008

Bear
Stearns
failed

Dec 2008

Fed lowered FFR
to 0.25 percent
(effectively zero)

July 2007

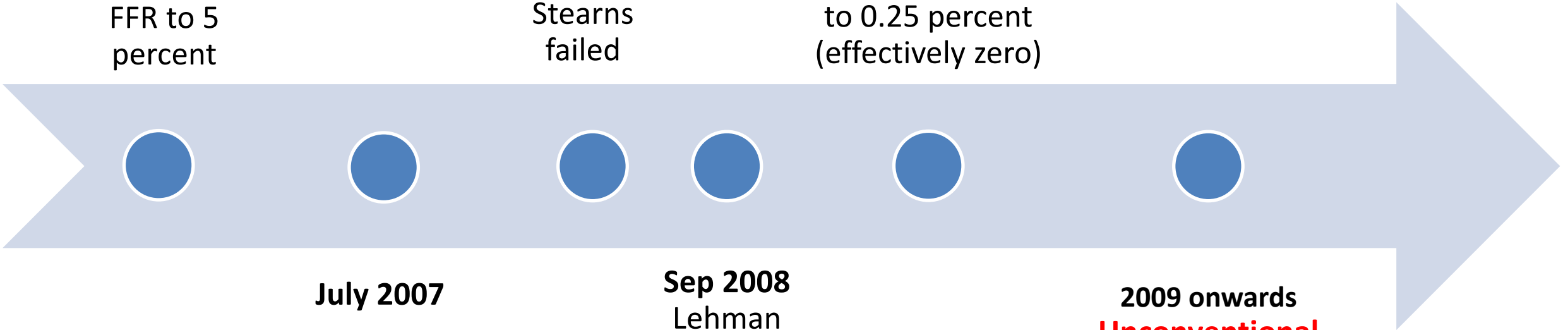
Fed begins lowering
FFR as housing
market weakened
and GDP growth
slowed

Sep 2008

Lehman
Bros failed

2009 onwards

**Unconventional
Monetary Policy to
combat slump**



A “Zero lower bound” for conventional monetary policy

It is hard for a Central Bank to keep the nominal interest rate significantly below 0%

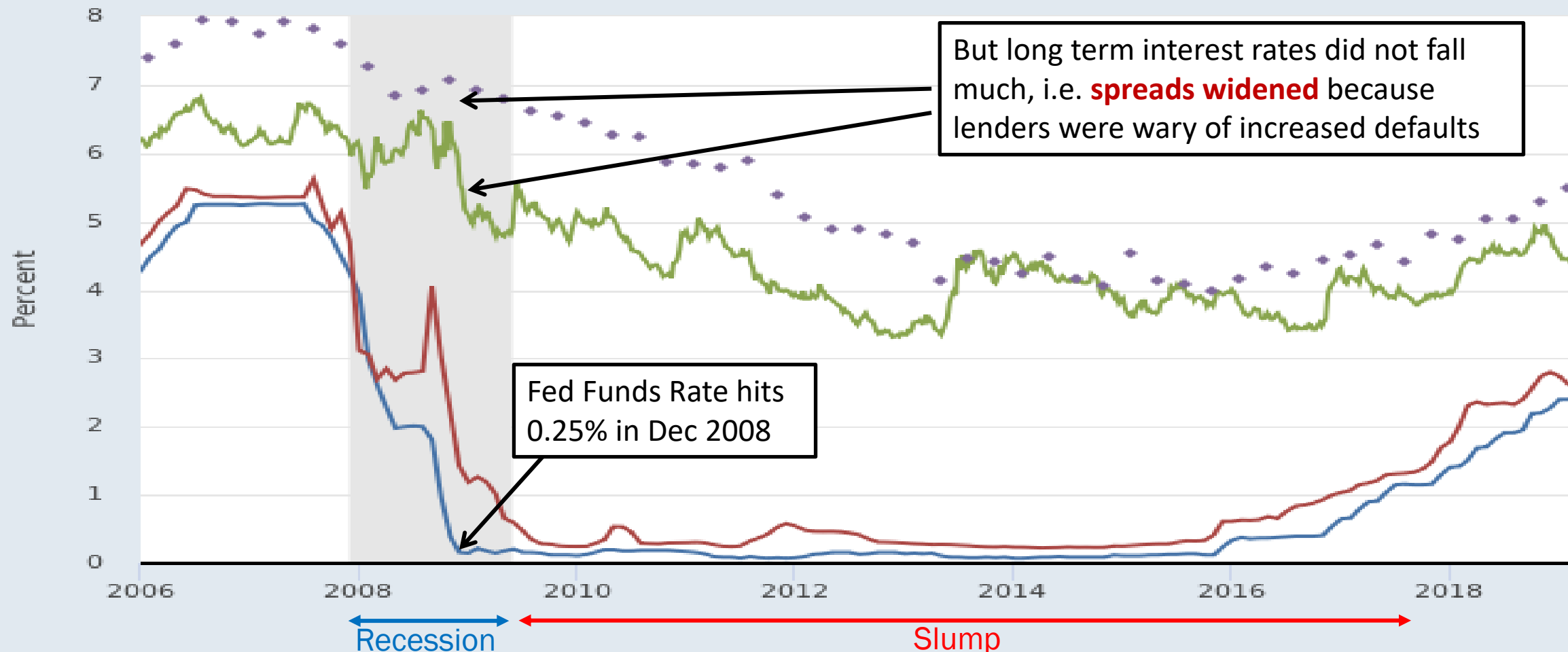
- Consider the simplest bond: a promise to pay its holder \$1,000 one year from now
- A negative interest rate means that the bond price exceeds \$1,000!

In a deep, prolonged slump, conventional monetary policy may hit the **zero lower bound**!

Hitting the “zero lower bound”

FRED

- Effective Federal Funds Rate
- 3-Month London Interbank Offered Rate (LIBOR), based on U.S. Dollar
- 30-Year Fixed Rate Mortgage Average in the United States
- Finance Rate on Consumer Installment Loans at Commercial Banks, New Autos 48 Month Loan



Quantitative Easing (QE) = large scale asset purchases

Fed and other central banks experimented with **unconventional monetary policy**

Quantitative Easing (QE): large scale purchase of financial assets, paying with newly created reserves

- Think of QE as “open market purchases on steroids”
- From 2008-2014, Fed bought several trillion dollars of MBS, long-term govt bonds, commercial bonds
- BOJ, ECB are still running their QE programs, and have even purchased stocks

Objectives of QE

Objectives of QE are to **boost asset prices** and **reduce long-term interest rates**

- Reduce pressure on financial institutions to **deleverage**
- Increase wealth → induce consumption?

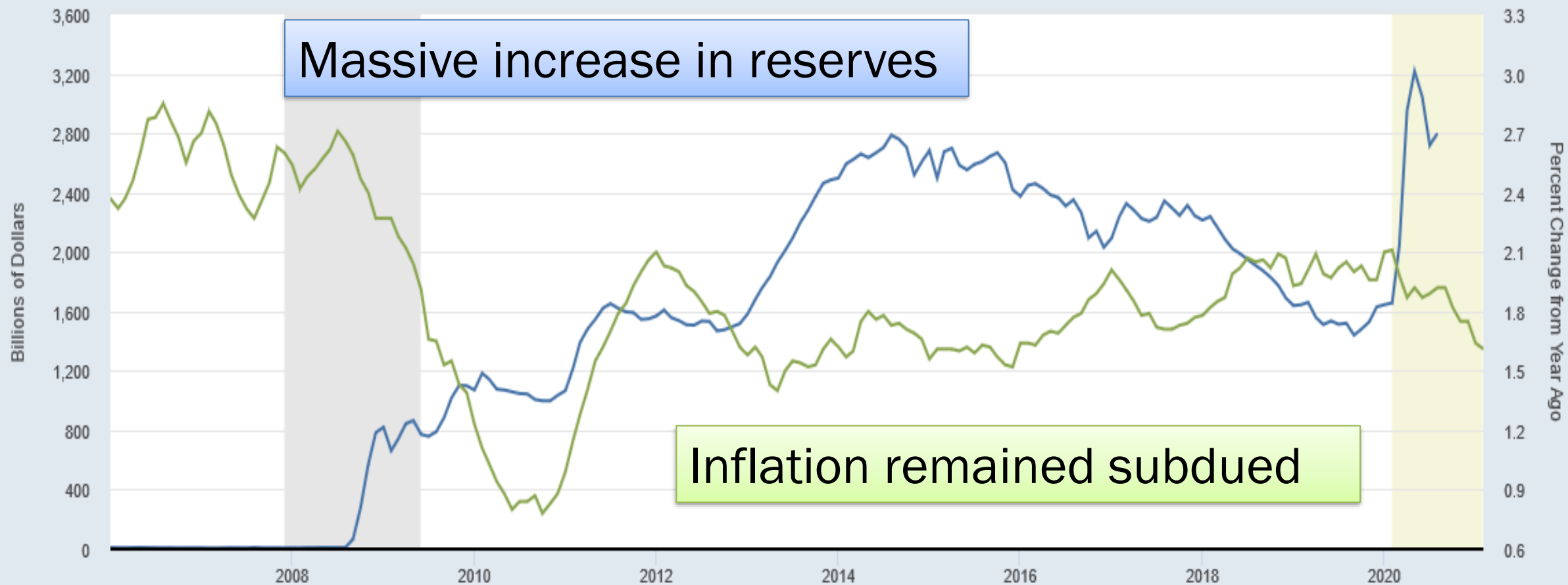
By conducting QE, Fed massively increased quantity of reserves, but this **did not lead to a massive increase in deposit creation**

- Banks wanted to hold excess reserves
- As a precaution, Fed started paying IOR of 0.25 percent, equal to the Fed Funds Rate

QE did not lead to hyperinflation

FRED

— Total Reserve Balances Maintained with Federal Reserve Banks (DISCONTINUED) (left)
— Trimmed Mean PCE Inflation Rate (right)



U.S. recessions are shaded; the most recent end date is undecided.

Sources: Board of Governors; Dallas Fed

fred.stlouisfed.org

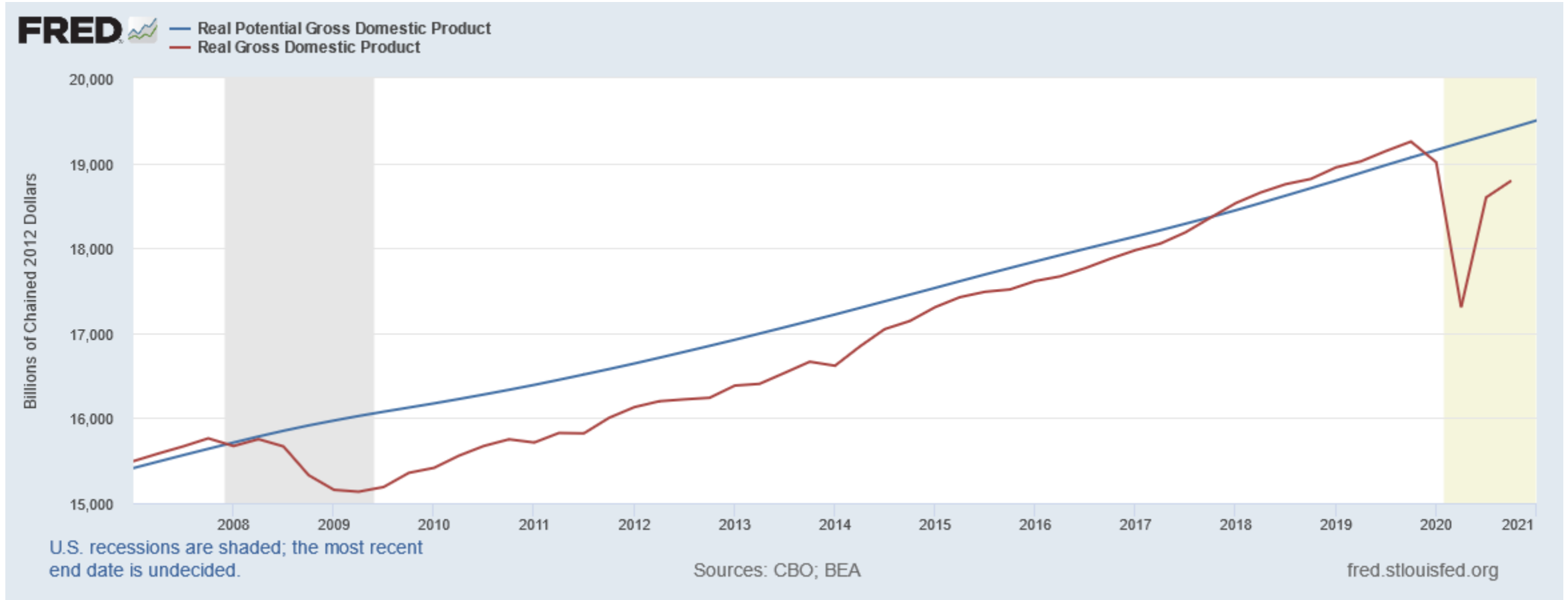
Forward guidance: communicating future policy

Another unconventional monetary policy adopted in 2011: Fed announced that it would **keep its target rate at 0.25% for the extended future**

The **communicating of future monetary policy** is called **forward guidance**, and is meant to influence business and household expectations of the future interest rate

As it turned out, the Fed kept the Fed Funds rate at 0.25% for 7 years

Impact of monetary policy?



A decade of unconventional monetary policy

Ambivalence about QE and forward guidance

- Helped combat the slump, but effect is weak
- Doesn't directly help the unemployed or people who have lost their homes; may have worsened inequality

To combat deep, prolonged slump, monetary policy isn't enough

- Fiscal policy should be used in tandem
- But fiscal policy was too focused on the long run (deficit reduction for growth)

Enrichment: Monetary Policy during Covid-19 pandemic

Once again, Fed has pushed the Fed Funds Rate to essentially zero, started QE and used forward guidance

It has also expanded lending to non-financial institutions (!)

See this Brookings Institution account of the Fed's action:

- Cheng, Powell, Skidmore and Wessel (2021). *What's the Fed doing in response to the Covid-19 crisis? What more could it do?* Available at <https://www.brookings.edu/research/fed-response-to-covid19/>

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6 Monetary Policy and Inflation

2022 is the year of Inflation!



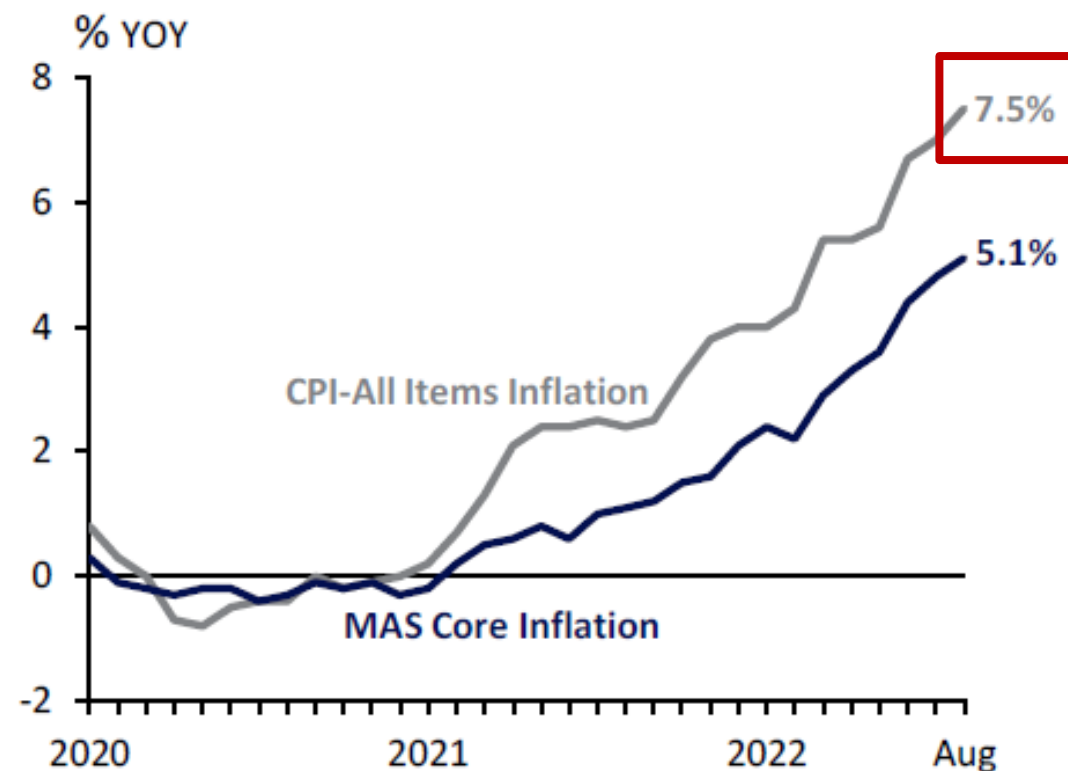
Monetary Authority of Singapore



Consumer Price Developments in August 2022

Summary

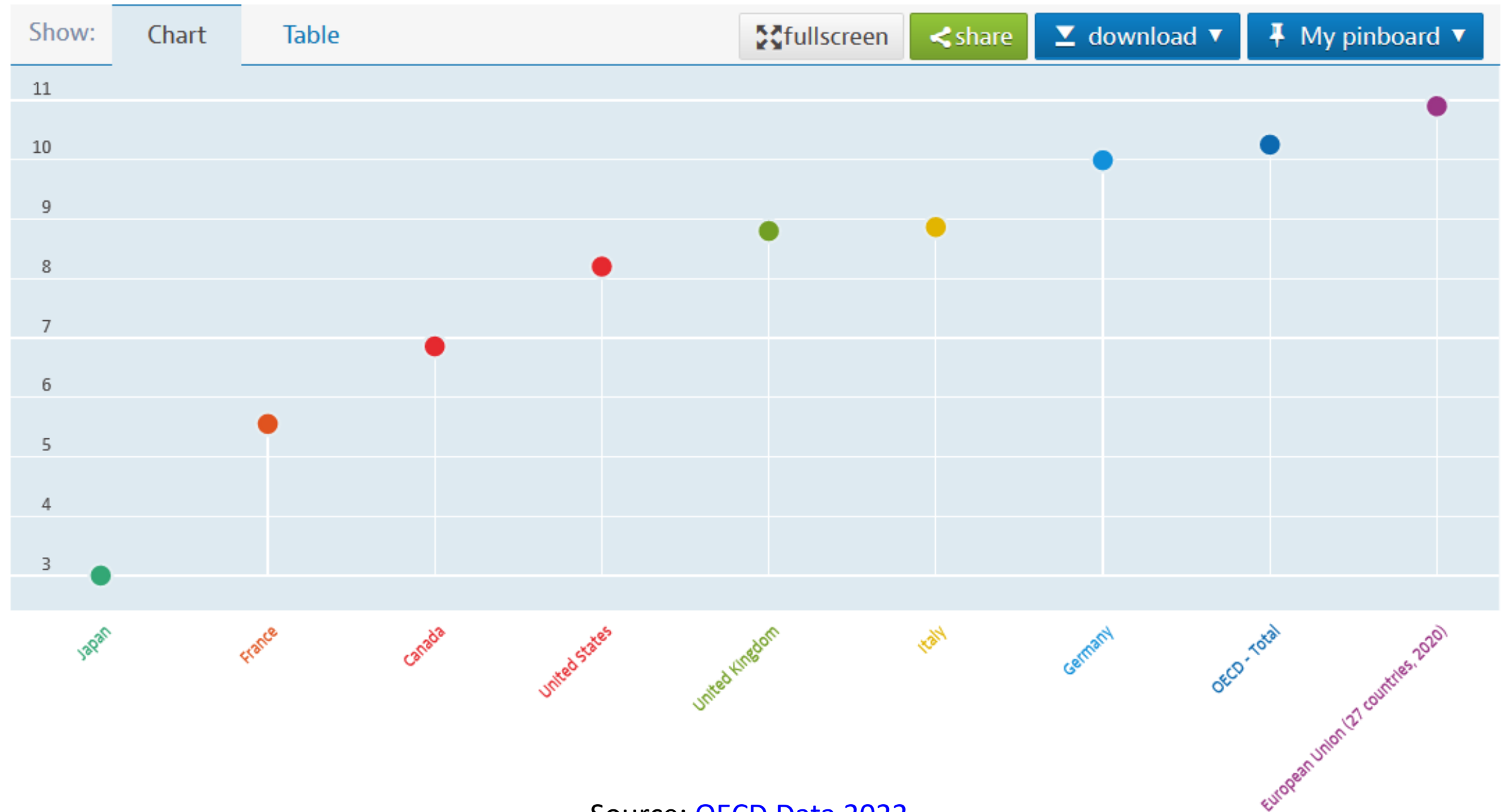
- MAS Core Inflation rose to **5.1%** on a year-on-year (y-o-y) basis in August, from **4.8%** in July.
 - The pickup in core inflation was mainly driven by larger increases in the prices of services and food.
- CPI-All Items inflation came in at **7.5%** y-o-y in August, up from **7.0%** in July.
 - The rise in headline inflation largely reflected higher private transport inflation, in addition to the pickup in core inflation.
- On a month-on-month (m-o-m) basis, core CPI and CPI-All Items increased by **0.5%** and **0.9%**, respectively.



From MAS-MTI [Consumer Price Developments](#)

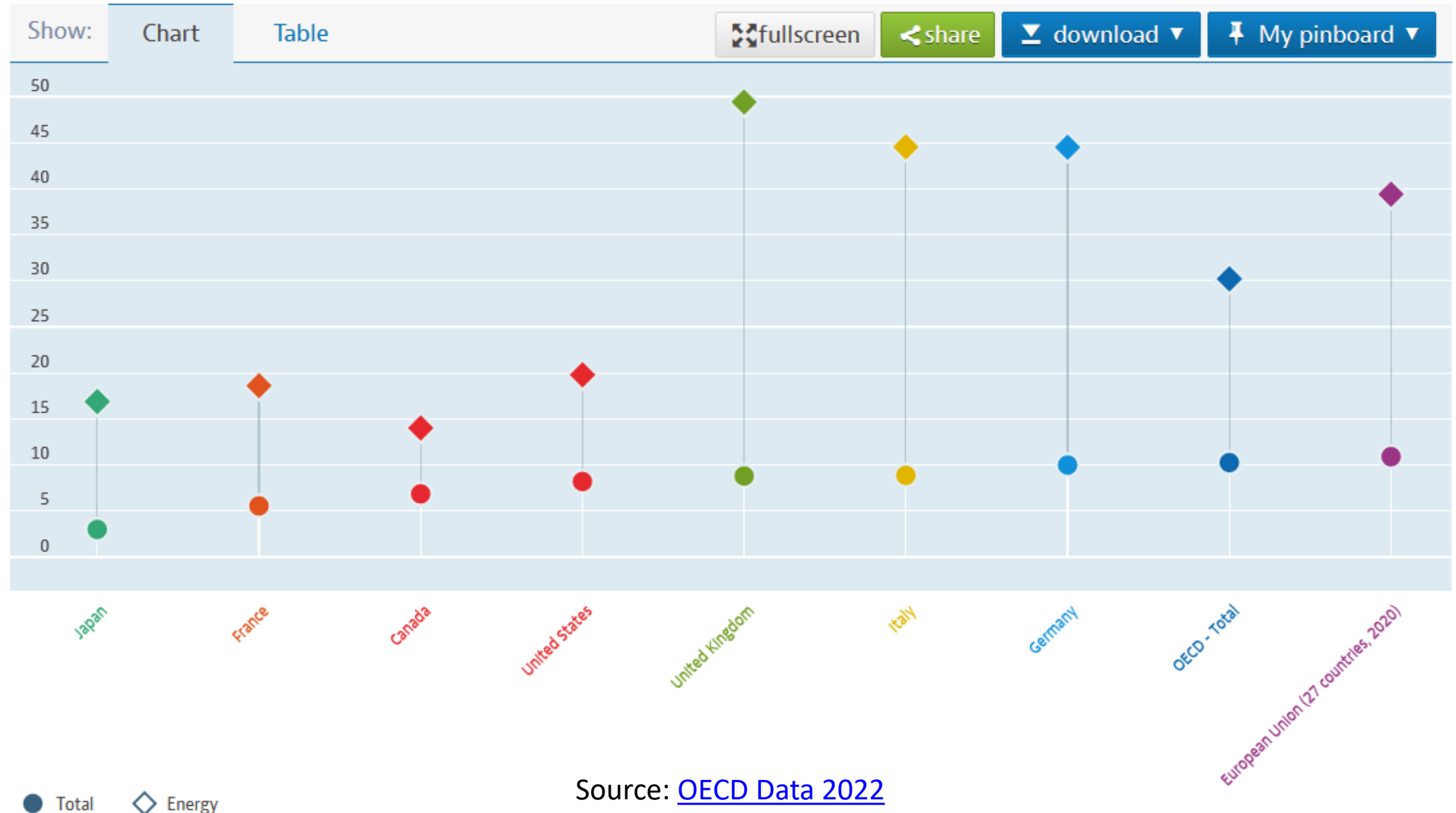
Inflation (CPI) Total, Annual growth rate (%), Sep 2022 or latest available

Source: Prices: Consumer prices



Inflation (CPI) Total / Energy, Annual growth rate (%), Sep 2022 or latest available

Source: Prices: Consumer prices



Inflation discussed in previous videos

In Macro 1

Goal: Stable Prices

The goal of **stable prices** = the goal of keeping inflation predictable, low, and positive

Many governments delegate the task of attaining stable prices to their **central banks**

A common target is for a long-term inflation rate of **2% per year**

In Macro 4

Money and Hyperinflation

With the advent of fiat money, governments can potentially finance budget deficits by “printing money”...
... but undisciplined money creation leads to ...

Hyperinflation = sustained inflation rate > 50% per month

Old examples: 1920s Weimar Germany, 1940s Hungary
Recent examples: 2000's Zimbabwe, 2015-present Venezuela

The Fed Intensifies Its Battle Against Inflation

Federal Reserve officials made another large rate increase and signaled more to come, pledging to quash inflation despite expected pain.

[New York Times, 2022 Sep 21](#)

Month in 2022	January	March	May	June	July	September
Fed Funds Rate	0.25%	0.50%	1.00%	1.75%	2.50%	3.25%

Fed Chairman Jerome Powell: “We have got to get inflation behind us. I wish there were a painless way to do that; there isn’t.”

Theory of inflation: intuitive version

A full model-based explanation for inflation is provided in EC2102

When *nominal* aggregate expenditure rises relative to *real* potential output

- In the short run, economy can produce above its potential
- In the long run, **prices and wages rise** until *real* aggregate expenditure falls back to equal *real* potential output

Inflation triggers: demand and supply shocks

Positive demand shocks: Increases in expenditure

1960s-70s: US govt
spending increases

2020's: overly
expansionary policies
to fight COVID-19
recession

Negative supply shocks: Reduction in potential output

Oil supply restrictions and price increases
in 1973 (OPEC embargo) and 1979-80
(Revolution in Iran)

2022: Russia-Ukraine war; lock-downs in
China

Stagflation: high inflation +
high unemployment

From a bout of high inflation to sustained high inflation

But **sustained high inflation** requires two ingredients

(1) Central banks being **hesitant to tighten monetary policy**

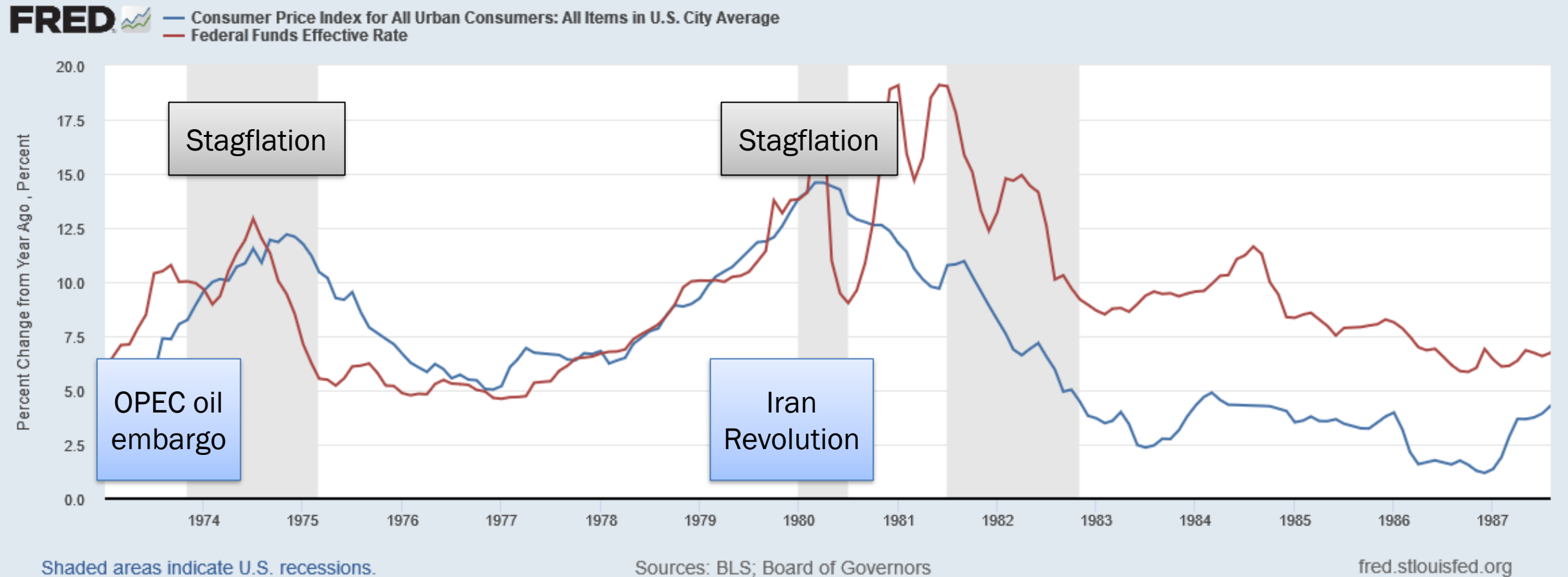
(2) People grow to **expect high inflation** to persist

- Unions push for **cost-of-living adjustments** to wages every year
- Firms raise prices of their products as costs increase
- Governments raise transfers to help people cope with inflation
- **Indexation** becomes more common

With (1) and (2): **expectations of high inflation become self-fulfilling**

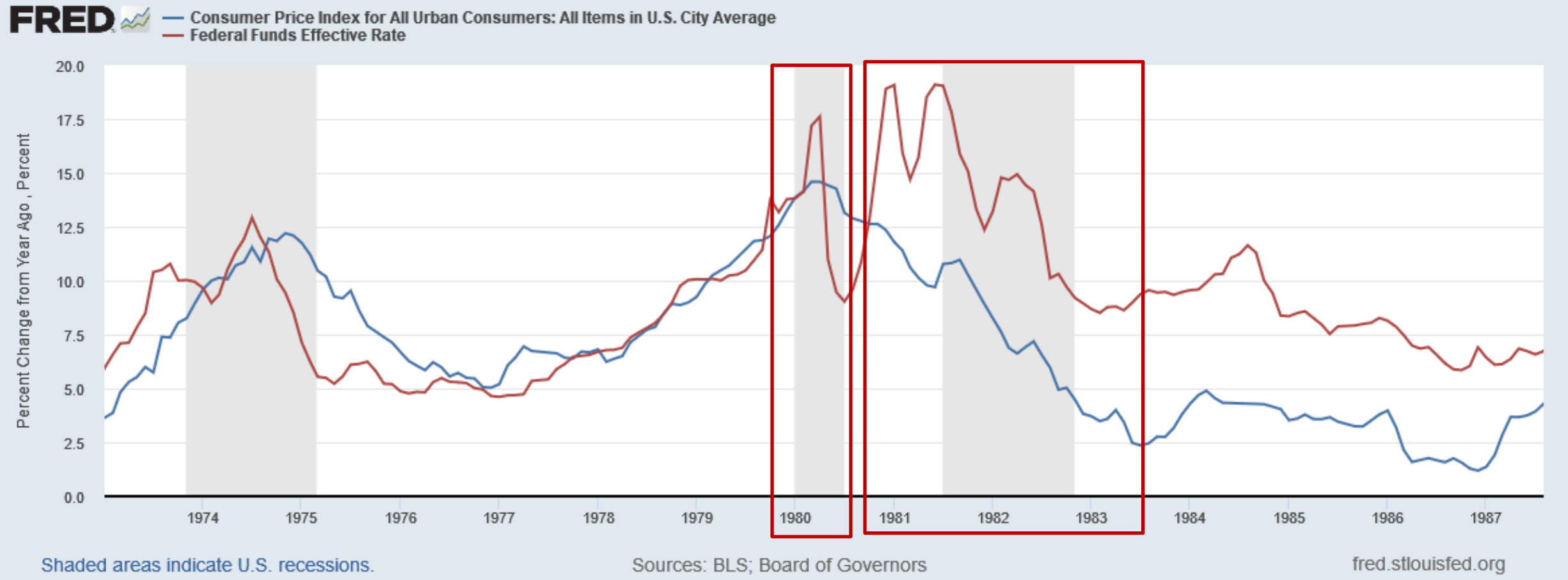
US inflation experience in 1970s and early 1980s

Paul Volcker's tenure as Fed Chair



The Volcker Disinflation

Paul Volcker's tenure as Fed Chair

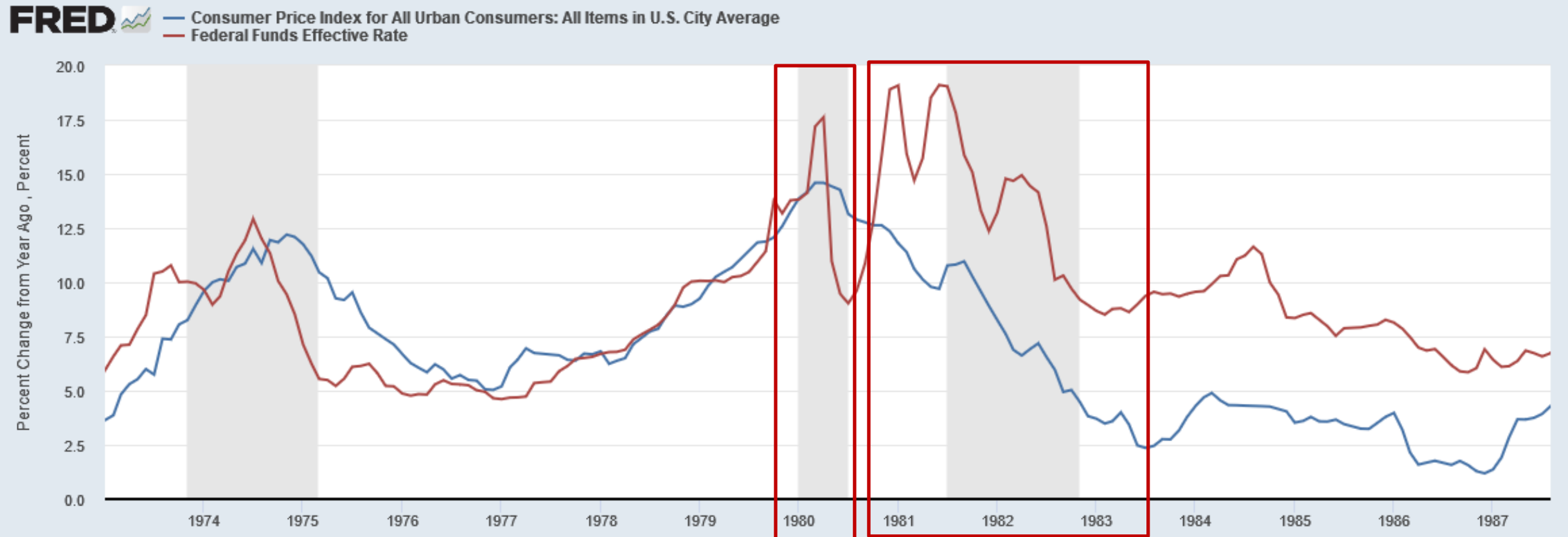


First
attempt

Second
attempt

The Volcker Disinflation

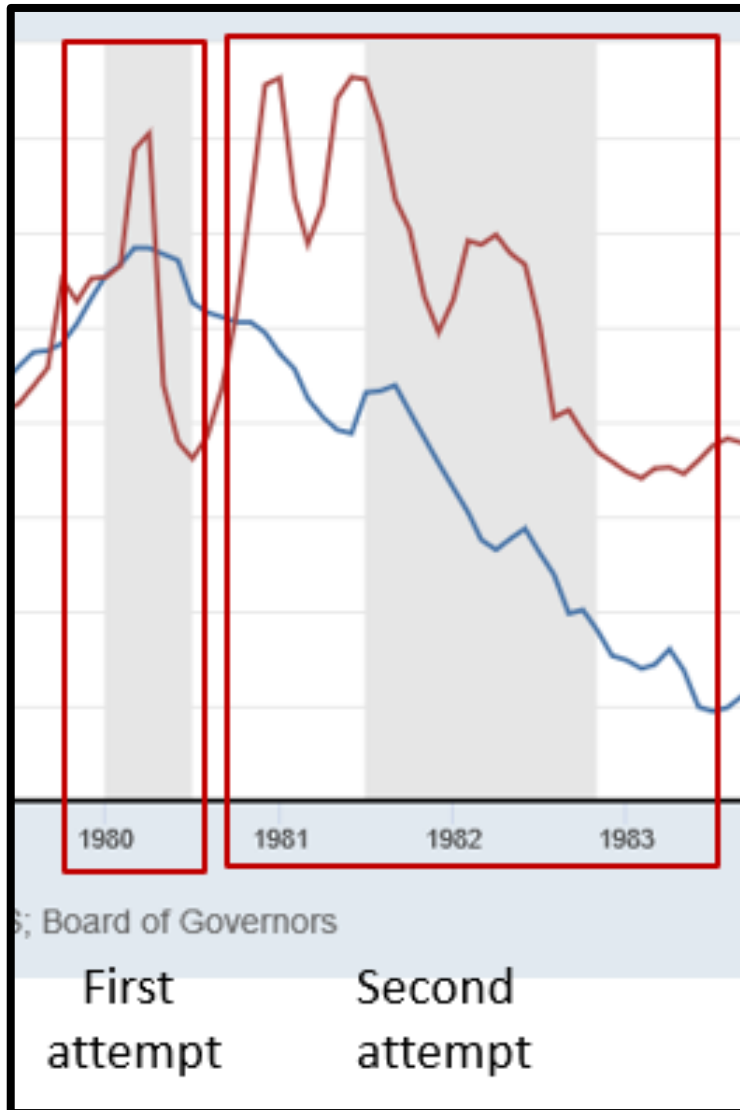
Paul Volcker's tenure as Fed Chair



First
attempt

Second
attempt

Lessons from the Volcker Disinflation



Beating high inflation involves doing contractionary monetary policy **until the job is done**

Central bank's **credibility** is important for **influencing inflation expectations**

Pre-emption: best to keep inflation low and stable, rather than to let it ramp up