

AFIN8003 - Workshop 4

Banking and Financial Intermediation

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! Workshop 4: Interest rate risk in action

Last week you saved AdriaBank from the capital review. This week the bank faces a different enemy: the RBA's next move.

Plan for the hour:

1. **Part A: Concept check** (about 10 min). Six quick questions. Self-mark.
2. **Part B: The ALCO Game** (about 35 min). A three-round rate-shock simulation. *This is the bulk of the workshop.*
3. **Part C: The big question** (about 10 min). Open discussion.
4. **Part D: Take-home practice set.** The full drill: more MCQs, short answers, and one challenge question. Do these before next week; worked answers are released with the solutions version.

Bring a pen and a calculator.

Part A: Concept check

Six questions, about 90 seconds each. Mark your own as we go.

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. AFIN 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 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
6. 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

Part B: The ALCO Game

! AdriaBank: six months later

AdriaBank survived the APRA capital review. The dividend was cancelled, the CEO is still grumpy, and you have all been promoted to the **Asset-Liability Committee (ALCO)**.

It is the day before the RBA's rate decision, and the market is split: some economists expect emergency hikes, others expect cuts. The Board wants to know one thing: *are we positioned to survive whatever happens?*

How the game works. Three rounds. In Round 1 you diagnose the bank's position. In Round 2 your team commits to ONE strategy, in writing, before anything is revealed. In Round 3 the instructor rolls a die to determine the RBA's move, and every team computes its own profit or loss. Highest score wins. Bragging rights (and a hypothetical bonus) are at stake.

AdriaBank's balance sheet (the day before the decision)

Assets (\$m)	Duration (yrs)		Liabilities & Equity (\$m)	Duration (yrs)	
Cash and ES balances	50	0	At-call online savings (rate moves with cash rate)	250	0.1
(non-interest-bearing) 3-month Treasury notes	100	0.25	6-month term deposits	130	0.5
Variable-rate mortgages (repriced quarterly)	150	0.25	2-year term deposits	100	1.9
5-year fixed-rate business loans	250	4.0	5-year senior notes	150	4.2
10-year fixed-rate Treasury bonds	150	7.0	Equity	70	
Total assets	700		Total L&E	700	

The current level of interest rates is $R = 5\%$.

Round 1: Read the position (10 min)

Work through these as a team. Every later step depends on them.

(a) The **one-year repricing gap**. Which items are rate-sensitive within one year? Compute $GAP = RSA - RSL$.

$RSA =$ _____ $RSL =$ _____ $GAP =$ _____

(b) The **duration of assets** D_A and **duration of liabilities** D_L (weighted averages).

$D_A =$ _____ $D_L =$ _____

(c) The **leverage-adjusted duration gap** $= D_A - D_L \times k$ where $k = L/A$.

$k =$ _____ Duration gap = _____

(d) Diagnosis, in one sentence: which direction of rate moves hurts AdriaBank, and through which channel?

Round 2: Commit to a strategy (10 min)

The ALCO must choose exactly **one** of the following before the RBA announcement. Annual costs are quoted by the treasury desk. Write down your choice and one sentence of justification. **No changing after the roll.**

#	Strategy	Effect on the position	Annual cost (\$m)
(a)	Do nothing.	Repricing gap −130; duration gap 1.72	0
(b)	Shorten assets. Sell \$100m of the 10-year Treasury bonds, buy 3-month Treasury notes.	Repricing gap −30; duration gap 0.75	0.5
(c)	Term out funding. Replace \$100m of at-call savings with new 5-year senior notes.	Repricing gap −30; duration gap 1.13	1.0
(d)	Hedge with swaps. Pay-fixed/receive-floating package quoted by the swap desk.	Repricing gap −30; duration gap 0.50	0.75

On strategy (d): how a swap changes the gaps is Week 5+ material. Today, trust the desk's quote. The other rows you can verify yourself with the Round 1 formulas (try it for strategy (b) if your team finishes early).

Our strategy: _____ **Because:**

Round 3: The RBA decides (10 min)

The instructor rolls a six-sided die:

Roll	Scenario	ΔR
1 or 2	Inflation shock: emergency hikes	+2%
3 or 4	On hold	0%
5	Gentle easing	−1%
6	Recession: crisis cuts	−2%

Every team now computes its **score** under the realised scenario:

$$\text{Score} = \underbrace{-\text{Duration gap} \times 700 \times \frac{\Delta R}{1.05}}_{\Delta E \text{ (equity value)}} + \frac{\text{GAP} \times \Delta R}{\Delta NII \text{ (one year)}} - \text{Strategy cost}$$

A deliberate simplification: the score adds a change in *market value* (ΔE) to a one-year *flow* (ΔNII). Strictly, these overlap: this year's net interest income is part of what the market value already capitalises. We add them so that both models stay visible in a single number. A real ALCO reports ΔEVE and ΔNII side by side and never sums them, which is exactly what the Basel IRRBB standards require (see lecture).

Our score: _____ (\$m)

Report your score for the class scoreboard. Highest score wins the round.

Part C: The big question

i Discuss together for the last 10 minutes

AdriaBank's at-call savings reprice the moment the cash rate moves. A major bank's transaction deposits mostly do not; they pay near zero regardless.

Who has more interest rate risk? Before you answer "AdriaBank": SVB's deposits didn't reprice either. They *left*. Is "my deposit rate never changes" the same as "my funding is safe when rates change"? Connect to the deposit franchise research note from the lecture.

Part D: Take-home practice set

These consolidate the mechanics. Attempt them before next week's workshop; the answers version will be released on iLearn.

MCQ

1. 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
2. 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
3. The repricing model:
 - ☐ implicitly assumes book value accounting
 - ☐ is over-aggregative
 - ☐ ignores the problem of runoffs
 - ☐ All of the listed options are correct.
4. 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
5. Other things equal, 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. 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

9. 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
- ☐ 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

Short answer questions

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 fall? What if the manager believes rates will rise in the next six months?

Repricing model

Consider the following balance sheet for AFIN 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
		Equity	10
Total assets	100	Total liabilities and equity	100

- (a) What is AFIN Bank's expected net interest income at year-end?
- (b) What will net interest income be at year-end if interest rates rise by 2 per cent?
- (c) Using the cumulative repricing gap model, what is the expected net interest income for a 2 per cent increase in interest rates?
- (d) 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?

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

Item	Amount	Duration
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?

Challenge question

i 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.

- 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?
- What accounts for the differences in the changes in the market value of equity between the two banks?
- 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.