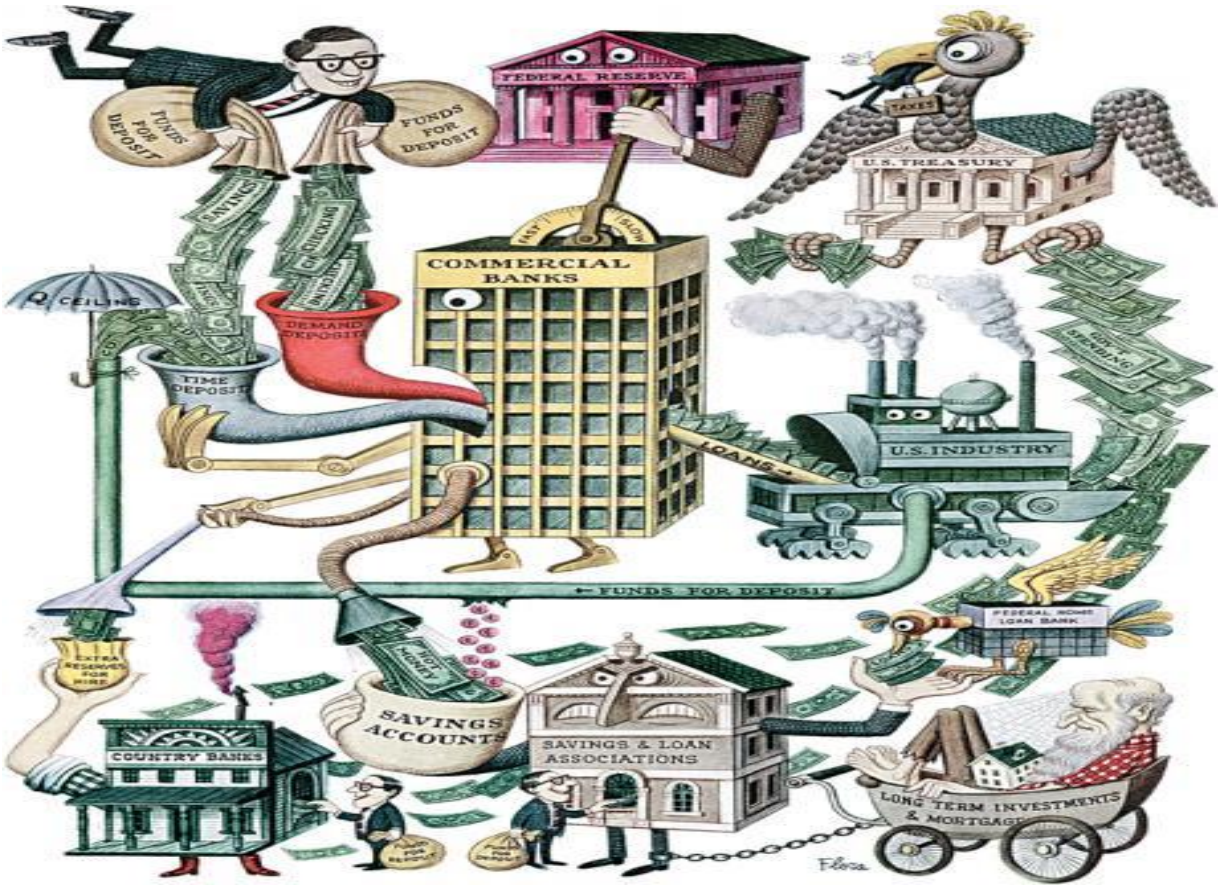
Money: The Essential Channel Between Markets

Money plays unique and very important roles in modern economies.



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Money & Monetary Policy

WHAT YOU WILL LEARN IN THIS CHAPTER

- The **roles** of **money**
- How the Federal Reserve, **the Fed**, determines the **money supply**
- **open-market operations** (**OMO**) and **monetary base** (**MB**)
- **Md-Ms model (liquidity preference model)**
- **monetary neutrality**: **"Money is Neutral"**

To First Active Learning

To Video

The Meaning of Money

Money: **any asset that can easily be used to purchase goods and services.**

In 1933, after many bank failures, some U.S. towns turned to homemade currency, like this clamshell used in Pismo Beach, California.

Federal Reserve (the Fed) measures money in Aggregates:

M0 = Cash (Currency in Circulation)

M1 = C + D

M2 = (C + D) + (SD + TD + MM)

M3 = (C + D) + (SD + TD + MM) → in large denomination

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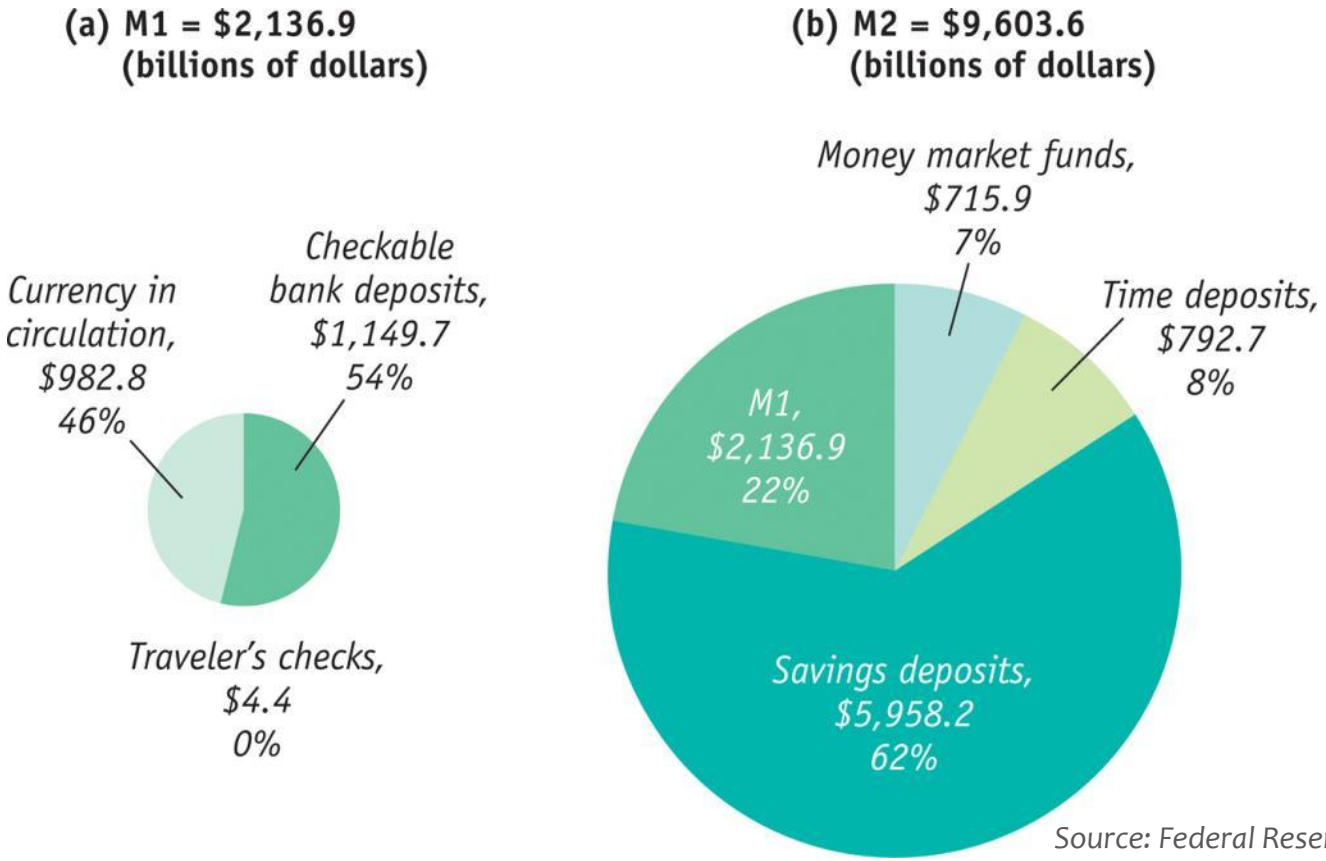
Measuring Money Supply: Monetary Aggregates



Source: Federal Reserve Bank of St. Louis.

M1 includes only the most liquid forms of money: C + D

M2 includes *near-moneys:* financial assets that can't be directly used as a medium of exchange but can be converted into cash or checkable bank deposits.

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Currency in Circulation (C)

Currency in circulation: **cash held by the public.**

Early U.S. currency: continental third of a dollar

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Checkable bank deposits (D)

Checkable bank deposits: **bank accounts on which people can write checks.**

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The Roles of Money

Money must function as:

- ***a medium of exchange.***

Something people accept as payment for goods and services

- ***a store of value.***

Money is a means of holding purchasing power *over time*.

It enables people to save the money they earn today *and use it to* buy *the goods and services they want* tomorrow.

- ***a unit of account.***

Money provides a yardstick for measuring and comparing the values of a wide variety of goods and services.

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Commodity Money

For thousands of years, societies have used commodity money.

Commodity money: a good used as a medium of exchange that **has intrinsic value in other uses.**

Some prisons use noodle spices as currency.

The island of Yap's currency

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Commodity-Backed Money

To make life simpler (and safer), societies began using commodity-backed money.

Commodity-backed money: a medium of exchange with **no intrinsic value** whose ultimate value is guaranteed by a promise that **it can be converted into valuable goods.**

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Fiat Money

Most modern economies use fiat money.

Fiat money: **money whose value derives entirely from its official status as a means of payment.**

What do you think of BITCOIN?

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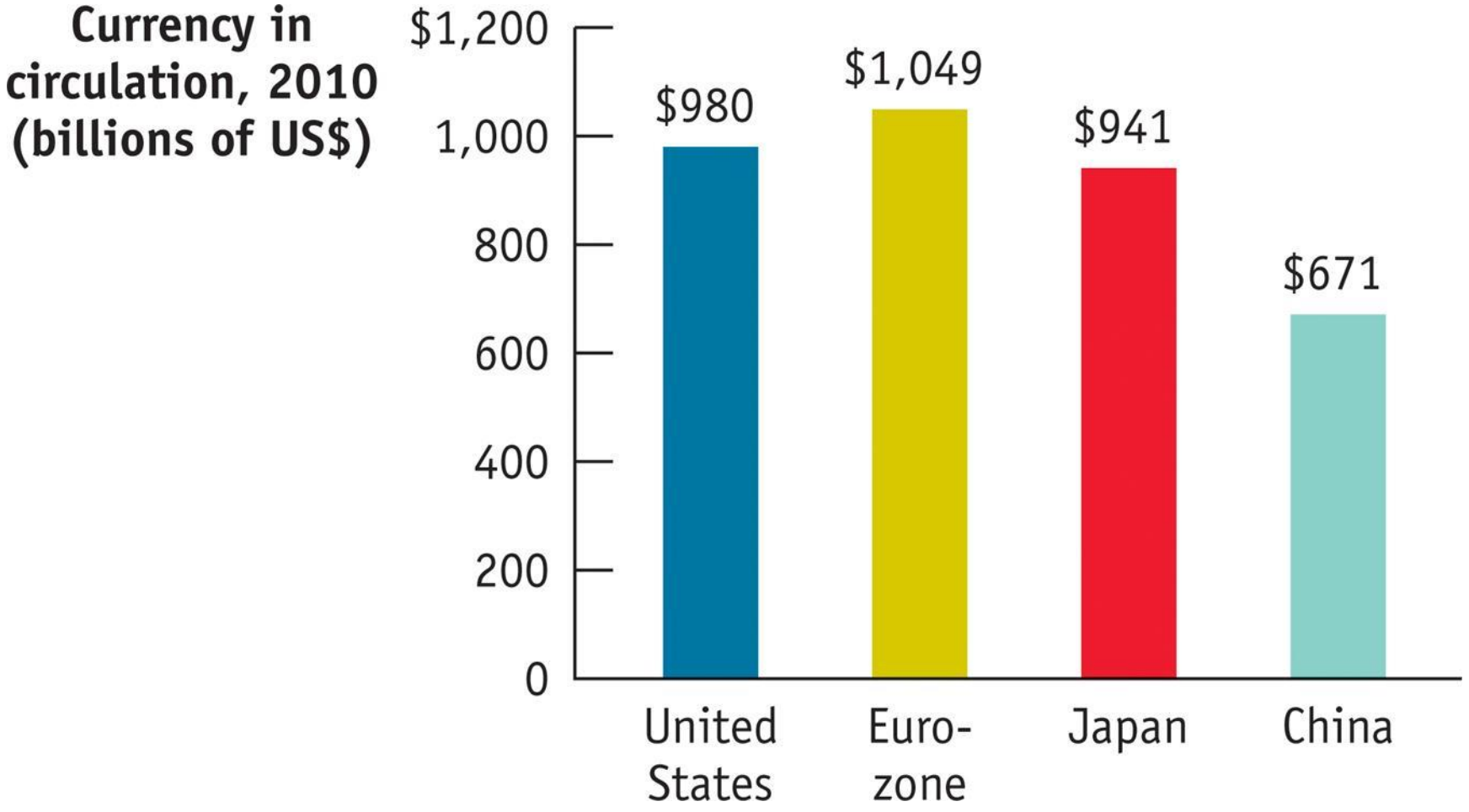
Money in The Big Four



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Bank Runs and Fractional System

Financial institutions operate as part of a *fractional reserve banking system.*

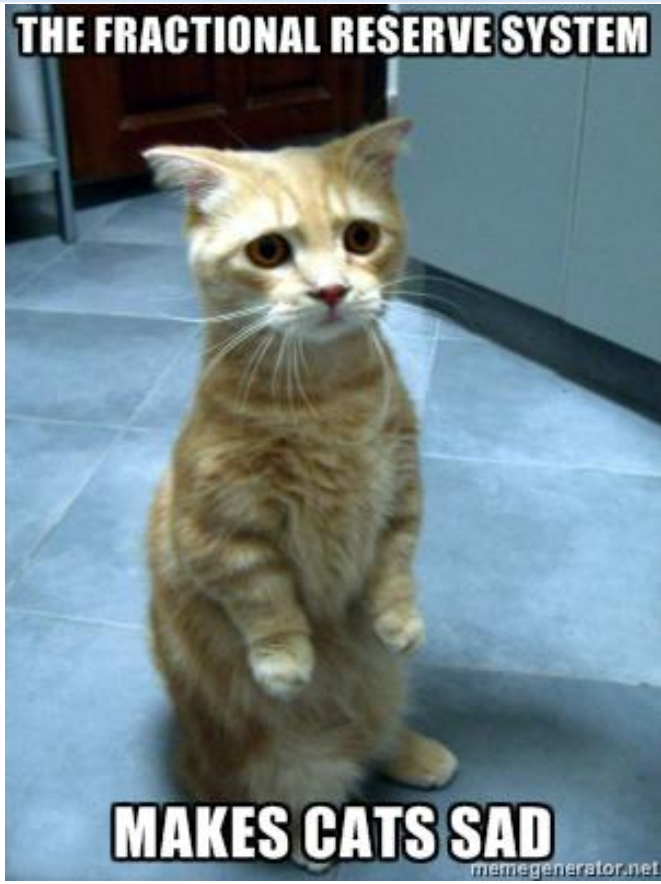
- **When you deposit money in a bank account, the bank is required to hold a part of it in its vault as cash, as REQUIRED reserve.**
  - *(or else in an account with the regional Federal Reserve Bank).*

Banks hold only a fraction of deposits on reserve. (The rest they use to make loans.)

- *From time to time people get worried about the bank losing their money.*

Bank run: **a phenomenon in which many of a bank's depositors try to withdraw their funds because they fear a bank failure.**

Historically, bank runs have often proved contagious.



This system's leverage makes some nervous.

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Recent Bank Runs

Southern California's IndyMac: July 2008

UK's Northern Rock: September 2007

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Bank Regulations – to prevent Bank Run

1. *Deposit insurance:* a guarantee that a bank's depositors will be paid even if the bank can't come up with the funds. (The FDIC currently guarantees the first $250,000 of each account.)
2. *Capital requirements:* requirement that banks hold substantially more assets than the value of bank deposits.

Deposit insurance creates a well-known incentive problem: Banks can take more risks, since they are insured.

To help motivate safe behavior, banks' capital is required to equal to 7% or more of their assets.

3. *Reserve requirements:* rules set by the Federal Reserve that determine the minimum reserve ratio for a bank.

For example, in the United States, the minimum reserve ratio for checkable bank deposits is 10%.

4. *The discount window policy:* an arrangement in which the Federal Reserve stands ready to lend money to banks in trouble (at "discount" rate).

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The Monetary Role of Banks

T-account: **a tool for analyzing a business's financial position by showing the business's assets and liabilities.**

Assets		Liabilities	
Loans	$1,200,000	Deposits	$1,000,000
Reserves	$100,000		

Bank reserves: **the currency that banks hold in their own vaults plus their deposits at the Federal Reserve.**

The required reserve ratio: (10%) : **the fraction of bank deposits that a bank holds as reserves ($100,000/$1,000,000) = 10%**

How Banks Create Money

Silas keeps a shoebox full of cash under his bed. Deciding to enter the twenty-first century, he deposits this cash at the bank. *What's the effect of his $1,000?*

(a) Initial Effect Before Bank Makes a New Loan

Assets		Liabilities	
Loans	No change	Checkable deposits	+$1,000
Reserves	+$1,000		

(b) Effect When Bank Makes a New Loan

Assets		Liabilities	
Loans	+$900		No change
Reserves	–$900		

Banks make their profit from loans, so eventually they will make new loans with 90% of Silas's money. (The 10%: they must hold in reserve.)

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Banks Create Money (Multiple Deposits)

The first bank lends $900 to Maya, who pays the money to Anne, who deposits it at her bank—and the cycle starts all over. Sound familiar?

	Currency in circulation	Checkable bank deposits	Money supply
First stage: Silas keeps his cash under his bed.	$1,000	$0	$1,000
Second stage: Silas deposits cash in First Street Bank, which lends out $900 to Maya, who then pays it to Anne Acme.	900	1,000	1,900
Third stage: Anne Acme deposits $900 in Second Street Bank, which lends out $810 to another borrower.	810	1,900	2,710

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Reserves, Bank Deposits, and the Money Multiplier

Increase in bank deposits from $1,000 in excess reserves =

$\$1{,}000 + [\$1{,}000 \times (1 - rr)] + [\$1{,}000 \times (1 - rr)^2] + [\$1{,}000 \times (1 - rr)^3] + \ldots$

This can be simplified to $1,000/*r*. The multiplier is: 1/r

In reality, the Money multiplier can be more complicated.

With r = 10%, why isn't the multiplier = 1/0.1 = 10?

1) *People hold significant amounts of **cash**, which reduces bank deposits.*
2) *Banks sometimes hold some extra bank reserves*

Excess reserves: **a bank's reserves above its required reserves.**

In normal times, the U.S. money multiplier for M1 is between 1.5 and 3.0;

We need a "revised" money multiplier.

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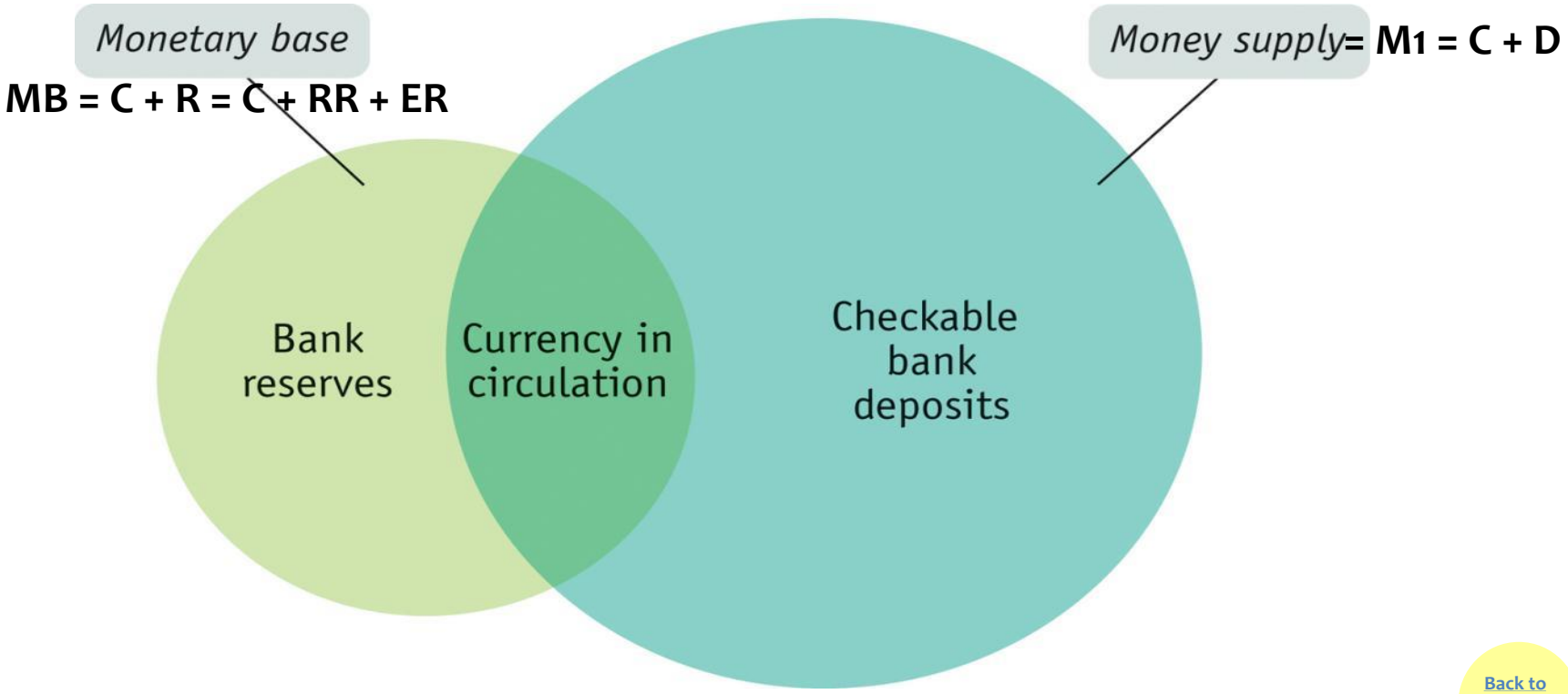
The Money Multiplier in Reality

The ***monetary base , MB,*** is the sum of currency in circulation and bank reserves. **MB = C + R** (where R is the sum of Bank's Required Reserves and Excess Reserves; so **R = RR + ER**)

Money supply, M1, is the sum of currency and checkable bank deposits. **M1 = C + D**

The money multiplier is: M1 /MB



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The Money Multiplier in Reality

The *money multiplier* is the ratio of the money supply (M1) to the monetary base : M1/MB = (C + D) / (C + RR + ER)

-Divide it with D/D

- The money multiplier is: **(c + 1) / (c + r + e)**

-where **c** = C/D; **r** = RR/D; **e** = ER/D ➔ as ratios to the Deposits (D).

-- what is the money multiplier, when c=0, and e=0?

Example:

An economy has the following info:

-Currency in circulation (C) is *$ 300 (bil.)*

-Checkable deposits (D) is *$ 900 (bil.)*

-Banks' required reserve ratio (RR=r) is *10% (of the checkable deposit)*

-Banks' excess reserves (ER) is *$ 50 (bil.)*

a) What is the money supply, M1?

b) What is the monetary base, MB?

c) What is the money multiplier?

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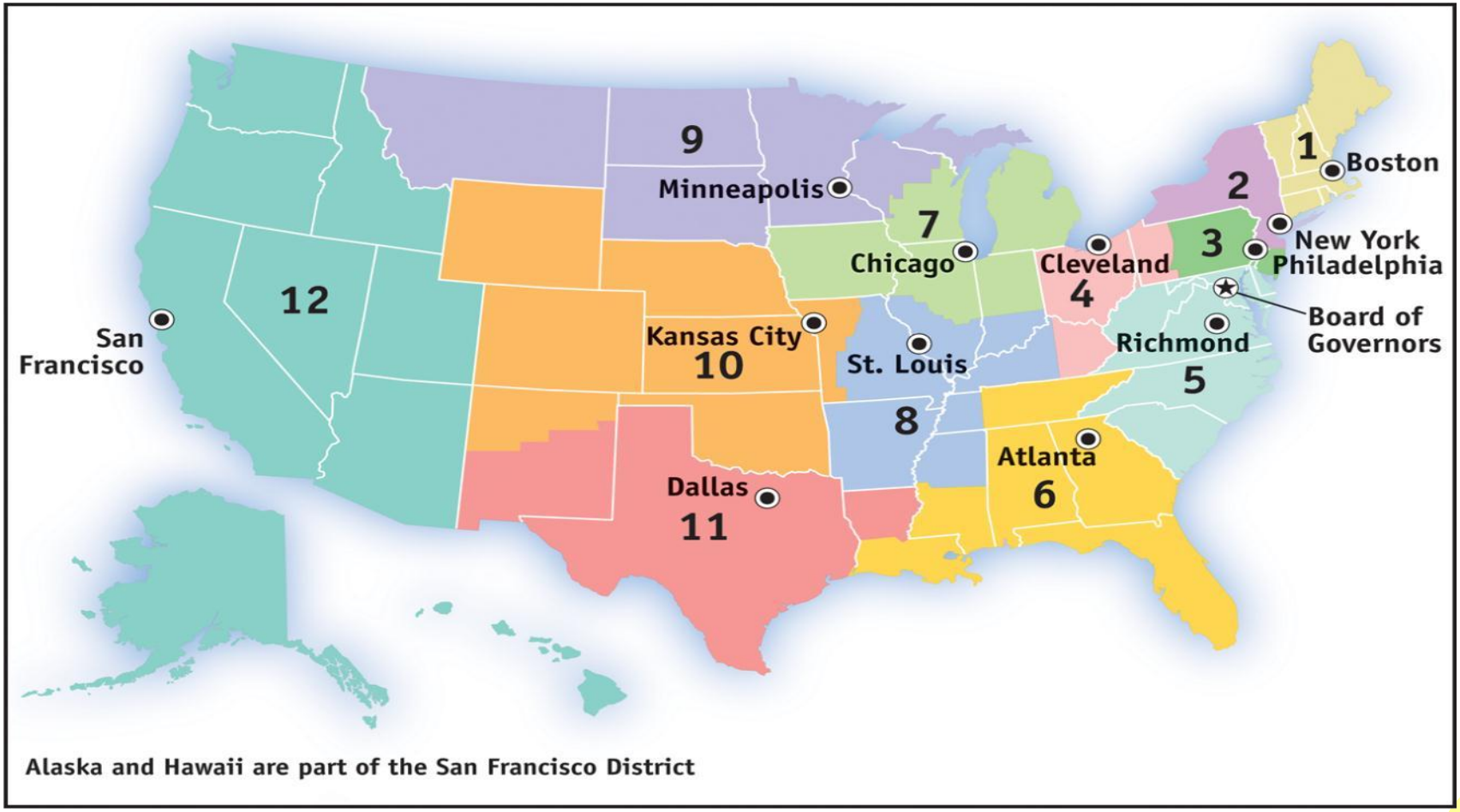
The Federal Reserve System

The ***Federal Reserve*** is a **central bank;** ***it oversees and regulates the banking system and controls the monetary base.***



Source: Board of Governors of the Federal Reserve System

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Monetary Policy Tools:
Reserve Requirements and the Discount Rate

What does a bank do if it can't meet the Fed's reserve requirement?

The ***federal funds market*** allows banks that fall short of the reserve requirement to borrow funds from other banks with excess reserves.

The ***federal funds rate*** (i_{ff}) is the interest rate of that overnight inter-banks loan.

LIBOR (London interbank offered rate) is Europe's equivalent to the federal funds rate.

The *discount rate* (i_d) is the rate of interest the Fed charges banks, when banks need liquidity, and cannot get it from other banks.

*-Normally, the discount rate is set 1 percentage point **above** the federal funds rate in order to discourage banks from turning to the Fed when they are in need of reserves.*

*-During liquidity crisis, the Fed can **lower** the discount rate below the federal funds rate, in order to help banks in need; the Fed as **"the lender of the last resort"**.*

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Open-Market Operations

Other than the other two policy tools (Reserve requirements and Discount window policies), Open-market operations are the principal tool of monetary policy: the Fed can increase or reduce the monetary base by buying or selling government debt to banks.

To *increase* the money supply, the Fed must inject reserves into the system.

To *decrease* the money supply, the Fed must remove reserves from the system.

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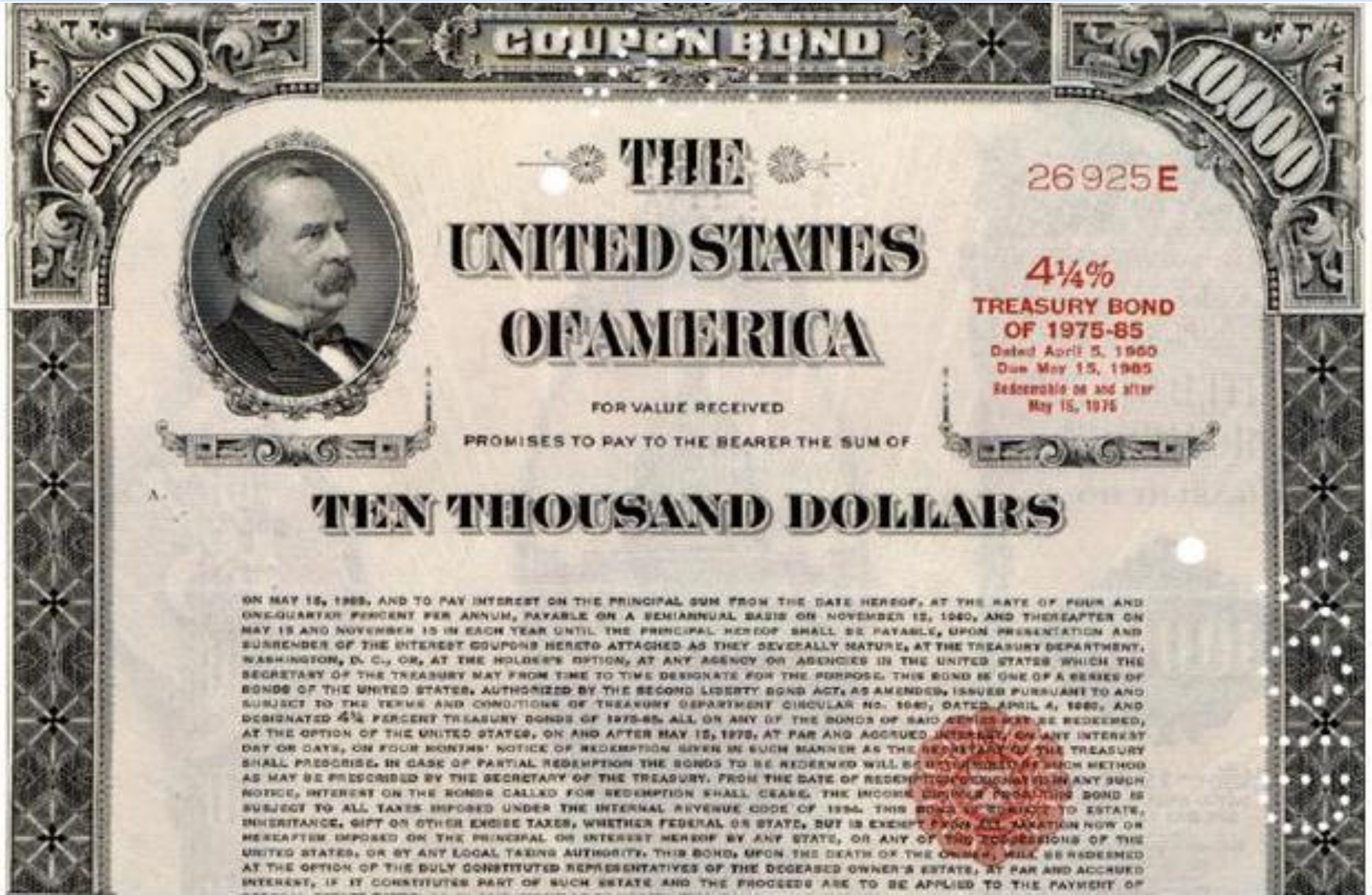
Treasury Bond



Open-Market Purchase by the Fed

An open-market purchase of $100 million: banks gain increase in reserves; and Money supply would increase (by the money multiplier).

	Assets		Liabilities	
Federal Reserve	Treasury bills	+$100 million	Monetary base	+$100 million

	Assets		Liabilities	
Commercial banks	Treasury bills	−$100 million	No change	
	Reserves	+$100 million		

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Open-Market Sale by the Fed

An open-market sale of $100 million: bank reserves decline, money supply would decrease.

	Assets		Liabilities	
Federal Reserve	Treasury bills	−$100 million	Monetary base	−$100 million

	Assets		Liabilities	
Commercial banks	Treasury bills	+$100 million	No change	
	Reserves	−$100 million		

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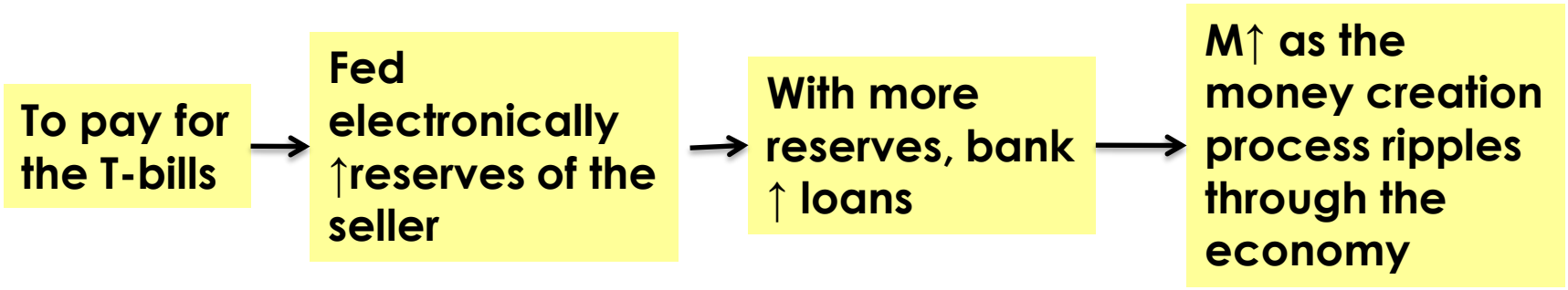
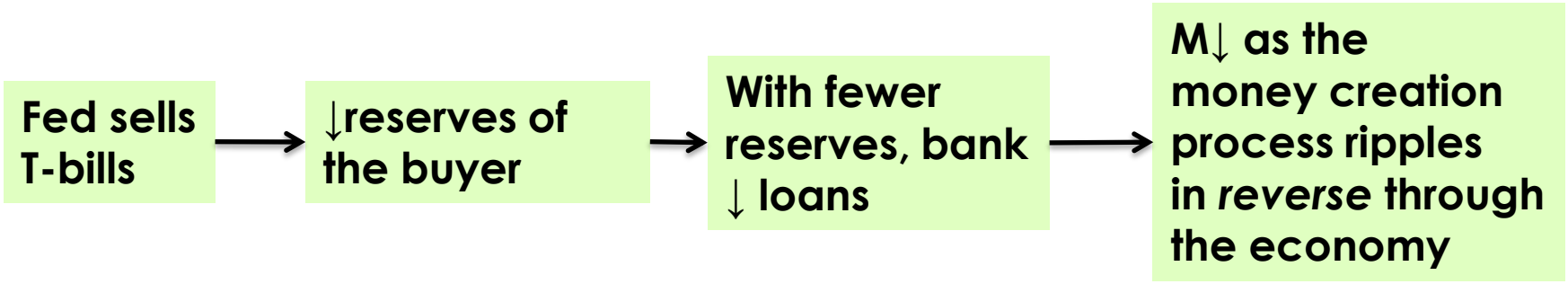
How Open-Market Operations Work

If the Fed wants to increase the money supply, it will buy T-bills:



If the Fed wants to decrease the money supply, it will sell T-bills:



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The Demand for Money

There is a price to be paid for the convenience of holding money.

The Opportunity Cost of Holding Money: Interest

We all carry some cash around for the convenience.

When we do, we give up interest income we'd collect

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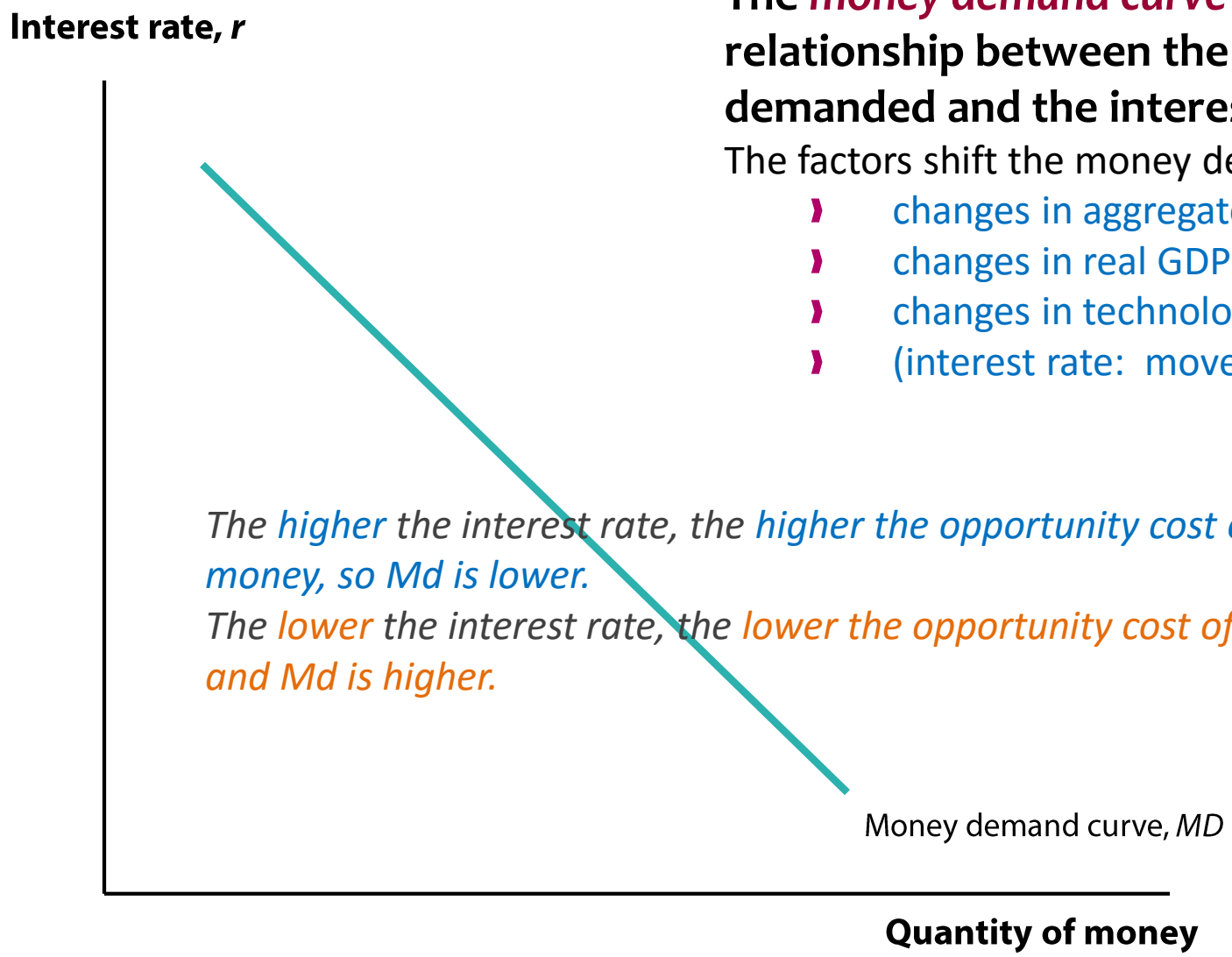
The Money Demand Curve



The *money demand curve* shows the relationship between the quantity of money demanded and the interest rate.

The factors shift the money demand curve:

- changes in aggregate price level (P)
- changes in real GDP (Y)
- changes in technology (T)
- (interest rate: move along the D curve)

The higher the interest rate, the higher the opportunity cost of holding money, so Md is lower.

The lower the interest rate, the lower the opportunity cost of holding money, and Md is higher.

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A Yen for Cash

Japan is still a cash society. Why?

-Small businesses haven't invested in the technology.

-Crime rate is low.

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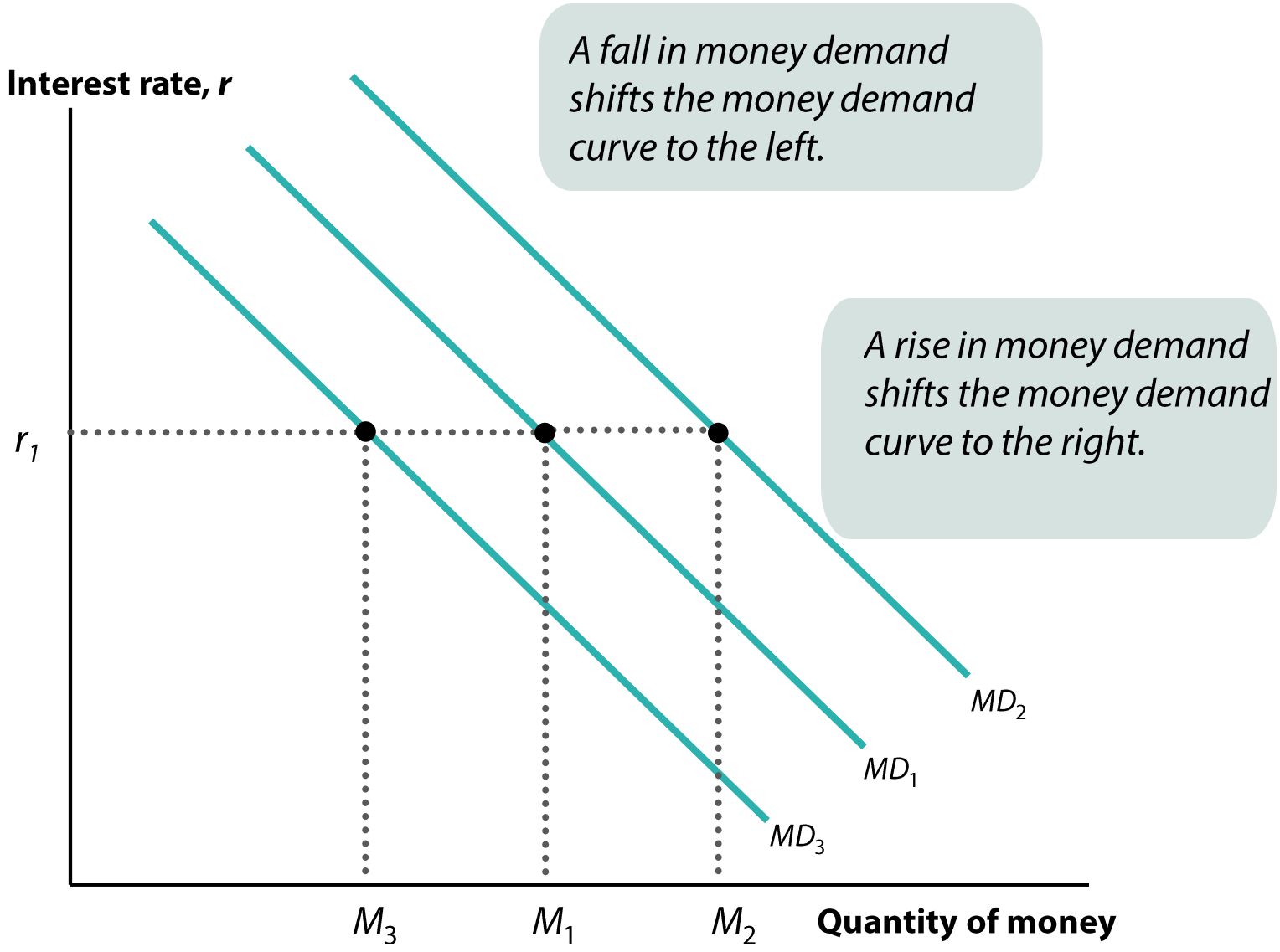
Shifts in the Demand for Money



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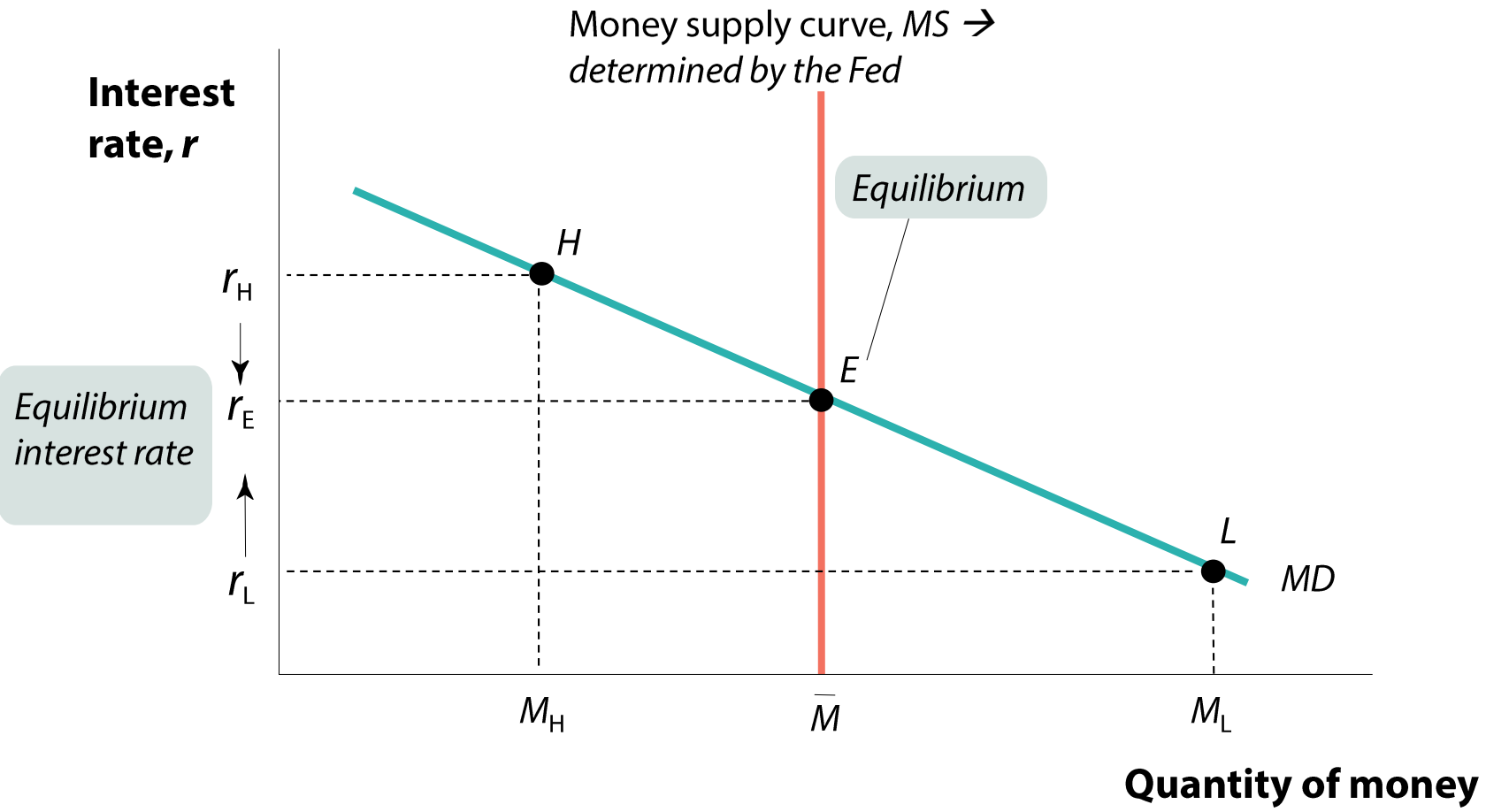
Equilibrium in the Money Market

At r_L, interest rates are low.
MD > MS, → a shortage of money means there is a surplus of other assets like T-bonds.



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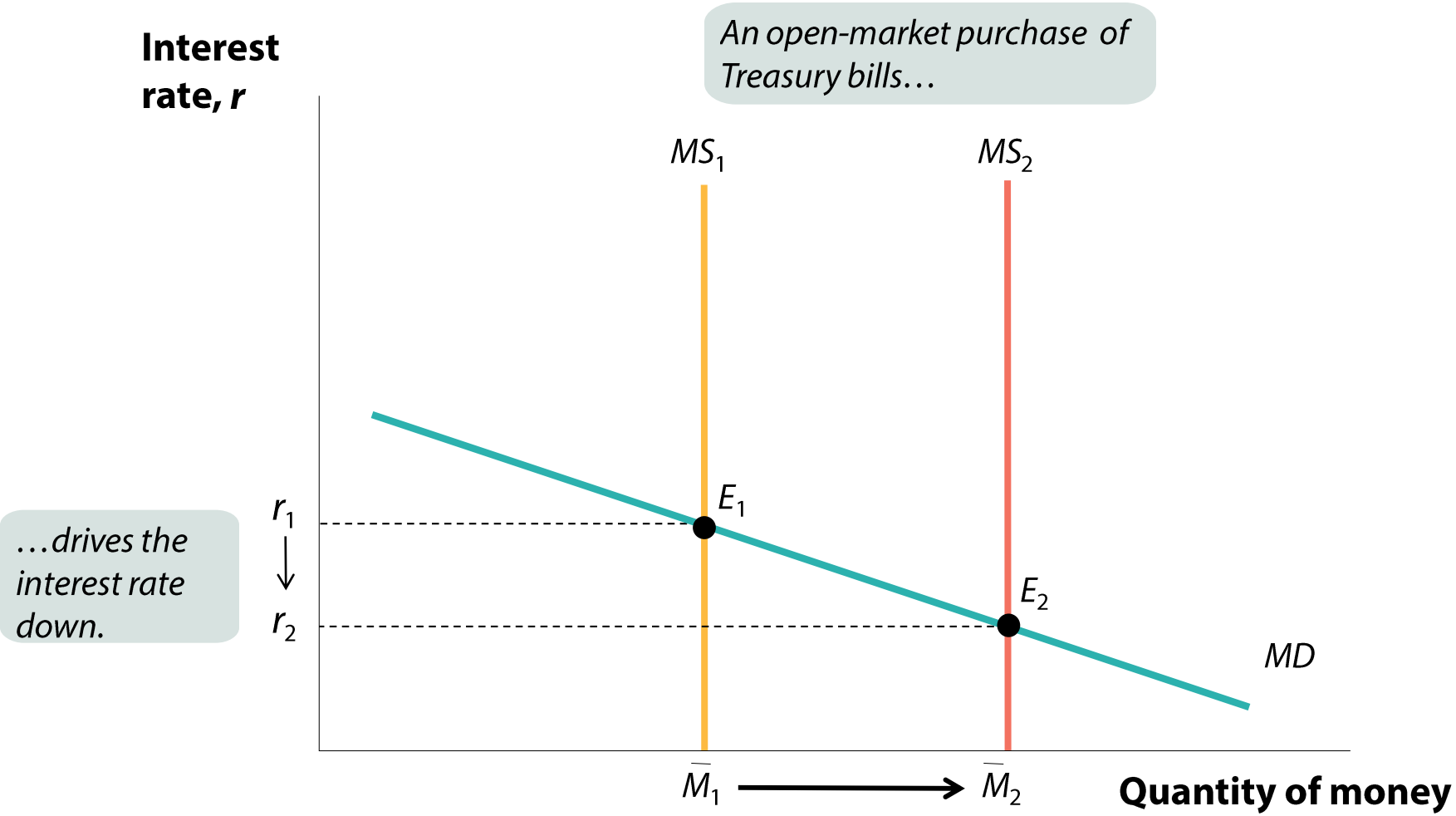
Setting the Federal Funds Rate

The Fed uses open-market purchases (increase Ms) to push the interest rate down to the target rate.



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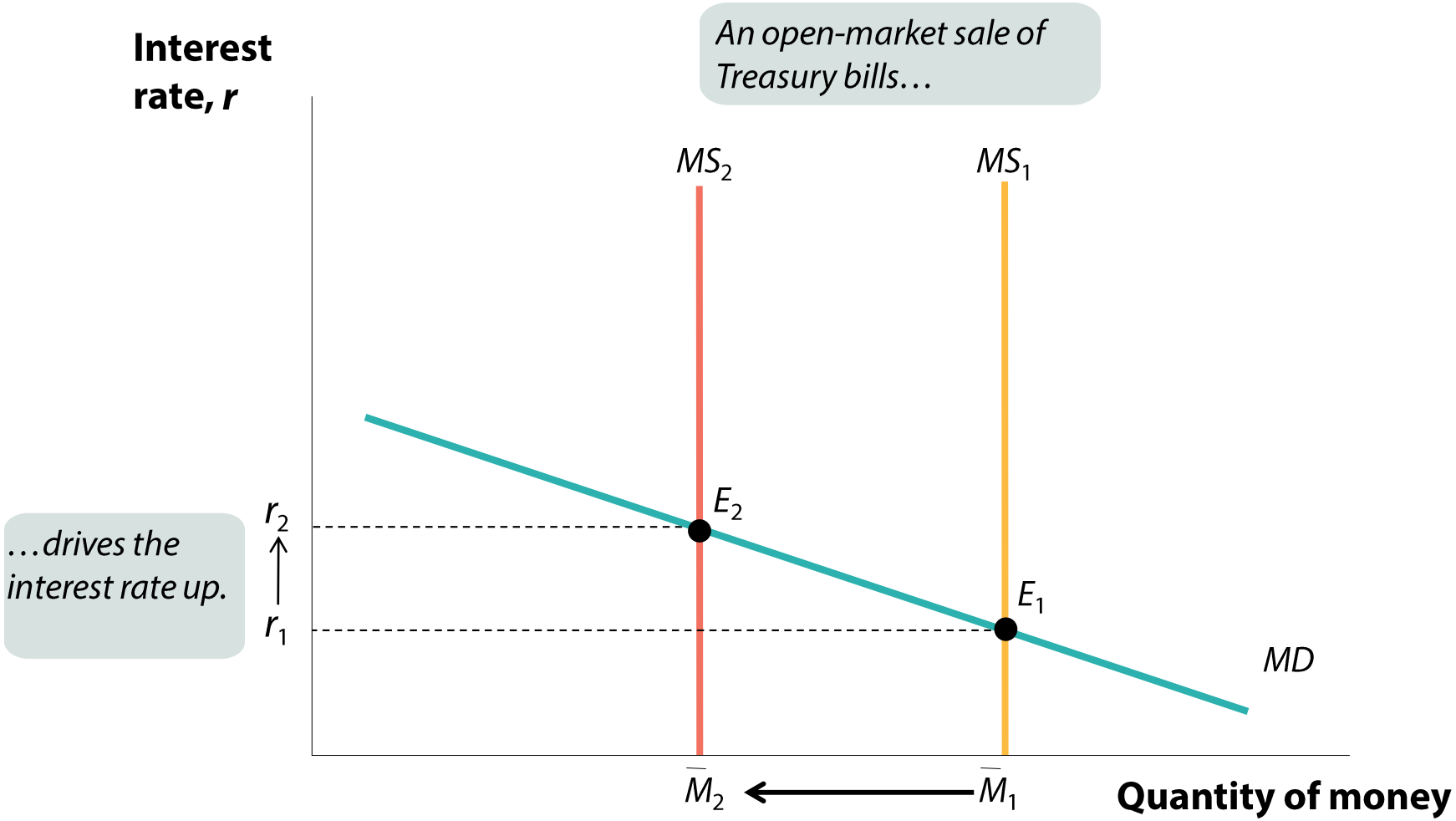
Setting the Federal Funds Rate

The Fed uses open-market sales (Ms falls) to pull the interest rate up to the target rate.



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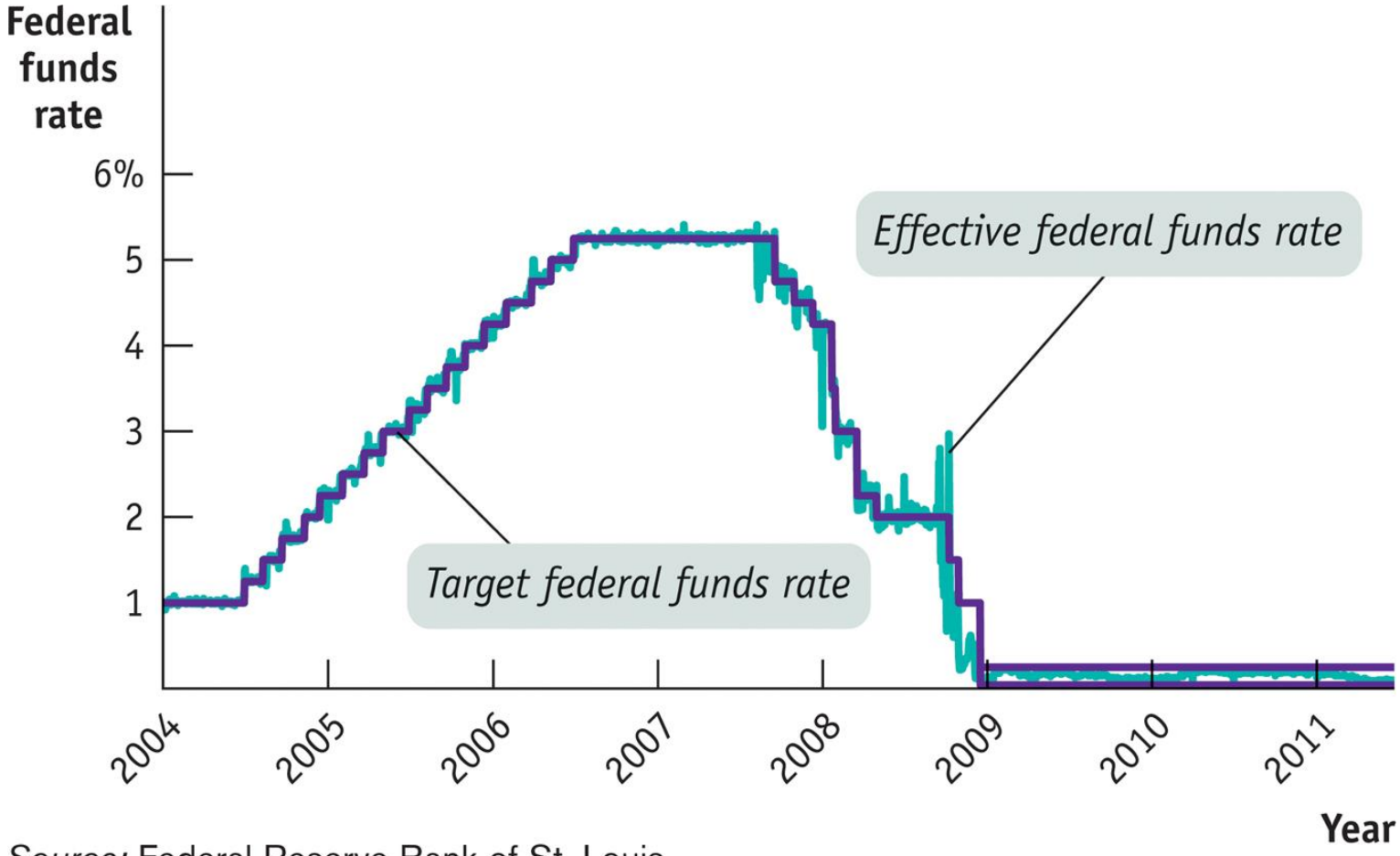
The Fed Reverses Course

Starting in Sept 2007, fighting the financial crisis took priority.



Source: Federal Reserve Bank of St. Louis.

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Monetary Policy and Aggregate Demand

Expansionary monetary policy: **monetary policy that increases aggregate demand (also called "easy money policy").**

With the three tools of monetary policy:

-Open Market Purchases of T-bills.

-Lowering the Discount rate.

-Lowering the Required Reserves in Banks.

Contractionary monetary policy: **monetary policy that reduces aggregate demand (also called "tight money policy").**

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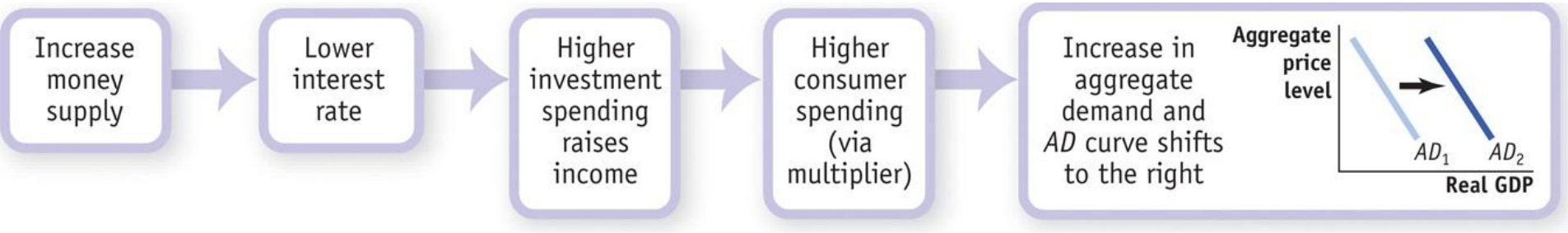
Monetary Policy and Aggregate Demand

How the expansionary monetary policy cycle works:



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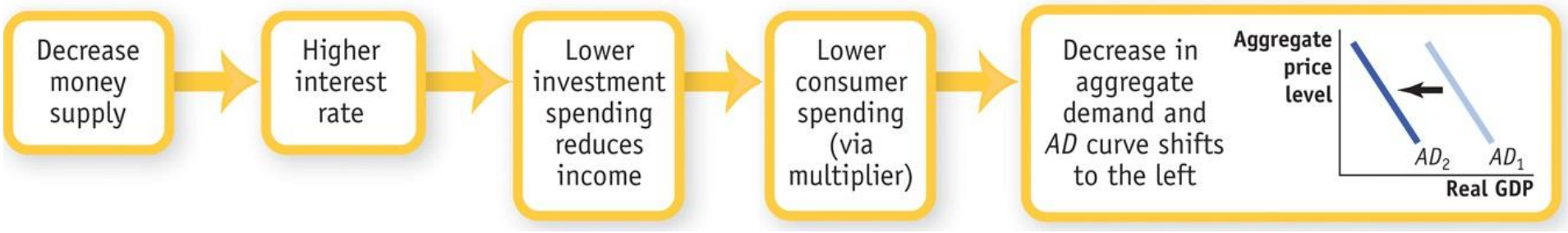
Monetary Policy and Aggregate Demand

How the contractionary monetary policy cycle works:



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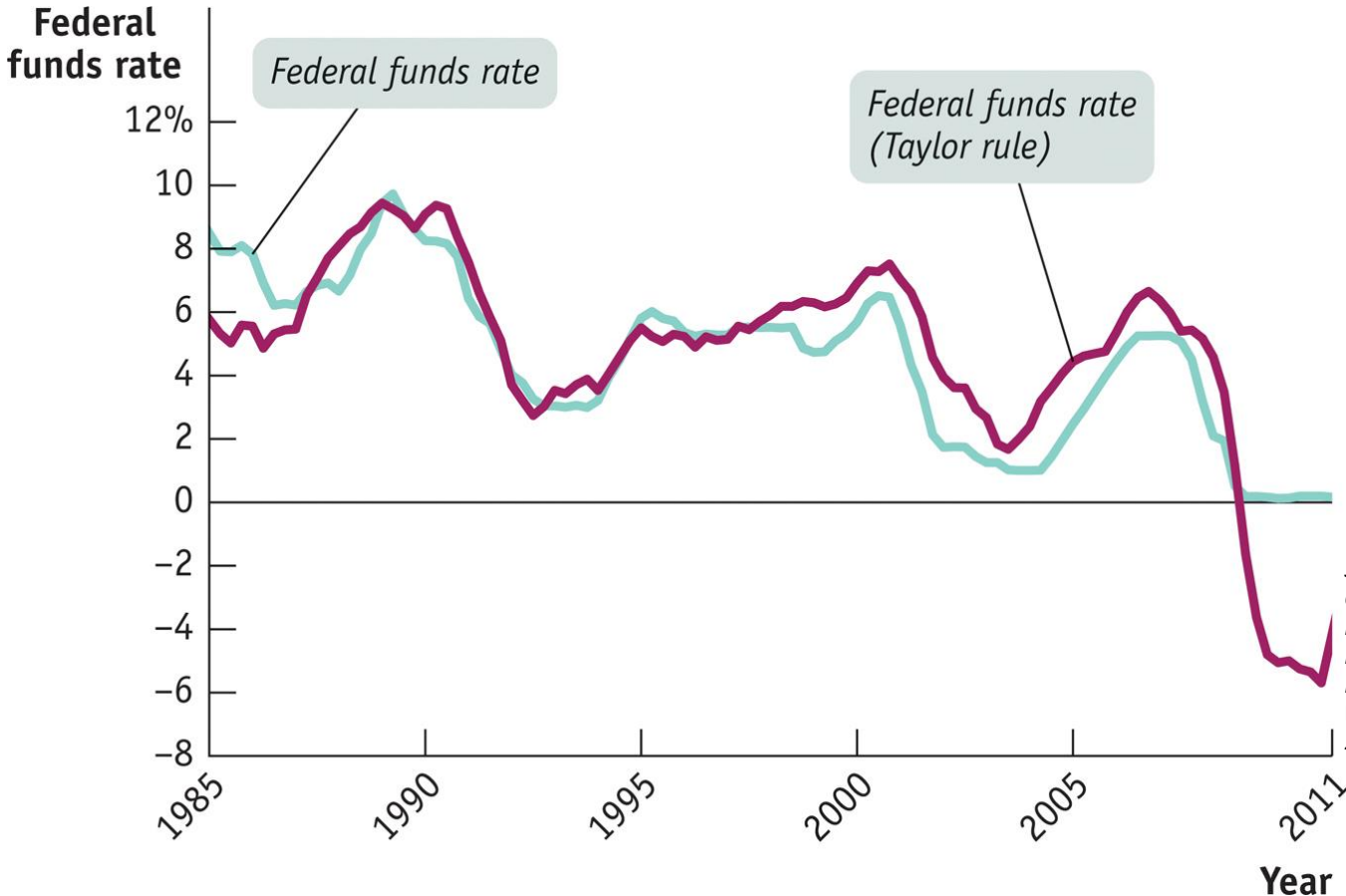
Tracking Monetary Policy

The actual federal funds rate tracked the predicted rate quite closely through the end of 2008.

After that the Taylor rule called for negative interest rates.



Sources: Bureau of Labor Statistics; Congressional Budget Office; Federal Reserve Bank of St. Louis; Glenn D. Rudebusch, "The Fed's Monetary Policy Response to the Current Crisis," FRBSF Economic Letter *#2009-17 (May 22, 2009).*

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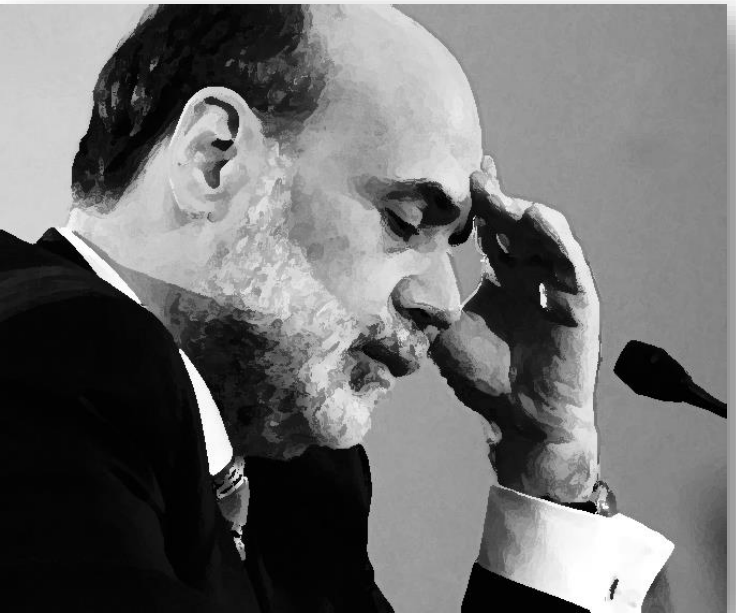
Zero Lower Bound & Q-E

The fact that interest rates can't go below zero ("zero lower bound") limits the power of monetary policy.

In 2010: Interest rates were at or near zero, but the economy was still far below potential output.

So the Fed got creative and tried "quantitative easing" – QE - another type of expansionary monetary policy, initially aiming at buying longer-term government bonds; and later, also buying private equities too).



QE policy have been used by other economies, in EU, and Japan during recessions.

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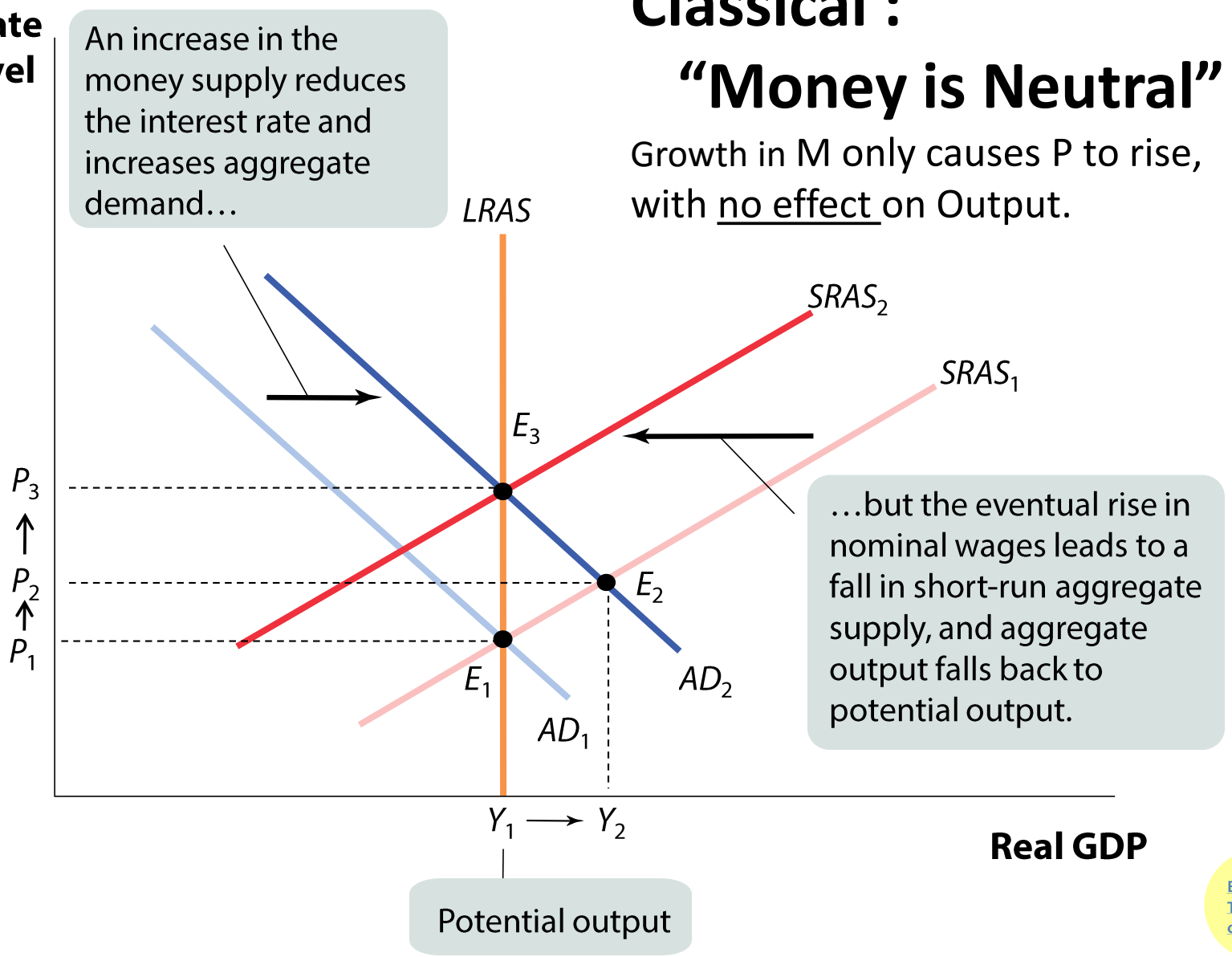
Money, Output, and Prices in the Long Run

Classical :

"Money is Neutral"

Growth in M only causes P to rise, with no effect on Output.



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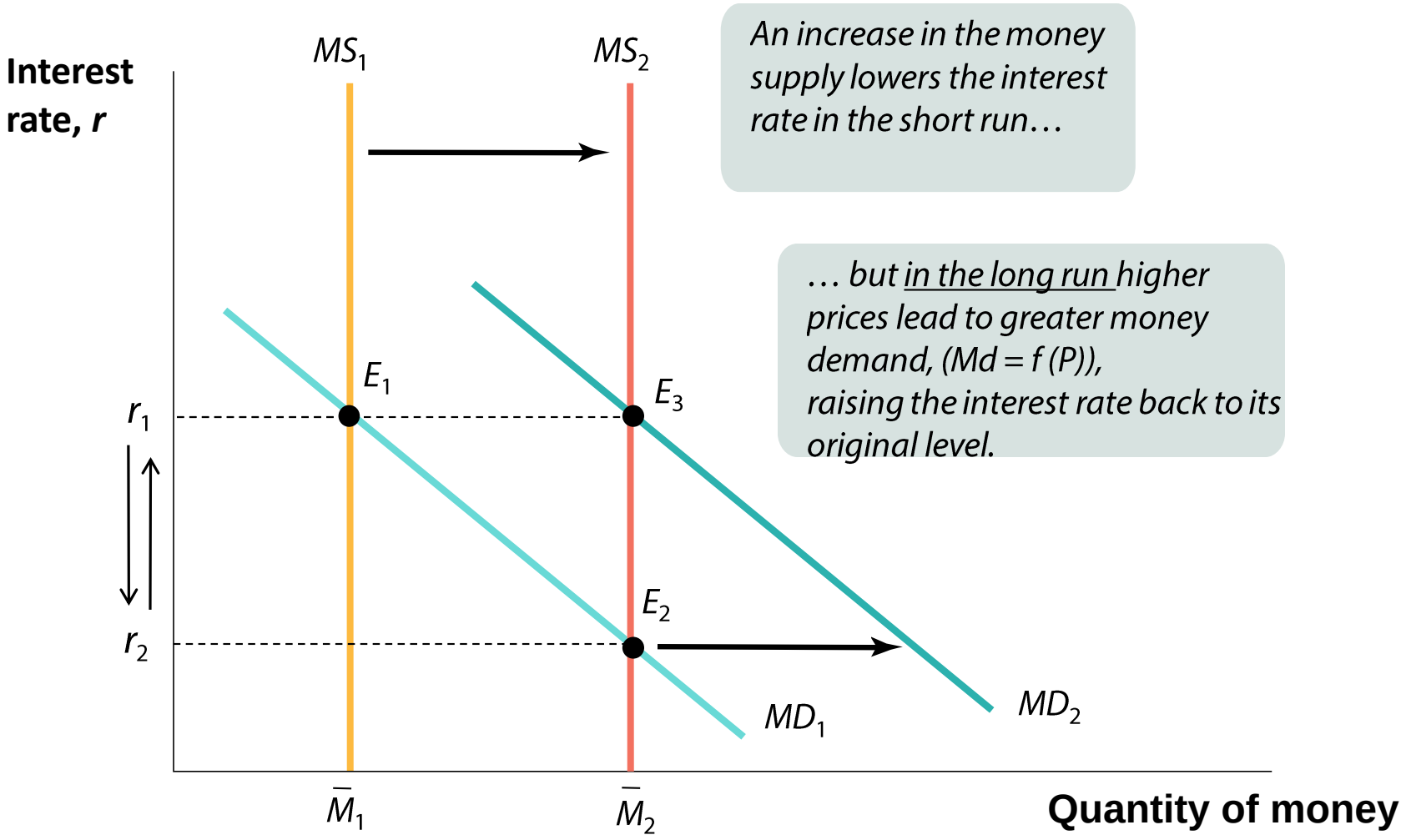
Long-Run Changes on interest rate

In the long run, changes in the MS don't affect the interest rate.



An increase in the money supply lowers the interest rate in the short run…

… but in the long run higher prices lead to greater money demand, (Md = f (P)), raising the interest rate back to its original level.

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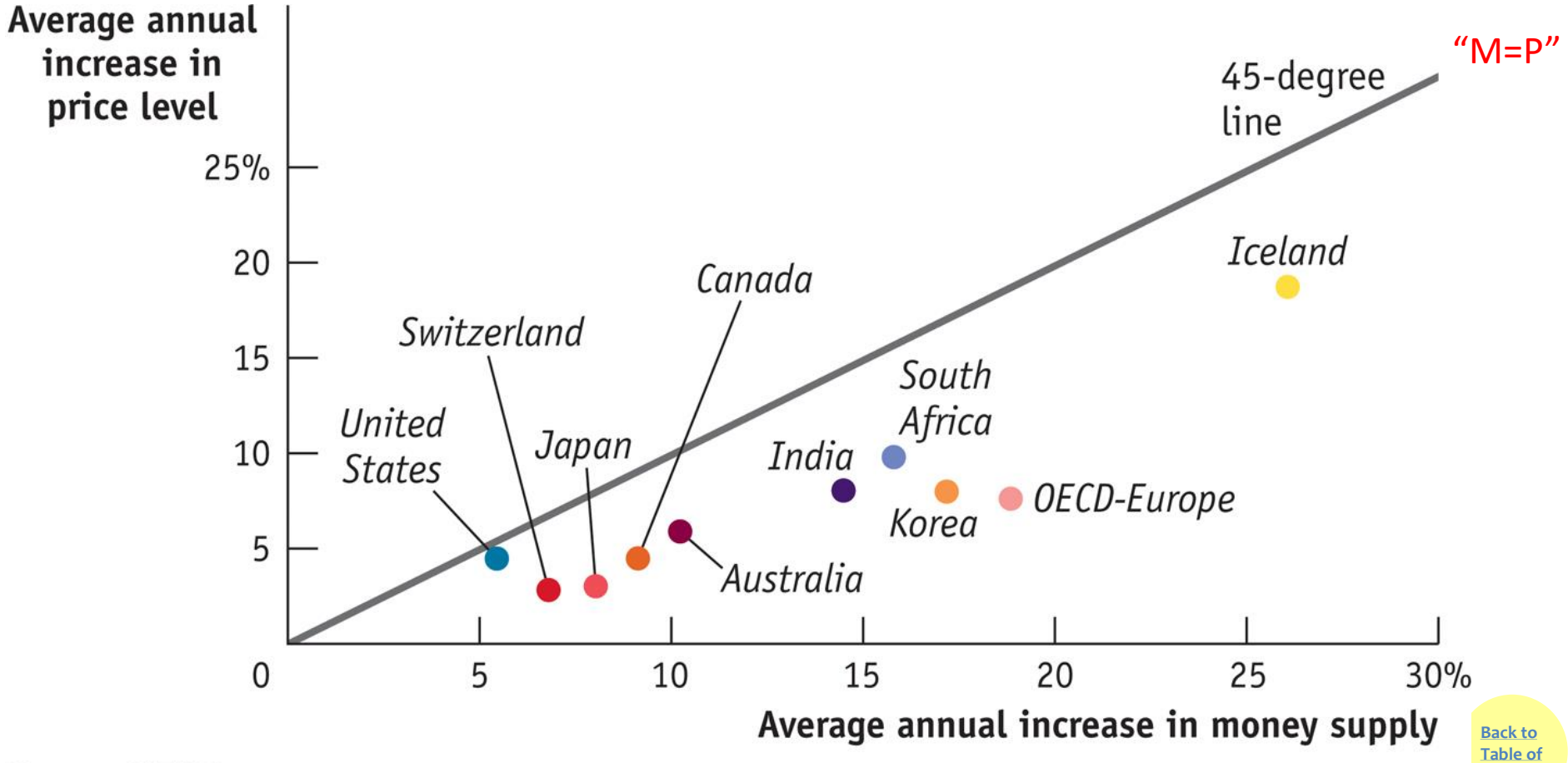
The Long-Run Relation Between Money and Inflation: "Money is Neutral"

Do increases in the money supply really lead to increases in the price level?



Source: OECD.

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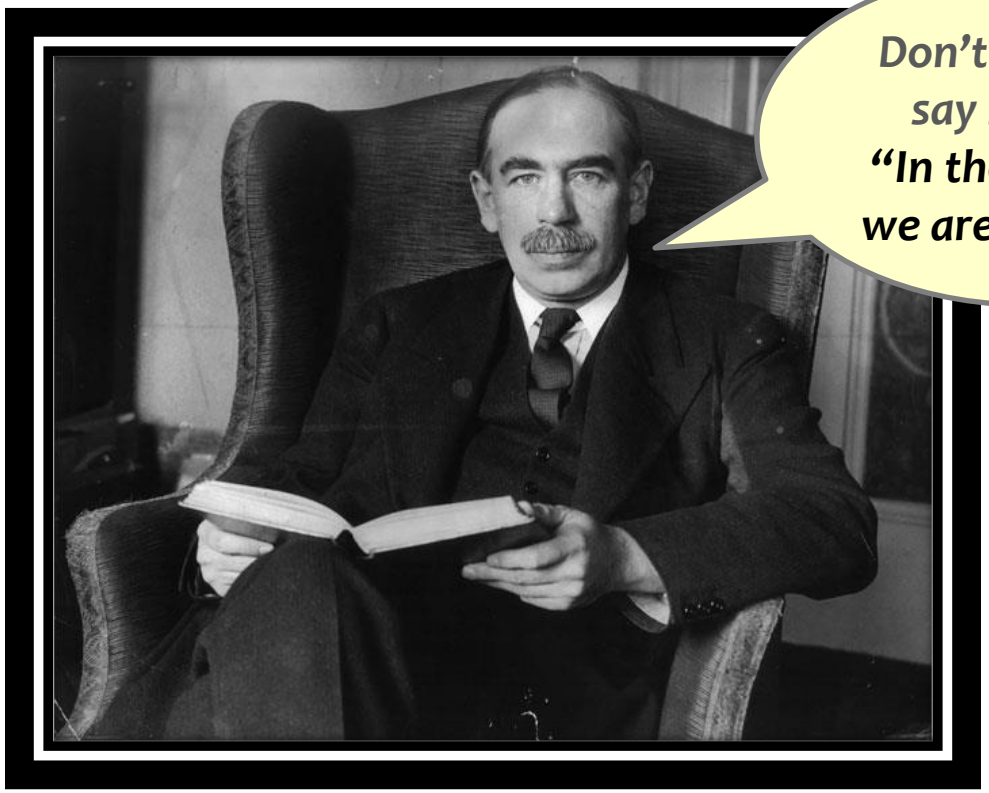
Monetary Neutrality

Monetary neutrality: **Changes in the money supply have no real effect on the economy in the long run;**

But Keynes would say:



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