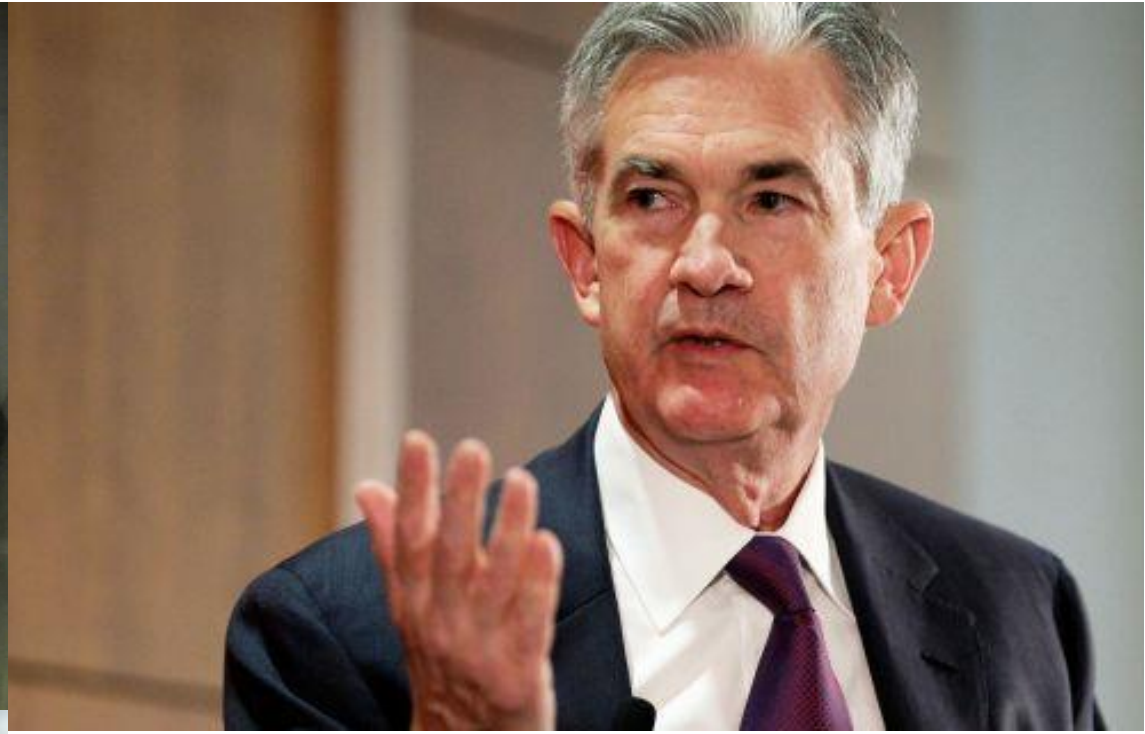


Money and Banking

EC1101E Macro Lecture 4

Don’t try this at home!

“If we’d gone and spent the money on swimming pools, Rolls-Royces, I don’t think people would be upset. It’s because we’ve burned it that people are upset. And I know that this is a kind of corny thing to say and it doesn’t really stand up but seeing as you’re talking about the charity angle **. . . us burning that money doesn’t mean there’s any less loaves of bread in the world, any less apples, any less anything. The only thing that’s less, is a pile of paper.”**

Agenda

1. Understanding Money
2. Banking and the financial system
3. Banks participate in money creation
4. How central banks influence bank money creation
5. Banks and financial stability

Agenda

1. Understanding Money
   - **What is money?**
   - **Money and hyperinflation**
   - **Monetary aggregates**
2. Banking and the financial system
3. Banks participate in money creation
4. How central banks influence bank money creation
4. Banks and financial stability

What is money?

Economists see money as a social technology that fulfills important economic functions

Three main functions are:

Medium of Exchange	Unit of account	Store of value

Function of money: Medium of exchange

Without money, people will often need to **barter**, i.e., trade g&s directly for other g&s

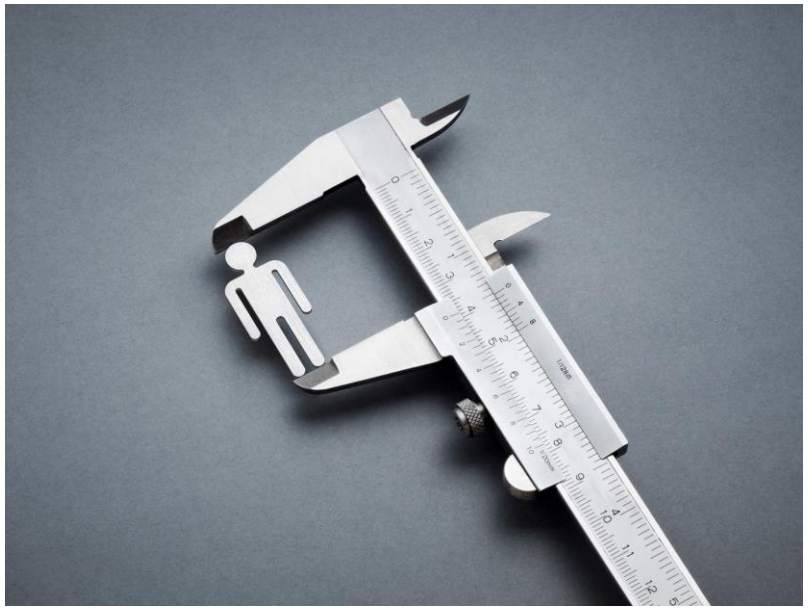
- This requires that each party desires the other party's goods on offer (**double coincidence of wants**)
- Consequently, barter can be a cumbersome process

Much easier to trade if everyone sells their g&s for money and buys their desired g&s with money → **medium of exchange**

Function of money: unit of account

Unit of account: a measuring stick for valuing goods, services, assets and liabilities on a common basis

- E.g., Joe owes the bank $1 million → recorded by bank as $1 million **asset**; recorded by Joe as $1 million **liability**)



Allows for monetary values of items to be compared against one another → vital for record-keeping, accounting, decision-making

Function of money: store of value

Money can function as a **store of value**: keep money today to be spent (i.e. exchanged for g&s) in the future

In other words, money in the hand is an **asset**

People hold money as an important part of their **asset portfolios**

Commodities as money

For most of history, commodities were used as money, with their **intrinsic value** anchoring their **exchange value**

- Cowry sea snail shells
- Metals
- Paper, plastic
- Cigarettes in prisons

Commodity-backed money in prison economies

THE WALL STREET JOURNAL.
WSJ.com

OCTOBER 2, 2008

Mackerel Economics in Prison Leads to Appreciation for Oily Fillets

Packs of Fish Catch On as Currency, Former Inmates Say; Officials Carp

By JUSTIN SCHECK

When Larry Levine helped prepare divorce papers for a client a few years ago, he got paid in mackerel. Once the case ended, he says, "I had a stack of macks."

Mr. Levine and his client were prisoners in California's Lompoc Federal Correctional Complex. Like other federal inmates around the country, they found a can of mackerel -- the "mack" in prison lingo -- was the standard currency.

"It's the coin of the realm," says Mark Bailey, who paid Mr. Levine in fish. Mr. Bailey was serving a two-year tax-fraud sentence in connection with a chain of strip clubs he owned. Mr. Levine was serving a nine-year term for drug dealing. Mr. Levine says he used his macks to get his beard trimmed, his clothes pressed and his shoes shined by other prisoners. "A haircut is two macks," he says, as an expected tip for inmates who work in the prison barber shop.

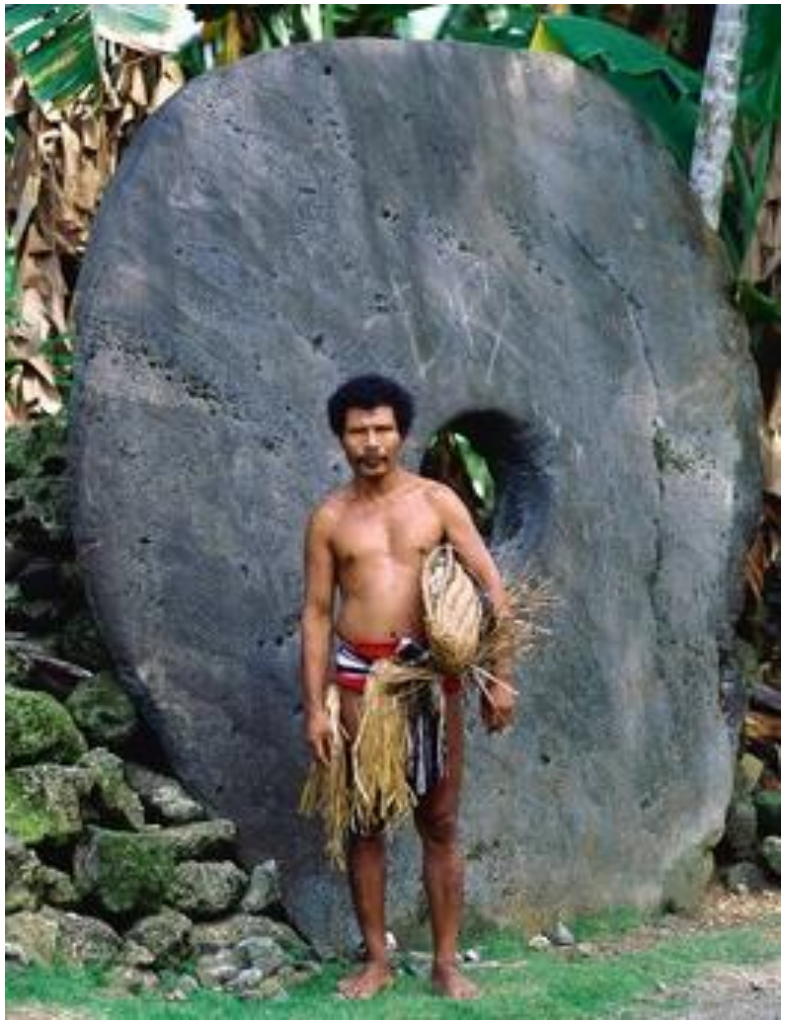
The stone money of Yap

“…a work crew was bringing was bringing a giant stone coin back to Yap on a boat. And just before they got back to the island, they hit a big storm. The stone wound up on the bottom of the ocean.

The crew made it back to the island and told everybody what happened. And everybody decided that the piece of stone money was still good — even though it was on the bottom of the ocean.

"So somebody today owns this piece of stone money, even though nobody's seen it for over 100 years or more,“…

NPR Planet Money, December 10, 2010



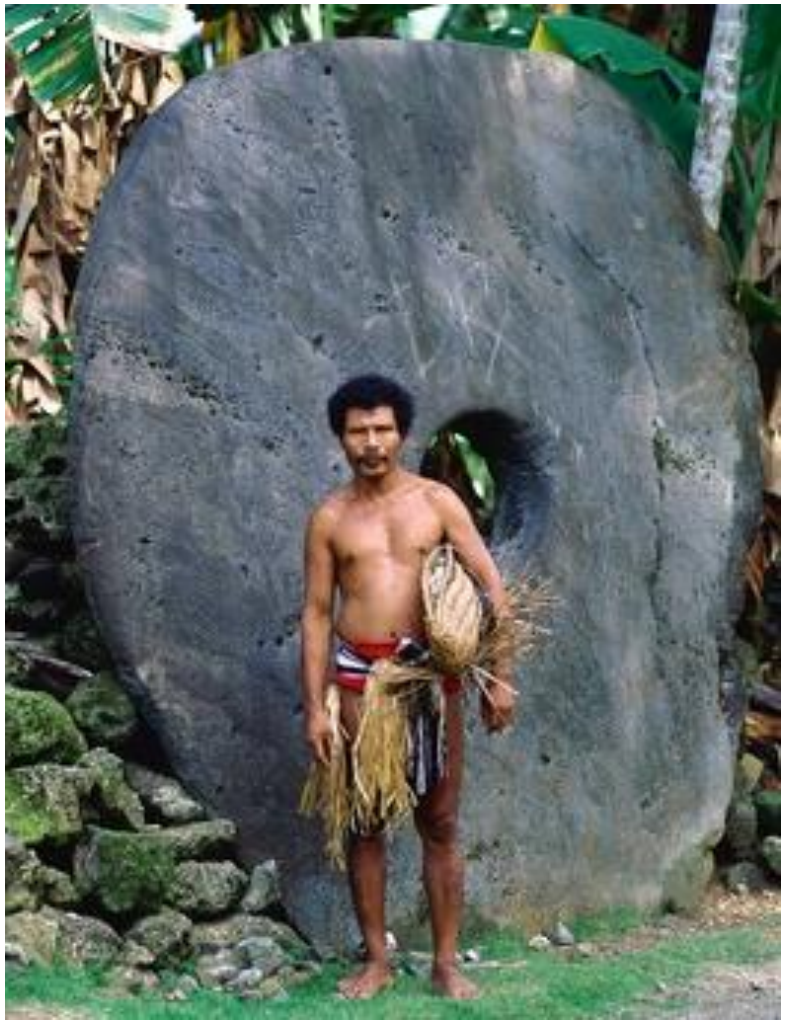
Stone money, island of Yap

The lesson from stone money

It is not the physical commodity itself that is crucial

It is the record-keeping of ownership and transfers, and the trust that everyone has in it

Most of money in modern economies are **entries in digital ledgers**



Stone money, island of Yap

Commodity-backed money

Certificates representing a **claim** on commodities in storage are more convenient to use for transactions than the commodities themselves

- E.g. banks issued **bank notes** for gold or silver deposits
- The bank note is much more convenient to carry, and to use for making exchanges
- We call such certificates **commodity-backed money**

As recently as 1971, the US dollar could be exchanged at the Federal Reserve for gold at $35 per ounce

Fiat Money

After 1971, US dollar is no longer backed by gold – it has **no intrinsic value**

Value of fiat money depends on **peoples' willingness to accept it in payment**

- Govt can create acceptability by decreeing a currency to be **legal tender**, i.e. recognized by law as valid for payments, and by mandating its use for paying taxes
- We call such a currency **fiat money**
- But ultimately it is up to people to accept. E.g. crumpled Indian rupees are legal tender in India but many businesses still won't accept them

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

Central banks, money and inflation

Governments impose rules on themselves to avoid the temptation

- US Treasury, Singapore's Ministry of Finance cannot print notes to pay for government spending

Power to create money is delegated to a central Bank e.g. US Federal Reserve, Monetary Authority of Singapore

- For all central banks, "**stable prices**" is an explicit monetary policy objective
- For some central banks it is the only explicit policy objective
- Central banks are not allowed to print money to make transfers or to purchase goods and services

Monetary aggregates

M1: currency in circulation, demand deposits

- **Currency in circulation** excludes cash in **bank vaults and ATMs**
- **Demand deposits** = deposits that are used for making transactions e.g. writing checks (cheques), NETS etc. Sometimes called **checking deposits**

Items in M1 have the greatest **liquidity** of all assets

- The more **quickly** an asset can be sold for currency, with as little impact on its selling **price** , the more **liquid** the asset is

More monetary aggregates

Different countries measure M2 and M3 somewhat differently, but all are capturing the same idea, namely that …

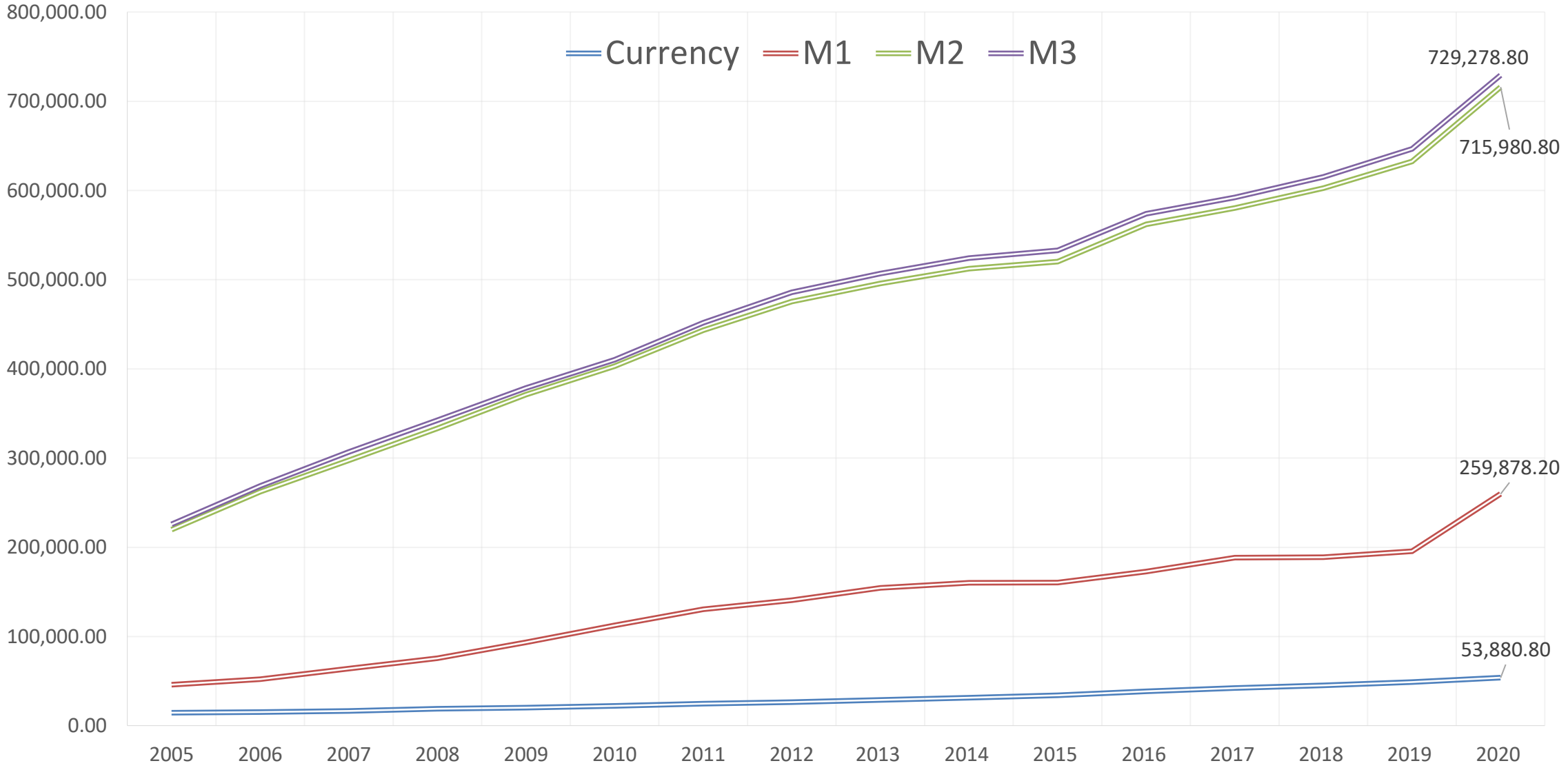
M2 = M1 + “very liquid assets”

- For USA, “very liquid assets” include savings deposits, small time (fixed) deposits, negotiable certificates of deposit, shares in “money market” funds, overnight repos, overnight Eurodollar deposits

M3 = M2 + “liquid assets”

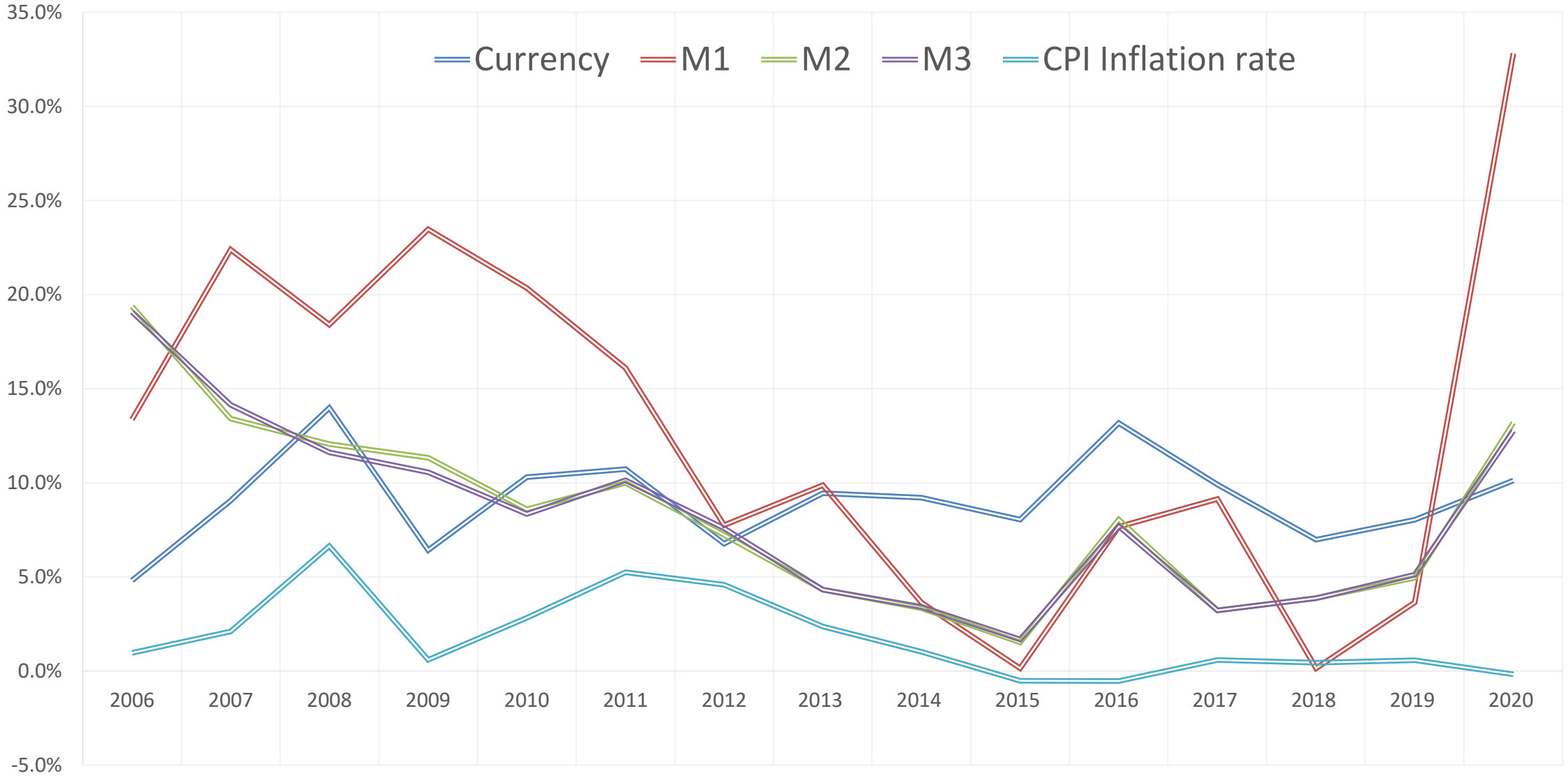
- For USA, “liquid assets” include large time deposits, term repos, term Eurodollar deposits

SG monetary aggregates ($ m), end-2005 to end-2020



Source: [Monetary Authority of Singapore Monthly Statistical Bulletin]

Annual growth rates of monetary aggregates, 2006 to 2020



Source: [Monetary Authority of Singapore Monthly Statistical Bulletin]

Agenda

1. Understanding Money

2. Banking and the financial system

- **Financial intermediaries and financial markets**
- **A bank's balance sheet**
- **Central banks and the payments system**

3. Banks participate in money creation

4. How central banks influence bank money creation

5. Banks and financial stability

Financial intermediaries and financial markets

Financial Intermediaries
(including banks)

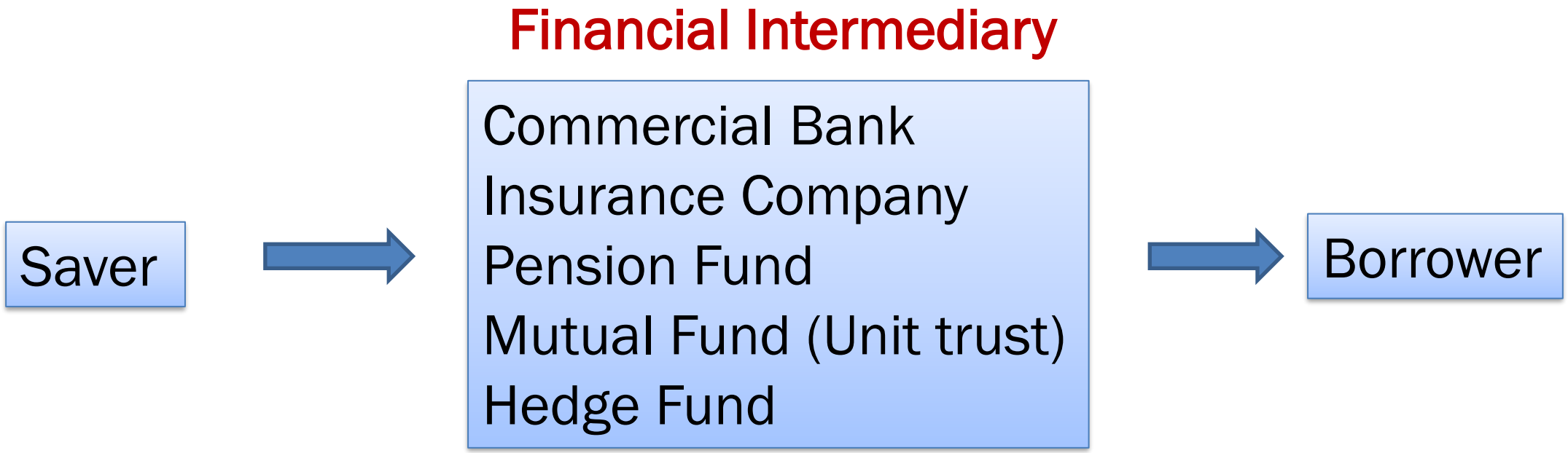
citibank

Deutsche Bank

DBS

Financial Markets

Financial Intermediaries



Financial intermediaries earn profit mainly by charging a **spread** between the **interest rate they pay to savers** and **interest rate they obtain from borrowers**

Why use financial intermediaries?

	Saver → Borrower	Saver → Bank → Borrower
Expertise at evaluating and monitoring borrowers	**Weak expertise** Typical saver isn't an expert at lending	**Strong expertise** Due to specialization
Ability to finance large projects	**Difficult to finance** Borrower must engage many savers	**Easy to finance** Borrower deals with bank Bank pools funds from many savers

Why use financial intermediaries?

	Saver → Borrower	Saver → Bank → Borrower
Risk to saver	**High risk** All depends on fortunes of one borrower	**Low risk** **Diversified** across many borrowers
Liquidity for saver	**Loans are illiquid** Bound by contract – cannot be converted into cash readily	**Deposits are liquid**

Financial markets (I)

Where lending and borrowing of funds are conducted

- Market for **bank loans**, and organized markets where **securities** (tradable financial instruments) are bought and sold

Example #1: Stocks

- **Stock**: a **tradable share** of a company's **equity and ownership rights**
- Companies can raise funds by doing an **initial public offering (IPO)** to sell its stocks
- After the IPO, the stocks are traded on a **stock exchange**

Financial markets (II)

Example #2: Bonds

- **Bond**: a tradable debt security representing a **promise to repay** borrowed funds
- A company can raise funds by doing a bond IPO
- Thereafter, the bonds are traded in the **bond market**

Securities markets provide competition to financial intermediaries as an alternative means to save and borrow

A bank's balance sheet

To understand banking, we will need some simple accounting knowledge about **balance sheets**.

An entity's balance sheet is a financial statement containing the list and values of:

- **Assets**: what the entity **owns**
- **Liabilities**: what the entity **owes**
- **Equity**: defined as Assets – Liabilities
  - Synonyms for Equity: **Net worth**, **Net assets**, **Bank capital** for banks

Basic balance sheet accounting

Balance sheet and its changes can be presented as a **T-account**

- Assets on left
- Liabilities and Equity on right
- Since Equity = Assets – Liabilities, placing equity on the right means the two sides are always equal

Assets		Liabilities and Equity	
Asset A	$1 million	Liability X	$500,000
Asset B	$2 million	Liability Y	$1.5 million
		Equity	**$1 million**
Total	$3 million	Total	$3 million

Balance sheet accounting uses **double-entry** , i.e. every transaction or event shows up in the balance sheet as two entries

E.g. Basic balance sheet accounting

We use T-accounts here to show changes in the balance sheet

E.g. Mike uses $200,000 of deposits and $1 million in borrowing (at 10%/yr interest rate) to buy a $1.2 million house

Changes to Mike's Balance Sheet

Borrows $1m from bank…

Assets		Liabilities & Equity	
Deposits	+$1m	Debt	+$1m

…and buys the house

Assets		Liabilities & Equity	
Deposits	-$1.2m		
House	+$1.2m		

Active Learning: Basic balance sheet accounting

Using double-entry, fill in the T-account entries representing each transaction or event

	Changes to Mike's Balance Sheet			
	Assets		Liabilities & Equity	
After a year, the house is now worth $1.7m, i.e. gaining $0.5m	House	+$0.5m	_____	_____
But he also now owes $100,000 in interest			_____	_____
			_____	_____
He sells the house and deposits the proceeds	_____	_____		
	_____	_____		
He pays off the loan and interest	_____	_____	_____	_____

Mike has made $_____ , using $200,000 of his own funds

A bank's balance sheet

Bank Reserves: Cash in Vault, ATMs + Deposits at Central Bank

Bank can exchange its deposits at Central Bank for cash

Assets		Liabilities and Bank Capital	
Property, buildings	$40m	Demand Deposits	$600m
Securities	$100m	Other Deposits	$200m
Loans	$800m	Other Borrowing	$75m
Cash in Vault and ATMs	$5m		
Deposits at the Central Bank	$55m	**Total Liabilities**	**$875m**
		Bank Capital	**$125m**
Total Assets	**$1,000m**	**Total Liabilities and Bank Capital**	**$1,000m**

Demand deposits are included in M1

The Bank's Equity

Central banks and the payments system

The Central Bank is the **bank for commercial banks**

- Commercial banks keep most of their reserves in the form of deposits with the central bank

The Central Bank is also the main **regulator** of banks and other financial institutions, though other agencies are also involved

- Regulations may cover reserves, bank capital, types of lending allowed, etc.

The Central Bank's main functions

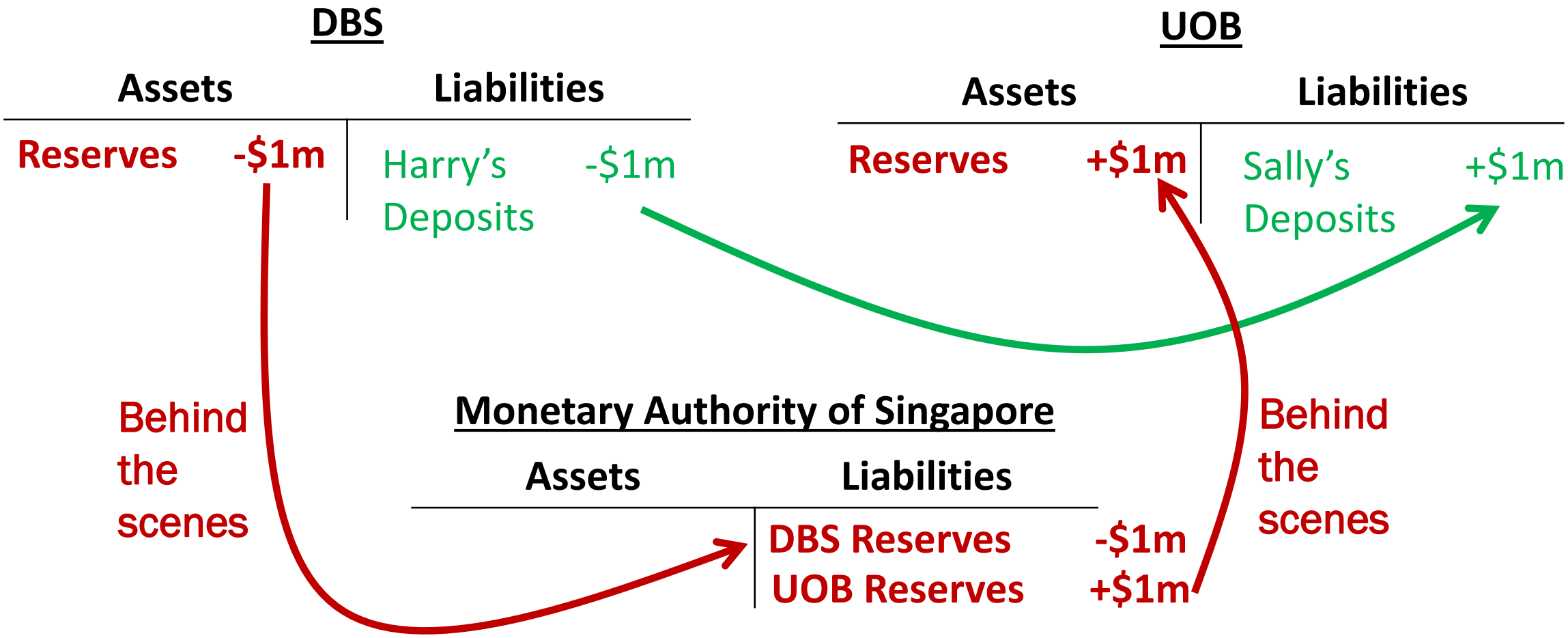
1. Ensure **Financial stability**
   - Keep payments system running smoothly
   - Regulate the financial system
   - Coping with financial crises

2. Conduct **Monetary policy** for price stability and/or managing economic fluctuations
   - Some central banks **manage the exchange rate**

The payments system in action

Suppose Harry buys $1 million of goods from Sally

Harry transfers $1m from his DBS account to Sally's UOB account



Reserve ratio and reserve requirements

$$\text{A bank's Reserve Ratio} = \frac{\text{Reserves}}{\text{Demand Deposits}}$$

Many central banks impose **reserve requirements**, which usually take the form of a minimum **required reserve ratio (RRR)**

- Banks can choose to hold **excess reserves**, i.e., above and beyond what is required
- If banks are short of reserves, they can (1) attract deposits (2) recall loans or sell other assets (3) borrow reserves from other banks or from the Central Bank

Agenda

1. Understanding Money

2. Banking and the financial system

3. Banks participate in money creation

- **A simple model of bank deposit creation**
- **The money multiplier**

4. How central banks influence bank money creation

5. Banks and financial stability

A simple model of bank deposit creation

Assume for simplicity

- RRR = 10%
- Banks do not want to hold excess reserves
- **Cashless society**, with money held only in the form of **bank deposits**
- By implication, **bank reserves** are composed entirely of **deposits at the central bank**

Step 0: Central Bank creates reserves

Suppose the Central Bank buys $100 of short-term government bonds in the bond market. Albert happens to be the seller and has an account at First Bank.

Central Bank has the power to create reserves

It pays Albert by **adding $100 of reserves into First Bank's reserve account**,

And instructs First Bank to add $100 to Albert's deposit account.

Central Bank

Assets		Liabilities	
Bonds	+$100	First Bank's Reserves	+$100

First Bank

Assets		Liabilities	
Reserves	+$100	Deposits	+$100

Step 1: First Bank creates deposits

First Bank only needs $10 of reserves to match the $100 rise in deposits → it now has **excess reserves of $90**

First Bank makes new loan of **90% x $100 = $90** to Beyonce

First Bank

Assets		Liabilities	
Loans	+$90	Deposits	+$90

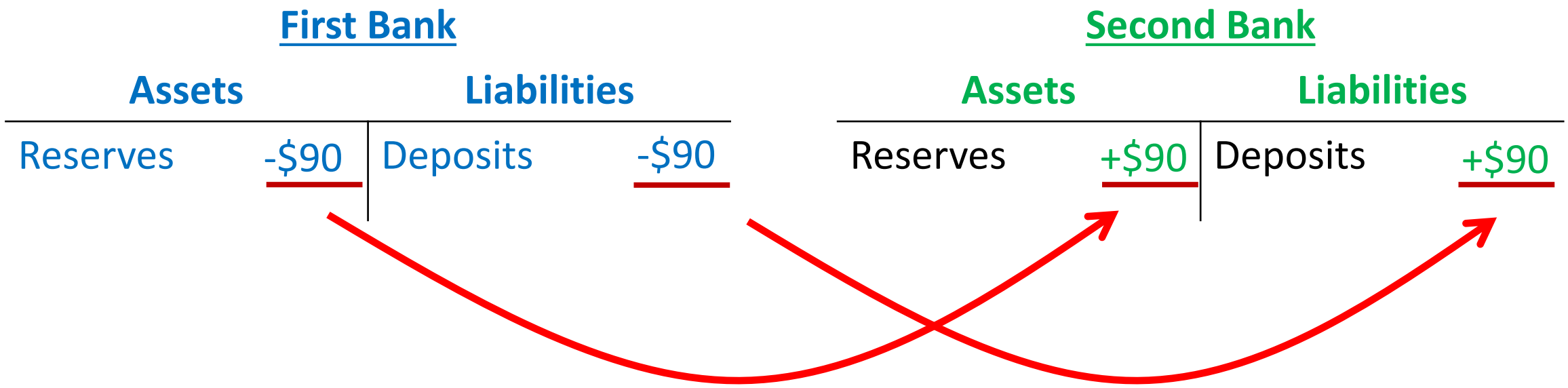
It records the $90 loan to Beyonce as an asset

It adds $90 to Beyonce's deposit account as a liability

Deposits and reserves flow to Second Bank

Suppose Beyonce uses the $90 deposits to pay Curt for a transaction

Curt's account is with Second Bank



Consolidate changes to First Bank's Balance Sheet

Central Bank pays Albert $100

First bank makes $90 loan to Beyonce

Beyonce pays Curt $90

First Bank

Assets		Liabilities	
Reserves	+$100	Deposits	+$100
Loans	+$90	Deposits	+$90
Reserves	-$90	Deposits	-$90

Consolidate all the entries

Assets		Liabilities	
Reserves	+$10	Deposits	+$100
Loans	+$90		

By making new loans = 90% of new deposits, First Bank just attains the 10% RRR

Step 2: Second Bank creates deposits

Second Bank

- Gets inflow of $90 reserves, adds $90 deposits to Curt's account
- Realizing it has excess reserves, lends **90% x $90 = $81** to David
- Creates $81 deposits in David's account

When David pays Eve $81 for a transaction and Eve's deposit account is with Third Bank …

Consolidate all the entries

Second Bank

Assets		Liabilities	
Reserves	+$9	Deposits	+$90
Loans	+81		

By making new loans = 90% of new deposits, Second Bank just attains the 10% RRR

Active Learning: Consolidate changes to Second Bank's Balance Sheet

1) _____

2) _____

3) _____

Second Bank

Assets		Liabilities	
Reserves	_____	Deposits	_____
Loans	_____	Deposits	_____
Reserves	_____	Deposits	_____

Assets		Liabilities	
Reserves	+$9	Deposits	+$90
Loans	+$81		

Consolidate all the entries

By making new loans = 90% of new deposits, Second Bank just attains the 10% RRR

Step 3: Third Bank creates deposits

Third Bank

- Gets inflow of $81 reserves, adds $81 deposits to Eve's account
- Realizing it has excess reserves, lends **90% x $81** = $72.9 to Frank
- Creates $72.9 deposits in Frank's account

When Frank pays Ginny $72.9 for a transaction and Ginny's deposit account is with Fourth Bank …

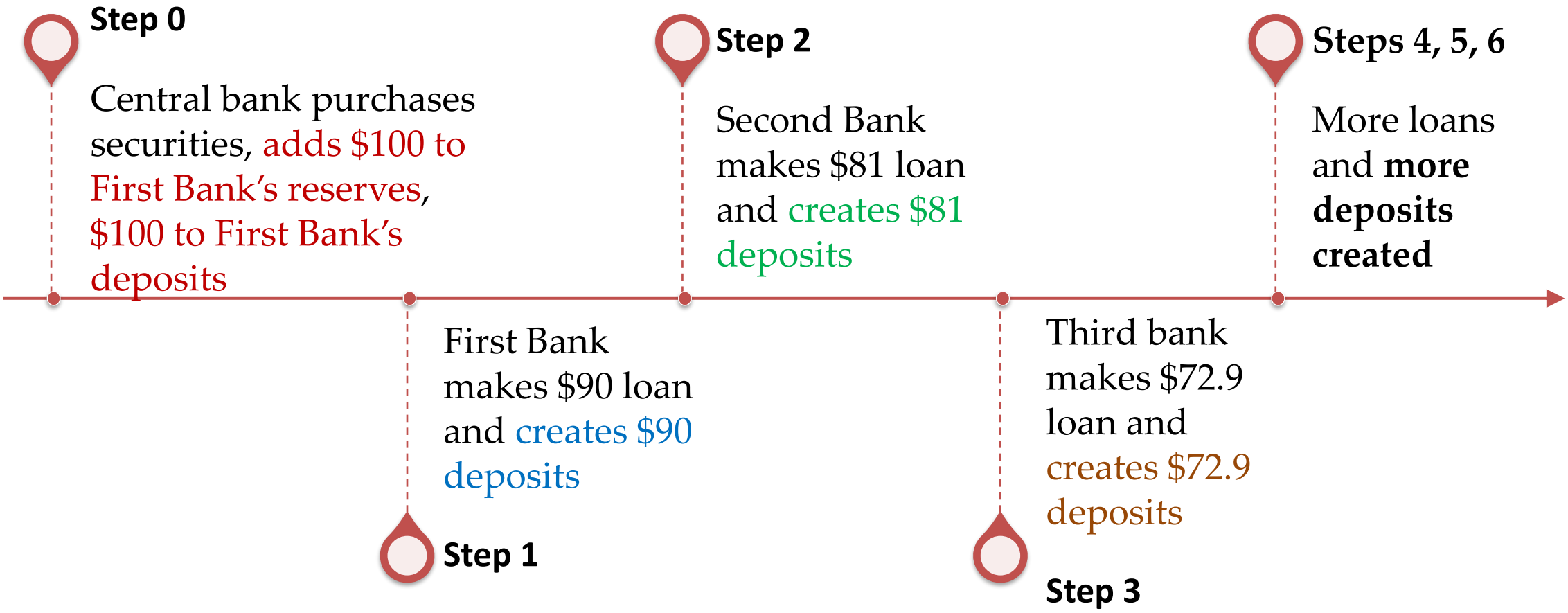
Consolidate all the entries

Third Bank

Assets		Liabilities	
Reserves	+$8.1	Deposits	+$81
Loans	+72.9		

By making new loans = 90% of new deposits, Third Bank just attains the 10% RRR

A process of deposit creation (I)



A process of deposit creation (II)

From an initial $100 increase in reserves …

Deposits created = $100 (First Bank) + $90 (Second Bank) + $81 (Third Bank) + $72.9 + ...

$$= (1 + 0.9 + 0.9^2 + \ldots) \times \$100$$

$$= \frac{1}{(1 - 0.9)} \times \$100$$

$$= \frac{1}{0.1} \times \$100$$

$$= 10 \times \$100 = \$1{,}000$$

The Money Multiplier

Money Multiplier: amount of money created (or destroyed) for each dollar of reserves injected (or withdrawn)

In the e.g. above, Money Multiplier = $\frac{1}{\text{RRR}} = \frac{1}{0.1} = 10$

In practice, the money multiplier could be smaller than $\frac{1}{\text{RRR}}$ because

(1) banks may hold excess reserves

(2) People may hold part of their money as cash

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How central banks influence money creation

Central banks Influence money creation for macroeconomic purposes

Instruments used include:

Required Reserve Ratio (RRR)	"Open market" operations
Discount Rate	Interest rate paid on reserves

Changing the RRR

Changing the RRR can affect the size of the money multiplier

Reduce RRR

Loans ↑,
Deposits ↑

Raise RRR

Loans ↓,
Deposits ↓

Caveat: Changing RRR will not work if banks are holding excess reserves

China cuts banks' reserve ratios, frees up $126 billion for loans as economy slows

Analysts had expected China to announce more policy easing measures soon as the world's second-largest economy comes under growing pressure from escalating U.S. tariffs and sluggish domestic demand.

The People's Bank of China (PBOC) said it would cut the reserve requirement ratio (RRR) by 50 basis points (bps) for all banks, with an additional 100 bps cut for qualified city commercial banks. The RRR for large banks will be lowered to 13.0%.

Reuters, Sept 6 2019

Open Market Operations

Open Market Operations: Central Bank changes the quantity of reserves by purchasing or selling (usually short-term) **government securities**

Open Market Purchase

Reserves↑

Loans↑,
Deposits↑

Open Market Sale

Reserves↓

Loans↓,
Deposits↓

Discount loans and the discount rate

Banks that are short of reserves can take a **discount loan** from the Central Bank; **Discount rate** = interest rate on discount loan

Reduce Discount Rate

Reserves↑

Loans↑, Deposits↑

Raise Discount Rate

Reserves↓

Loans↓, Deposits↓

Changing the Interest rate paid on reserves

Some central banks pay interest on reserves. Changing the interest rate on reserves (IOR) changes bank willingness to make loans

Reduce IOR

Encourages banks to make more loans

Loans↑, Deposits↑

Increase IOR

Encourages banks to make fewer loans

Loans↓, Deposits↓

Changing IOR can be used when even banks have excess reserves

Negative interest rate on reserves!

PRESS RELEASE

Monetary policy decisions

European Central Bank
12 September 2019

12 September 2019

At today's meeting the Governing Council of the ECB took the following monetary policy decisions:

(1) The interest rate on the deposit facility will be decreased by 10 basis points to -0.50%. The interest rate on the main refinancing operations and the rate on the marginal lending facility will remain unchanged at their current levels of 0.00% and 0.25% respectively. The Governing Council now expects the key ECB interest rates to remain at their present or lower levels until it has seen the inflation outlook robustly converge to a level sufficiently close to, but below, 2% within its projection horizon, and such convergence has been consistently reflected in underlying inflation dynamics.

Active Learning: Central Bank Monetary Policy Instruments

The central bank intends to increase money creation. Which of the following actions is not advisable?

(a) Reduce the RRR

(b) Raise the Discount Rate

(c) Do open market purchases

(d) Reduce the IOR

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- **Banks are inherently fragile**
- **Policies for financial stability**

Banks are inherently fragile

Amongst financial intermediaries, banks are particularly important because of

- They are integral to the payment system
- In making loans, they create money
- Bank failures can damage the functioning of the economy

But banks are **inherently fragile** , because they

- are **highly leveraged**
- **“borrow short” and “lend long”**

Banks are highly leveraged

Leverage
Using borrowed funds to buy assets

Assets		Liabilities and Equity	
Reserves	$200m	Deposits	$800m
Loans	$700m	Debt	$150m
Securities	$100m	**Bank capital**	**$50m**
Total	$1,000m	Total	$1,000m

Leverage ratio = $\frac{\text{Assets}}{\text{Equity}}$ = 1000/50 = 20

Capital Ratio = $\frac{\text{Equity}}{\text{Assets}}$ = 50/1000 = 0.05 or 5%

Leverage amplifies gains

With a leverage ratio of 20, If assets rise in value by 10%…

Assets		Liabilities and Equity	
Assets	~~$1,000m~~ **$1,100m**	Liabilities	$950m
		Bank capital	~~$50m~~ **$150m**

…bank capital rises by 200%!

But Leverage also amplifies losses

With a leverage ratio of 20, If assets fall in value by 10%...

Assets		Liabilities and Equity	
Assets	~~$1,000m~~ **$900m**	Liabilities	$950m
		Bank capital	~~$50m~~ **-$50m**

...bank capital falls by 200% and becomes negative!

Bank is **insolvent**: it cannot pay off its liabilities **even if it sells all its assets** !

Bank Runs

If depositors simply *suspect* a bank to be insolvent, they will rush to withdraw their deposits – that's a **bank run**!

Deposits are short term liabilities as they can be withdrawn any time

A bank does not have the reserves to handle massive deposit withdrawals, and its **loans are long term assets**, and cannot be quickly recalled

The bank will have to shut down!

From bank run to banking panic

With one bank run, depositors may become suspicious about health of other banks → bank runs are contagious!

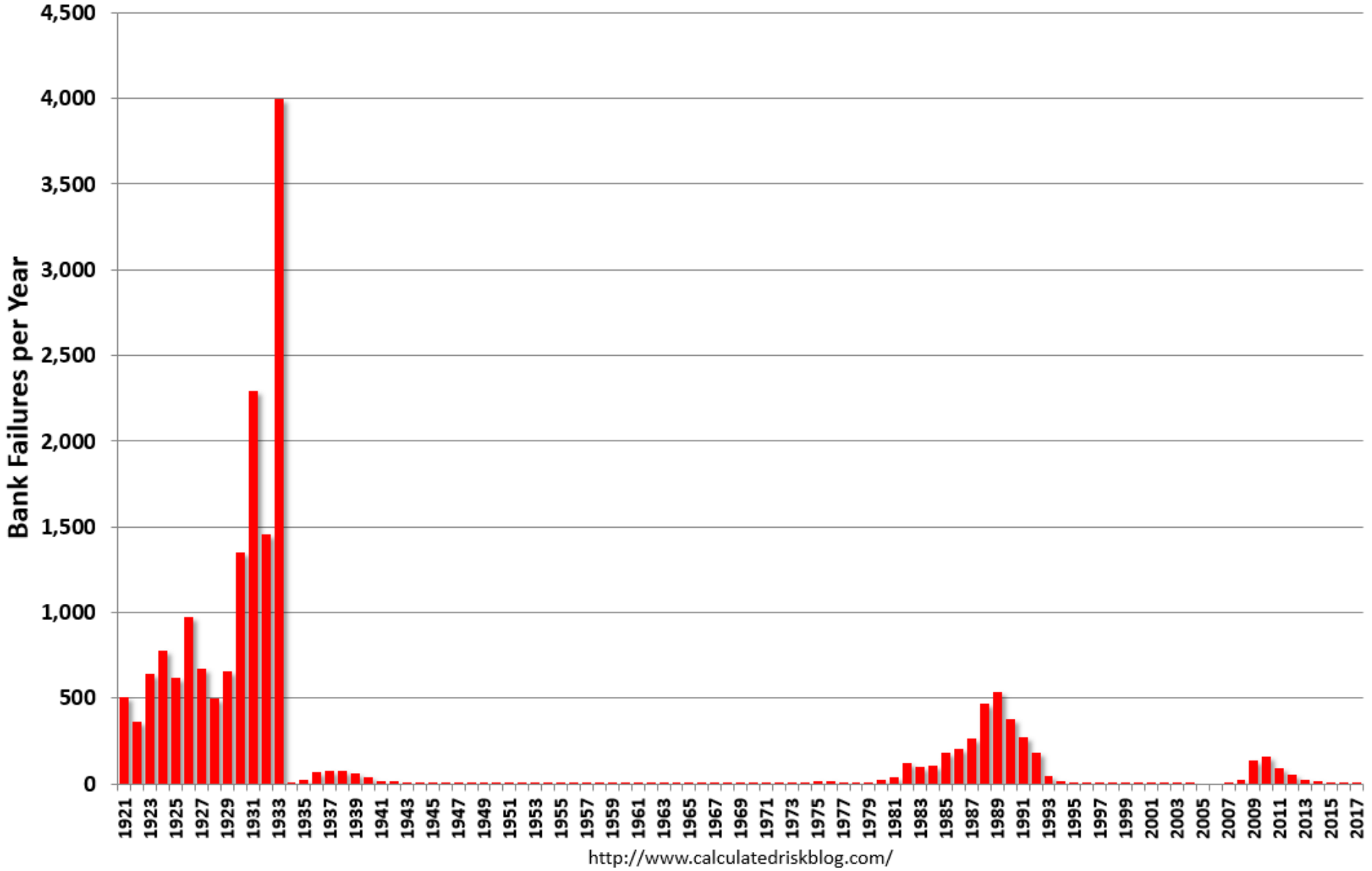
A **banking panic**: many banks experience runs and shut down

Banking panics cause tremendous damage to an economy

- Payment systems are disrupted
- Wealth is destroyed
- Lack of bank lending

Number of bank failures, USA 1920 to 2017

Data includes small rural banks and ‘thrifts’



Policies for Financial Stability

Regulations are put in place to prevent bank runs and banking panics, e.g.

- Reserve requirements (i.e. RRR)
- Capital requirements (minimum capital ratio) to reduce leverage
- Restricting bank's activities, regular monitoring by central bank etc.

Enrichment: Basel III global regulatory framework

Deposit Insurance

Mandatory deposit insurance, provided by govt, helps prevent runs and panics

- **Banks pay insurance premiums** to the SDIC
- If there is a bank run and the bank cannot pay depositors, **SDIC will pay on its behalf**

Singapore Deposit Insurance Corporation, owned by SG govt

- Deposit insurance **removes the sense of urgency to withdraw deposits**, and thus helps to prevent bank runs from happening

Lender of Last Resort, Owner of Last Resort

To stop a banking panic, the Central bank must act as a **lender of last resort**: lend to troubled banks when no one else will

Central bank and/or the Government may also need to inject funds to boost bank capital, effectively becoming **owner of last resort**

In Macro 5, we will see how the US Federal Reserve confronted a financial crisis that greatly resembled a traditional banking panic

Active Learning: Financial Stability

Fill in the blanks:

Banks are vulnerable because (1) they are highly _____

and (2) they borrow _____ term and lend _____ term

R_____ are needed to keep banks from taking excessive risks

Deposit _____ helps to forestall bank runs

A banking system in deep trouble needs a _____ of Last Resort, and, perhaps, an _____ of Last Resort