Banking and the Management of Financial Institutions

EE 431 Semester 2/2016

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Preview

- This chapter examines how banks attempt to maximize their profits.

- Although the discussion that follows focuses primarily on commercial banks, many of the same principles apply to other financial intermediaries as well.

Learning Objectives

- Summarize the features of a bank balance sheet.
- Apply changes to a bank's assets and liabilities on a T-account.
- Identify ways in which banks can manage their assets and liabilities to maximize profit.

Learning Objectives

- List the ways in which banks deal with credit risk.
- Apply gap and duration analysis and identify interest-rate risk.

Readings

- Mishkin Chapter 9
- Kent Matthew and John Thompson,
  - Chapter 7: Bank behaviors
  - Chapter 12: Risk management

Basic banking activities: The Bank Balance Sheet

- **Liabilities:**
  - Checkable deposits
  - Non-transaction deposits
  - Borrowings
  - Bank capital

Basic banking activities: The Bank Balance Sheet

- **Assets:**
  - Reserves
  - Cash items in process of collection
  - Deposits at other banks
  - Securities
  - Loans
  - Other assets

Table 1 Balance Sheet of All Commercial Banks (items as a percentage of the total, June 2014)

TABLE 1 Balance Sheet of All Commercial Banks (items as a percentage of the total, June 2014)

Assets (Uses of Funds)*		Liabilities (Sources of Funds)	
Reserves and cash items	19%	Checkable deposits	11%
Securities		Nontransaction deposits	
U.S. government and agency	13	Small-denomination time deposits (<$100,000) + savings deposits	47
State and local government and other securities	6	Large-denomination time deposits	11
Loans		Borrowings	20
Commercial and industrial	12	Bank capital	11
Real estate	25		
Consumer	8		
Interbank	1		
Other	7		
Other assets (for example, physical capital)	9		
Total	100	Total	100

*In order of decreasing liquidity.

Source: http://www.federalreserve.gov/releases/h8/current/.

Balance Sheet of All Commercial Banks (items as a percentage of the total, Feb 2017)

Items	Assets			Items	Liability	
1	Currency and Deposits	4.62		8	Deposits Incl. in Broad Money (BM)	62.48
2	Securities Other Than Shares	12.35		9	Deposits Excl. from BM	5.05
3	Loans	74.29		10	Other Deposits	4.37
4	Shares and Other Equity	2.68		11	Securities Other Than Shares Incl. in BM	1.04
5	Other Accounts Receivable	3.09		12	Securities Other Than Shares Excl. from BM	2.19
6	Nonfinancial Assets	2.98		13	Borrowing	8.60
7	Total Assets	100.00		14	Other Accounts Payable	7.96
				15	Shares and Other Equity	12.67
				16	Total Liabilities	100.00

Sources: BOT / exclude foreign bank, foreign branch

Basic banking operation: taking deposit

- Cash Deposit:

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

- Opening of a checking account leads to an increase in the bank's reserves equal to the increase in checkable deposits.

Basic Banking: Deposit/withdrawal/Reserve

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

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

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

Basic Banking: mismatch maturity

- Making a profit:

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

First National Bank	
Assets	Liabilities
Required reserves +$100	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; mismatch maturity.

Objectives of Bank management

- Maximizing value of Bank (long-term profit maximized.)
  - **Enhancing return/ minimizing Risk → required risk/return management**
  - Ensuring long-term financial strength → required capital management

Types of common risk exposure

- Liquidity risk
- Market risk (interest rate)
- Credit risk

Liquidity risk

- Why liquidity risk?
  - Mismatch structure between liability and asset

Asset	Liability
Credit loan - **highly illiquid** - **Difficult to resell**	**Deposit** - **highly liquid** - **Outflow can occur anytime.**
Marketable security - Bonds	Market borrowing - Issue bonds - Bill of exchange

Liquidity risk

- Deposit outflows can occur at any time, and bank needs to have money ready when depositors withdraw money from their accounts.
- *Prone* to have trouble with liquidity shortage.
- Need to manage/handle when deposit outflow occurs.

Liquidity risk: management

- Banking business model is sometimes called the fractional reserve banking. That is, banks usually hold "reserve" to protect themselves against the risk of deposit outflow.

- In most countries, financial regulator would require commercial banks to hold a certain amount of reserve. Typically, this is calculated as the percentage of total outstanding of transaction deposit accounts.

- If the reserve drops below the required level, bank needs to fill up the deficit. This requires some forms of management.

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		

  - Suppose a bank's required reserves are 10%.
  - If a bank has ample excess reserves, a deposit outflow does not necessitate changes in other parts of its balance sheet.

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

  - Typically called “inter bank borrowing”.
  - 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

- Central bank:

Assets		**Liabilities**	
Reserves	$9M	Deposits	$90M
Loans	$90M	**Borrow from Central bank**	**$9M**
Securities	$10M	Bank Capital	$10M

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

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.

Types of common risk exposure

- Liquidity risk
- Market risk (interest rate)
- Credit risk

Interest rate risk: motivation

- Banks raise funds in terms of deposit, and make the profit from grating loan.
  - Deposit rate/loan rate can be considered as “price” of banks’ output.
- Change in market interest rate could affect the deposit rate and loan rate, and hence affect the ability that a commercial bank can earn its profit.
- As the financial position of a commercial bank could be varied with market interest rate, the commercial bank faces with interest rate risk exposure.

Interest-Rate Risk: measuring the exposure

- 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.

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	

Gap Analysis

- Basic GAP analysis:

$$\Delta\, profit = \Delta i * GAP$$

GAP = (rate sensitive assets - rate sensitive liabilities)

Gap Analysis

- Basic gap analysis:

  $$(\text{rate sensitive assets} - \text{rate sensitive liabilities}) \times \Delta \text{interest rates} = \Delta \text{in bank profit}$$

- Maturity bucked approach:
  - Measures the gap for several maturity subintervals
- Standardized gap analysis:
  - Accounts for different degrees of rate sensitivity

What happen if loan interest increases by 1% and borrowing rate increase by 0.5%?

Assets		Liabilities and Equities	
Fixed Rate Asset	**350**	**Fixed rate libilities**	**230**
reserves, long-term security, fixed rate loans, government bonds		checkable deposits long-term CDs	
Variable Rate Assets	**130**	**Variable Rate Liabilities**	**230**
S-T securities, variable rate loans		S-T CDS, saving deposits	
		Net Worth	.....
Total Asset	**480**	**Total Liabilities**	.....

Interest rate risk: GAP v.s. Duration

10 years

Assets		Liabilities and Equities	
Fixed Rate Asset	**350**	**Fixed rate libilities**	**230**
reserves, long-term security, fixed rate loans, government bonds		checkable deposits long-term CDs	
Variable Rate Assets	**130**	**Variable Rate Liabilities**	**230**
S-T securities, variable rate loans		S-T CDS, saving deposits	
		Net Worth	.....
Total Asset	**480**	**Total Liabilities**	.....

5 years

- GAP ignores all fixed rate asset/liability. (what if not held to maturity)
- Face value fixed, but market value of fixed rate might change.

Different *compositions* on maturity of long-term asset/liability might matter for profit/loss of banks.

Interest rate risk: Duration

- Change in interest rate affects market value of asset and liability as a whole.
- This needs comprehensive measurement using market-valued approach.
- 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

Measuring sensitivity of bank's balance sheet position with respect to market interest rate:

$$\frac{\%\Delta NW}{\Delta i} = ??$$

$$NW = Asset - Liability$$

Interest rate risk: Duration

$$\frac{\Delta NW}{\Delta i} = \frac{\Delta Asset}{\Delta i} - \frac{\Delta Liability}{\Delta i}$$

$$\frac{\%\frac{\Delta NW}{NW}}{\Delta i} = \frac{\%\frac{\Delta Asset}{Asset}}{\Delta i} * \frac{Asset}{NW} - \frac{\%\frac{\Delta Liability}{liability}}{\Delta i} * \frac{liability}{NW}$$

Interest rate risk: Duration

$$\frac{\%\frac{\Delta Asset}{Asset}}{\Delta i} = -MOD_A \text{ and } \frac{\%\frac{\Delta Liability}{liability}}{\Delta i} = -MODD_L$$

$$\frac{\%\frac{\Delta NW}{NW}}{\Delta i} = -MOD_A * \frac{Asset}{NW} + MOD_L * \frac{liability}{NW}$$

Interest rate risk: Duration

Assets		Liabilities and Equities	
long term assets	480	short-term liablities	460

- Suppose that modified duration of bank assets = 3 years, modified duration of liabilities = 2 years. The interest rate is expected to fall by 5%.

Need to evaluate the impact of every 1% change in interest.
Then multiply by 5.

Interest rate risk: Duration

- Initial NW = _____
- From the formula, we know that:

$$\frac{\%\frac{\Delta NW}{NW}}{\Delta i} = -MOD_A * \frac{Asset}{NW} + MOD_L * \frac{liability}{NW}$$

So, $\frac{\%\frac{\Delta NW}{NW}}{\Delta i}$ = _____

Interest rate risk management

- Passive portfolio manager typically minimizes risk.
  - This is different from active portfolio manage who might bet against the market trend.

- What do we need to do so that interest rate risk is minimized.

Interest rate risk management

- Balance duration/leverage
  - Practically, balancing maturity structure of asset and liability.
  - Attempt to make them stay close together, on average

- In finance, this is called **immunization**.

Interest-rate risk management

- **Using financial derivative**

Bank A

Asset	Liability
Long-term instrument (fixed rate)	Short-term instrument (variable-rate)

Bank B

Asset	Liability
Short-term instrument (variable rate)	Long-term instrument (fixed rate)

Interest-rate risk management

- **Using financial derivative**

Bank A

Asset	Liability
Long-term instrument (fixed rate)	Short-term instrument (variable-rate)

Bank B

Asset	Liability
Short-term instrument (variable rate)	Long-term instrument (fixed rate)

- Bank A gets hurt if market rate increases.
- BUT bank B gets hurt if market rate decreases.
- Different risk exposure to different kind of an adjustment in market rate.

Interest-rate risk management

- Perfect neutralization if both banks could simply swap the balance sheet.

Bank A

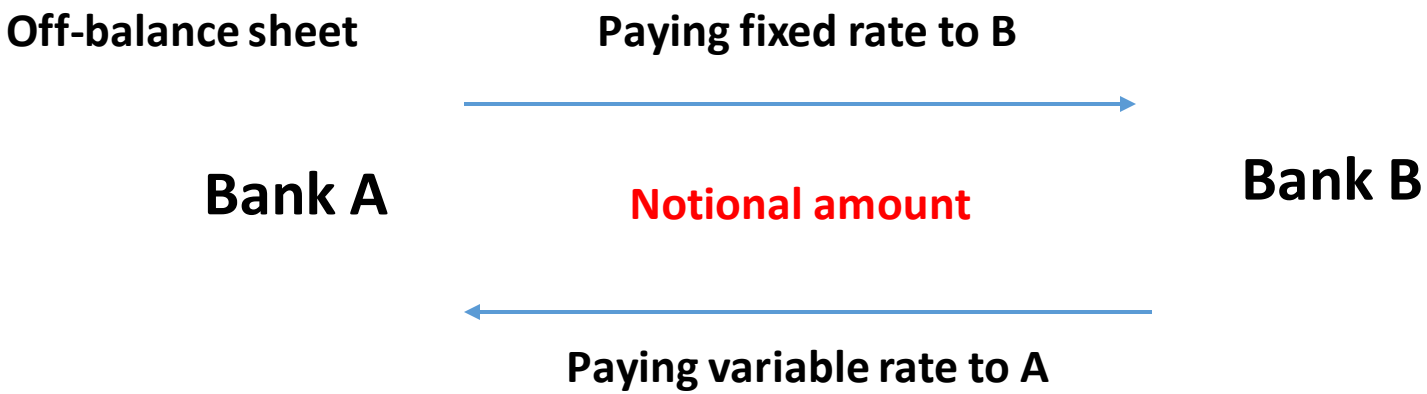
Asset	Liability
Long-term instrument (fixed rate)	Short-term instrument (variable-rate)

Practically, not possible

Bank B

Asset	Liability
Short-term instrument (variable rate)	Long-term instrument (fixed rate)

Interest-rate risk management



On-balance sheet

Bank A

Asset	Liability
Long-term instrument (fixed rate)	Short-term instrument (variable-rate)

Bank B

Asset	Liability
Short-term instrument (variable rate)	Long-term instrument (fixed rate)

Types of common risk exposure

- Liquidity risk
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- Credit risk

Credit risk

- Interest payment on credit loan is the largest source of bank's income/revenue/return.
- Payment on credit loan is subjected to default.
  - Default loss suffers bank's balance sheet.
  - Reducing bank's net-worth
- While enhancing return on credit loan, banks need to concern about the possibility of default too.

Credit risk management 1

- Screening and Monitoring:
  - Screening
  - Specialization in lending
  - Monitoring and enforcement of restrictive covenants.

Credit risk management 2

- Long-term relationship with borrower and Loan-Commitment
  - Asymmetric information leads to screening and monitoring cost.
  - One way to reduce the cost is to incentivize borrowers with loan-commitment contract.

Credit risk management 3

- Diversifications
  - The same principle in basic portfolio investment applies to credit loan management.
  - Different industries/borrowers might have different characteristics.
  - Not to concentrate on granting loan to a single client or a single line of credit business.

Credit risk management 4

- Require collateral
  - Reduce the chance of getting bad borrower into
    - High risk borrowers don't usually want to use their own collateral in the borrowing.
  - Worst comes to worst, loss can be mitigated by having collateral put upfront.

Credit risk management 5

- Credit rationing
  - Choose to limit quantity of loan granted, rather than using interest rate as tool for allocation.
  - Loan is limitedly **rationed** among borrowers, i.e. maximum loan value granted.
  - Bank won't grant loan further even borrowers are willing to pay-off higher rate. Why?

Credit risk management 6

- Use financial derivative
  - E.g. Credit Default Swap
  - Seller of the CDS promises to pay the buyer of CDS (bank) for a compensation of loss given the default.
  - Seller receive a certain amount of insurance premium as the incentive to accept the risk.

Objectives of Bank management

- Maximizing value of Bank (long-term profit maximized.)
  - Enhancing return/ minimizing Risk → required risk/return management
  - **Ensuring long-term financial strength → required capital management**

Capital Adequacy Management

- Bank capital helps prevent bank failure.
- The amount of capital affects return for the owners (equity holders) of the bank.
- Regulatory requirement

Capital Adequacy Management

How Bank Capital Helps Prevent Bank Failure:

High Capital Bank

Assets		Liabilities	
Reserves	$10 million	Deposits	$90 million
Loans	$90 million	Bank capital	$10 million

Low Capital Bank

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

High Capital Bank

Assets		Liabilities	
Reserves	$10 million	Deposits	$90 million
Loans	$85 million	Bank capital	$ 5 million

Low Capital Bank

Assets		Liabilities	
Reserves	$10 million	Deposits	$96 million
Loans	$85 million	Bank capital	−$ 1 million

Capital Adequacy Management

How the Amount of Bank Capital Affects Returns to Equity Holders:

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

$$\text{EM} = \frac{\text{Assets}}{\text{Equity Capital}}$$

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

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

Capital Adequacy Management

- Trade-off between safety and returns to equity holders:
  - 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

Application: How a Capital Crunch Caused a Credit Crunch During the Global Financial Crisis

- Shortfalls of bank capital led to slower credit growth:
  - Huge losses for banks from their holdings of securities backed by residential mortgages.
  - Losses reduced bank capital
- Banks could not raise much capital on a weak economy, and had to tighten their lending standards and reduce lending.