THEORY OF FINANCIAL INSTITUTIONS II: BASIC BANKING MANAGEMENT

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EE431

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READINGS

Mishkin Chapter 9

Kent Matthew and John Thompson,

- Chapter 7: Bank behaviors
- Chapter 12: Risk management

AGENDA

What does a commercial bank do: balance sheet analysis

Goals of commercial banks, how do they operate and manage their business?

BASIC BANKING ACTIVITIES: THE BANK BALANCE SHEET

Assets	Liabilities
- Reserves - Cash items in process of collection - Deposits at other banks - Tradable Securities - Credit Loans - Other assets	- Checkable deposits - Non-transaction deposits - Borrowings Bank capital

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

WHAT DOES A COMMERCIAL DO?

- Commercial banks share a similar objective to other businesses, i.e. maximize profits.
  - Raise funds in the market (liability)
  - Generate return from investment (Asset)
- Difficulty: Banks face various kind of risks in the investment.
  - Risks appear both on the liability side and asset side.
- Principle: Bank operates by managing asset and liability.

OBJECTIVES OF ASSET/LIABILITY 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

- Banks typically raise fund in the deposit market. (Special feature of deposit?)

- Banks face with an imbalance in liquidity structure.

To provide liquidity insurance, banks hold large amount of non-tradable long-term asset, i.e. highly illiquid asset, but offer short

- How does a commercial bank manage the liquidity risk?

MANAGING LIQUIDITY RISK: HOLDING RESERVE

- Traditional approach is to rely on a so called fractional reserve banking management.

- Bank holds x% of deposit to insurance against the outflow.

- After the establishment of financial regulation, this x% is typically required by law, and is then called reserve requirement ratio.

- Under the reserve requirement policy, banks need to make sure that it meets with deposit outflow, and maintain the reserve requirement ratio as well.

MANAGING LIQUIDITY RISK: HOLDING EXCESS RESERVE

Then what to do if deficit in reserve occurs?

- Having failed to meet reserve require ratio is costly to bank; regulatory punishment.

- Banks sometime holds excess reserve to cover the deficit.

MANAGING LIQUIDITY RISK: HOLDING EXCESS RESERVE

Excess reserves:

Before

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

After $10M deposit outflow

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.

MANAGING LIQUIDITY RISK: TRADABLE SECURITIES

- Holding excess reserve ratio is costly; reserve account earns banks a very small amount of return, nearly 0%.

- Bank holds some liquid assets in terms of tradable securities, e.g. treasury bills and government bond.

Asset	Liability
Credit loan **- highly illiquid** **- Difficult to resell**	**Deposit** **- highly liquid** **- Outflow can occur anytime.**
Reserve - Required - Excess	
Marketable security - Short-term Bonds - Long-term Bond	

MANAGING LIQUIDITY RISK: TRADABLE SECURITIES

Securities (outright) sale:

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

After $10M withdrawal			
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.
- Depressed price

MANAGING LIQUIDITY RISK: INTERBANK BORROWING

- Some banks may be running surplus in their reserve, and would seek to loan the money.

- Bank may choose to borrow from the so called "interbank borrowing market"

Asset	Liability
Credit loan **- highly illiquid** **- Difficult to resell**	**Deposit** **- highly liquid** **- Outflow can occur anytime.**
Reserve - Required - Excess	Interbank borrowing
Marketable security - Short-term Bonds - Long-term Bond	

MANAGING LIQUIDITY RISK: INTERBANK BORROWING

Borrowing:

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

After $10M outflow			
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
- Unsecured.

MANAGING LIQUIDITY RISK: REPO BORROWING

REPO = Repurchase Agreement

- REPO is a collateral-backed borrowing.

- Agreement:

Open-leg: Sell marketable-security.

Closed-leg: Buy back the marketable security (reverse the initial operation)

Standard REPO is to use T-bills/Govt

Fixed term (1 day, 14 days, etc.) → For Thailand, the most active one is 1 day.

MANAGING LIQUIDITY RISK: BORROW CENTRAL BANK FACILITY

- Commercial banks might secure findings and meet the liquidity shortage through the standard lending facility designed by the central bank.
- Marginal lending facility
- Discount rate

Asset	Liability
Credit loan - **highly illiquid** - **Difficult to resell**	**Deposit** - **highly liquid** - **Outflow can occur anytime.**
Reserve - Required - Excess	Interbank borrowing
Marketable security - Short-term Bonds - Long-term Bond	Central bank borrowing - Lending facility - Discount rate

LIQUIDITY MANAGEMENT AND THE ROLE OF RESERVES

Central bank:

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

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

- Borrowing from the central bank also incurs interest payments based on the discount rate or market rate + fees (penalty)
- Reputational cost! → poor liquidity management plus bad signal to bank's quality as well.

MANAGING LIQUIDITY RISK: LOAN SALE!

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

Interest rate risk

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: PROBLEMS

- Assuming that one percent change in market interest produces an even impact to both borrowing and deposit rate.

1. Maturity bucked approach:
   - Long-rate assets/liabilities tend to move more with one another than short-rate assets/liabilities
   - Measures the gap for several maturity subintervals.

2. Standardized gap analysis:
   - Accounts for different degrees of rate sensitivity by using simulation

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

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

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

INTEREST RATE RISK: DURATION

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

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

$$\frac{\frac{\Delta NW}{NW}}{\Delta i} = \frac{\frac{\Delta Asset}{Asset}}{\Delta i}\frac{Asset}{NW} - \frac{\frac{\Delta Liability}{Liability}}{\Delta i}\frac{Liability}{NW} = -MOD^A * \frac{Asset}{NW} + MOD^L * \frac{liability}{NW}$$

INTEREST RATE RISK: DURATION

$$Asset = \sum_{j=1}^{N} Asset_j$$

$$\frac{\frac{\Delta Asset}{Asset}}{\Delta i} = \sum_{j=1}^{N} \frac{\frac{\Delta Asset_j}{Asset_j}}{\Delta i} * \frac{Asset_j}{Asset}$$

$$\boldsymbol{MOD^A = \sum_{j=1}^{N} MOD_j^A * \frac{Asset_j}{Asset} = weighted - average\ asset\ Duration}$$

INTEREST RATE RISK: DURATION

$$Liability = \sum_{k=1}^{M} Liability_k$$

$$\frac{\frac{\Delta Liability}{Liability}}{\Delta i} = \sum_{k=1}^{M} \frac{\frac{\Delta Liability_k}{liability_k}}{\Delta i} * \frac{Liability_k}{Libaility}$$

$$\boldsymbol{MOD^L = \sum_{k=1}^{M} MOD_k^L \frac{Liability_k}{Libaility} = weighted - average\ liability\ duration}$$

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%.

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

MANAGING THE INTEREST RATE RISK

Having know that banks face with interest rate risk, what then can a bank do?

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

MANAGING THE INTEREST RATE RISK

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**.

MANAGING THE INTEREST RATE RISK

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)

MANAGING THE INTEREST RATE RISK

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.

MANAGING THE INTEREST RATE RISK

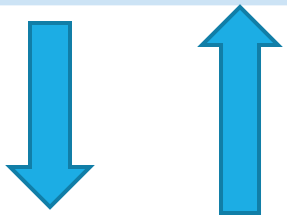
Perfect neutralization if both banks could simply swap the balance sheet.

Bank A

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

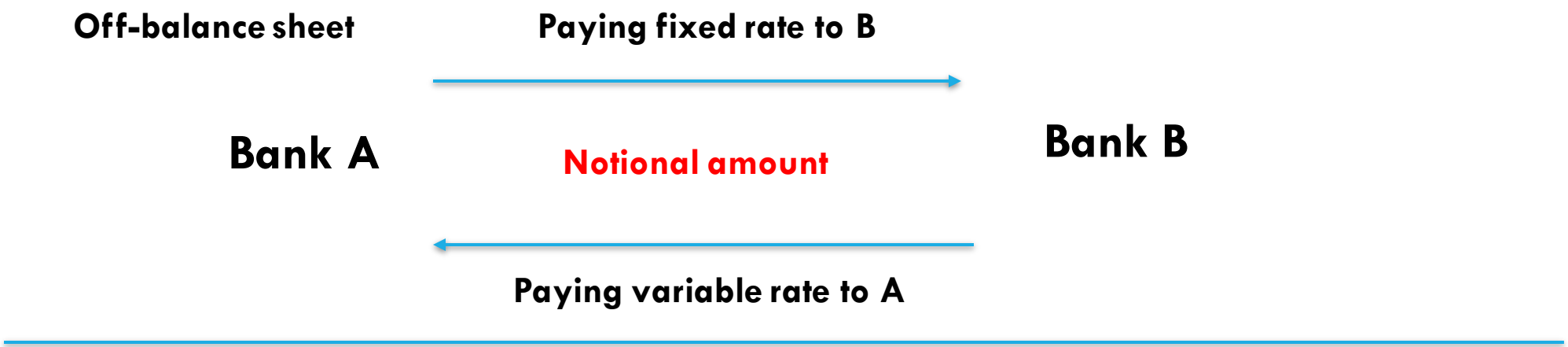
Practically, not possible

Bank B



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

MANAGING THE INTEREST RATE RISK



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

Market risk (interest rate)

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 → solvency issue.

While enhancing return on credit loan, banks need to concern about the possibility of default too.

CREDIT RISK MANAGEMENT 1

Screening *and* Monitoring → common activity to cope with moral hazard and adverse selection

- Intrinsic default (Adverse selection): Screening and Specialization in lending
- Strategic default; incentive-based default (Moral hazard): Monitoring and enforcement of restrictive covenants.

CREDIT RISK MANAGEMENT 2

Develop 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.

Loan syndicate

CREDIT RISK MANAGEMENT 4

Require collateral → solving moral hazard and adverse selection

- 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

- What is 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.
- Under asymmetric information, rationing in quantity of credit might be an optimal bank strategy, and hence representing an equilibrium feature in the credit market.
- 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.

- Banks face with a trade-off between returns and solvency!

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