

# AFIN8003 - Workshop 4

## Banking and Financial Intermediation

Dr. Mingze Gao

2024-08-14

### 1 Recap

1. What is interest rate risk for banks and what are the primary sources of interest rate risk?
2. How does interest rate risk impact a bank's balance sheet and income statement?
3. What is maturity gap and how does it affect a bank's exposure to interest rate risk?
4. What are the key models used by banks to measure interest rate risk?
5. How do Basel III guidelines address the issue of interest rate risk?

### 2 MCQ - Repricing model

1. Because of its simplicity, the Australian Prudential Regulation Authority (APRA) requires smaller ADIs to use \_\_\_\_\_ as their primary measure of interest rate risk.
  - ☐ the maturity model
  - ☐ the repricing model
  - ☐ the duration model
  - ☐ the option pricing model
2. The difference between the dollar amount of assets whose interest rates will change and the dollar amount of liabilities whose interest rates will change when market rates change in some given time window is:
  - ☐ rate-sensitive assets
  - ☐ the repricing gap
  - ☐ rate-sensitive liabilities
  - ☐ the duration gap
3. A positive gap implies that a decrease in interest rates will cause \_\_\_\_\_ in net interest income
  - ☐ decrease
  - ☐ increase
  - ☐ no change
  - ☐ an uncertain change
4. Mingze Bank has a repricing gap of -\$400 million. Interest rates are expected to increase by 1 per cent. What will be the impact on the bank's net interest income (NII)?
  - ☐ 4 million
  - ☐ 2 million
  - ☐ -2 million
  - ☐ -4 million
5. An FI operating with a negative gap implies that management expects interest rates
  - ☐ to decrease

- ☐ to increase
  - ☐ to not change
  - ☐ to have an uncertain change
6. Ignoring information regarding the distribution of assets and liabilities within buckets when defining buckets over a range of maturities is the problem of:
- ☐ runoff
  - ☐ ignoring cash flows from off-balance-sheet activities
  - ☐ over-aggregation
  - ☐ market value effects
7. The repricing model:
- ☐ implicitly assumes book value accounting
  - ☐ is over-aggregative
  - ☐ ignores the problem of runoffs
  - ☐ All of the listed options are correct.

### 3 MCQ - Duration model

1. A measure of the weighted-average time to maturity on an asset using the relative present values of the cash flows as weights is:
- ☐ average maturity
  - ☐ duration
  - ☐ the Monte Carlo simulation
  - ☐ the funding gap
2. An FI has invested in a five-year, zero-coupon bond that is selling to yield 6 per cent. What is the duration of this bond?
- ☐ less than 5 years
  - ☐ more than 5 years
  - ☐ exactly 5 years
  - ☐ less than 5 years only if using semi-annual compounding
3. An FI has invested \$400 in an asset with a duration of 2 years and \$600 in an asset with a duration of 4 years. What is the duration of the total assets?
- ☐ 3 years
  - ☐ 0.8 years
  - ☐ 2.4 years
  - ☐ 3.2 years
4. Duration increases with the maturity of a fixed-income asset:
- ☐ at a decreasing rate
  - ☐ at a constant rate
  - ☐ at an increasing rate
  - ☐ and can become infinite
5. The higher the coupon or promised interest payment is on a fixed-income asset:
- ☐ the higher the duration
  - ☐ the more likely it is that impact on duration cannot be determined
  - ☐ the lower the duration
  - ☐ the more likely it is that the duration will eventually become negative
6. If interest rate shocks leave the value of an FI's equity unaffected, then:

- ☐ the duration of its assets must equal the duration of its liabilities
  - ☐ its duration gap must be positive
  - ☐ its leverage adjusted duration gap must be positive
  - ☐ its leverage adjusted duration gap must be zero
7. The effect of interest rate changes on the market value of an FI's equity is determined by:
- ☐ the size of the interest rate shock
  - ☐ the size of the FI
  - ☐ the leverage adjusted duration gap
  - ☐ All of the listed options are correct.
8. In order for an FI manager to immunise the net worth ratio against interest rate shocks, then the:
- ☐ duration of assets must equal the duration of liabilities
  - ☐ duration gap must be positive
  - ☐ leverage adjusted duration gap must be positive
  - ☐ leverage adjusted duration gap must be zero
9. The duration model:
- ☐ underestimates price decreases
  - ☐ overestimates price increases
  - ☐ is more accurate for large interest rate changes because of its price–yield convexity assumption
  - ☐ is less accurate for large interest rate changes because of its price–yield linearity assumption
10. The larger the duration for an asset or liability:
- ☐ the higher the return on the asset
  - ☐ the lower the interest cost of the liability
  - ☐ the higher the interest rate sensitivity of that asset or liability
  - ☐ the lower the interest rate sensitivity of that asset or liability
11. Which of the following assets or liabilities fit the one-year rate or repricing sensitivity test?
- ☐ 91-day treasury notes
  - ☐ One-year treasury bonds
  - ☐ 20-year treasury bonds
  - ☐ 20-year floating-rate corporate bonds with annual repricing
  - ☐ 30-year floating-rate mortgages with annual repricing
  - ☐ 30-year floating-rate mortgages with biannual repricing
  - ☐ overnight interbank funds
  - ☐ nine-month fixed-rate term deposits
  - ☐ one-year fixed rate term deposits
  - ☐ five-year floating-rate corporate bonds with annual repricing
  - ☐ common equity

## 4 Short answer questions

### 4.1 Q1 - Repricing gap

A bank manager is quite certain that interest rates are going to fall within the next six months. How should the bank manager adjust the bank's six-month repricing gap and spread to take advantage of this anticipated rise? What if the manager believes rates will rise in the next six months?

### 4.2 Q2 - Repricing model

Consider the following balance sheet for Mingze Bank (in millions):

Assets	\$	Liabilities and equity	\$
Floating-rate mortgages (currently 10% annually)	50	1-year term deposits (currently 6% annually)	70
30-year fixed-rate loans (currently 7% annually)	50	3-year term deposits (currently 7% annually)	20
		<b>Equity</b>	10
<b>Total assets</b>	100	<b>Total liabilities and equity</b>	100

- What is Mingze Bank's expected net interest income at year-end?
- What will net interest income be at year-end if interest rates rise by 2 per cent?
- Using the cumulative repricing gap model, what is the expected net interest income for a 2 per cent increase in interest rates?
- What will net interest income be at year-end if interest rates on RSAs increase by 2 per cent but interest rates on RSLs increase by 1 percent? Is it reasonable for changes in interest rates on RSAs and RSLs to differ? Why?

### 4.3 Q3 - Duration model

The following balance sheet information is available (amounts in thousands of dollars and duration in years) for a financial institution:

Item	Amount	Duration
T-notes	\$90	0.50
T-notes	\$55	0.90
T-notes (5 year)	\$176	4.3931
Loans	\$2724	7.00
Deposits	\$2092	1.00
Interbank borrowings	\$238	0.01
Equity	\$715	

- What is the average duration of all the assets?
- What is the average duration of all the liabilities?
- What is the leverage adjusted duration gap? What is the interest rate risk exposure?
- What is the forecasted impact on the market value of equity caused by a relative upward shift in the entire yield curve of 0.5 percent? That is,  $\frac{\Delta R}{1+R} = 0.0050$ .
- What variables are available to the financial institution to immunize the balance sheet? How much would each variable need to change to get duration gap equal to 0?

## 5 Extra

### Note

This is a somewhat challenging question. Please take time to work it through.

Two banks are being examined by regulators to determine the interest rate sensitivity of their balance sheets. Bank A has assets composed solely of a 10-year \$1 million loan with a coupon rate and yield of 12 per cent. The loan is financed with a 10-year \$1 million CD with a coupon rate and yield of 10 per cent. Bank B has assets composed solely of a 7-year, 12 per cent zero-coupon bond with a current (market) value of \$894 006.20 and a maturity (principal) value of \$1 976 362.88. The bond is financed with a 10-year, 8.275 per cent coupon \$1 000 000 face value CD with a yield to maturity of 10 per cent. The loan and the CDs pay interest annually, with principal due at maturity.

- (a) If market interest rates increase 1 per cent (100 basis points), how do the market values of the assets and liabilities of each bank change? That is, what will be the net effect on the market value of the equity for each bank?
- (b) What accounts for the differences in the changes in the market value of equity between the two banks?
- (c) Verify your results above by calculating the duration for the assets and liabilities of each bank, and estimate the changes in value for the expected change in interest rates. Summarize your results.