ECO 202 Principles of Economics II

Lecture 9: Money, Banks, and the Federal Reserve System

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Overview

Money

- Economists consider money to be any asset that people are generally willing to accept in exchange for goods and services or for payment of debts.
- Asset is anything of value owned by a person or a firm.
- We will begin by considering what role money serves, and what can be used as money.
- Then we will consider modern forms of money and the roles of banks and the government in creating and managing money.
- Finally, we will create a model relating prices to the amount of money.

What is Money, and Why Do We Need It?

The Origin of Money

- Pure Exchanged Economy (barter, double coincidence of wants).
- Commodity money (goods used as money that also have value independent of their use as money-like animal skins or precious metals.)
- The existence of money makes trading much easier and allows specialization, an important step for developing an economy.

The Four Primary Functions of Money

- Medium of exchange
  Money is acceptable to a wide variety of parties as a form of payment for goods and services.
- Unit of account
  Money allows a way of measuring value in a standard manner.
- Store of value
  Money allows people to defer consumption till a later date by storing value. Other assets can do this too, but money does it particularly well because it is liquid, easily exchanged for goods.
- Standard of deferred payment
  Money facilitates exchanges across time when we anticipate that its value in the future will be predictable.

What Can Serve as Money

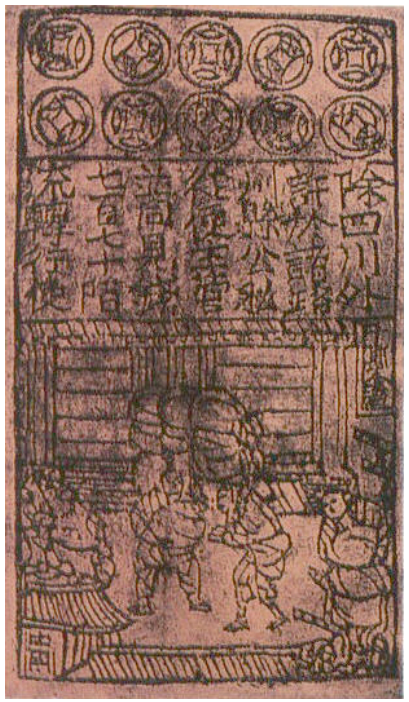
- The good must be **acceptable** to most people.
- It should be of **standardized quality** so any two units are alike.
- It should be **durable** so that value is not lost by storage.
- It should be **valuable** relative to its weight, so that it can easily be transported even in large quantities.
- It should be **divisible** because different goods are valued differently.

Commodity Money

- Cowrie shells
- Precious metals, such as gold or silver.
- Beaver pelts in colonial North America.
- Cigarettes in prisons.

Paper Money to Fiat Money

Beginning in China in the tenth century and spreading throughout the world, paper money was issued by banks and governments. The paper money was exchangeable for some commodity, typically gold, on demand.



Paper Money to Fiat Money

- In modern economies, paper money is generally issued by a central bank run by the government.
- The Federal Reserve is the central bank of the United States. However, money issued by the Federal Reserve is no longer exchangeable for gold, nor is any current world currency. Instead, the Fed issues currency known as fiat money.

Definition

Fiat money refers to any money, such as paper currency, that is authorized by a central bank or governmental body and that does not have to be exchanged by the central bank for gold or some other commodity money.

Advantages and Disadvantages of Fiat Money

Fiat money has the advantage that governments do not have to be willing to exchange it for gold or some other commodity on demand. This makes central banks more flexible in creating money.

However it also creates a potential problem: fiat money is only acceptable as long as households and firms have **confidence** that if they accept paper dollars in exchange for goods and services, the dollars will not lose much value during the time they hold them.

Example: Apple Didn't Want My Cash

Example

A woman in California went to an Apple store and tried to buy an iPad using $600 in currency. Apple refused the sale. It wanted to keep track of people buying multiple iPads to resell, so it was only accepting credit or debit cards.

Can Apple do this legally? Yes! Firms are not obliged to accept currency as payment. (Debts are a different story.)

A different story in China

How is Money Measured in the United States Today?

Money Supply

How much money is there in America? This is harder to answer than it first appears, because you have to decide what to count as “money”.

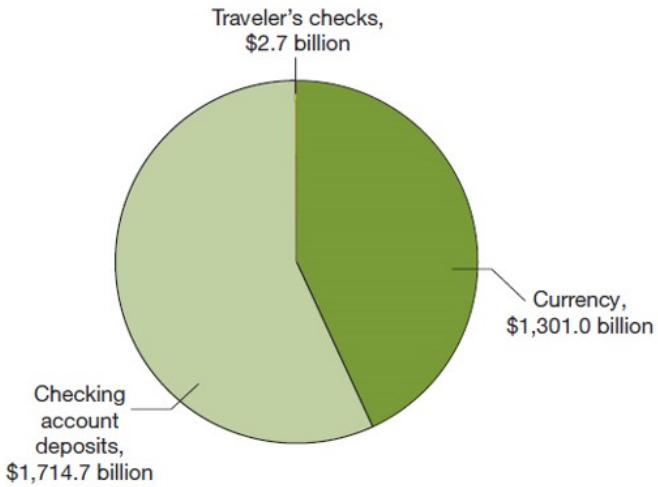
Definition

M1 is the narrowest definition of the money supply: the sum of currency in circulation, checking account deposits in banks, and holdings of traveler’s checks.

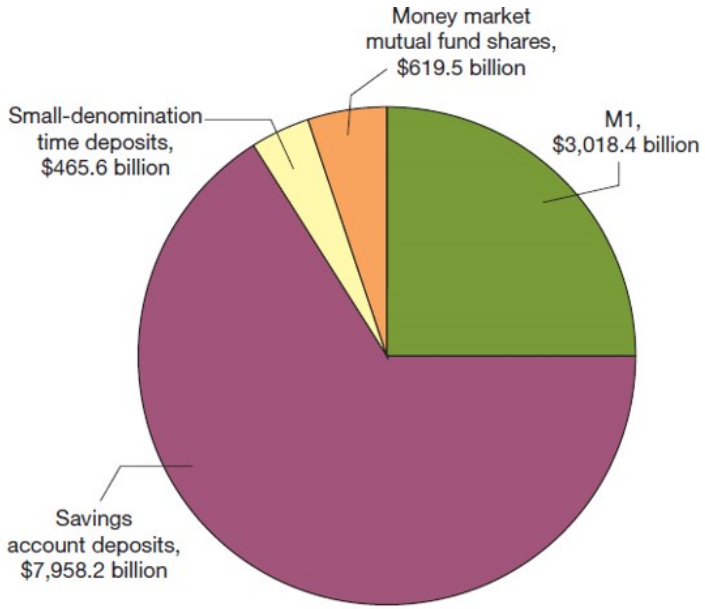
Definition

M2 is a broader definition of the money supply: it includes M1, plus savings account deposits, small-denomination time deposits, balances in money market deposit accounts, and noninstitutional money market fund shares.

Money Supply



(a) M1 = $3,018.4 billion



(b) M2 = $12,061.7 billion

The charts show U.S. M1 and M2 as of July 2015. U.S. currency holdings are unusually high by world standards; people in other countries sometimes hold and use U.S. dollars.

Either one might be valid, but we are mostly interested in money's role as the medium of exchange, so this suggests using M1. In our discussion, we:

- Treat both currency and checking account balances as "money" but nothing else.
- Realize that banks play an important role in the money supply, since they control what happens to money when it is in a checking account.

Debit and Credit Cards

- Debit cards directly access checking accounts, but the card is not money, the checking account balance is.
- Credit cards are a convenient way to obtain a short-term loan from the bank issuing the card. But transactions are not really complete until you pay the loan offtransferring money to pay off the credit card loan.

How Do Banks Create Money?

The Balance Sheet of a Typical Large Bank

Assets (in billions)		**Liabilities and Stockholders' Equity in (billions)**	
Reserves	$135	Deposits	$1,000
Loans	900	Short-term borrowing	400
Securities	700	Long-term debt	360
Buildings and equipment	15	Other liabilities	275
Other assets	550	Total liabilities	$2,035
		Stockholder's equity	265
Total assets	$2,300	Total liabilities and stockholders' equity	$2,300

- The left and right sides must add to the same amount.
- Banks use money deposited with them to make loans and buy securities (investments).
- Their largest liabilities are their deposit accounts: money they owe to their depositors.

Required and Excess Reserves

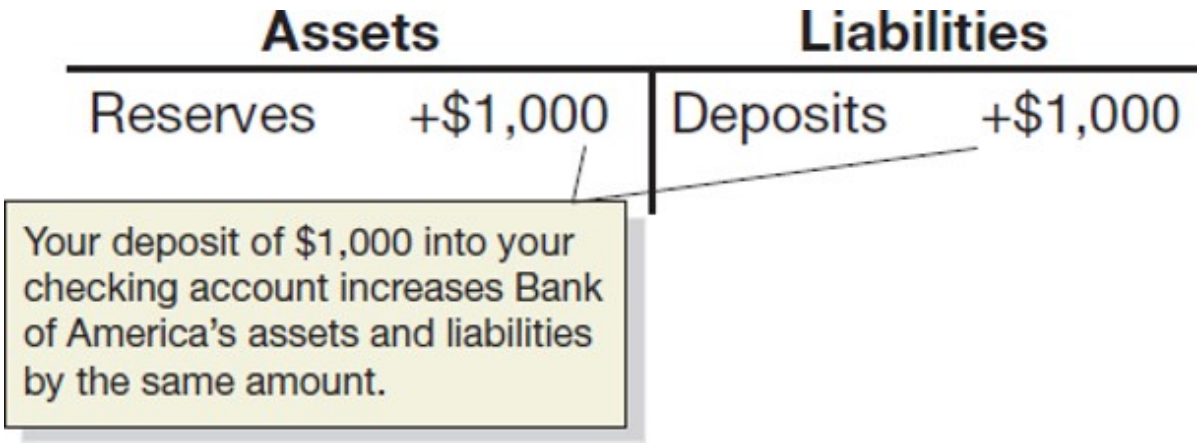
The bank must keep some cash available for its depositors; it does this through a combination of vault cash and deposits with the Federal Reserve.

Banks in the U.S. are required to hold required reserves: reserves that a bank is legally required to hold, based on its checking account deposits.

10 percent is the required reserve ratio (RR): the minimum fraction of deposits banks are required by law to keep as reserves.

Banks might choose to hold excess reserves: reserves over the legal requirement.

Money Creation

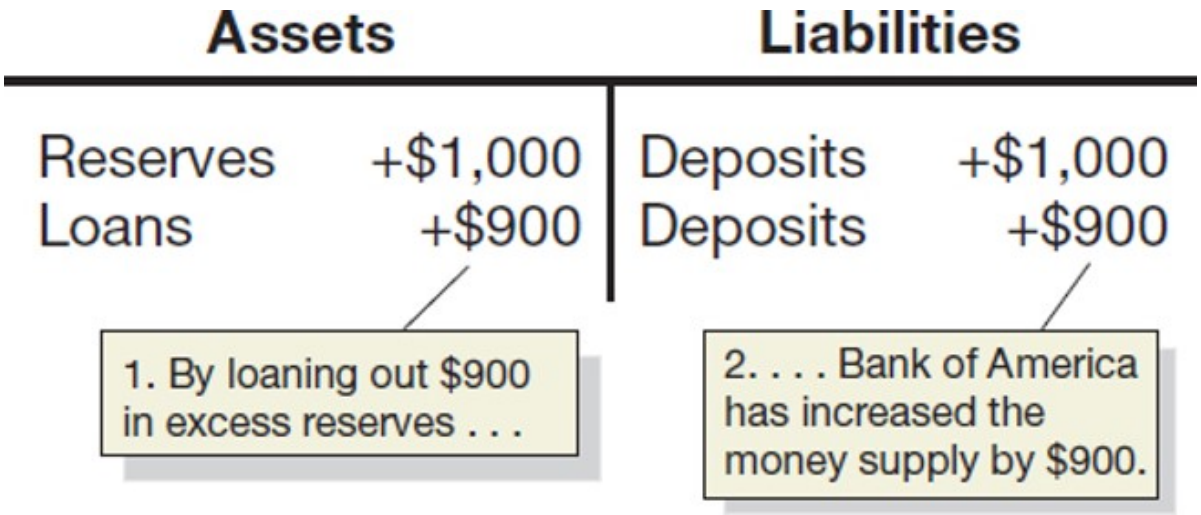


A T-account is a stripped-down version of a bank balance sheet, showing only how a transaction changes a banks balance sheet.

When you deposit $1,000 in currency at Bank of America, its reserves increase by $1,000 and so do its deposits.

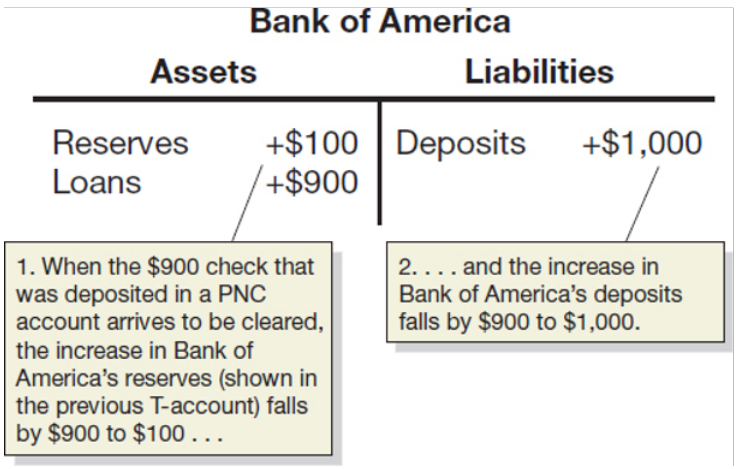
The currency component of the money supply decreases by the $1,000, since that $1,000 is no longer in circulation, but the checking deposits component increases by $1,000. So there is no net change in the money supply-yet.

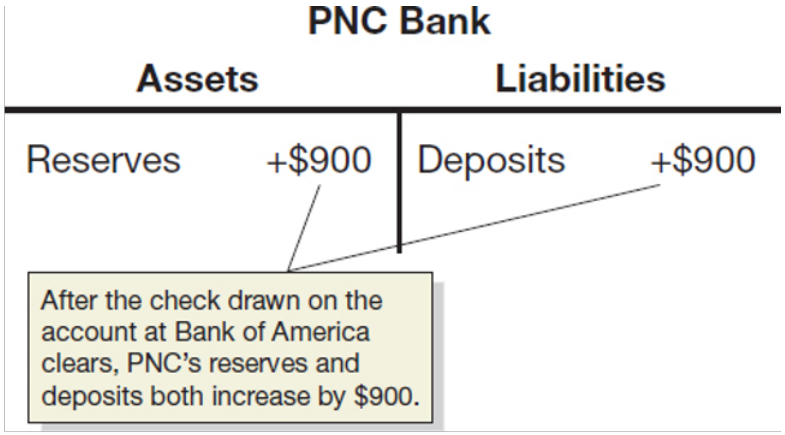
Money Creation



But Bank of America needs to make a profit, so it keeps 10 percent of the deposit as reserves and lends out the rest, creating a $900 checking account deposit.

Money Creation of Banks





The $900 initially appears in a BoA checking account, but will soon be spent, and Bank of America will transfer $900 in currency to the bank at which the $900 check is deposited. And the cycle will continue, with PNC now making a loan.

Money Creation

Bank	Increase in Checking Account Deposits
Bank of America	$1,000
PNC	+ 900 (= 0.9 : $1,000)
Third Bank	+ 810 (= 0.9 : $900)
Fourth Bank	+ 729 (= 0.9 : $810)
•	+ •
•	+ •
•	+ •
Total change in checking account deposits	= $10,000

Each round, the additional checking account deposits get smaller and smaller.

Every round, 10 percent of the deposits are kept as reserves. This allows us to tell by how much the checking deposits will eventually increase: the $1,000 in currency will become the 10 percent required reserves for all of the checking deposits, so a total of $10,000 in checking deposits can be created.

Money Creation of Banks

An alternative way to find out how much money the original \$1,000 in currency will create is to add up all of the checking account deposits.

$$
\begin{aligned}
& 1000 + (0.9 \times 1000) + (0.9 \times 0.9 \times 1000) + \ldots \\
=& 1000 + 0.9 \times 1000 + 0.9^2 \times 1000 + \ldots \\
=& 1000(1 + 0.9 + 0.9^2 + 0.9^3 + \ldots) \\
=& 1000 \left(\frac{1}{1 - 0.9} \right) \\
=& 1000 \times \frac{1}{0.1} \\
=& 10000
\end{aligned}
$$

Familiar?

Simple Deposit Multiplier

$$\text{Simple Deposit Multiplier} = \frac{1}{RR}$$

So with a 10 percent required reserve ratio (RR), the simple deposit multiplier is 10.

But in reality, we do not observe this: currency deposits only end up being multiplied about 2.5 times, during "normal" periods. Because

- Banks may not lend out as much as we predict, either because they want to keep excess reserves, or they cannot find credit-worthy borrowers.
- Consumers keep some currency out of the bank; that currency cannot be used as required reserves.

Note: during the recession of 2007-2009, research suggests that the real-world multiplier fell to close to 1.

Example

The collapse of Northern Rock Bank was the first sign in Britain of the coming global financial crisis.

In general, we can assume that the real-world deposit multiplier is greater than 1. So we conclude that:

- When banks gain reserves, they make new loans, and the money supply expands.
- When banks lose reserves, they reduce their loans, and the money supply contracts.

Summary

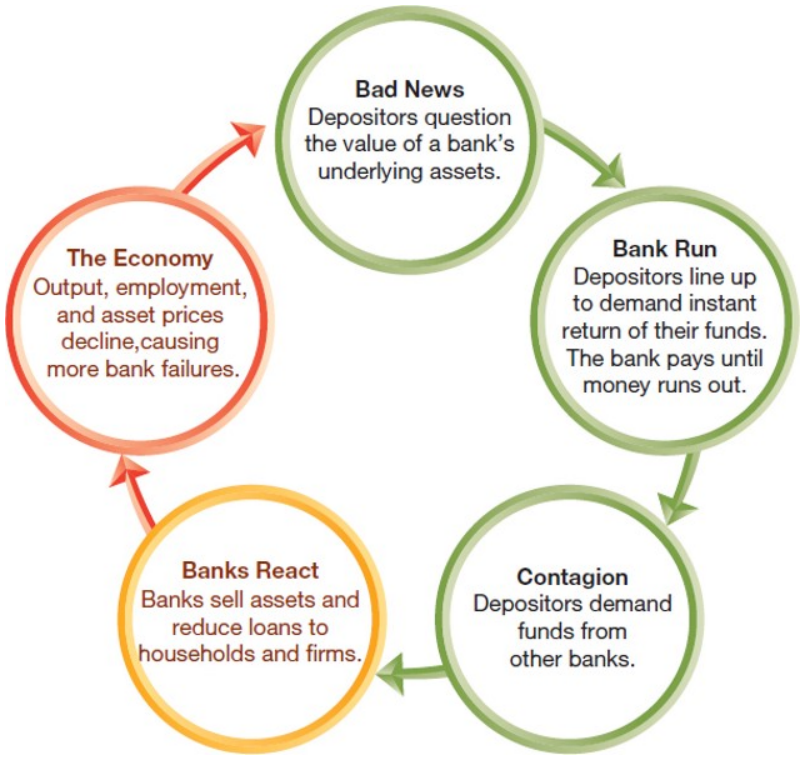
- The origin of money and function of money.
- Money supply and banks' role.
- Deposit multiplier

The Federal Reserve System

Bank Run

- We know that banks keep less than 100 percent of deposits as reserves.
- What if depositors lost confidence in a bank and tried to withdraw their money all at once? (Recall Northern Rock)
- This situation is known as a **bank run**; if many banks simultaneously experience bank runs, a **bank panic** occurs.

Central Bank's Role



The figure shows how a bank panic can take place.

- Central banks, like the Federal Reserve, can help to prevent bank runs and panics by acting as a **lender of last resort**, promising to make loans to banks in order to pay off depositors.
- This assurance can break the negative feedback loop.

The Establishment of the Federal Reserve System

In the late nineteenth and early twentieth centuries, the United States experienced several bank panics.

- In 1914, the Federal Reserve system started. “The Fed” makes loans to banks called discount loans, charging a rate of interest called the discount rate.

During the Great Depression of the 1930s, many banks were hit by bank runs. Afraid of encouraging bad banking practices, the Fed refused to make discount loans to many banks, and more than 5,000 banks failed.

- Today, many economists are critical of the Feds decisions in the early 1930s, believing they made the Great Depression worse.

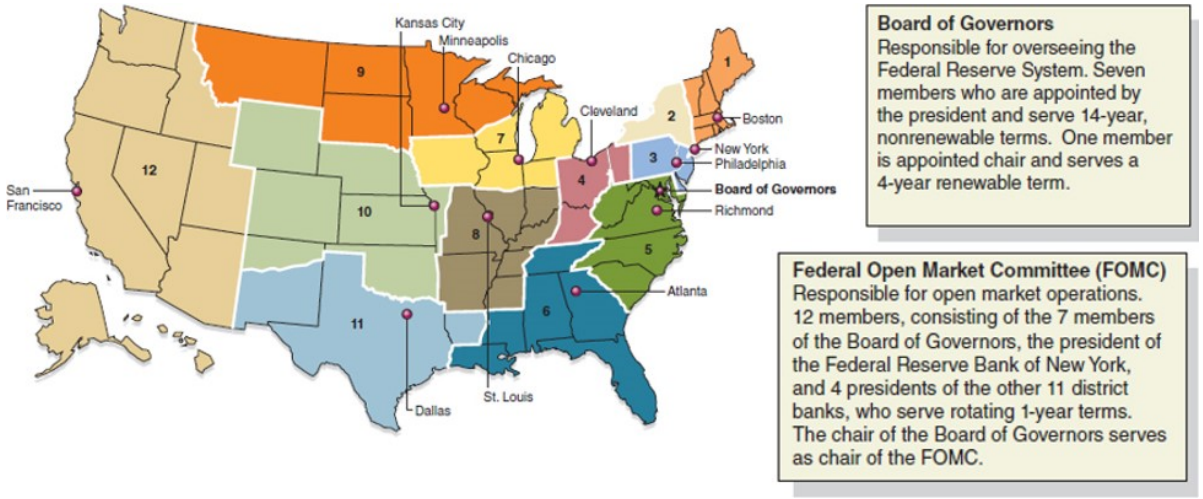
Response to the Great Depression

- **Federal Deposit Insurance Corporation (FDIC)**

You can check any statements on you debit card or checking account.

The FDIC insures deposits in many banks, up to a limit (currently $250,000). This government guarantee has helped to limit bank panics.

The Federal Reserve System



- In 1913, Congress divided the country into 12 Federal Reserve districts, each of which provides services to banks in the district. But the real power of the Fed lies in Washington DC, with the Board of Governors.
- The Federal Open Market Committee (FOMC) conducts America's monetary policy (managing the money supply): the actions the Federal Reserve takes to manage the money supply and interest rates to pursue macroeconomic policy objectives.

Open Market Operations

Definition

Open market operations: the buying and selling of Treasury securities by the Federal Reserve in order to control the money supply.

- To increase the money supply, the Fed directs its trading desk in New York to buy U.S. Treasury securities (1 year or less, 2-10 years, 30 years).
- To decrease the money supply, the Fed sells its securities.

Open Market Operations

Banking System

Assets		Liabilities
Treasury bills	–$10 million	
Reserves	+$10 million	

Federal Reserve

Assets		Liabilities	
Treasury bills	+$10 million	Reserves	+$10 million

Suppose the Fed engages in an open market purchase of $10 million.

- The banking systems T-account reflects an increase in reserves and a corresponding decrease in assets due to its debt to the Fed.
- The banking systems reserves are liabilities for the Fed, but it gains assets equal to the debt owed to it by the banking system.

Other Fed Tools for Managing the Money Supply

- **Discount policy**
  - The interest rate paid on money banks borrow from the Fed.
  - By lowering the discount rate, the Fed encourages banks to borrow (and hence lend out) more money, increasing the money supply. Raising the discount rate has the opposite effect.
- **Reserve requirement**
  - The Fed can alter the required reserve ratio. A decrease would result in more loans being made, increasing the money supply.
  - An increase would result in fewer loans being made.

The Rise and Effects of the Shadow Banking System

The banks we have been discussing so far are commercial banks, whose primary role is to accept funds from depositors and make loans to borrowers.

In the last 20 years, two important developments have occurred in the financial system:

1. Banks have begun to resell many of their loans rather than keep them until they are paid off.
2. Financial firms other than commercial banks have become sources of credit to businesses.

Securitization Comes to Banking

A security is a financial asset-such as a stock or a bond-that can be bought and sold in a financial market.

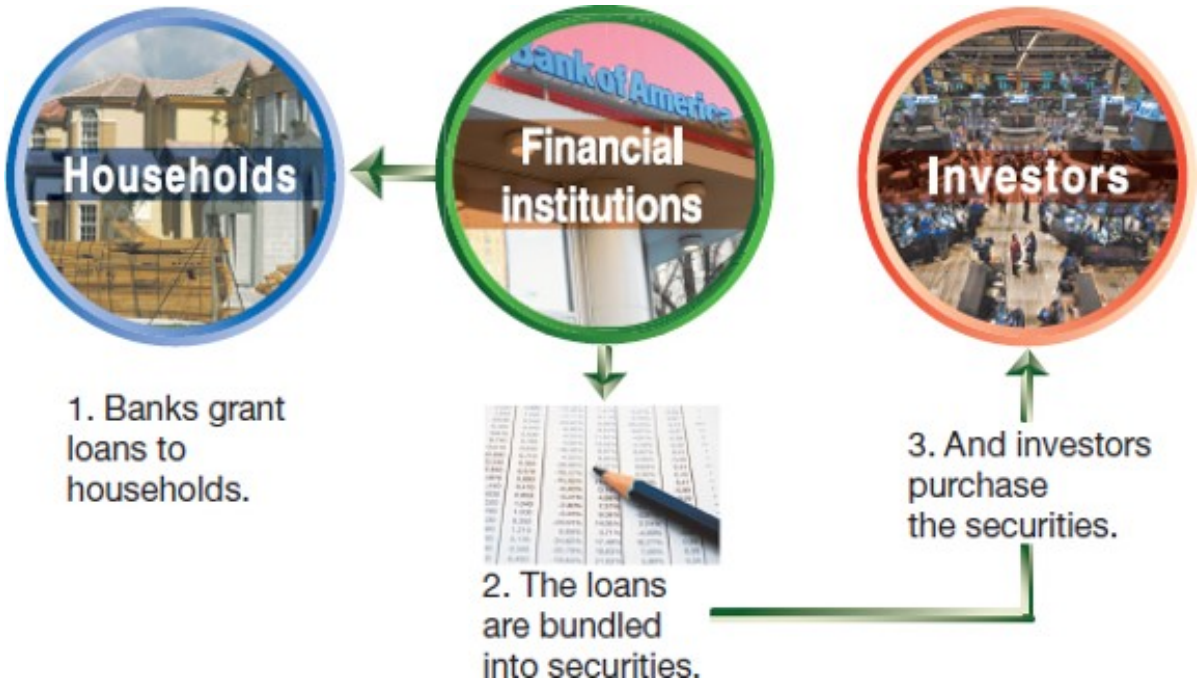
Traditionally, when a bank made a loan like a residential mortgage loan, it would “keep” the loan and collect payments until the loan was paid off.

In the 1970s, secondary markets developed for securitized loans, allowing them to be traded, much like stocks and bonds.

Definition

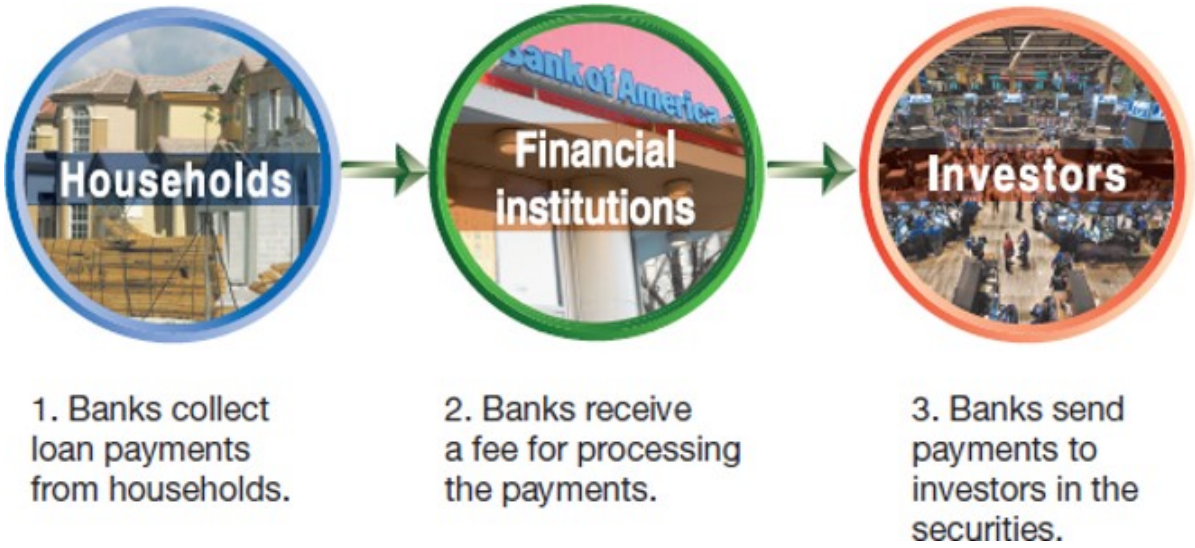
Securitization: The process of transforming loans or other financial assets into securities.

The Process of Securitization



The securitization process of a bank loan.

The Process of Securitization



The payment of the loan.

The Shadow Banking System and The Financial Crisis

- **Investment banks** (provide investment advice and engage in creating and trading securities such as mortgage-backed securities.)
- **Money market mutual funds** (sell shares to investors and use the money to buy short-term Treasury bills and commercial paper)
- **Hedge funds** (funds that raise money from wealthy investors, and make "sophisticated" investments.)

By raising funds from investors and providing them directly or indirectly to firms and households, these firms have become a "shadow banking system."

The Shadow Banking System and The Financial Crisis

What's the difference from commercial banks?

- Less regulated by the government, including not being FDIC-insured.
- Highly leveraged, relying more heavily on borrowed money; hence their investments had more risk, both of gaining and losing value.

Beginning in 2007, firms in the shadow banking system were quite vulnerable to runs.

- In spring of 2008, investment bank Bear Stearns avoided bankruptcy only by being purchased by JPMorgan Chase.
- In fall of 2008, investment bank Lehman Brothers did declare bankruptcy, after most of its clients pulled their money out.

The Fed's Response

Troubled Asset Relief Program (TARP):

- Providing funds to banks in exchange for stock
- Offering discount loans to previously ineligible investment banks
- Buying commercial paper for the first time since the 1930s

These combined actions eventually stabilized the financial system.

The Quantity Theory of Money

Little History

- Beginning in the sixteenth century, Spain sent gold and silver from Mexico and Peru back to Europe.
- These metals were minted into coins, increasing the money supply.
- Prices in Europe rose steadily during those years.

This helped people to make the connection between the amount of money in circulation and the price level.

Connecting Money and Prices: The Quantity Equation

In the early twentieth century, Irving Fisher formalized the relationship between money and prices as **the quantity equation**:

$$M \times V = P \times Y$$

- M: money supply
- V: velocity of money: the average **number of times** each dollar in the money supply is used to purchase goods and services included in GDP.
- P: price level
- Y: real output

Rewriting it we have

$$V = \frac{P \times Y}{M}$$

Calculating the Velocity of Money

- M: use M1
- P: use GDP deflator
- Y: real GDP

$$V = \frac{1.09 \times \$16.0\text{trillion}}{\$2.8\text{trillion}} = 6.2$$

We can always calculate V. But will we always get the same answer? Yes.

Theory

Quantity theory of money: A theory about the connection between money and prices that assumes that the velocity of money is constant.

The Quantity Theory Explanation of Inflation

Trick

When variables are multiplied together in an equation, we can form the same equation with their **growth rates added together**.

So

$$\text{Growth rate of the money supply} + \text{Growth rate of velocity} = \text{Growth rate of the price level} + \text{Growth rate of real output}$$

Notice Growth rate of the price level is just inflation and assuming growth rate of velocity is zero, so

$$\text{Inflation rate} = \text{Growth rate of the money supply} - \text{Growth rate of real output}$$

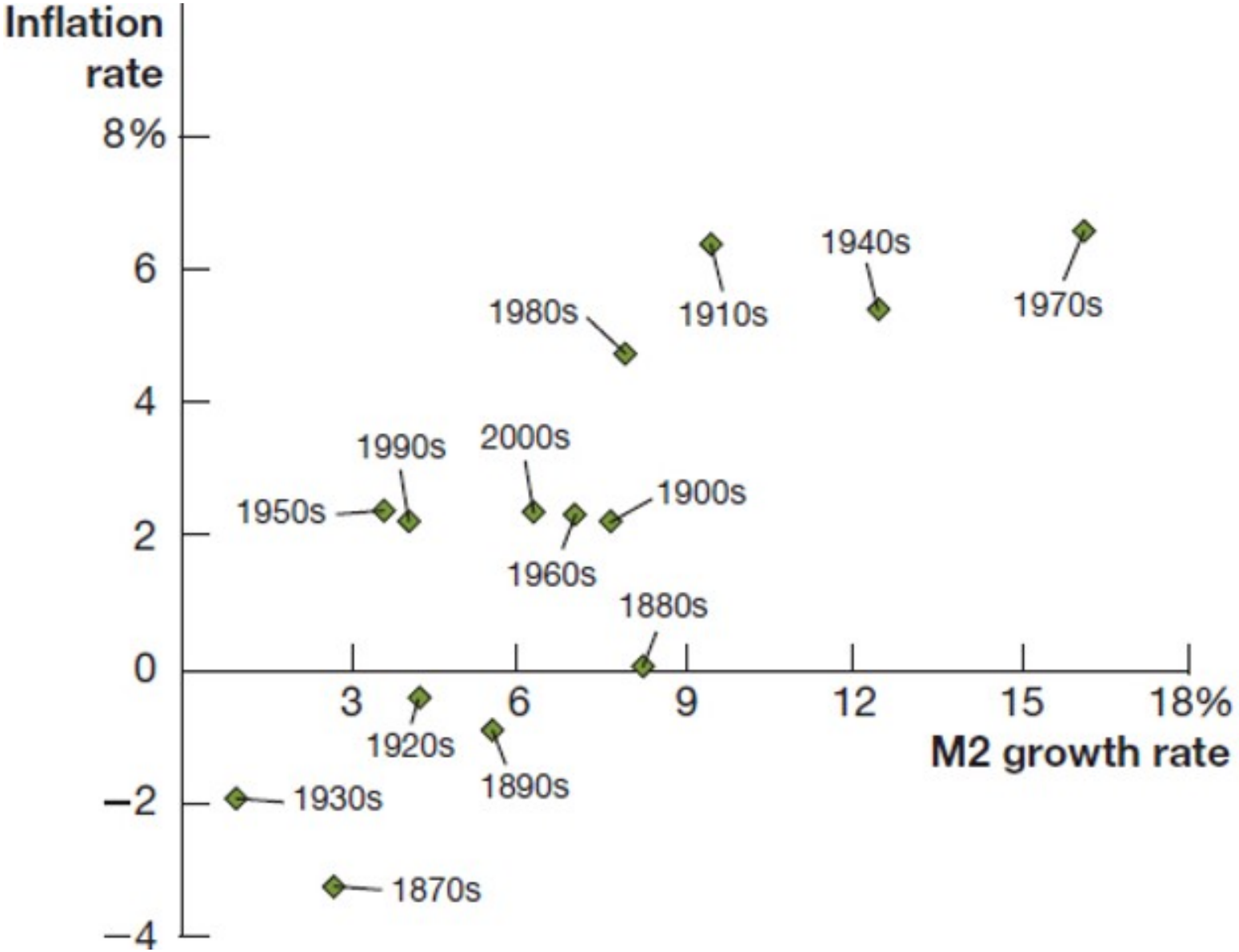
The Quantity Theory Explanation of Inflation

$$\text{Inflation rate} = \text{Growth rate of the money supply} - \text{Growth rate of real output}$$

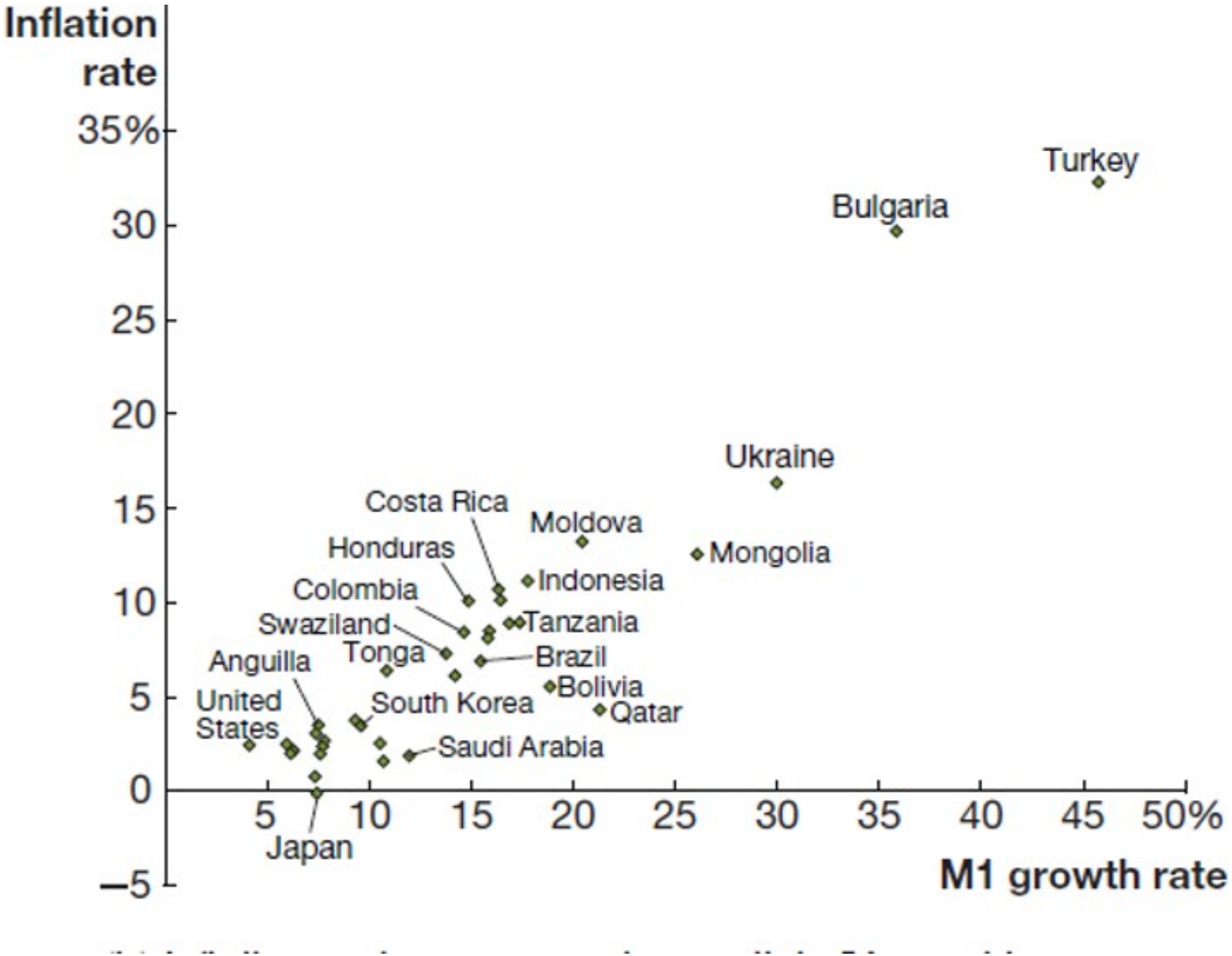
- If the money supply grows faster than real GDP, there will be inflation.
- If the money supply grows slower than real GDP, there will be deflation (a decline in the price level).
- If the money supply grows at the same rate as real GDP, there will be neither inflation nor deflation: the price level will be stable.

Is velocity truly constant from year to year? The answer is **no**. But the quantity theory of money can still provide insight: In the long run, inflation results from the money supply growing at a faster rate than real GDP. (Can you link it to some school of thoughts in macroeconomics?)

Empirical Evidence



Empirical Evidence



Hyperinflation

Very high rates of inflation-in excess of 100 percent per year-are known as hyperinflation.

- Hyperinflation results when central banks increase the money supply at a rate far in excess of the growth rate of real GDP.
- This might happen when governments want to spend much more than they raise through taxes, so they force their central bank to "buy" government bonds.

Recently, hyperinflation has occurred in Zimbabwe. During the 2000s, prices increased by (on average) 7500 percent per year.

At that rate, a can of soda costing $1 this year would cost $75 next year and over $5,600 the year after that.

Summary on Friday

- Bank panic and the need for central bank.
- Central banks use various tools to manage money supply (open market operation, discount rate, reserve requirement).
- Shadow banking and securitization.
- The quantity theory of money and the relationship between money supply and price level.