

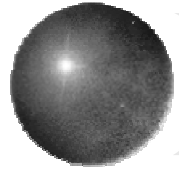
Banking and the Money Supply

Money Aggregates

How Banks Work

How Banks Create Money

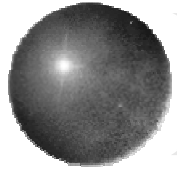
The Fed's Tools of Monetary Control



Definitions of the Money Supply

⊕ M1

- ⊗ The narrow definition of money
- ⊗ Currency (including coins) in nonbanking public
- ⊗ Checkable deposits
 - Deposits against which checks can be written
 - Earn no or few interest
 - Liabilities of issuing banks stand ready to convert them into currency
 - Not legal tender (非法定貨幣, 對方可拒收)
- ⊗ Travelers checks

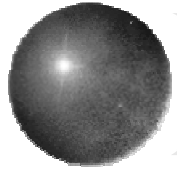


❁ 1.本位貨幣與輔幣

- ❁ (1)本位貨幣：是指一國用一定價值單位表示的基本貨幣，具有無限法償的能力。
- ❁ (2)輔幣：本位貨幣以下，便利於小額交易的貨幣，為有限法償。

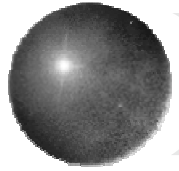
❁ 2.有限法償與無限法償

- ❁ (1)無限法償：債務人用以清償債務時，無論數量多少對方均不得拒絕接受。
- ❁ (2)有限法償：債務人用以清償債務時，超過一定數量時對方得以拒絕接受。



Circulating Currency

- ⊕ **Primary currency circulating in the U.S. consists of Federal Reserve notes**
 - ⊗ **fiat money**
 - its status come from the power of government
 - Not redeemable for anything other than more fiat money nor is it backed by anything of intrinsic value
- ⊕ **U.S. coins are token money**
 - ⊗ **metal value < face value**



M2 Money Supply

⊕ Includes M1, plus

⊗ *Savings deposits* (活存)

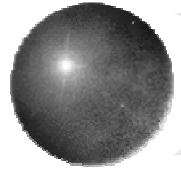
- earn interest but have no specific maturity date
- savings deposits

⊗ *Small-denomination time deposits*

- Time deposit also called certificates of deposit(定存),
 - earn a fixed rate of interest if held for the specified period
 - premature withdrawals penalized by loss of interest

⊗ *Money market mutual funds*

- have limited check-writing privileges → Not belong to M1
- Shares in these funds are claims on a portfolio of short-term interest-earning assets



Other Money Supply Definitions

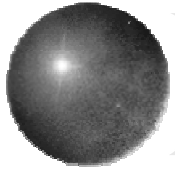
⊕ M3 includes

- ⊗ M2 plus large-denomination time deposits
 - Larger than \$100,000

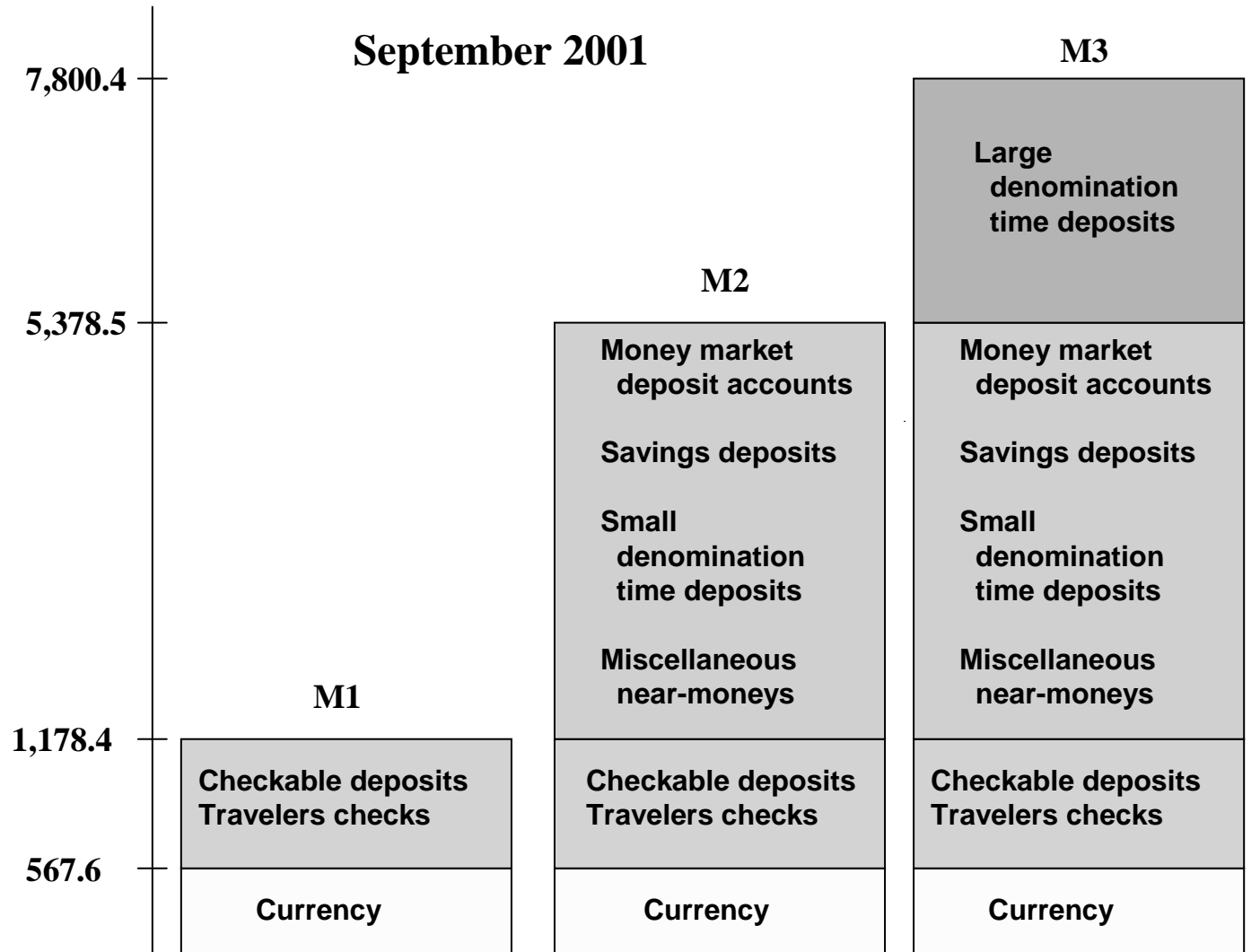
⊕ Remark:

- ⊗ M3 is less liquid than M2
- ⊗ M2 is less liquid than M1
- ⊗ The distinction between M1 and M2 is less meaningful
- ⊗ Debit card is included in M1 → Like checks
- ⊗ Credit card is not. → It likes a loan. You simply delay the payment.

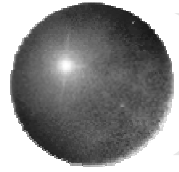
⊕ The size and relative importance of M1, M2, and M3 is in next slide



The Money Supply



Based on monthly estimates from the Federal Reserve Board



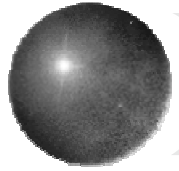
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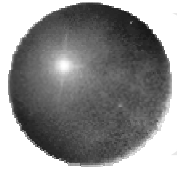
The Fed's Tools of Monetary Control



Financial Intermediaries

- ⊕ **Banks serve as *financial intermediaries*,**
 - ⊞ **Reduce the transaction costs of channeling savings to credit worthy borrowers**
 - **Coping with Asymmetric Information**
 - **Reducing risk through diversification**

Discussed as follows:

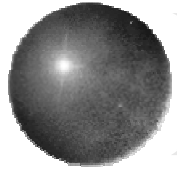


Asymmetric Information

- ⊗ **Identify borrowers who are**
 - ⊗ willing to pay interest
 - ⊗ able to repay the loans

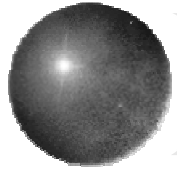
- ⊗ **Borrowers have more information about their credit history and financial plans**
 - ⊗ *asymmetric information* → an inequality in what's known by each party to the transaction

- ⊗ **Banks have a greater ability to cope with asymmetric information**
 - ⊗ Drawing up and enforcing contracts
 - ⊗ Savers are better off dealing with banks



Reducing Risk

- ⊕ **By developing a diversified portfolio of assets rather than lending funds to a single borrower, banks reduce the risk to each individual saver**
 - ⊞ **In effect, lends a tiny fraction of each saver's deposits to each of its many borrowers**



Starting a Bank

- ⊕ **To obtain the right to operate,**
 - ⊞ **Must apply to**
 - the state banking authority (state bank)
 - the U.S. Comptroller of the Currency (national bank)

- ⊕ **The founders invest \$500,000**
 - ⊞ become the *owner's equity* or the *net worth* of the bank

- ⊕ **\$50000 goes to the FED to buy shares in their district bank → \$450,000 left**

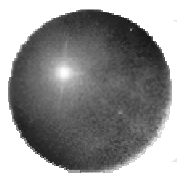
Home Bank's Balance Sheet (資產負債表)

<u>Assets</u>		<u>Liabilities and Net Worth</u>	
Building and furniture	\$ 450,000	Net worth	\$500,000
Stock in district Fed	<u>50,000</u>		<u> </u>
Total	<u><u>\$500,000</u></u>	Total	<u><u>\$500,000</u></u>

The left side lists the bank's *assets* (any physical property or financial claim owned by the bank)

The right side lists the bank's *liabilities* (an amount the bank owes) and their *net worth*

Note that: Assets = Liabilities + Net Worth



Home Bank's Balance Sheet after \$1,000,000 Deposit

Assets		Liabilities and Net Worth	
Cash	\$1,000,000	Checkable deposits	\$1,000,000
Building and furniture	\$450,000	Net worth	\$500,000
Stock in district Fed	<u>50,000</u>		<u> </u>
Total	<u><u>\$1,500,000</u></u>	Total	<u><u>\$1,500,000</u></u>

Suppose a customer deposits \$1,000,000 into a checking account.

Bank promises to repay the depositor that amount → A liability to the bank

This deposit increases the bank's assets and liabilities by \$1,000,000

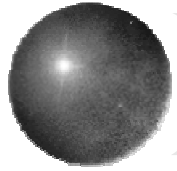


Reserve Accounts

- ✦ Banks are required to hold in reserve a percentage of their checkable deposits

(存款準備)

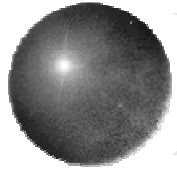
- ❑ The amount must be held in reserve is called *required reserves* (法定存款準備)
- ❑ = Checkable deposits multiplied by the required reserve ratio
- ❑ *Required reserve ratio* dictates the minimum proportion of deposits must hold in reserve



Reserve Accounts

- ⊕ **Current required reserve requirement is 10% on checkable deposits**
 - ▣ **Held as cash in the bank's vault or**
 - ▣ **deposits at the FED,**
 - ▣ **Earns no interest**

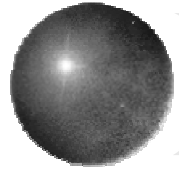
- ⊕ **In our example, Home Bank hold \$100,000 ($= \$1,000,000 * .10$) as reserve**



Reserve Accounts

- ⊕ **If deposits required reserves with the FED,**
 - ⊗ **\$900,000 *excess reserves* held as cash**

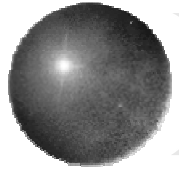
- ⊕ **Excess reserves can be used**
 - ⊗ **To make loans, or**
 - ⊗ **To purchase interest-bearing assets, such as government bonds**



Liquidity versus Profitability

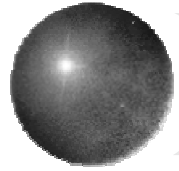
- ⊕ **Required reserves are not used to meet depositor requests for funds**
 - ⊗ **Banks hold excess reserves or assets that can be easily converted to cash to satisfy demand for funds**

- ⊕ **Banks management must structure the portfolio of assets with an eye towards**
 - ⊗ **Liquidity**
 - ⊗ **Profitability**



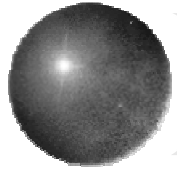
Liquidity

- ⊕ **The ease with which an asset can be**
 - ⊞ converted into cash
 - ⊞ without a significant loss of value
- ⊕ **Most liquid asset**
 - ⊞ bank reserves,
 - in the bank's vault as cash
 - on account with the FED,
 - but reserves earn no interest
- ⊕ **Complete liquidity would mean holding all its assets as cash reserves**
 - ⊞ No difficulty meeting depositors' demands for funds
 - ⊞ No interest-earning → no profits



Liquidity versus Profitability

- ⊕ **At the other extreme, if the bank uses all its excess reserves to acquire high-yielding but illiquid assets,**
 - ⊞ **run into problems whenever withdrawals exceed new deposits**
- ⊕ ***Tradeoff between liquidity and profitability***



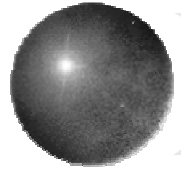
Reserves

- ⊕ **Reserves earn no interest,**
 - ▣ keep excess reserves to a minimum
 - ▣ Sweep excess reserves and put them to interest-bearing use

- ⊕ **The *federal funds market* provides for day-to-day lending and borrowing among banks of excess reserves on account at the FED**

- ⊕ **The interest rate paid on these loans is called the *federal funds rate*,**
 - ▣ FED targets as a tool of monetary policy

Discussed later



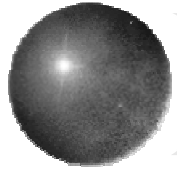
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Creation of Money

After Home Bank Lends You \$1,000

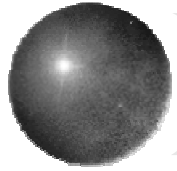
⊕ **Excess reserves support the creation of money**

Let's assume there are no excess reserves in the banking system.

Assets	Liabilities and Net Worth	
Reserves At Fed + 1,000	Checkable deposits	+ 1,000

Let Fed buys a \$1,000 U.S. government bond from a securities dealer,
*The Fed pays by crediting Home Bank's reserve account with \$1,000,
*Home Bank can increase the dealer's checking account by \$1,000.

Where did the Fed get these reserves? It makes them up –
The securities dealer has exchanged one U.S. bond to checkable deposit.
U.S. bond is not money but checkable deposits are,
Money supply increases by \$1,000 in this first round.
Above shows the changes in balance sheet.



Creation of Money

After the Bank Makes a \$900 Loan

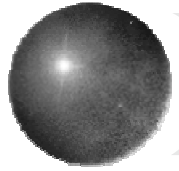
Assets		Liabilities and Net Worth	
Loans	+ 900	Checkable deposits	+ 900

**Home Bank set aside 10% of the initial deposit as required reserves
→ \$900 in excess reserves.**

**Suppose you borrow \$900 loan
Increases your checking account by \$900.
→ Increases the money supply by \$900.**

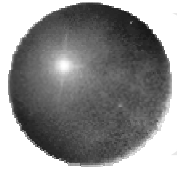
**Money supply has increased \$1,900 to this point
\$1,000 increase in the securities dealer's checkable deposit
\$900 increase in your checkable deposits.**

**On the balance sheet:
Loans increase by \$900 on the assets side
Liability side has increased by the same amount because of the checkable deposit**



Check Clearing

- ⊕ Spend \$900 → A saves the check at Merchant's Trust
 - ⊗ Increases A's account by \$900
 - ⊗ Sends the check to the Fed
 - Transfers \$900 in reserves from Home Bank's account to Merchants Trust's account
 - ⊗ Sends the check to Home Bank,
 - Reduces your checkable deposits by \$900
- ⊕ The Fed has thereby *cleared your check*
- ⊕ Remark: 在台灣透過票據交換所



Change in Merchants Trust's Balance Sheet After an \$810 Loan

Assets

Liabilities and Net Worth

Loans

+ 810

Checkable deposits

+ 810

Merchants Trust has \$900 more in reserves on deposit with the Fed.

\$90 in required reserves,

\$810 in excess reserves.

Loan money to someone else as above.

Money increase by a total of \$2,710 (= \$1,000 + \$900 + \$810)

Let \$810 is spent and deposited in an account at Fidelity Bank,

Credits the depositor's account with \$810

Sets the check to the Fed for clearance.

Fed reduces Merchants Trust reserves by \$810

increases Fidelity's by the same amount.

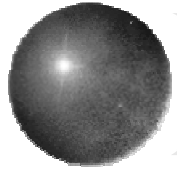
The Pattern of Deposits and Loans

- ⊕ **Bank gets a fresh deposit,**
 - ▣ 10% goes to required reserves
 - ▣ Rest becomes excess reserves,
 - Fuel new loans or other asset acquisitions
 - Bank can't lend more than excess reserves

- ⊕ **Borrower spends the amount loaned,**
 - ▣ Reserves at one bank fall,
 - ▣ Total reserves in the banking system do not

- ⊕ **Recipient bank uses most of new deposit to extend more loans**
 - ▣ More checkable deposits

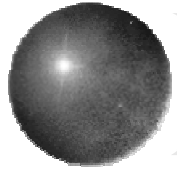
- ⊕ **The process of money creation is summarized as follows:**



Summary

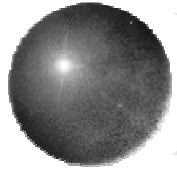
During each round, the increase in checkable deposits (1) minus the increase in required reserves (2) equals the potential increase in loans (3). Checkable deposits in this example can potentially increase by as much as \$10,000.

Bank	Increase in Checkable Deposits (1)	Increase in Required Reserves (2)	Loans (3) = (1)–(2)
1. College Bank	\$ 1,000	\$ 100	\$ 900
2. Merchants Trust	900	90	810
3. Fidelity Bank	810	81	729
All remaining rounds	<u>7,290</u>	<u>729</u>	<u>6,561</u>
Total	\$10,000	\$1,000	\$9,000



Reserve Requirements and Money Expansion

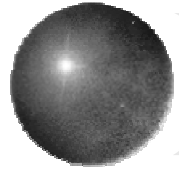
- ⊕ **Increases in money supply =
Increase in banking system's reserves * *money multiplier***
- ⊕ ***Simple money multiplier* = $1 / r$,**
 - ⊕ where r is the reserve ratio
- ⊕ **In our example the reserve ratio was $0.1 = 1/10$
(Reserve ratio = 10)**
- ⊕ **Initial deposit of \$1,000 increase in fresh
reserves by the Fed could support up to \$10,000
in money supply**



Money Multiplier

- ⊕ **The higher the reserve requirement,**
 - ❖ **The greater the fraction of deposits that must be held as reserves**
 - ❖ **The smaller the money multiplier**

- ❖ **Reserve requirement of 20%**
- ❖ **money multiplier of 5**
- ❖ **Reserve requirement of 5% → money multiplier of 20**

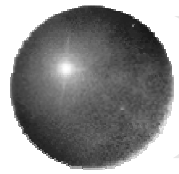


Limitations on Money Expansion

- **Various leakages from expansion process reduce the money multiplier.**

We previously assume that

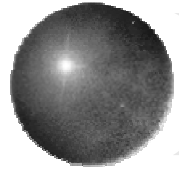
- **Banks do not let excess reserves sit idle –**
 - Profit incentive leads banks to minimize the amount of excess reserves idle
- **Borrowers spend the money -**
 - People would not borrow unless they need
- **People do not choose to increase their cash holdings –**
 - Some may be held as cash, which reduces the money multiplier



Contraction of the Money Supply

- ⊕ **If the Fed reduced bank reserves, thereby reducing the money supply**
 - ⊗ **Fed's sale of government bonds**
 - reduces bank reserves,
 - forcing banks to recall loans
 - multiple contraction would work

- ⊕ **Ex: Let reserve requirement = 10%,**
 - ⊗ **\$1,000 sale of bonds**
 - ⊗ **reduce the money supply by a maximum of \$10,000**



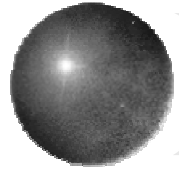
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Tools for Controlling Reserves

❖ **Three tools for controlling reserves hence money supply**

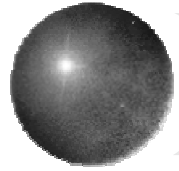
❑ **Open market operations → buying and selling of U.S. bonds**

❑ **Setting the discount rate,**

- the interest rate the Fed charges for loans makes to banks

❑ **Setting the required reserve ratio,**

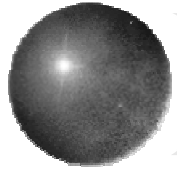
- the minimum fraction of reserves that banks must hold against deposits



Open Market Operations

- ⊕ Increase the money supply, → buys U.S. bonds → open-market purchase
- ⊕ Reduce the money supply → sells U.S. bonds → open-market sale

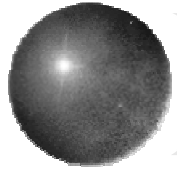
- ⊕ **Advantage of open-market operations**
 - ⊠ Relatively easy to carry out
 - ⊠ Require no change in laws or regulations
 - ⊠ Can be executed in any amount



Federal Funds Market

- ⊕ **Through open-market operations, the Fed influences**
 - ⊠ **bank reserves**
 - ⊠ ***federal funds rate***
 - **the rate banks charge one another for borrowing excess reserves at the Fed, typically overnight**

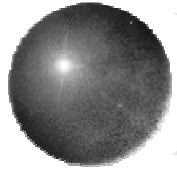
- ⊕ **Banks that are unable to meet legal reserve requirements can borrow in the federal funds market**



Federal Funds Market

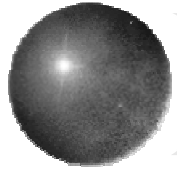
- ⊕ **The federal funds rate serves as a good indicator of the *tightness of monetary policy***

- ⊕ **Ex:**
 - ⊗ **Fed buys bonds**
 - ⊗ **Increases reserves in the banking system**
 - ⊗ **Banks have more excess reserves**
 - ⊗ **Demand for excess reserves falls while the supply increases**
 - ⊗ **Federal funds rate declines**



Discount Rate

- ⊕ **Discount rate is the interest rate the Fed charges on loans it makes to banks**
- ⊕ **Banks can borrow from the Fed when they need reserves to satisfy reserve requirements**
- ⊕ **By lowering or raising the discount rate, the Fed encourages or discourages banks from borrowing, which affects the money supply**



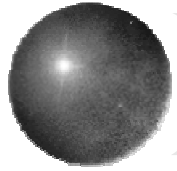
Discount Rate

⊕ Lower discount rate

- ⊗ Reduces the cost of borrowing reserves,
- ⊗ encouraging banks to borrow reserves
- ⊗ More bank lending
- ⊗ Increase money supply

⊕ Higher discount rate

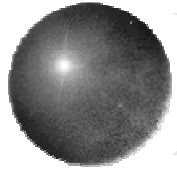
- ⊗ Increases the cost of borrowing reserve
- ⊗ Less bank lending
- ⊗ Reduced money supply



Discount Rate

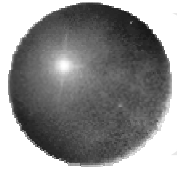
- ⊕ **No guarantee that banks will borrow more if the discount rate is reduced**
 - ⊞ **If**
 - business prospects look poor
 - banks view lending as risky,
 - a lower discount rate may not entice banks to borrow from the Fed**

- ⊕ **Fed uses the discount rate more as a signal to financial markets about its monetary policy than as a tool**



Reserve Requirements

- ⊗ **Minimum amount of reserves that banks must hold to back up deposits**
- ⊗ **If Fed increases the reserve requirement,**
 - ⊗ **banks hold more reserves**
 - ⊗ **A reduction in the fraction of each dollar that can be lent out**
 - ⊗ **Reduces the banking system's ability to create money**



Reserve Requirements

- ⊗ **Decrease in the reserve requirement**
 - ⊗ **Increases the fraction of each dollar on deposit that can be lent out**
 - ⊗ **Increases the banking system's ability to create money**
- ⊗ **Reserve requirements can be changed by a simple majority vote by the Board of Governors**
- ⊗ **However, since even a small change in the reserve requirement can be disruptive, the Fed seldom employs this tool**