

# Week 1 Introduction to Bank Technology

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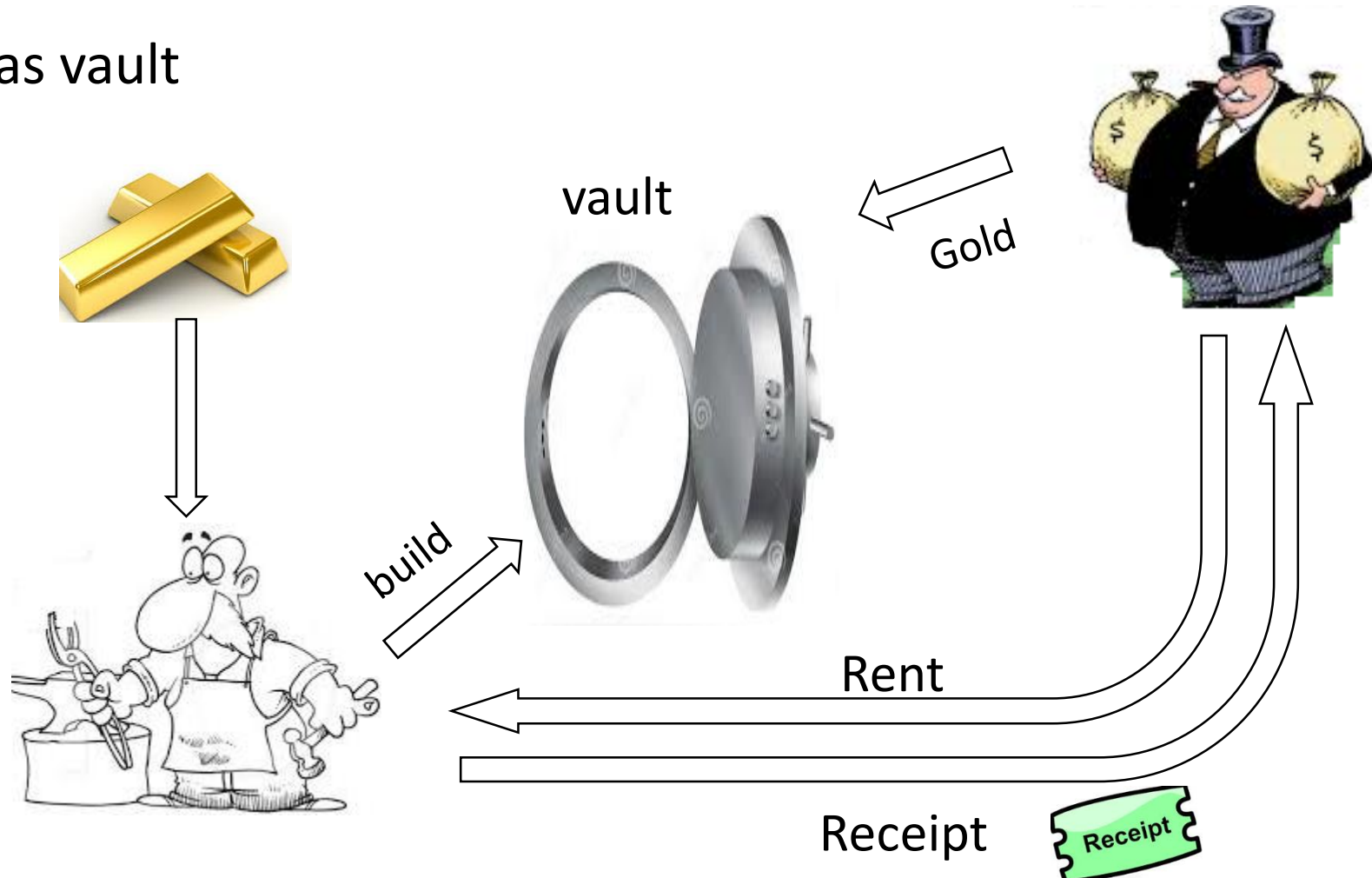
# Learning Outcome

- Describe the core elements of banking and the social functions they service
- Understand how bank operates
- Distinguish between types of bank risk; credit, market, liquidity, operational and reputational

# Section 1: History of Banking

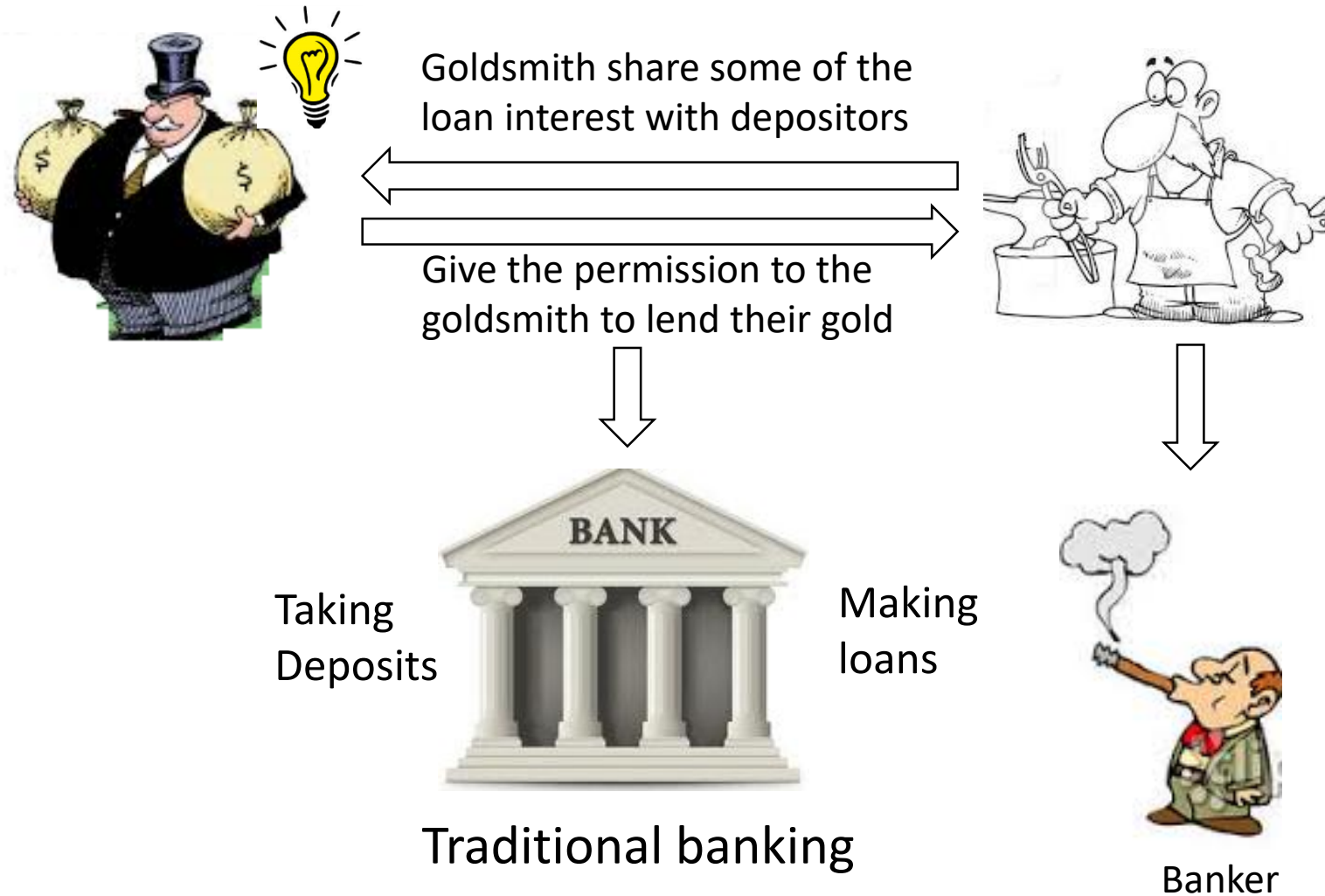
# History of Banking

## Stage 1 bank as vault



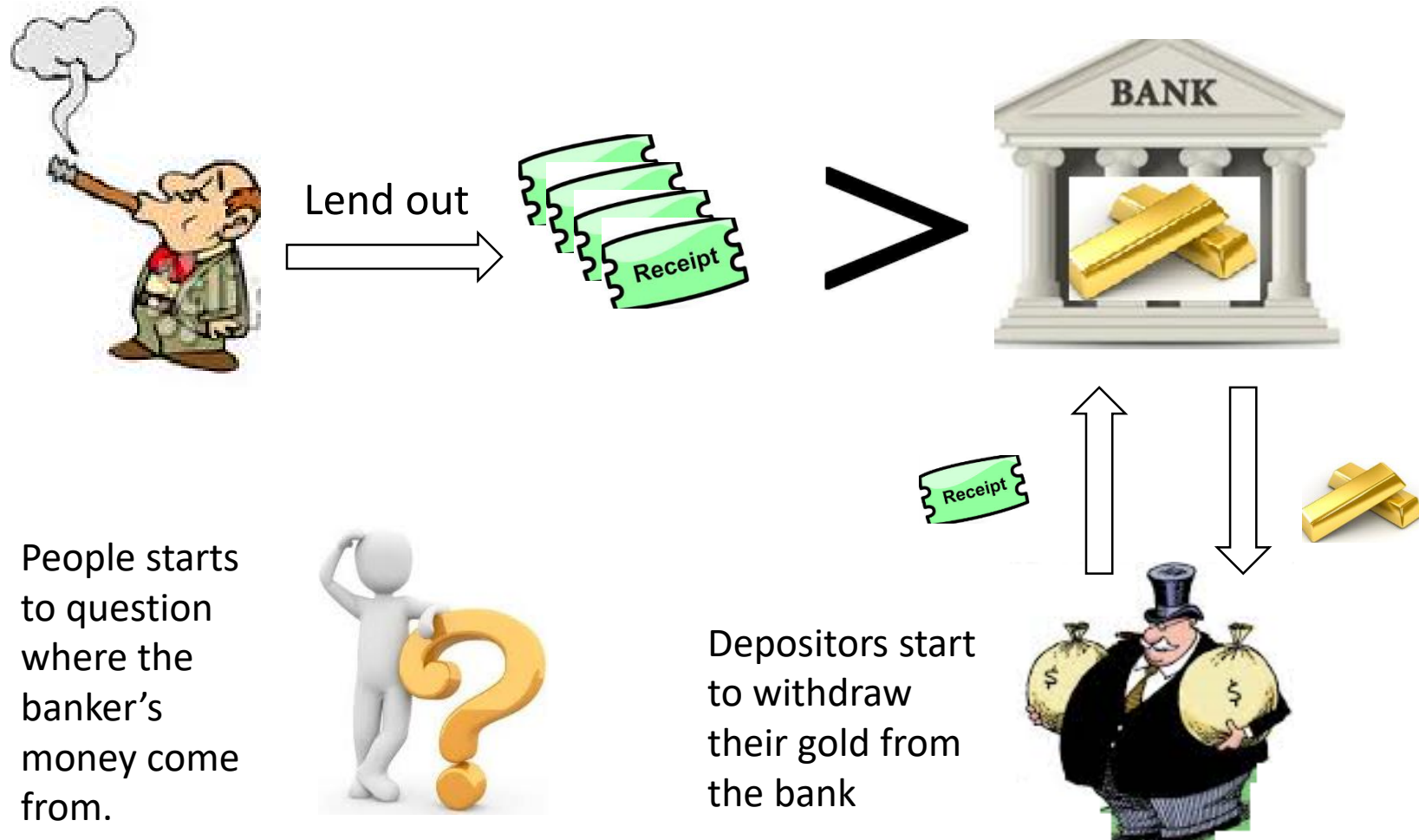
# History of Banking (Continued...)

## Stage 2 Bank as lender



# History of Banking (Continued...)

## Stage 3 reserve banking system



# History of Banking (Continued...)

## Bank run

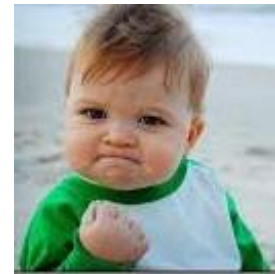
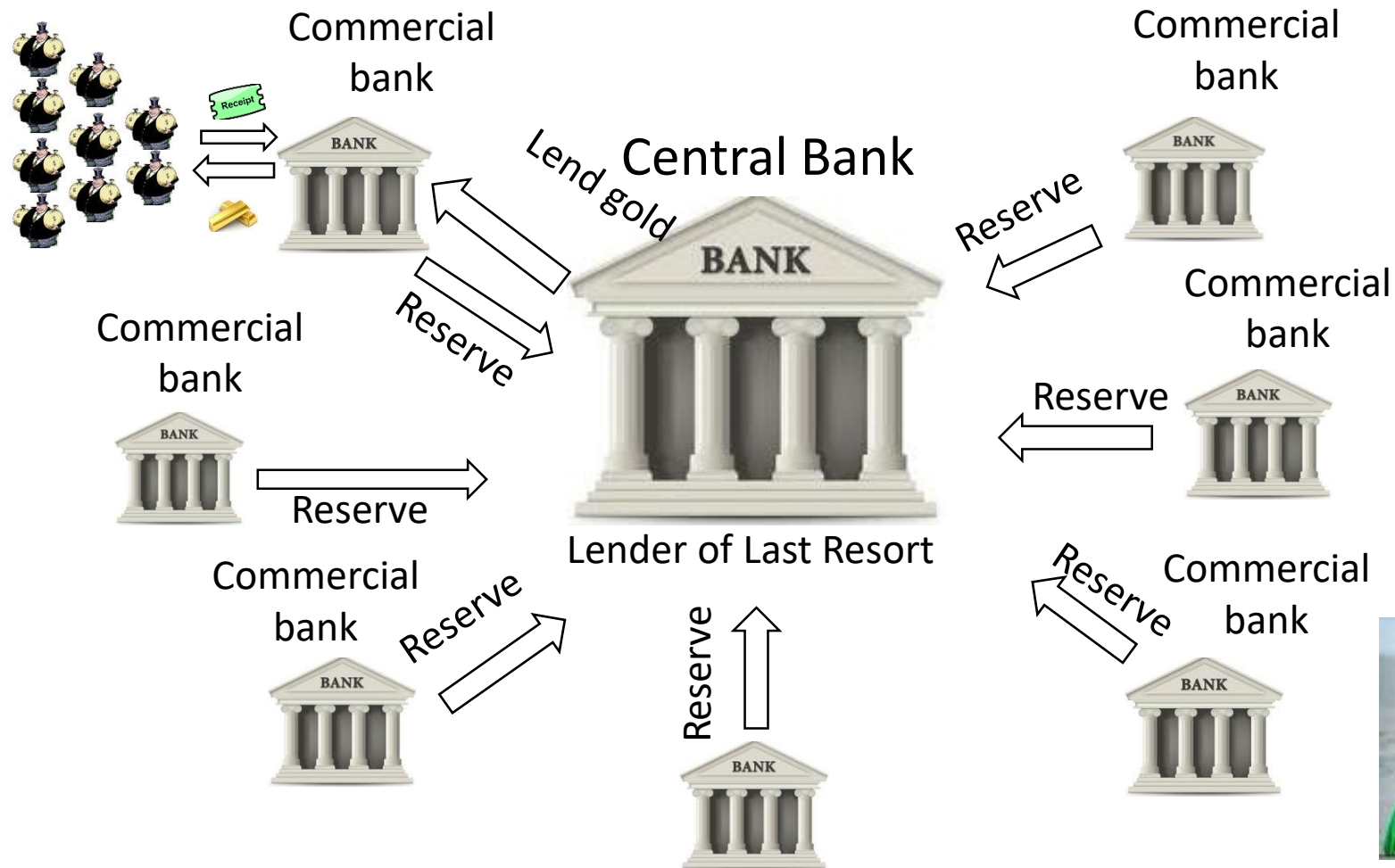


# Bank run in Northern Rock Bank





# History of Banking (Continued...)



Problem  
Solved

# History of Banking (Continued...)

Banks borrow short and lend long

This creates inherent fragility

No problem in normal times, i.e. when people have confidence

Problem when confidence disappears, i.e. one or more banks experience solvency problem.

Therefore, robust risk management is required

## Section 2: How does a Bank Operate?

# How does a Bank Operate?

## 1. Set up the bank with shareholders' funds – shareholders' Equity

### Shareholder's Equity

- i. Common and preferred stock are listed at par value while the surplus account represents proceeds in excess of par.
- ii. Retained earnings represent cumulative net income minus all dividends paid to shareholders.
- iii. Other equity usually reflects capital reserves.
- iv. Minority interest in consolidated subsidiaries is the non-controlling interest in minority subsidiaries.

# Shareholder's Equity

Balance Sheet	PNC Bank, National Association					
	Dec-12			Dec-13		
	% Cha	\$ 1,000	% of Total	% Cha	\$ 1,000	% of Total
<b><i>TOTAL BANK EQUITY CAPITAL</i></b>	14.6	36,267,544	12.3	0.6	36,502,602	11.8
<b>Minority Interest Cons Subs</b>	-42.4	2,142,466	0.7	-15.9	1,802,315	0.6
<b>Total Bank Capital &amp; Minority Int.</b>	8.6	38,410,010	13.0	-0.3	38,304,917	12.4
<b>Total Liabilities &amp; Capital</b>	12.0	295,026,390	100.0	5.1	309,999,678	100.0

# How does a Bank Operate? (continued...)

## 2. Taking deposit.

### **Core deposit**

1. Demand deposits
2. Negotiable orders of withdrawal (NOW)
3. automatic transfers from savings (ATS)
4. Money market deposit accounts (MMDA)
5. Time deposit

Stable deposits not usually withdrawn over the short term.

Most valuable and stable source of institutions' funding

# How does a Bank Operate? (continued...)

## **Noncore deposits**

1. Central bank funds purchased and securities sold under agreement to repurchase
2. Brokered deposits
3. Deposits held in foreign offices
4. Federal Home Loan Bank borrowings (US only)
5. Subordinated notes and debentures

# Bank's Liabilities

Balance Sheet	PNC Bank, National Association					
	Dec-12			Dec-13		
	% Cha	\$ 1,000	% of Total	% Cha	\$ 1,000	% of Total
<b>LIABILITIES</b>						
Demand deposits	26.5	37,117,705	12.6	5.8	39,280,715	12.7
All NOW & ATS Accounts	23.3	3,501,310	1.2	5.3	3,688,494	1.2
Money market deposit accounts	17.7	136,768,146	46.4	5.5	144,240,092	46.5
Other savings deposits	19.8	11,290,198	3.8	6.6	12,035,164	3.9
Time Deps Below Insurance Limit	-21.2	21,382,958	7.2	-14.4	18,312,116	5.9
Less: Fully Insured Brokered Deposits	-35.9	200,987	0.1	-100.0	99	0.0
<b>Core Deposits</b>	13.7	209,859,330	71.1	3.7	217,556,482	70.2
Fully Insured Brokered Deposits	-35.9	200,987	0.1	-100.0	99	0.0
Time Deposits Above Insurance Limit	-10.1	1,785,623	0.6	-3.9	1,716,366	0.6
Deposits held in foreign offices	-52.9	4,897,325	1.7	32.0	6,465,924	2.1
<b>Total deposits</b>	9.8	216,743,265	73.5	4.2	225,738,871	72.8
Fed funds purchased & resale	11.4	3,351,286	1.1	29.8	4,349,832	1.4
FHLB borrowings <1 yr	161.7	7,960,051	2.7	-23.5	6,092,549	2.0
Other borrowings inc mat <1 yr	82.9	8,906,811	3.0	-37.7	5,546,515	1.8
<b>Memo: Volatile liabilities</b>	15.4	26,901,096	9.1	-10.1	24,171,186	7.8
FHLB borrowings >1 Yr	-62.4	1,476,526	0.5	361.9	6,819,579	2.2
Other borrowings inc mat >1 yr	61.8	6,089,605	2.1	82.9	11,138,049	3.6
Acceptances & other liabilities	-13.4	6,098,816	2.1	-20.2	4,867,216	1.6
<b>Total Liabilities before Sub. Notes</b>	12.4	250,626,360	85.0	5.6	264,552,611	85.3



# How does a Bank Operate? (continued...)

## 3. Holding legal reserves, making loans and investments

### **Bank assets**

- i. Loans
- ii. Investment securities
- iii. Noninterest cash and due from banks
- iv. Other asset

# Bank's Assets

	PNC Bank, National Association					
	Dec-12			Dec-13		
	% Cha	\$ 1,000	% of Total	% Cha	\$ 1,000	% of Total
<b>Balance Sheet</b>						
<b>ASSETS</b>						
<b>Loans:</b>						
Real estate loans	11.2	84,702,621	28.7	1.0	85,507,520	27.6
Commercial loans	25.4	63,489,326	21.5	8.1	68,636,927	22.1
Individual loans	10.9	24,969,293	8.5	5.2	26,257,534	8.5
Agricultural loans	33.1	109,067	0.0	8.2	117,967	0.0
Other LN&LS in domestic off.	35.3	14,861,017	5.0	1.4	15,071,565	4.9
LN&LS in foreign off.	-7.3	1,606,524	0.5	66.3	2,671,988	0.9
Loans held for sale	26.1	3,702,343	1.3	-38.9	2,263,778	0.7
Loans not held for sale	16.9	186,034,160	63.1	5.4	195,998,417	63.2
Memo: Total loans	17.0	189,736,503	64.3	4.5	198,262,195	64.0
LN&LS loss Allowance	-7.2	4,035,708	1.4	-10.6	3,608,665	1.2
<b>Net Loans &amp; Leases</b>	17.7	185,700,795	62.9	4.8	194,653,530	62.8
<b>Investments:</b>						
U.S. Treasury & Agency securities	-3.4	35,499,632	12.0	-4.9	33,746,638	10.9
Municipal securities	20.3	2,947,442	1.0	24.5	3,669,924	1.2
Foreign debt securities	22.2	1,113,763	0.4	3.6	1,153,930	0.4
All other securities	7.0	21,752,329	7.4	-0.6	21,612,153	7.0
Interest bearing bank balances	256.7	3,951,114	1.3	206.2	12,099,025	3.9
Fed funds sold & resales	-21.0	1,741,009	0.6	28.8	2,242,907	0.7
Trading account assets	-3.8	3,000,248	1.0	39.1	4,174,830	1.3
<b>Total Investments</b>	4.7	70,005,537	23.7	12.4	78,699,407	25.4
<b>Total Earning Assets</b>	13.8	255,706,332	86.7	6.9	273,352,937	88.2
Nonint Cash & Due from banks	27.1	5,213,060	1.8	-22.6	4,034,133	1.3
Premises, fixed assets & capital leases	5.2	4,521,665	1.5	2.5	4,633,026	1.5
Other real estate owned	5.5	887,467	0.3	-31.9	604,503	0.2
Dir & Indir Inv RE Ventures	0.0	0	0.0	0.0	0	0.0
Investment in unconsolidated subs.	0.0	0	0.0	0.0	0	0.0
Acceptances and other assets	-2.4	28,697,866	9.7	-4.6	27,375,080	8.8
<b>Total Assets</b>	12.0	295,026,390	100.0	5.1	309,999,679	100.0
<b>Average Assets During Quarter</b>	10.7	290,037,593	98.3	4.5	303,072,731	97.8

## Section 3: Bank Management

# Liquidity Risk

- Risk to earnings and equity from the bank's inability to timely meet payments or obligations.
  - i. Funding liquidity risk is the inability to liquidate assets or raise required funding.
  - ii. Market liquidity risk is the inability of the institution to easily unwind or offset specific exposures without significant losses from inadequate market depth or market disturbances.
- Liquid assets are costly to hold because they pay very low rates of interest.

# Liquidity Risk (continued...)

- Banks attempt to minimize cash holdings due to the cost of holding.
- Liquid assets consist of unpledged, marketable short-term securities classified as available for sale plus federal funds sold and securities purchased under agreement to resell.
  - Pledged securities cannot be sold without a release.
- Banks with large amounts of funding from core deposits have better liquidity than banks without them.

# Credit Risk

- Potential variation in net income from loan nonpayment or deferred payment.
- Net losses = gross losses (charge-offs) – recoveries (dollar loans that were previously written off and collected).
- Expected future losses:
  - **Past-due loans** are still accruing interest.
  - **Nonperforming loans** are more than 90 days past due.
  - **Nonaccrual loans** are not currently accruing interest.
  - **Restructured loans** have modified payments or interest.
  - **Classified loans** have reserves for recognized losses.

# Market Risk

- Risk to earnings and equity from adverse movements in market rates or prices.
- Interest rate risk is the potential variability in an institution's net interest income and market value of equity due to changes in market interest rates.
- Equity and security price risk is the potential risk of loss associated with trading account portfolios.
- Foreign exchange risk is the risk to an institution from adverse movements in foreign exchange rates.

# Example: interest rate risk

Sussex bank made £100 loan to a customer with a coupon rate of 10%. This customer will pay back the interest annually and pay back the principle at the end of the 10<sup>th</sup> year.

Sussex bank also issued a time deposit of £100 with an interest rate of 10%. The interest will be paid out annually and the principle will be paid out at the end of the 5<sup>th</sup> year.

We assume that the current market interest rate is 7%, the market value for the loan and time deposit are:

$$\text{Loan} = \frac{10}{1+7\%} + \frac{10}{(1+7\%)^2} \dots + \frac{10+100}{(1+7\%)^{10}} = £121.07$$

$$\text{Time deposit} = \frac{10}{1+7\%} + \frac{10}{(1+7\%)^2} \dots + \frac{10+100}{(1+7\%)^5} = £112.30$$



# Example: interest rate risk (continued)

The balance sheet of Sussex bank should be read as:

Sussex Bank			
Assets		Liability	
Bond A	121.07	Bond B	112.30
		Capital	8.77

If the market interest rate increases to 12%, the balance sheet of Sussex bank should be read as:

Sussex Bank			
Assets		Liability	
Bond A	88.69	Bond B	92.79
		Capital	-4.10

This bank is now insolvent

# Capital or Solvency Risk

- Not considered a separate risk because all of the other risks affect a bank's capital and solvency.
- Capital risk refers to the potential decrease in the market value of assets below the market value of liabilities.
- A firm is formally insolvent when its net worth is negative.
  - Fundamentally a bank fails when its cash inflows are insufficient to meet mandatory cash outflows.

# Off-balance-sheet Risk

- Refers to volatility in income and market value of equity from unanticipated losses due to off-balance sheet liabilities.
- Risk-based capital requirements oblige a bank to convert off-balance sheet activities to “on-balance” sheet equivalents and hold capital against them.
  - Tier 1 (or core) capital is total common equity capital plus noncumulative preferred stock plus minority interest in unconsolidated subsidiaries less ineligible intangibles.
  - Risk-weighted assets are the total of risk-adjusted assets.

# Operational Risk

- Possibility that operating expenses might vary significantly from what was expected.
- May occur as the result of:
  - Business interruptions
  - Transaction processing
  - Inadequate information systems
  - Breaches in internal controls
  - Client liability

# Operational Risk: example



TSB customers were locked out of their accounts last year during a prolonged tech failure

## TSB IT meltdown cost bank £330m and 80,000 customers

The company lost £34m due to waived fees and charges as a result of the tech failure

Caitlin Morrison | @citycait |



TSB has revealed that last year's massive IT failure cost the bank £330m, while 80,000 customers switched their account to a competitor.

The lender was rocked by **serious tech issues** in April last year after attempting to move to a new IT system, which left **thousands of customers locked out of their accounts** and some reporting that they were able to **access to other people's details**.

The problems **prompted a parliamentary inquiry** and **Paul Pester** was **forced to step down as chief executive** in the wake of the scandal.

# Legal and Reputation Risk

- Legal risk:
  - Risk that unenforceable contracts, lawsuits or adverse judgments could disrupt or negatively affect the operations, profitability, condition or solvency of the institution.
- Reputation risk:
  - Risk that negative publicity, true or untrue, can adversely affect a bank's customer base or bring forth costly litigation that negatively affects profitability.

# Summary

- We reviewed the history of banking: bank as vault, bank as lender and reserve banking system.
- We discussed the reason why banks need robust risk management.
- We briefly discussed how bank operates
- We summarised the key risks banks are facing.