

NOVA SCHOOL OF BUSINESS & ECONOMICS

Interest rate risk

2206 - Banking | 2025S2 | Session 8 | Carla Rebelo

Newsflow lounge









Wellfleet case

Questions & Group distribution

1. Explain Wellfleet strategy and the fit to the risk management process. Do you think it is appropriate?

2. What are the special challenges posed by mega-loans? Should the bank get involved in these loans? What are the pros and the cons of entering that activity? How can the bank mitigate the associate risks?

3. How does Wellfleet manage its credit risk? Explain the credit approval process. What are its advantages and disadvantages?

4. Compute the economic profit of the proposed Gatwick Gold loan.

5. Would you approve the loan? Explain your reasoning.





Credit Risk Why is it important?

Lloyds Bank axes risk staff after executives complain they are a 'blocker'

Lender 'having to say goodbye' to employees as part of effort to 'move at greater pace'



Source: Financial Times, April 10, 2024

Exam suggestion:

Write a short summary on:
the nature of the problem at stake,
The role the Risk unit plays in the
Bank's governance model
The plus and minus of such a
decision





Interest rate Risk



- A bank bears interest rate risk when it performs a maturity transformation function, meaning assets and liabilities have different maturities.
- A short-funded bank, with shorter maturity liabilities than assets, bears a refinancing risk.
- A long-funded banks incurs reinvestment risk.



Interest rate Risk Disclaimer!

Interest rate risk should not be confused with Market risk - even if market prices tend to move because of changes in interest rates

Market risk







Trading Book:

- Consists of positions in financial instruments and commodities held for trading or to hedge other elements of the trading portfolio;
- Positions must be valued frequently and the portfolio should be actively managed;
- Instruments must be negotiated without difficulty;
- Instruments must be completely covered.

Segregation between Trading and Banking books is meant to avoid regulatory arbitrage given diferent approaches for calculating capital requirements



Interest rate risk Impact channels



- Net Interest Income => Earnings @ risk
- Net worth => Economic value of the bank

Interest Rate risk in the Banking book The current or prospective risk to both earnings and capital, in respect of the banking book only, arising from adverse movements in interest rates.



Interest rate risk An introduction to Euribor

Euribor

Euribor is short for Euro Interbank Offered Rate. The Euribor rates are based on the average interest rates at which a large panel of European banks borrow funds from one another. There are different maturities, ranging from one week to one year.

| 4/4/2025 | |
|-------------------|---------|
| Euribor 1 week | 2.414 % |
| Euribor 1 month | 2.341 % |
| Euribor 3 months | 2.323 % |
| Euribor 6 months | 2.259 % |
| Euribor 12 months | 2.235 % |

Euribor® and Eonia® are registered trademarks of EMMI a.i.s.b.l.

The Euribor rates are considered to be the most important reference rates in the European money market. The interest rates do provide the basis for the price and interest rates of all kinds of financial products like interest rate swaps, interest rate futures, saving accounts and mortgages. That's the exact reason why many professionals as well as individuals do monitor the development of the Euribor rates intensively.

In total, there are 5 different Euribor rates (until November 1st 2013 there were 15 Euribor rates). See current Euribor rates for an overview of all rates. Next to that there is also a 1-day European interbank interest rate called ESTER. On this site you will find lots of information about Euribor and the different Euribor rates. We do offer background information, the current Euribor rates as well as historical data.

Furthermore, we do offer information about the ECB interest rate, also called main refinancing rate or minimum bid rate, as well.









Repricing risk Refinancing risk





Interest rate risk Sub-components - methods

| Component | Method | Focus |
|------------------|--|---|
| Repricing risk | Gap analysis | The volume of mismatches in different time bands |
| Yield curve risk | Gap analysis, partial durations | The dispersion and concentration of mismatches in different time bands |
| Basis risk | Inventory of instrument groups based on different interest rates | Use of derivatives and other hedging instruments in terms of different bases, convexity and timing difference neglected by gap analysis |
| Option risk | Inventory of all instruments with embedded options | The volume of mortgages, current accounts, savings and deposits where the customer has the option to deviate from the contractual maturity |



Repricing Gap model

Every asset / liability is classified by its sensitivity to interest rate changes in a given period (the gap period):

Sensitive Assets (SA) Sensitive Liabilities (SL)

will mature or be repriced during the gap period

Non Sensitive Assets (NSA) Non Sensitive Liabilities (NSL)

will not be repriced during the gap period.

- For a 6 month gap period:
 - A 30-yr maturity mortgage loan indexed to 3-month Euribor is a Sensitive Asset
 - A 1-year term deposit is a Non Sensitive Liability (... well, not so fast!);
 - Premises are Non Sensitive Assets (we consider a 0% rate for margin calculation).







Interest rate fluctuations only impact on Sensitive Assets and Liabilities



Maturity ladder An example

(cumulative values per period)

| | overnight | 1 week | 1 month | 3 months |
|-------------------------------------|-----------|--------|---------|----------|
| Cash inflows (loan repayments) | 50 | 300 | 2 000 | 10 000 |
| Cash outflows (deposit withdrawals) | 30 | 450 | 2 250 | 16 000 |
| Net funding requirements | -20 | 150 | 250 | 6 000 |
| Changes in liquid assets (-) | 15 | -100 | -100 | 200 |
| Changes in purchased liquidity | -5 | 50 | 150 | -800 |
| Changes in stable funding | 0 | 0 | 0 | 7 000 |
| Funding requirements coverage | -20 | 150 | 250 | 6 000 |

REMINDER

From session 3

on liquidity

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Repricing Gap Example 1

| Period | SA | SL | Marginal Gap | Cumulative Gap |
|--------------------|-------|-----|--------------|----------------|
| 0 to 1 month | 200 | 60 | 140 | 140 |
| 1 to 3 months | 30 | 200 | -170 | -30 |
| 3 to 6 months | 200 | 80 | 120 | 90 |
| 6 to 12 months | 70 | 160 | -90 | 0 |
| 1 to 5 years | 170 | 180 | -10 | -10 |
| 5 to 10 years | 200 | 120 | 80 | 70 |
| More than 10 years | 130 | 80 | 50 | 120 |
| Total | 1 000 | 880 | | |

 In the bucket 0 to 1 months, there are 200M assets which will see their interest rate changed and only 60M liabilities which will also be repriced.

This implies the Bank will have a 140M positive gap being repriced in the 0-1 mth period₁₇



Repricing Gap Example 2

| Period | SA | SL | Marginal Gap | Cumulative Gap |
|--------------------|-------|-----|--------------|----------------|
| 0 to 1 month | 200 | 60 | 140 | 140 |
| 1 to 3 months | 30 | 200 | -170 | -30 |
| 3 to 6 months | 200 | 80 | 120 | 90 |
| 6 to 12 months | 70 | 160 | -90 | 0 |
| 1 to 5 years | 170 | 180 | -10 | -10 |
| 5 to 10 years | 200 | 120 | 80 | 70 |
| More than 10 years | 130 | 80 | 50 | 120 |
| Total | 1 000 | 880 | | |

 In the bucket 1 to 3 months, there are 30M assets which will see their interest rate changed and 200M liabilities which will also be repriced.
 This implies the Bank will have a 170M negative gap being repriced in the 1-3 mth period, or a cumulative negative gap of 30M in the 0-3 months period.



Repricing Gap Drivers





Asset & Liability Management The heart of a bank

 give guidance to the bank in the short term in order to achieve long term goals.

Objectives

 deals with the management of assets, liabilities and capital each one per se but also integrating the three categories.

- For assets and liabilities:
- the price rate (return or cost);
- volume;
- mix;
- volatility of rate, volume and mix

Scope

- For integrated management:
- liquidity gaps for each time period;
- maturity imbalances;
- repricing;
- duration gaps



Asset & Liability Management Step by step

Measurement

 We need accounting information of rates and volumes so that we can calculate gaps.

Key assumptions We need a base scenario for interest rates on assets and liabilities, exchange rates, prices for relevant securities. Alternative scenarios can be considered.

Key variables forecast

 Forecast NII of the bank based on the forecasted values for the main variables. This would equate to an 'unmanaged projection', as no ALM decision is taken in consideration in this step.

Strategy definition

• Finally, the bank has to define strategies to improve the projection and minimize the risks of the worse scenarios.



Repricing Gap The concept of swap



Source: Finanzasmania.com

Repricing Gap How to hedge a marginal gap



SWAPS

| Period | SA | SL | Marginal Gap | Cumulative Gap |
|---------------|-----|-----|-----------------|-------------------|
| • • • | | ••• | | |
| 3 to 6 months | 200 | 80 | 120 | 90 |
| | | | | |

Transaction: 4 month swap, notional 120, paying variable and receiving fixed.

Impact: Increase SL (the paying side) + no impact on SA, reducing the 3 to 6 month marginal gap to zero.



Repricing Gap Why swaps?





Repricing gap model BPI example

At 31 December 2015, the repricing gap (of interest rates) accumulated up to 1 year of EUR was 7 433 M.€.

| Interest rate risk ² Structural position, at 31 December 2015 Amounts in M.€ | | | | | | |
|--|-----------------|--------------|--------------|--------------|---------------|--------------|
| | Until 1 year | 1-2 years | 2-5 years | 5-7 years | 7-15 years | >15 years |
| Accumulated gap | 7 433 | 7 420 | 7 906 | 8 003 | 8 212 | 8 260 |
| | | | | | | Table 79 |

The Bank is structurally exposed to the risk of a fall in interest rates. A classical stress test to a 50 b.p. change in interest rates points to a loss in net interest income of 33 M. \in ³.

Nowadays, EBA requires a standard shock of 200bps



Interest rate risk The case of SVB

Silicon Valley Bank profit squeeze in tech downturn attracts short sellers

California institution that serves start-up scene under scrutiny over investments that have left it with unrealised \$15bn loss



Source: Financial Times, February 22, 2023

Investors dump US bank shares amid fears over value of bond portfolios

Difficulties at Silicon Valley Bank spark biggest one-day sell-off since early months of pandemic



Source: Financial Times, March 9, 2023

With the collapse of Silicon Valley Bank, tech may lose a vital organ

Institution played an important role in the sector's smooth functioning

RICHARD WATERS (+ Add to myFT



Source: Financial Times, March 11, 2023

Exam suggestion: How would you tell the story of SVB's failure in your own words?



Interest rate Risk The SVB case: Basics

By way of background, a bank that acquires a bond must classify it in one of three categories under US GAAP:

Held-to-maturity ("HTM").

- Into the HTM category goes any bond that the bank intends, and has the ability, to hold to maturity.
- Fluctuations in the price of this bond due to interest rate changes are irrelevant for most reporting purposes;
- the bank continues to show these bonds on its balance sheet at their amortized cost and ignores any
 price fluctuations when calculating its income for that period.

Trading:

- At the other extreme, in the trading account, all fluctuations in a bond's value appear immediately in the income statement, and, by extension, on the balance sheet as part of retained earnings.
- Inclusion of a bond in this category must be accompanied by the bank's desire to trade this bond in the expectation of making a quick profit.

Available for Sale ("AFS")

- The third and intermediate category, AFS, includes all bonds that are not classified in either the HTM account or the trading account.
- This category attracts the most complex accounting treatment: fluctuations in value are immediately recognized on the balance sheet, but do not go through the income statement until the bond is sold.



Interest rate risk The case of SVB

FT Alphaville Credit Suisse Group AG 🗸 Added

How crazy was Silicon Valley Bank's zero-hedge strategy?

Not as nuts as you might thi

Exam suggestion:

Write a summary answering the article's question. Some possible topics:

. List the main concepts underlying the discussion;

. Describe the strategy pursued by SVB;

. Comment on whether something different could have been done to avoid the forced sale.



The only perfect hedge may be in a Japanese garden, but Silicon Valley Bank could have done better than this

Source: Financial Times, March 17, 2023

Interest rate risk



| (Dollars in millions, except par value and share data) | | 2022 | | 2021 | 2 |
|--|----|---------|----|-------|-----|
| Assets | | | | L | 2 |
| Cash and cash equivalents | S | 13.803 | \$ | 14.5 | 86 |
| Available-for-sale securities, at fair value (cost of \$28,602 and \$27,370, respectively, including \$530 and \$61 pledged as collateral, respectively) | | 26,069 | | 27,2 | 21 |
| Held-to-maturity securities, at amortized cost and net of allowance for credit losses of \$6 and \$7 (fair value of \$76,169 and \$97,227, respectively) | | 91,321 | | 98,1 | 95 |
| Non-marketable and other equity securities | | 2,664 | | 2,5 | 43 |
| Total investment securities | | 120,054 | _ | 127,9 | 59 |
| Loans, amortized cost | | 74,250 | | 66,2 | 76 |
| Allowance for credit losses: loans | | (636) | | (4: | 22) |
| Net loans | | 73,614 | | 65,8 | 54 |
| Premises and equipment, net of accumulated depreciation and amortization | | 394 | | 2 | 70 |
| Goodwill | | 375 | | 3 | 75 |
| Other intangible assets, net | | 136 | | 1/ | 60 |
| Lease right-of-use assets | | 335 | | 3 | 13 |
| Accrued interest receivable and other assets | | 3,082 | | 1,7 | 91 |
| Total assets | \$ | 211,793 | \$ | 211,3 | 08 |
| Liabilities and total equity | | | | | |
| Liabilities: | | | | | |
| Noninterest-bearing demand deposits | \$ | 80,753 | \$ | 125,8 | 51 |
| Interest-bearing deposits | | 92,356 | | 63,3 | 52 |
| Total deposits | 1 | 173,109 | _ | 189,2 | 03 |
| Short-term borrowings | | 13,565 | | | 71 |
| Lease liabilities | | 413 | | 3 | 88 |
| Other liabilities | | 3,041 | | 2,4 | 67 |
| Long-term debt | | 5,370 | | 2,5 | 70 |
| Total liabilities | | 195,498 | | 194,6 | 99 |
| Commitments and contingencies (Note 21 and Note 26) | | | | | |
| SVBFG stockholders' equity: | | | | | |
| Preferred stock, \$0.001 par value, 20,000,000 shares authorized; 383,500 and 383,500 shares issued and outstanding, respectively | | 3,646 | | 3,6 | 46 |
| Common stock, \$0.001 par value, 150,000,000 shares authorized; 59,171,883 and 58,748,469 shares issued and outstanding, respectively | | - | | | - |
| Additional paid-in capital | | 5,318 | | 5,1 | 57 |
| Retained earnings | | 8,951 | | 7,4 | 42 |
| Accumulated other comprehensive income (loss) | | (1,911) | | | (9) |
| Total SVBFG stockholders' equity | | 16,004 | | 16,2 | 36 |

| | | | | | | | | Decembe | r 31, 2022 | | | | | | |
|------------------------------------|----|------------------|------------------------------|----|-------------------|------------------------------|----|-------------------|------------------------------|----|-------------------|------------------------------|----|-------------------|------------------------------|
| | | Tota | al | | One or L | Year ess | | After On Five | e Year to Years | | After Five Ten | e Years to Years | | Aft Ten Y | er lears |
| (Dollars in millions) | C | arrying Value | Weighted Average Yield | | Carrying Value | Weighted Average Yield |
| U.S. Treasury securities | \$ | 16,135 | 1.49 % | \$ | 983 | 1.16 % | \$ | 14,373 | 1.43 % | \$ | 779 | 2.96 % | \$ | - | - % |
| U.S. agency debentures | | 101 | 4.15 | | - | - | | 33 | 4.47 | | 68 | 4.02 | | - | - |
| Foreign government debt securities | | 1,088 | 2.12 | | 101 | 1.06 | | 52 | 2.29 | | 935 | 2.21 | | - | - |
| Residential MBS: | | | | | | | | | | | | | | | |
| Agency-issued MBS | | 6,603 | 1.54 | | - | - | | - | - | | 43 | 2.86 | | 6,560 | 1.53 |
| Agency-issued CMO - fixed rate | | 678 | 1.33 | | - | - | | - | - | | - | - | | 678 | 1.33 |
| Agency-issued CMBS | 1 | 1,464 | 1.89 | _ | - | - | _ | 326 | 2.21 | _ | 1,138 | 1.84 | _ | - | - |
| Total | \$ | 26,069 | 1.56 | \$ | 1,084 | 1.15 | \$ | 14,784 | 1.46 | \$ | 2,963 | 2.32 | \$ | 7,238 | 1.51 |

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Interest rate risk The case of SVB

How rising interest rates are exposing bank weaknesses

Recent collapses in US and Europe highlight new threats to lenders and upend conventional wisdom



Banks face new dangers as interest rates rise, depositors opt for higher returns in assets such as cryptocurrency, and real estate loans cause concern © FT montage/Dreamstime

Exam suggestion:

Write a summary describing the main channels via which banks can benefit or be affected by changes in interest rates. Discuss the advantages / disadvantages of using floating versus fixed rates.

Source: Financial Times, March 30, 2023



Duration Gap Model

- To overcome the shortfalls of the Repricing Gap model, we can use a Duration Gap model.
- This is an equity based model that takes into account the effect on the capital value due to fluctuations in interest rates.

Economic Value of Equity as per EBA's definition For purposes of measuring Interest Rate risk,

the change in the discounted present value of the bank's expected future net cash flows without spread,

focusing on the sensitivity of the economic values of the banking book items to interest rate changes



Duration Gap Model

Impact on asset value





Interest rate risk Methods (II)

| Quantitative tools and models | Description | Plus & minus | Risk types potentially |
|-------------------------------------|---|--|---|
| Earnings measures | | | |
| <u>Static model</u> Gap analysis | Measures arithmetic difference between nominal amounts of SA/SL; Works on the basis of certain time buckets; A gap can be multiplied by an assumed change in interest rates to yield the ~change in NII | (+) Simple method, easy to understand and explain (-) based on the assumption that all positions within time bucket mature or reprice simultaneously (-) Static model not taking into account interest rate sensitivity of optionality parameters (-) Yield curve and/or basis risk cannot be analysed adequately | Repricing risk |
| Dynamic models | | | |
| Earnings at risk | EaR is the difference between a base case scenario and an alternative scenario Allocation of SA/SL to time buckets is a starting point Applies to all instruments | (+) Interest rate risk profile is analyzed in a tailored way (-) Results are very sensitive to assumptions on customer behaviour and management responses to designed scenarios (-) Focus on a relatively short horizon, so changes in earnings outside observation period are ignored | Repricing risk Yield curve risk Basis risk Option risk |



Interest rate risk Methods (II)

| Quantitative tools and models | Description | Plus & minus | Risk types potentially |
|---|---|--|---|
| Economic Value measu | ures | | |
| Static model Economic Value of Equity (Capital at risk) | Based on the net present value of the balance sheet (PV assets less PV liabilities), allowing to calculate the change in equity caused by an interest rate shock Equity under stress is compared to base case equity | (+) Simple and intuitive measure (-) NPV calculation which does not adjust for the impact of rate changes on cash-flows will not capture basis or option risks (-) Valuation is highly dependent on timings and discount rate used | Repricing risk Yield curve risk |
| Modified duration | . Modified duration shows the relative change in market value for a marginal parallel shift of the yield curve of 1% | (+) Economic value impact of a given change in interest rates relating as whole in a simple way (-) It only considers parallel shifts the yield curve: not accounting for convexity when interest rates changes are larger not accounting for basis and option risk (-) Static measure | Repricing risk |
| Dynamic models | | | |
| Economic Value of Equity (Capital at risk) | . More sophisticated version of the static measure where cash-flows are calculated dinamically to account for the fact that their size and timing may differ under various scenarios of customer behaviour | (+) If stress scenarios are properly designed, it is a comprehensive measure of interest rate risk (-) Valuation is highly dependent on timings and discount rate used | Repricing risk Yield curve risk Basis risk Option risk |



IRRBB Practical questions

| Subject Matter: | IRRBB Application of the sudden parallel |
|-----------------------------|--|
| Question: | How should banks apply the sudden parallel +-200 basis points shift of the yield curve in their forecast yield curve? |
| Background on the question: | The European Banking Authority (EBA) has updated its <u>Guidelines on the management of interest rate risk arising from non-trading</u> <u>activities</u> , which were published on 22 May 2015. |
| | Paragraph 113 of the Guidelines on the management of interest rate risk arising from non-trading activities (EBA/GL/2018/02). |
| | Per guideline 113 (EBA/GL/2018/02) banks will discount the cashflows on both the actual curve and the curve with +- 200 basis points shift, for the calculation of the impact on their EVE of a sudden parallel +- 200 basis points shift of the yield curve. The impact is the delta of both calculations. |
| | As described in guideline 115d. (EBA/GL/2018/02) behavioural options should be reflected in the calculation. Client behaviour of prepayments is interest rate sensitive and banks use internal forecasts of the yield curve to predict prepayment cashflows. The question focuses on the use of the forecast of the yield curve that is required for reflecting client behavior. The guidelines impose an instant shock to the spot yield curve, but no specific guidance is given on how banks should apply the parallel shift to their forecasted yield curve n years ahead? |
| | We determined 4 applications. Please refer to the attached file for descriptions. |
| | |
| | |

https://eba.europa.eu/single-rule-book-qa/-/qna/view/publicId/2019_4448



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