Chapter 9

Banking and the Management of Financial Institutions
Bank Balance sheet

total assets = total liabilities + capital

• Banks obtain funds by borrowing and by issuing other liabilities such as deposits.
• They then use these funds to acquire assets such as securities and loans.
• Banks make profits by charging an interest rate on their holdings of securities and loans that is higher than the expenses on their liabilities.
# Table 1: Balance Sheet of All Commercial Banks (items as a percentage of the total, January 2006)

<table>
<thead>
<tr>
<th>Assets (Uses of Funds)*</th>
<th>Liabilities (Sources of Funds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves and cash items</td>
<td>Checkable deposits 7%</td>
</tr>
<tr>
<td>Securities</td>
<td>Nontransaction deposits</td>
</tr>
<tr>
<td>U.S. government and agency</td>
<td>Small-denomination time deposits</td>
</tr>
<tr>
<td>State and local government and other securities</td>
<td>(&lt; $100,000) + savings deposits 43%</td>
</tr>
<tr>
<td>Loans</td>
<td>Large-denomination time deposits 16%</td>
</tr>
<tr>
<td>Commercial and industrial</td>
<td>Borrowings 26%</td>
</tr>
<tr>
<td>Real estate</td>
<td>Bank capital 8%</td>
</tr>
<tr>
<td>Consumer</td>
<td></td>
</tr>
<tr>
<td>Interbank</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Other assets (for example, physical capital)</td>
<td>Total 100%</td>
</tr>
<tr>
<td>Total</td>
<td>Total 100%</td>
</tr>
</tbody>
</table>

*In order of decreasing liquidity.

Source: [www.federalreserve.gov/releases/h8/current/](http://www.federalreserve.gov/releases/h8/current/)
Liabilities

• **Checkable Deposits.** Checkable deposits are bank accounts that allow the owner of the account to write checks to third parties. E.g. all accounts on which checks can be drawn: non-interest-bearing checking accounts (demand deposits), interest-bearing accounts, and money market deposit accounts (MMDAs).

• Checkable deposits and money market deposit accounts are payable on demand;

• that is, if a depositor shows up at the bank and requests payment by making a withdrawal, the bank must pay the depositor immediately.
Liabilities cont..

• **Nontransaction Deposits.**
  Nontransaction deposits are the primary source of bank funds (56% of bank liabilities in Table 1). Owners cannot write checks on nontransaction deposits,
  • interest rates are usually higher than those on checkable deposits.
  • E.g. savings accounts and time deposits (also called certificates of deposit, or CDs).
Liabilities cont..

- **Borrowings.** Banks obtain funds by borrowing from the Federal Reserve System, the Federal Home Loan banks, other banks, and corporations.
- Borrowings from the Fed are called discount loans (also known as advances).
- Banks also borrow reserves overnight in the federal (fed) funds market from other U.S. banks and financial institutions.
- Banks borrow funds overnight in order to have enough deposits at the Federal Reserve to meet the amount required by the Fed.
Liabilities cont..

- **Bank Capital**: the bank’s net worth, which equals the difference between total assets and liabilities.

- The funds are raised by selling new equity (stock) or from retained earnings.
Assets

• A bank uses the funds that it has acquired by issuing liabilities to purchase income earning assets.
• Bank assets are thus naturally referred to as uses of funds,
• the interest payments earned on them are what enable banks to make profits.
Assets cont..

- **Reserves**: Reserves that are held to meet the Fed’s requirement that for every dollar of deposits at a bank, a certain fraction must be kept as reserves.

- Two types of reserves:
  - **required reserves (RR)**: Banks are required by law to keep certain amount of money at CB. Eg. 10 percent of all the deposit.
  - **Excess reserve (ER)**: used by a bank to meet its obligations when funds are withdrawn, either directly by a depositor or indirectly when a check is written on an account.
• **Cash Items in Process of Collection:** Suppose that a check written on an account at another bank is deposited in your bank and the funds for this check have not yet been received (collected) from the other bank.

• The check is classified as a cash item in process of collection, and it is an asset for your bank because it is a claim on another bank for funds that will be paid within a few days.
Assets cont..

• **Deposits at Other Banks**: Many small banks hold deposits in larger banks in exchange for a variety of services, including check collection, foreign exchange transactions, and help with securities purchases.

• This is an aspect of a system called correspondent banking.

• Collectively, reserves, cash items in process of collection, and deposits at other banks are often referred to as **cash items**.
Assets Cont..

- **Securities:** A bank’s holdings of securities are an important income earning asset:
- Securities (made up entirely of debt instruments for commercial banks, because banks are not allowed to hold stock)
Assets cont..

• **Loans**: A loan is a liability for the individual or corporation receiving it, but an asset for a bank, because it provides income to the bank.

• Loans are typically less liquid than other assets, because they cannot be turned into cash until the loan matures.
Other Assets: The physical capital (bank buildings, computers, and other equipment) owned by the banks is included in this category.
### Basic Banking—Cash Deposit

**Opening of a checking account leads to an increase in the bank’s reserves equal to the increase in checkable deposits**

<table>
<thead>
<tr>
<th></th>
<th>First National Bank</th>
<th>First National Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td><strong>Liabilities</strong></td>
<td><strong>Assets</strong></td>
</tr>
<tr>
<td>Vault</td>
<td>+$100</td>
<td>Reserves</td>
</tr>
<tr>
<td>Cash</td>
<td>Checkable deposits</td>
<td>Checkable deposits</td>
</tr>
</tbody>
</table>

+$100

+$100
Basic Banking—Check Deposit

If Jane had opened her account with a $100 check written on an account at another bank, say, the Second National Bank, we would get the same result. The initial effect on the T-account of the First National Bank is as follows:

<table>
<thead>
<tr>
<th>First National Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
</tr>
<tr>
<td>Cash items in process of collection</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>First National Bank</th>
<th>Second National Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td><strong>Liabilities</strong></td>
</tr>
<tr>
<td>Reserves</td>
<td>+$100</td>
</tr>
<tr>
<td>Reserves</td>
<td>-$100</td>
</tr>
</tbody>
</table>
Basic Banking—Making a Profit

<table>
<thead>
<tr>
<th>FIRST NATIONAL BANK</th>
<th>FIRST NATIONAL BANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Liabilities</td>
</tr>
<tr>
<td>Required reserves</td>
<td>Checkable deposits</td>
</tr>
<tr>
<td>+$10</td>
<td>+$100</td>
</tr>
<tr>
<td>Excess reserves</td>
<td></td>
</tr>
<tr>
<td>+$90</td>
<td></td>
</tr>
</tbody>
</table>

- **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, because it makes long-term loans and funds them by issuing short-dated deposits.
- RR = 10%
Principles of Bank Management

- Liquidity Management
- Asset Management
- Liability Management
- Capital Adequacy Management
- Credit Risk
- Interest-rate Risk
Liquidity Management: Ample Excess Reserves

- Withdrawals of $10m
- If a bank has ample excess reserves, a deposit outflow does not necessitate changes in other parts of its balance sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR $10M</td>
<td>Deposits $100M</td>
<td>RR $10M</td>
<td>Deposits $90M</td>
</tr>
<tr>
<td>ER $10</td>
<td>ER $0</td>
<td>ER $0</td>
<td>Bank Capital $10M</td>
</tr>
<tr>
<td>Loans $80M</td>
<td>Bank Capital $10M</td>
<td>Loans $80M</td>
<td>Bank Capital $10M</td>
</tr>
<tr>
<td>Securities $10M</td>
<td>Securities $10M</td>
<td>Securities $10M</td>
<td>Bank Capital $10M</td>
</tr>
</tbody>
</table>
Liquidity Management: Shortfall in Reserves

- Withdrawal $10m
- Reserves are a legal requirement and the shortfall must be eliminated
- Excess reserves are insurance against the costs associated with deposit outflows

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR</td>
<td>$10M</td>
<td>Deposits</td>
<td>$100M</td>
</tr>
<tr>
<td>ER</td>
<td>$0</td>
<td>Bank Capital</td>
<td>$10M</td>
</tr>
<tr>
<td>Loans</td>
<td>$90M</td>
<td>RR</td>
<td>$0</td>
</tr>
<tr>
<td>Securities</td>
<td>$10M</td>
<td>Deposits</td>
<td>$90M</td>
</tr>
<tr>
<td>Securities</td>
<td>$10M</td>
<td>Bank Capital</td>
<td>$10M</td>
</tr>
</tbody>
</table>
After $10 million has been withdrawn from deposits and hence reserves, the bank has a problem: It has a reserve requirement of 10% of $90 million, or $9 million, but it has no reserves!

To eliminate this shortfall, the bank has four basic options:

- acquire reserves to meet a deposit outflow by borrowing them from other banks in the federal funds market or by borrowing from corporations.
- A second alternative is for the bank to sell some of its securities to help cover the deposit outflow.
- acquire reserves by borrowing from the CB.
- by reducing its loans by this amount and depositing the $9 million it then receives with the Fed, thereby increasing its reserves by $9 million.
### Liquidity Management: Borrowing 9m

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
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<tbody>
<tr>
<td>RR</td>
<td>$9M</td>
</tr>
<tr>
<td>Deposits</td>
<td>$90M</td>
</tr>
<tr>
<td>ER</td>
<td>$0</td>
</tr>
<tr>
<td>Loans</td>
<td>$90M</td>
</tr>
<tr>
<td>Borrowing</td>
<td>$9M</td>
</tr>
<tr>
<td>Securities</td>
<td>$10M</td>
</tr>
<tr>
<td>Bank Capital</td>
<td>$10M</td>
</tr>
</tbody>
</table>

- Cost incurred is the interest rate paid on the borrowed funds
Liquidity Management: Securities Sale

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR</td>
<td>Deposits</td>
</tr>
<tr>
<td>$9M</td>
<td>$90M</td>
</tr>
<tr>
<td>ER</td>
<td>$0</td>
</tr>
<tr>
<td>Loans</td>
<td>Bank Capital</td>
</tr>
<tr>
<td>$90M</td>
<td>$10M</td>
</tr>
<tr>
<td>Securities</td>
<td></td>
</tr>
<tr>
<td>$1M</td>
<td></td>
</tr>
</tbody>
</table>

- The cost of selling securities is the brokerage and other transaction costs
Liquidity Management: Federal Reserve

- Borrowing from the Fed also incurs interest payments based on the discount rate
- Borrowing from CB also compromise bank reputation
Liquidity Management: Reduce Loans

- Reduction of loans is the most costly way of acquiring reserves
- Calling in loans antagonizes customers - drive customers away
- sell them off to other banks: other banks may only agree to purchase loans at a substantial discount

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR</td>
<td>$9M</td>
</tr>
<tr>
<td>ER</td>
<td>$0</td>
</tr>
<tr>
<td>Loans</td>
<td>$81M</td>
</tr>
<tr>
<td>Securities</td>
<td>$10M</td>
</tr>
<tr>
<td>Deposits</td>
<td>$90M</td>
</tr>
<tr>
<td>Bank Capital</td>
<td>$10M</td>
</tr>
</tbody>
</table>
Asset Management: Three Goals

• Seek the highest possible returns on loans and securities by:
  • Reduce risk
  • Have adequate liquidity
Asset Management: Four Tools

• Find borrowers who will pay high interest rates and have low possibility of defaulting
  - (i.e., engage in screening to reduce the adverse selection problem)
• Purchase securities with high returns and low risk
• Lower risk by diversifying
  - by purchasing many different types of assets (short- and long-term, U.S. Treasury, and municipal bonds) and approving many types of loans to a number of customers
• Balance need for liquidity against increased returns from less liquid assets
Liability Management

• Recent phenomenon due to rise of money center banks (large Banks)- explore ways in which the liabilities on their balance sheets could provide them with reserves and liquidity.

• Expansion of overnight loan markets and new financial instruments (such as negotiable CDs), which enabled money center banks to acquire funds quickly.

• Checkable deposits have decreased in importance as source of bank funds
Capital Adequacy Management

• Banks have to make decisions about the amount of capital they need to hold for three reasons:
  ❖ Bank capital helps prevent bank failure
  ❖ The amount of capital affects return for the owners (equity holders) of the bank
  ❖ Regulatory requirement - a minimum amount of bank capital (bank capital requirements) is required by regulatory authorities
Capital Adequacy Management: Preventing Bank Failure When Assets Decline

consider two banks with identical balance sheets, except that the High Capital Bank has a ratio of capital to assets of 10% while the Low Capital Bank has a ratio of 4%.

<table>
<thead>
<tr>
<th>High Bank Capital</th>
<th>Low Bank Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Liabilities</td>
</tr>
<tr>
<td>Reserves $10M</td>
<td>Deposits $90M</td>
</tr>
<tr>
<td>Loans $90M</td>
<td>Bank Capital $10M</td>
</tr>
</tbody>
</table>
Capital Adequacy Management: Preventing Bank Failure When Assets Decline

Suppose that both banks get caught up in the euphoria of the telecom market, only to find that $5 million of their telecom loans became worthless and bad loans are written off (valued at zero), the total value of assets declines by $5 million, and so bank capital, which equals total assets minus liabilities, also declines by $5 million. The balance sheets of the two banks now look like this:

<table>
<thead>
<tr>
<th>High Bank Capital</th>
<th>Low Bank Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Liabilities</td>
</tr>
<tr>
<td>Reserves $10M</td>
<td>Deposits $90M</td>
</tr>
<tr>
<td>Loans $85M</td>
<td>Bank Capital $5M</td>
</tr>
</tbody>
</table>

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• The Low Capital Bank, however, is in big trouble.

• Now the value of its assets has fallen below its liabilities, and its net worth is now -$1 million.

• Because the bank has a negative net worth, it is insolvent: It does not have sufficient assets to pay off all holders of its liabilities (creditors). When a bank becomes insolvent, government regulators close the bank, its assets are sold off, and its managers are fired.

• A bank maintains bank capital to lessen the chance that it will become insolvent.
Capital Adequacy Management: How the Amount of Bank Capital Affects Returns to Equity Holders

Return on assets measures how efficiently the bank is run and the return on equity measures how well the owners are doing on their investment.

Return on Assets: net profit after taxes per dollar of assets

\[ \text{ROA} = \frac{\text{net profit after taxes}}{\text{assets}} \]

Return on Equity: net profit after taxes per dollar of equity capital

\[ \text{ROE} = \frac{\text{net profit after taxes}}{\text{equity capital}} \]

Relationship between ROA and ROE is expressed by the Equity Multiplier: the amount of assets per dollar of equity capital

\[ \text{EM} = \frac{\text{Assets}}{\text{Equity Capital}} \]

\[ \frac{\text{net profit after taxes}}{\text{equity capital}} = \frac{\text{net profit after taxes}}{\text{assets}} \times \frac{\text{assets}}{\text{equity capital}} \]

\[ \text{ROE} = \text{ROA} \times \text{EM} \]
The formula ROE = ROA x EM, tells us what happens to the return on equity when a bank holds a smaller amount of capital (equity) for a given amount of assets.

As we have seen, the High Capital Bank initially has $100 million of assets and $10 million of equity, which gives it an equity multiplier of 10 (=$100 million/$10 million).

The Low Capital Bank, by contrast, has only $4 million of equity, so its equity multiplier is higher, equaling 25 (=$100 million/$4 million).

Suppose that these banks have been equally well run so that they both have the same return on assets, 1%.

The return on equity for the High Capital Bank equals 1% x 10 = 10%, while the return on equity for the Low Capital Bank equals 1% x 25 = 25%.

The equity holders in the Low Capital Bank are clearly a lot happier than the equity holders in the High Capital Bank because they are earning more than twice as high a return. We now see why owners of a bank may not want it to hold too much capital.

Given the return on assets, the lower the bank capital, the higher the return for the owners of the bank.
Capital Adequacy Management: Trade-off Between Safety and Returns to Equity Holders

• High Capital
  - Benefits the owners of a bank by making their investment safe
  - Costly to owners of a bank because the higher the bank capital, the lower the return on equity
  - Choice depends on the state of the economy and levels of confidence
Credit Risk: Overcoming Adverse Selection and Moral Hazard

• **Screening and information collection** - screen out the bad credit risks from the good ones so that loans are profitable to them.
  - Lenders must collect reliable information from prospective borrowers.

• **Specialization in lending** - lending to local firms or to firms in particular industries, such as energy.

• **Monitoring and enforcement of restrictive covenants** - By monitoring borrowers’ activities to make sure that borrowers are not taking on risks at their expense.

• **Long-term customer relationships** - If a prospective borrower has had a checking or savings account or other loans with a bank over a long period of time, a loan officer can look at past activity on the accounts and learn quite a bit about the borrower.

• **Loan commitments** - a bank’s commitment - (for a specified future period of time) to provide a firm with loans up to a given amount at an interest rate that is tied to some market interest rate.
Credit Risk: Overcoming Adverse Selection and Moral Hazard

• Collateral and compensating balances
  - provide collateral that the lender will take if the borrower default.
  - Compensating balances require a borrower to keep a required minimum amount of funds in a checking account at the bank.

• Credit rationing
  - a lender refuses to make a loan of any amount to a borrower, even if the borrower is willing to pay a higher interest rate. OR
  - when a lender is willing to make a loan but restricts the size of the loan to less than the borrower would like.
• Suppose that interest rates rise by 5 percentage points on average, from 10% to 15%. The income on the assets rises by $1 million (= 5% x $20 million of rate-sensitive assets), while the payments on the liabilities rise by $2.5 million (= 5% x $50 million of rate-sensitive liabilities). The First National Bank’s profits now decline by $1.5 million (= $1 million - $2.5 million).

• If a bank has more rate-sensitive liabilities than assets, a rise in interest rates will reduce bank profits and a decline in interest rates will raise bank profits.
Interest Rate Risk: Gap Analysis

- The sensitivity of bank profits to changes in interest rates can be measured more directly using **gap analysis**, in which the amount of rate-sensitive liabilities is subtracted from the amount of rate-sensitive assets.
- In our example, this calculation (called the "gap") is -$30 million (= $20 million - $50 million).
- By multiplying the gap times the change in the interest rate, we can immediately obtain the effect on bank profits.
- For example, when interest rates rise by 5 percentage points, the change in profits is 5% x -$30 million, which equals -$1.5 million.
Interest Rate Risk: Gap Analysis

Basic Gap Analysis:

\[(\text{rate-sensitive assets} - \text{rate sensitive liabilities}) \times \Delta \text{interest rates} = \Delta \text{in bank profits}\]

Maturity Bucket Approach
measures the gap for several maturity subintervals

Standardized Gap Analysis
accounts for differing degrees of rate sensitivity
Gap Analysis: Two ways

1. **Maturity Bucket Approach**
   - Group rate sensitive assets and rate sensitive liabilities according to their maturity levels.
   - Since assets and liabilities have different maturities, the gap can be measured for several maturity subintervals (e.g. 3 months, 6 months, 1 year etc.

2. **Standardised Gap analysis**
   - accounts for the differing degrees of rate sensitivity for different rate-sensitive assets and liabilities to change in interest rate.
Interest Rate Risk: Duration Analysis

• examines the sensitivity of the market value of the bank’s total assets and liabilities to changes in interest rates
• provides a good approximation of the sensitivity of a security’s market value to a change in its interest rate
Interest Rate Risk: Duration Analysis

Duration Analysis:

\[ \% \Delta \text{ market value of security} \approx -\text{percentage point} \ \Delta \text{ interest rate} \times \text{duration in years} \]

Uses the weighted average duration of a financial institution's assets and of its liabilities to see how net worth responds to a change in interest rates.
Interest Rate Risk: Duration Analysis

example

• suppose that the average duration of its assets is three years (that is, the average lifetime of the stream of payments is three years),
• while the average duration of its liabilities is two years. In addition, the First National Bank has $100 million of assets and $90 million of liabilities, so its bank capital is 10% of assets.
• With a 5-percentage-point increase in interest rates, the market value of the bank’s assets falls by 15% (= -5% x 3 years), a decline of $15 million on the $100 million of assets.
• However, the market value of the liabilities falls by 10% (= -5% x 2 years), a decline of $9 million on the $90 million of liabilities.
• The net result is that the net worth (the market value of the assets minus the liabilities) has declined by $6 million (=15m – 9m), or 6% of the total original asset value.
• Similarly, a 5-percentage-point decline in interest rates increases the net worth of the First National Bank by 6% of the total asset value.
Off-Balance-Sheet Activities

- Off-balance sheet activities involve trading financial instruments and generating income from fees and loan sales, activities that affect bank profits but do not appear on bank balance sheets.

- Loan sales (secondary loan participation)
  - Involves a contract that sells all or part of the cash stream from a specific loan and thereby removes the loan from the bank’s balance sheet.
  - Banks earn profits by selling loans for an amount slightly greater than the amount of the original loan.
Off-Balance-Sheet Activities

- **Generation of fee income**
  - generation of income from fees that banks receive for providing specialized services to their customers,
  - E.g. foreign exchange trades on a customer’s behalf, servicing a mortgage-backed security
  - by collecting interest and principal payments and then paying them out,
  - guaranteeing debt securities such as banker’s acceptances

- **Trading activities and risk management techniques**
  - Futures, options, interest-rate swaps, foreign exchange
  - Speculation
Off-Balance-Sheet Activities (cont’d)

• Trading activities and risk management techniques (cont’d)
  ♦ Principal-agent problem
    • Internal Controls
      ♦ Separation of trading activities and bookkeeping
      ♦ Limits on exposure
      ♦ Value-at-risk
      ♦ Stress testing