Topic 5 : Banking and the Management of Financial Institutions

The Economics of Money, Banking and Financial Markets
Federic Mishkin, Chapter 9, pp 219 - 238 (HG173 .M57 2007)
The Economics of Banking, Kent Matthews and John Thompson*

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Contents

1 Introduction : What does a bank do?

- What is financial intermediary? What does a bank do?
- Why does financial intermediary exist? (topic 6)
- Why do we need to regulate financial intermediaries?
- This topic focuses on the first question, what is financial intermediary?
- The answers to the rest questions are the main focus of topic 6, 7, 8, in which we are going to deal with economic models with asymmetric information.
- Financial institutions perform two main functions:

  1. to match transactors (like marriage brokers do)
  2. to manage risk and transform the nature of claims (qualitative asset transformation)

  - Banks make profits by selling liabilities (e.g. deposits) with one set of characteristics and using the proceeds to buy assets (e.g. loans) with a different set of characteristics.
  - Normally, banks borrows from short-dated deposits and lends through long-term loans.

- Financial intermediaries are entities that intermediate between providers and users of financial capital . They borrow on on hand and lend on the other.
- Financial intermediaries perform qualitative asset transformation.
- Financial intermediaries are “firms” which produce “financial services”
- manufacturing firms hold inventories, machines, patents
- financial intermediaries hold large quantities of financial claims
- Both finance their assets by issuing “debt” or “equity”
- Debts : Predetermined return, interests
- Equity : Residual return, dividends
- D/E ratio 2019H1: DTAC = 4.76, TRUE= 3.14, ADVANC = 3.46, LPN = 0.71, CPN=1.43, PTT = 1.24, QH=0.98, CPALL = 3.26, MINT = 2.58, THAI = 14.63

  - Source: https://www.set.or.th/set/commonslookup.do?language=en&countr
    - company summary

- Guess: What is the average D/E ratio of all commercial banks in Thailand?

- One distinction between financial institutions and manufacturing business is that FIs are highly financial leveraged. In other words, their debt to equity ratio is very high.
- Industrial organization of banking: It is hard to define "production"
  1. deposits as inputs, loans as output
  2. deposits and loans are output, inputs are human capital and physical capital
- To understand banking business, the simplest way is to look at the bank balance sheet
- Balance sheet : the source of funds = the use of funds, total liabilities + capital = total assets
- Liabilities : deposits, borrowings
- Asset : loans, cash (required reserves + excess reserves), securities
- Basic banking operation: Mr Johny opens a checking deposit account with Baht 100, the reserve requiement ratio is 10%.

Bangkok Bank Plc.

Assets	Liabilities and Equities
required reserves	checkable deposits
excess reserves	

- Assume that the bank choose not to hold any excess reserves but to make loans

Bangkok Bank Plc.

Assets	Liabilities and Equities
required reserves	checkable deposits
loans	

- Suppose that deposit rate is 1 percent and loan rate is 10% and the operation cost is 1 Baht. Then the bank is making a profit of 10%(.....) - 1%(.....) - 1 Baht
- Banking business is making profits by borrowing at low interest rate and then lending at high interest rate

2 Major Risks Faced by Banks

- Is this an easy money making?
  - liquidity risk
  - interest rate risk
  - default risk (credit risk)
  - capital adequacy risk

3 Liquidity management and the role of reserves

- Banks borrow short terms to lend for long terms (maturity mismatch)
- They need to hold enough cash for their depositors to withdraw
- Why don't hold a large amount of reserve to prevent liquidity risk?

  $\Rightarrow$ The optimal reserve decision : opportunity cost of holding reserve and the adjustment costs of having to conduct unanticipated borrowing to meet withdrawals [details in section 3.2]

  $\Rightarrow$ Balance sheet analysis : maturity mismatch $\rightarrow$ liquidity problem $\rightarrow$ how to cope with the problem and associated cost [details in section 3.1]
- Normally banks retain only some fractions of their customer's deposits as reserve

- In a normal situation, there is no problem in doing this. Why?
- Large number of depositors → the amount withdrawals become more predictable, interbank lending
- If a bank does not have enough cash to pay back their depositors on demand, there will be panics. Large number of depositors withdraw their deposits, not because they need to use the money, but because they fear the bank will fail. The effect is contagious. Interbank lending cannot help. Liquidity problem → bank failues → economy. (Bank runs and deposit insurance - Topic 8)
- Liquidity risk → bankrupcy risk (default risk)

3.1 Balance Sheet Analysis

- How a bank can deal with deposit outflows : reserve requirement ratio = 10%

Bangkok Bank Plc. (million Baht)

Assets		Liabilities and Equities	
Reserves	20	checkable deposits	100
Loans	80	bank capital	10
Securities	10		

- Legal Reserve= ..... Excess Reserve = ...
- *Note*
  - Bank capital refers to bank "equity". It is the part of the bank's asset that belongs to the bank's shareholder.
  - "Bank capital is the value of the bank's assets minus its liabilities, or debts. Assets include cash, loans and securities, while liabilities cover customer deposits, and money owed to other banks and bondholders. If all the assets were sold and all the debts repaid, the value which would be left over is equal to the bank's equity. A bank's capital is made up of **certain loss-absorbing bonds, as well as its equity**. These bonds include additional tier 1 bonds and tier 2 bonds. **These bonds have equity-like features, which is why regulators allow them to count towards a banks' capital**. The more capital there is, this means the bank can absorb more losses on its assets before it becomes insolvent. Since

the 2008 global financial crisis began, bank capital has been in the spotlight. Regulators, which act on behalf of governments, require this to be above a prescribed minimum level. Typically capital is measured as a ratio against a bank's risk-weighted assets." Financial Times.

– Suppose there is a deposit outflow of 10 M.Baht.

Bangkok Bank Plc.

Assets	Liabilities and Equities
Reserves	checkable deposits
Loans	bank capital
Securities	

- With 10% reserve requirement, bank still has excess reserves of 1 million Baht: no changes needed in balance sheet
- No excess reserve.

Bangkok Bank Plc. (million Baht)

Assets		Liabilities and Equities	
Reserves		checkable deposits	100
Loans		bank capital	10
Securities	10		

- Suppose there is a deposit outflow of 10 M.Baht.

Bangkok Bank Plc.

Assets	Liabilities and Equities
Reserves	checkable deposits
Loans	bank capital
Securities	

- Now the bank has a problem. It does not have enough reserves as required.

- Basically, the bank has four options: there is a cost associated with all the four options.

    1. borrow from other banks in the interbank market, Cost : interbank rate
    2. sell some of its securities, Cost : capital loss, opportunity cost
    3. borrowing from the central bank, Cost : discount window rate
    4. sell off loans
        - Cost : capital loss, opportunity cost
        - it is not always possible to sell off loans

3.2 The Optimal Reserve Decision : Chapter 7, Kent Matthews and John Thompson*

- A simple model of liquidity management : let the balance sheet of the bank be described by loans (L) plus reserves (R) and deposits (D)

$$L + R = D \tag{1}$$

- The bank faces a continuous outflow of deposits over a specific period of time before new deposits or inflows replenish them.
- Let x be deposit outflow. $f(x)$ is the probability distribution function of x.
- A reserve deficiency occurs if reserves is not enough for deposit outflow: $R < x$.
- The cost of meeting a reserve deficiency is p per unit of reserve deficiency.
- The expected adjustment cost of a reserve deficiency (denoted by A) is as follows.

$$A = \int_R^\infty p(x - R) f(x) dx \tag{2}$$

- Let the opportunity cost of holding reserves is the interest they could have earned had they been held as earning asset. r be the interest earned on the bank's earnings assets.
- The expected cost function is as follows.

$$\begin{array}{rcccc} C & = & rR & + & A \\ & = & \begin{array}{c}\text{opportunity cost of} \\ \text{holding reserve}\end{array} & + & \begin{array}{c}\text{expected adjustment} \\ \text{cost of a reserve deficiency}\end{array} \\ & = & rR & + & \int_R^\infty p(x - R) f(x) dx \end{array} \tag{3}$$

- Minimizing the expected cost function in equation (3) with repect to R, yields

$$\frac{\partial C}{\partial R} = r - p \int_R^\infty f(x) dx = 0$$

$$\frac{r}{p} = \int_R^\infty f(x) dx$$

- The bank chooses the level of reserves such that the probability of a reserve deficiency is just equal to $\frac{r}{p}$.
- **The model says that, in the absence if regulatory reserve ratios, a bank will decide on the optimal level of reserves for its business on the basis of**

    1. **the interest on earning assets,**
    2. **the cost of meeting a reserve deficiency and**
    3. **the probability distribution of deposit withdrawals**

- Example :

x	f(x)	prob ($x \geq x_i$)
70	0.1	
80	0.1	
90	0.1	
100	0.1	
110	0.1	
120	0.1	
130	0.1	
140	0.1	
150	0.1	
160	0.1	

4 Interest Rate Risk Management

- Most of a bank's income comes from interest paid from loan repayment.
- Most of a bank's expense comes from interest paid to depositors.
- A change in the interest rate affects the bank's income, expenses, profit or loss, financial position (value of asset and liabilities)
- The bank is facing with the interest rate risk.
- How a change in the interest rate affect a bank's financial position and performance?
- Both sides of the bank's balance sheets are debt instruments.
- However, on the asset side, most are long-term debt instruments (loans). On the liabilities side, most are short-term debt instruments(deposits).
- A change in the interest rate may affect the bank's income and the bank's expense at different rates.
- A change in the interest rate can bring about a decrease in a bank's profit or a fall in a bank's net worth.

4.1 Gap Analysis

Bangkok Bank Plc. (million Baht)

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**	**.....**

- GAP = rate-sensitive assets – rate-sensitive liabilities = ... − ..... =..... million Baht
- When i ↑ 5%:

1. Δ Income on assets = ...×..... = ...
2. Δ Costs of liabilities = ...×..... = ...
3. $$\begin{aligned} \Delta Profits &= \text{.....} = \text{.....} \\ &= 5\% \times (\text{.....} - \text{.....}) = \\ &= 5\% \times \text{GAP} \end{aligned}$$

- $\Delta\text{Profit} = \Delta i \times \text{GAP}$
- Hence, when Gap is negative, the bank's net worth would decrease when interest rate .....
- When GAP is positive, the bank's net worth would decrease when interest rate .....
- **Gap is negative**
- Variable Rate Asset .... Variable Rate liabilities
  interest rate ↑
  income on assets..... ..... costs of liabilities.....
  Profits .....
- **Gap is positive**
- Variable Rate Asset .... Variable Rate liabilities
  interest rate ↓
  income on assets..... ..... costs of liabilities.....
  Profits .....

4.2 Duration Analysis

Bangkok Bank Plc.

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

- Suppose that modified duration of bank assets = 3 , modified duration of liabilities = 2 . The interest rate is expected to fall by 5%.
- %Δ value = $\Delta i \times$ Modified Duration
- $i \uparrow$, value $\downarrow$
- % Δ assets = ...
- %Δ liabilities = ...
- Δ net worth = ...
- Strategies to Manage Interest-rate Risk
    1. Rearrange balance-sheet
    2. Use financial derivatives

5 Credit Risk Management

- What will happen if there is a default?

Bangkok Bank Plc.

Assets		Liabilities and Equities	
Reserves	20	checkable deposits	100
Loans	80	bank capital	10
Securities	10		

- Suppose that the bank find that 20 M.Baht of their loans become worthless.

Bangkok Bank Plc.

Assets	Liabilities and Equities
Reserves	checkable deposits
Loans	bank capital
Securities	

- Banks try to find borrowers who will pay high interest rates and unlikely to default on their loans.
- It is very difficult to predict the riskiness of each borrower because of the asymmetric information problem
- adverse selection :
  - the bank should charge high(low) interest rate to high(low) risk customers
  - screening, credit analysis, long-term customer relationship
  - if the bank cannot separate high risk from low risk customers, it cannot price its financial products correctly
  - then, the bank will make a loss on its lending business
- moral hazard : monitoring, collateral requirement
- Banks are in a better position than individual savers. They can analyse credit risk better than individual savers. (Topic 6)
- How to design a loan contract that reduces moral hazard behaviour? (Topic 7)

6 Capital Adequacy Management

- What will happen if there is a default?

Bangkok Bank Plc.

Assets		Liabilities and Equities	
Reserves	20	checkable deposits	100
Loans	80	bank capital	10
Securities	10		

- Suppose that the bank find that 5 M.Baht of their loans become worthless.

Bangkok Bank Plc.

Assets	Liabilities and Equities
Reserves	checkable deposits
Loans	bank capital
Securities	

- If the bank has held only 4 M.Baht capital, what will happen?

Bangkok Bank Plc.

Assets		Liabilities and Equities	
Reserves	20	checkable deposits	106
Loans	80	bank capital	4
Securities	10		

- Suppose that the bank find that 5 M.Baht of their loans become worthless.

Bangkok Bank Plc.

Assets	Liabilities and Equities
Reserves	checkable deposits
Loans	bank capital
Securities	

- The bank would fail. It does not have enough asset to pay back its liability

- A bank maintains bank capital to lessen the chance that it will become insolvent.
- Why don't hold a large amount of capital?
- Large equilty capital $\rightarrow$ lower return on equity for the bank's shareholders
- Returns on assets: $ROA = \dfrac{\text{net profit after taxes}}{\text{assets}}$
- Returns on equity: $ROE = \dfrac{\text{net profit after taxes}}{\text{equity}}$
- Equity multiplier: $EM = \dfrac{\text{assets}}{\text{equity}}$
- $ROE = ROA \times EM$
- As equity $\uparrow$, ROE .....
- "limited liability"$\rightarrow$ shareholders of the bank want to hold minimum amount of equity capital
- Bank equity capital is important to prevent banks from the risk of failures.
- Regulators has to set "minimum capital adequacy regulations" ; as suggested by BIS

Bank of Thailand
FI_CB_001_S5 : All Commercial Banks' Assets and Liabilities
Unit : Millions of Baht

	JUN 2019 r	DEC 2019 r
Assets		
1. Cash	255,136	304,662
2. Interbank and money market items, net	2,399,919	2,628,477
3. Claims on securities	22,943	76,962
4. Derivatives assets	497,423	500,669
5. Investments - net	2,787,553	2,843,466
6. Investments in subsidiaries and associates, net	172,441	331,651
7. Loans to customers, net	12,679,091	12,800,536
8. Customers' liabilities under acceptances	1,612	884
9. Properites foreclosed, net	93,181	95,395
10. Premises and equipment, net	212,824	212,861
11. Goodwill and other intangible assets, net	67,543	70,135
12. Deferred tax assets	17,027	25,189
13. Other assets, net	210,572	203,979
Total Assets	**19,417,265**	**20,094,865**
Liabilities and Equities / Equity of Head Office and Other Branches comprising		
Liabilities		
14. Deposits	13,625,069	14,030,881
15. Interbank and money market items, net	1,242,677	1,258,391
16. Liabilities payable on demand	91,043	64,373
17. Liabilities to deliver securities	23,256	76,962
18. Financial liabilities designated at fair value through profit or loss	54,910	45,561
19. Derivatives liabilities	478,387	478,685
20. Debt issued and Borrowings	724,773	749,649
21. Bank's liabilities under acceptances	1,612	884
22. Provision	84,696	94,330
23. Deferred tax liabitities	4,305	5,359
24. Other liabilities	373,580	397,621
25. Shareholders' Equity	**2,173,410**	**2,371,624**
26. Head office and other branches of the same Juristic person's Entity	539,547	520,546
Liabilities and Equities / Equity of Head Office	**19,417,265**	**20,094,865**
No. of banks	30	30

Bank of Thailand : FI_CB_040_S4 : All Commercial Banks' Income and Expense
Unit : Millions of Baht

	H1/2019	H2/2019 p
1. Interest income	**378,496**	**375,973**
1.1 Loans	290,740	288,912
1.2 Transactions with financial institutions and money market	23,440	19,905
1.3 Hire purchase and Financial leasing	38,193	39,837
1.4 Investments	25,763	26,711
1.5 Others	358	609
2. Interest expenses	**124,176**	**126,286**
2.1. Deposits	66,357	69,521
2.2 Transactions with financial institutions and money market	13,154	11,000
2.3 Debt issued and Borrowings	12,543	13,085
2.4 Fees from the borrowings	38	76
2.5 Premium to deposit insurance	31,693	32,137
2.6 Others	392	468
3. Fees and service income	97,444	103,040
4. Fees and service expenses	26,498	27,814
5. Gains (Losses) on tradings and foreign exchange transactions	29,286	26,456
6. Gains (Losses) on financial instrument designated at fair value throuth profit or (loss) Fair value option	-3,424	-2,635
7. Gains (Losses) on investments	11,162	111,680
8. Share of profit (loss) from investment for using equity method	0	0
9. Others operation incomes	29,454	19,291
10. Other operatiing expenses	182,159	195,329
Number of employees	150,563	150,468
Number of directors	203	203
11. Impairment loss of loans and debt securities	67,505	95,028
12. Profit (loss) before income tax and extraordinary items	142,080	189,347
13. Income tax	24,167	36,381
14. Net profit (loss)	117,914	152,967
No. of banks	30	30