Banking and the Management of Financial Institutions

Chapter 9

Econ 351 – Monetary Economics

University of Tennessee, Knoxville

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Preview

This chapter explains how banks maximize profits and how these principles apply to financial intermediaries more broadly.

Four questions this chapter answers

- What is on a bank's balance sheet (assets, liabilities, capital)?
- How does a bank earn profit from basic banking on a T-account?
- How do banks manage liquidity, assets, liabilities, and capital?
- How do banks manage credit risk and interest-rate risk?

Outline

The Bank Balance Sheet

Basic Banking on a T-account

General Principles of Bank Management

Managing Credit Risk

The Bank Balance Sheet

A bank balance sheet shows a bank's **assets, liabilities, and capital**.

$$\text{Assets} = \text{Liabilities} + \text{Capital}$$

- **Assets**: Uses of funds.
- **Liabilities**: Sources of funds.
- **Capital**: Cushion against losses.

How Banks Differ from Nonfinancial Firms

- Banks mainly deal in a highly standardized product: **money**.

Banks must balance **profitability** and **risk**.

Balance Sheet of All Commercial Banks

Assets (Uses of Funds)*		**Liabilities (Sources of Funds)**	
Reserves and cash items	15%	Checkable deposits	14%
Securities		Nontransaction deposits	
U.S. government and agency	16	Savings deposits	52
State and local government and other securities	4	Small-denomination time deposits	2
		Large-denomination time deposits	9
		Borrowings	10
Loans		Bank capital	13
Commercial and industrial	14		
Real estate	23		
Consumer	7		
Other	8		
Other assets (for example, physical capital)	13		
Total	100	Total	100

Items as a percentage of the total, June 2020.

Source: Federal Reserve; Mishkin, Table 9.1

Liabilities: Sources of Funds

Transaction deposits (highly liquid)

- Checkable deposits: interest-bearing or non-interest-bearing; non-interest-bearing does NOT mean low cost
- Other transaction deposits: NOW accounts (Negotiable Order of Withdrawal) and other checkable deposits

Borrowing

- From the central bank: discount loans (discount window)
- From other banks: interbank loans and repurchase agreements (repos)
- From financial markets: bonds, repos, and other market funding

Bank capital

- Equity capital held by the bank; the **last line of defense** against losses

LIBOR

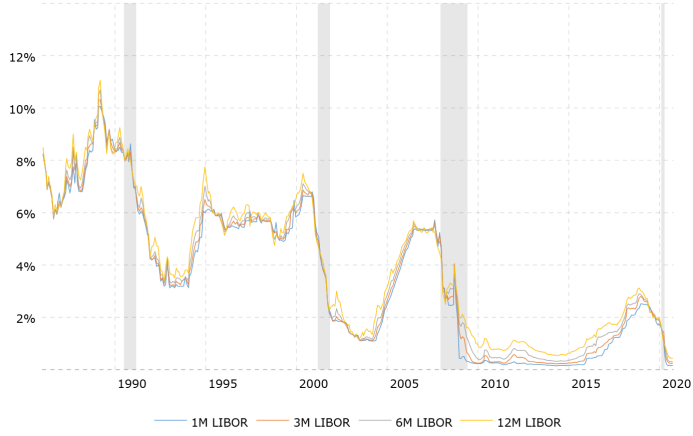
What is LIBOR (London Interbank Offered Rate)?

- LIBOR = interest rate at which major global banks lend to each other
- Calculated from reported borrowing rates in the London interbank market
- Used as a **benchmark interest rate** worldwide

Why is LIBOR Important?

- Benchmark for many financial contracts:
  - Adjustable-rate mortgages
  - Corporate loans
  - Derivatives and swaps
- Influences borrowing costs for households and firms

LIBOR: 30-Year History



LIBOR rates, 30-year historical chart.

Source: macrotrends.net

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Basic Banking Activities

Asset Transformation

Banks transform assets and bear the associated risks:

- High liquidity $\rightarrow$ low liquidity
- Short-term $\rightarrow$ long-term
- Low risk $\rightarrow$ higher risk
- Small scale $\rightarrow$ large scale

Other Services

- Payments and clearing services

Banks make profits through **asset transformation**: they sell liabilities with one set of characteristics and use the proceeds to buy assets with a different set of characteristics.

Cash Deposit

First National Bank				First National Bank			
Assets		Liabilities		Assets		Liabilities	
Vault cash	+$100	Checkable deposits	+$100	Reserves	+$100	Checkable deposits	+$100

Opening a checking account increases bank reserves by the same amount as checkable deposits.

Check Deposit

First National Bank			
Assets	Blank	Liabilities	Blank
Cash items in process of collection	+$100	Checkable deposits	+$100

First National Bank			
Assets		Liabilities	
Reserves	+$100	Checkable deposits	+$100

Second National Bank			
Assets		Liabilities	
Reserves	-$100	Checkable deposits	-$100

When a bank receives additional deposits, it gains an equal amount of reserves; when it loses deposits, it loses an equal amount of reserves.

Bank Profits

First National Bank			
Assets	Blank	Liabilities	
Required reserves	+$10	Checkable deposits	+$100
Excess reserves	+$90		

First National Bank			
Assets		Liabilities	
Required reserves	+$10	Checkable deposits	+$100
Loans	+$90		

- Asset transformation: selling liabilities with one set of characteristics and using the proceeds to buy assets with a different set of characteristics
- The bank borrows short and lends long

Bank Profits: A Simple Example

- **Loan income:** Lend \$90 at 10% $\Rightarrow$ \$9 per year.
- **Funding & servicing cost:**
  - Pay 5% interest on \$100 of checkable deposits $\Rightarrow$ \$5
  - Servicing costs $\Rightarrow$ \$3
  - **Total cost:** \$5 + \$3 = \$8 per year

$$\text{Net Profit} = 9 - 8 = \$1 \text{ per year.}$$

Why This Matters

- Banks choose reserves and loans to **maximize profits**.
- Profitability comes from the **interest rate spread** (loan rate $>$ deposit rate).

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Bank Management

Management of Banking Operations

- Asset management
- Liability management
- Capital management
- Off-balance-sheet activities

Risk Management

- Credit risk
- Market risk
  - Interest-rate risk
  - Exchange-rate risk
  - Stock price risk
- Liquidity risk

Liquidity Management and the Role of Reserves

Excess Reserves

Assets		Liabilities	
Reserves	$20M	Deposits	$100M
Loans	$80M	Bank Capital	$10M
Securities	$10M		

Assets		Liabilities	
Reserves	$10M	Deposits	$90M
Loans	$80M	Bank Capital	$10M
Securities	$10M		

- Required reserves $= 10\%$.
- A \$10M deposit outflow shifts the balance sheet to the right panel.
- With sufficient excess reserves, no other balance-sheet changes are needed.

Liquidity Management and the Role of Reserves

Shortfall

Assets		Liabilities	
Reserves	$10M	Deposits	$100M
Loans	$90M	Bank Capital	$10M
Securities	$10M		

Assets		Liabilities	
Reserves	$0	Deposits	$90M
Loans	$90M	Bank Capital	$10M
Securities	$10M		

- Reserves are a legal requirement, and the shortfall must be eliminated.
- Excess reserves are insurance against the costs associated with deposit outflows.

Liquidity Management and the Role of Reserves

Borrowing

Assets		Liabilities	
Reserves	$9M	Deposits	$90M
Loans	$90M	Borrowing	$9M
Securities	$10M	Bank Capital	$10M

- Cost incurred is the interest rate paid on the borrowed funds.

Liquidity Management and the Role of Reserves

Securities sale

Assets		Liabilities	
Reserves	$9M	Deposits	$90M
Loans	$90M	Bank Capital	$10M
Securities	$1M		

- The cost of selling securities is the brokerage and other transaction costs.

Liquidity Management and the Role of Reserves

Borrowing from the Federal Reserve

Assets		Liabilities	
Reserves	$9M	Deposits	$90M
Loans	$90M	Borrow from Fed	$9M
Securities	$10M	Bank capital	$10M

- Borrowing from the Fed also incurs interest payments based on the discount rate.



Federal Reserve Bank of New York, Liberty Street: banks borrow at the discount window of their district Reserve Bank.

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Liquidity Management and the Role of Reserves

Reduce loans

Assets		Liabilities	
Reserves	$9M	Deposits	$90M
Loans	$81M	Bank Capital	$10M
Securities	$10M		

- Reduction of loans is the most costly way of acquiring reserves.
- Calling in loans antagonizes customers.
- Other banks may only agree to purchase loans at a substantial discount.

Liquidity Management and the Role of Reserves

Why Do Banks Hold Excess Reserves?

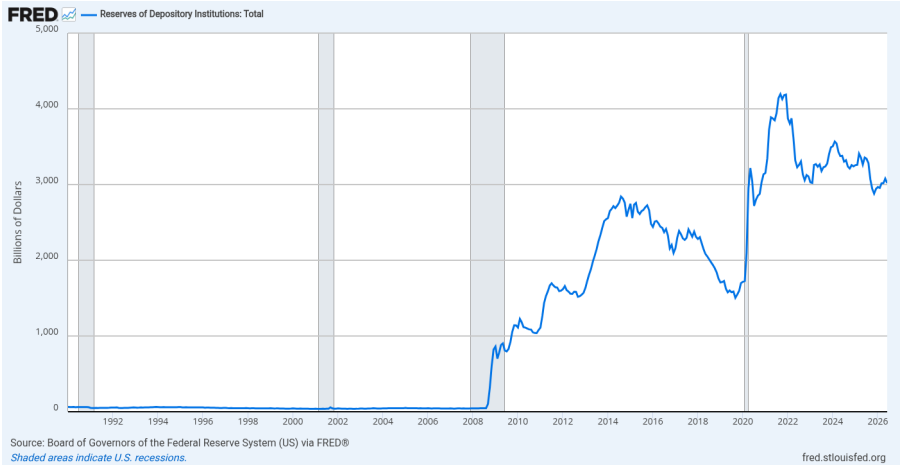
- Insurance against unexpected deposit outflows
- Protection during periods of financial stress

Why are banks willing to hold large excess reserves during recessions?

Cost of Holding Excess Reserves

- Opportunity cost: loss of interest income

Reserves Held by U.S. Banks



Total reserves of depository institutions, billions of dollars, monthly since 1990; shaded areas are recessions. Reserves jumped during the 2008 and 2020 crises.

Source: FRED, Federal Reserve Bank of St. Louis (series TOTRESNS)

Asset Management

- Maximize returns on loans and securities.
- Minimize risk.
- Maintain adequate liquidity.

Tools

- Make loans to borrowers with high returns and low default risk.
- Purchase securities with high returns and low risk.
- Reduce risk through diversification.
- Balance liquidity needs against higher returns from less liquid assets.

Liability Management

Shift Toward Liability Management

- Banks increasingly manage liabilities actively to obtain funds.

Why Liability Management Was Once Neglected

- Deposit costs were relatively fixed
- Borrowing markets were underdeveloped (limited size and maturity)

Why It Became Important

- Greater competition among financial institutions
- Financial innovation expanded funding options

The Development of Bank Management

Asset Management

- Focus on income generation
- Emphasis on managing loans and securities

Liability Management

- Focus on funding costs
- Active management of deposits and borrowed funds

Asset–Liability Management

- Balance both assets and liabilities
- Goal: maximize profits while managing risk
- Matching strategy between assets and liabilities

Capital Adequacy Management

How Bank Capital Helps Prevent Bank Failure

High Capital Bank				Low Capital Bank			
Assets		Liabilities		Assets		Liabilities	
Reserves	$10 million	Deposits	$90 million	Reserves	$10 million	Deposits	$96 million
Loans	$90 million	Bank capital	$10 million	Loans	$90 million	Bank capital	$ 4 million

High Capital Bank				Low Capital Bank			
Assets		Liabilities		Assets		Liabilities	
Reserves	$10 million	Deposits	$90 million	Reserves	$10 million	Deposits	$96 million
Loans	$85 million	Bank capital	$ 5 million	Loans	$85 million	Bank capital	- $1 million

Capital Adequacy Management

Why Capital Adequacy Matters

- Bank capital helps prevent bank failure.
- The level of capital affects returns to equity holders.
- Banks must satisfy regulatory capital requirements.

$$\text{ROA} = \frac{\text{Net profit}}{\text{Assets}} \qquad \text{ROE} = \frac{\text{Net profit}}{\text{Equity}} \qquad \text{EM} = \frac{\text{Assets}}{\text{Equity}}$$

$$\boxed{\text{ROE} = \text{ROA} \times \text{EM}}$$

Trade-off Between Safety and Returns to Equity Holders

Higher Bank Capital

- More capital increases safety and reduces bankruptcy risk.
- However, higher capital usually lowers return on equity (ROE).

How Banks Make the Trade-off

- Banks balance stability and profitability.
- During periods of high uncertainty, banks tend to hold more capital.
- Extra capital helps absorb potential loan losses.

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Managing Credit Risk

Information Asymmetry in Banking

- Banks face information problems when lending.
- **Adverse selection:** Risky borrowers are often the most eager to borrow.
- **Moral hazard:** Borrowers may take actions that increase risk after receiving loans.

Why Small Firms Face Higher Borrowing Costs

- Less available information about credit quality.
- Higher perceived risk for lenders.
- Banks charge higher rates or restrict lending.

How Banks Reduce Credit Risk

Screening and Monitoring

- **Screening:** Collect information to reduce information asymmetry.
- Investigate borrower credit history and background.
- Evaluate firm financial statements and business conditions.

Examples

- Personal credit checks and income verification.
- Firm-level analysis:
  - Financial reports
  - On-site inspections
  - Management reputation

How Banks Reduce Credit Risk

Long-Term Customer Relationships

- Long-term relationships help banks collect more information.
- Better information reduces uncertainty and moral hazard.
- Banks can observe borrower behavior over time.

Loan Commitments

- Banks promise to provide credit in the future under agreed terms.
- Helps establish stable long-term relationships with firms.
- Firms regularly provide information to maintain access to credit.

Managing Interest-Rate Risk: Gap Analysis

First National Bank			
Assets		Liabilities	
Rate-sensitive assets	$20 million	Rate-sensitive liabilities	$50 million
Variable-rate and short-term loans		Variable-rate CDs	
Short-term securities		Money market deposit accounts	
Fixed-rate assets	$80 million	Fixed-rate liabilities	$50 million
Reserves		Checkable deposits	
Long-term loans		Savings deposits	
Long-term securities		Long-term CDs	
		Equity capital	

$$\text{Gap} = \text{Rate-sensitive assets} - \text{Rate-sensitive liabilities}, \qquad \Delta\text{Profit} = \text{Gap} \times \Delta i$$

Duration Analysis: Maturity and Price Risk

- Two bonds, face value = \$100, coupon rate = 10%; Bond A: maturity = 2 years, Bond B: maturity = 3 years
- Initial yield = 10%; market yield rises to 12%

Price After Interest Rate Increase

$$P_A = \frac{10}{1.12} + \frac{110}{(1.12)^2} = 96.62 \qquad P_B = \frac{10}{1.12} + \frac{10}{(1.12)^2} + \frac{110}{(1.12)^3} = 95.20$$

- Longer maturity $\Rightarrow$ higher duration
- Higher duration $\Rightarrow$ larger price decline when interest rates rise
- Therefore, the **3-year bond has higher interest-rate risk**

Duration Analysis: Which Loan Is Riskier?

A borrower takes a $100 loan:

- Maturity: 2 years
- Yield: 10%
- Three repayment methods

Three Repayment Structures

(1) Coupon loan: pay 10% interest each year, principal repaid in year 2

(2) Zero-coupon style: pay $121 once in year 2

(3) Equal payments: pay $57.62 each year

Which repayment structure has the highest interest-rate risk?

Duration Analysis: Macaulay Duration

- Maturity alone is a poor measure of interest-rate risk.
- Maturity only considers the **final cash flow**.
- Bonds with the same maturity can have very different risk.

Macaulay Duration

$$D = \frac{\sum_{t=1}^{N} t \times \frac{CF_t}{(1+i)^t}}{\sum_{t=1}^{N} \frac{CF_t}{(1+i)^t}}$$

- Duration = weighted average time to receive cash flows
- Longer duration $\Rightarrow$ higher interest-rate risk

Duration Analysis: A Bank Example

- Bank assets: \$100 million, duration $D_A = 3$
- Bank liabilities: \$90 million, duration $D_L = 2$
- Interest rate decreases by 5%

Effect of Interest Rate Changes

$$\Delta A \approx -A \times D_A \times \Delta i$$

$$\Delta L \approx -L \times D_L \times \Delta i$$

$$\Delta E = \Delta A - \Delta L = -A \times \Delta i \left(D_A - D_L \frac{L}{A} \right)$$

Duration Analysis: The Duration Gap

$$\%\Delta P \approx -(\text{Duration}) \times \Delta i$$

- Uses weighted average duration of assets and liabilities
- Measures how net worth responds to interest-rate changes

Duration Gap

$$DGAP = D_A - \frac{L}{A} D_L, \qquad D_A = \text{duration of assets}, \quad D_L = \text{duration of liabilities}$$

- If $DGAP > 0$: interest rates $\uparrow \Rightarrow$ bank net worth $\downarrow$
- If $DGAP < 0$: interest rates $\uparrow \Rightarrow$ bank net worth $\uparrow$

Two Types of Gaps

Interest-Rate Sensitive Gap

- Focus: **Net Interest Income (NII)**
- Measures: Rate-sensitive assets − Rate-sensitive liabilities
- Interest-rate changes affect short-run bank profits

Duration Gap

- Focus: **Economic value of equity**
- Measures sensitivity of asset and liability values: $D_A - D_L \frac{L}{A}$

Difference

- Interest-rate gap $\Rightarrow$ **Income effect (short run)**
- Duration gap $\Rightarrow$ **Value effect (long run)**

Chapter Summary

- A bank's balance sheet: assets (uses of funds) = liabilities (sources of funds) + capital (cushion against losses).
- Banks profit through asset transformation: they borrow short and lend long, earning the interest-rate spread.
- Liquidity management: excess reserves are insurance against deposit outflows; the alternatives (borrowing, selling securities, discount loans, calling in loans) are all costly.
- Capital is a trade-off: more capital means more safety but a lower return on equity ($\text{ROE} = \text{ROA} \times \text{EM}$).
- Credit risk is managed by screening, monitoring, and long-term relationships; interest-rate risk is measured by gap analysis (income) and duration analysis (net worth).