

## Chapter Twenty Two

### Risk Management in Financial Institutions

## Managing Credit Risk

- The risk arising from the possibility that the borrower will default
- Adverse selection and moral hazard

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## Solving Asymmetric Information Problems

1. Screening
  - Screen out the bad credit risks from the good ones
  - Credit score + judgment by loan officer
  - Specialize in lending, a tradeoff between diversification and information collection
2. Monitoring and enforcement of restrictive covenants
  - See whether borrowers are complying with the restrictive covenants

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## Solving Asymmetric Info. Problems (cont)

3. Establish long-term customer relationships
  - Help screening and monitoring
  - Reduce borrowers' incentive to take on risky activities
4. Loan commitment arrangements
  - Bank's commitment to provide loans up to a given amount at a fixed interest rate
5. Collateral and compensating balances
6. Credit rationing
  - Lenders refuse to make loans of any amount *or* make a loan but restricts the size of loan

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## Managing Interest-Rate Risk

First National Bank			
Assets		Liabilities	
Reserves and cash items	\$5 million	Checkable deposits	\$15 million
Securities		Money market deposit accounts	\$5 million
Less than 1 year	\$5 million	Savings deposits	\$15 million
1 to 2 years	\$5 million	CDs	
Greater than 2 years	\$10 million	Variable-rate	\$10 million
Residential mortgages		Less than 1 year	\$15 million
Variable-rate	\$10 million	1 to 2 years	\$5 million
Fixed-rate (30-year)	\$10 million	Greater than 2 years	\$5 million
Commercial loans		Fed funds	\$5 million
Less than 1 year	\$15 million	Borrowings	
1 to 2 years	\$10 million	Less than 1 year	\$10 million
Greater than 2 years	\$25 million	1 to 2 years	\$5 million
Physical capital	\$5 million	Greater than 2 years	\$5 million
		Bank capital	\$5 million
Total	\$100 million	Total	\$100 million

Risk Management Association home page  
<http://www.rmba.org>

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## Income Gap Analysis

$$\begin{aligned}
 \text{Rate-Sensitive Assets (RSA)} &= \$5\text{m} + \$10\text{m} + \$15\text{m} + 20\% \times \$20\text{m} \\
 &= \$32\text{m} \\
 \text{Rate-Sensitive Liabs (RSL)} &= \$5\text{m} + \$25\text{m} + \$5\text{m} + \$10\text{m} + 10\% \times \$15\text{m} + 20\% \times \$15\text{m} \\
 &= \$49.5\text{m} \\
 i \uparrow 5\% \Rightarrow & \\
 \text{Asset Income} &= +5\% \times \$32.0\text{m} = +\$1.6\text{m} \\
 \text{Liability Costs} &= +5\% \times \$49.5\text{m} = +\$2.5\text{m} \\
 \text{Income} &= \$1.6\text{m} - \$2.5 = -\$0.9\text{m} \\
 \text{IF } RSL > RSA, i \uparrow \text{NIM} \downarrow, \text{Income} \downarrow & \\
 \text{GAP} &= \text{RSA} - \text{RSL} \\
 &= \$32.0\text{m} - \$49.5\text{m} = -\$17.5\text{m} \\
 \text{Income} &= \text{GAP} \times i \\
 &= -\$17.5\text{m} \times 5\% = -\$0.9\text{m}
 \end{aligned}$$

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**TABLE 1** Duration of the First National Bank's Assets and Liabilities

	Amount (\$ millions)	Duration (years)	Weighted Duration (years)
<b>Assets</b>			
Reserves and cash items	5	0.0	0.00
Securities			
Less than 1 year	5	0.4	0.02
Greater than 1 year	5	1.6	0.08
Greater than 2 years	10	7.0	0.70
Residential mortgages			
Variable-rate	10	0.5	0.05
Fixed-rate (30-year)	10	6.0	0.60
Commercial loans			
Less than 1 year	15	0.7	0.11
1 to 2 years	10	1.4	0.14
Greater than 2 years	25	4.0	1.00
Physical capital	5	0.0	0.00
<i>Average duration</i>			2.70
<b>Liabilities</b>			
Checkable deposits	15	2.0	0.32
Money market deposit accounts	5	0.1	0.01
Savings deposits	15	1.0	0.16
CDs			
Variable-rate	10	0.5	0.05
Less than 1 year	15	0.2	0.03
1 to 2 years	5	1.2	0.06
Greater than 2 years	5	2.7	0.14
Fed funds	5	0.0	0.00
Borrowings			
Less than 1 year	10	0.3	0.03
1 to 2 years	5	1.3	0.07
Greater than 2 years	5	5.1	0.16
<i>Average duration</i>			1.03

## Duration Gap Analysis

$\% \Delta P \approx -DUR \times \Delta i / (1 + i)$   
 $i \uparrow 5\%$ , from 10% to 15%  $\Rightarrow$

$\Delta \text{Asset Value} = \% \Delta P \times \text{Assets}$   
 $= -2.7 \times .05 / (1 + .10) \times \$100\text{m}$   
 $= -\$12.3\text{m}$

$\Delta \text{Liability Value} = \% \Delta P \times \text{Liabilities}$   
 $= -1.03 \times .05 / (1 + .10) \times \$95\text{m}$   
 $= -\$4.5\text{m}$

$\Delta \text{NW} = -\$12.3\text{m} - (-\$4.5\text{m}) = -\$7.8\text{m}$

$DUR_{gap} = DUR_a - [L/A \times DUR_l]$   
 $= 2.7 - [(95/100) \times 1.03]$   
 $= 1.72$

$\% \Delta \text{NW} = -DUR_{gap} \times \Delta i / (1 + i)$   
 $= -1.72 \times .05 / (1 + .10)$   
 $= -.078 = -7.8\%$

$\Delta \text{NW} = -.078 \times \$100\text{m}$   
 $= -\$7.8\text{m}$

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## Example of Finance Company

Friendly Finance Company			
Assets		Liabilities	
Cash and deposits	\$3 million	Commercial paper	\$40 million
Securities		Bank loans	
Less than 1 year	\$5 million	Less than 1 year	\$3 million
1 to 2 years	\$1 million	1 to 2 years	\$2 million
Greater than 2 years	\$1 million	Greater than 2 years	\$5 million
Consumer loans		Long-term bonds and other long-term debt	\$40 million
Less than 1 year	\$50 million	Capital	\$10 million
1 to 2 years	\$20 million		
Greater than 2 years	\$15 million		
Physical capital	\$5 million		
<b>Total</b>	<b>\$100 million</b>	<b>Total</b>	<b>\$100 million</b>

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**TABLE 2** Duration of the Friendly Finance Company's Assets and Liabilities

	Amount (\$ millions)	Duration (years)	Weighted Duration (years)
<b>Assets</b>			
Cash and deposits	3	0.0	0.00
Securities			
Less than 1 year	5	0.5	0.05
1 to 2 years	1	1.7	0.02
Greater than 2 years	1	9.0	0.09
Consumer loans			
Less than 1 year	50	0.5	0.25
1 to 2 years	20	1.5	0.30
Greater than 2 years	15	3.0	0.45
Physical capital	5	0.0	0.00
<i>Average duration</i>			1.16
<b>Liabilities</b>			
Commercial paper	40	0.2	0.09
Bank loans			
Less than 1 year	3	0.3	0.01
1 to 2 years	2	1.6	0.04
Greater than 2 years	5	3.5	0.19
Long-term bonds and other long-term debt	40	5.5	2.44
<i>Average duration</i>			2.77

## Gap and Duration Analysis

If  $i \uparrow 5\%$

**Gap Analysis**

$GAP = RSA - RSL = \$55\text{m} - \$43\text{m} = \$12\text{million}$   
 $\Delta \text{Income} = GAP \times \Delta i = \$12\text{m} \times 5\% = \$0.6\text{million}$

**Duration Gap Analysis**

$DUR_{gap} = DUR_a - [L/A \times DUR_l]$   
 $= 1.16 - [90/100 \times 2.77] = -1.33\text{ years}$

$\% \Delta \text{NW} = -DUR_{gap} \times \Delta i / (1 + i)$   
 $= -(-1.33) \times .05 / (1 + .10)$   
 $= .061 = 6.1\%$

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## Managing Interest-Rate Risk

- Problems with GAP Analysis
  - Assumes slope of yield curve unchanged and flat
  - Manager estimates % of fixed rate assets and liabilities that are rate sensitive

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## Managing Interest-Rate Risk

- Strategies for Managing Interest-Rate Risk
  - In example above, shorten duration of bank assets or lengthen duration of bank liabilities
  - To completely immunize net worth from interest-rate risk, set  $DUR_{gap} = 0$

$$\text{Reduce } DUR_a = 0.98 \Rightarrow DUR_{gap} = 0.98 - [(95/100) \times 1.03] = 0$$

$$\text{Raise } DUR_l = 2.80 \Rightarrow DUR_{gap} = 2.7 - [(95/100) \times 2.80] = 0$$