Banking

Ana Lacerda

Fall Semester 2024

Course: Banking [2206]

Class 4

Disclaimer: The views expressed are my own and do not necessarily represent the views of Banco de Portugal.

To be covered today

- Interest Rates at the current juncture
- Interest Rate Risk

- Interest Rates at the current juncture

ECB raises interest rates to all-time high

Quarter-point increase comes despite faltering growth in the eurozone

In a knife-edge decision, the ECB lifted its deposit rate for the 10th consecutive time to 4% © Reuters

Martin Arnold in Frankfurt and **Mary McDougall** in London SEPTEMBER 14 2023 195

The European Central Bank has raised interest rates to an all-time high in a bid to cool consumer prices, but the euro fell after the central bank signalled its cycle of increases was near its end.

The ECB's knife-edge decision to lift its deposit rate for the 10th consecutive time, by 25 basis points to 4 per cent, came as officials cut their growth forecasts for the eurozone economy.

2023

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ECONOMY | CENTRAL BANKING

Fed Holds Rates Steady but Pencils In One More Hike This Year

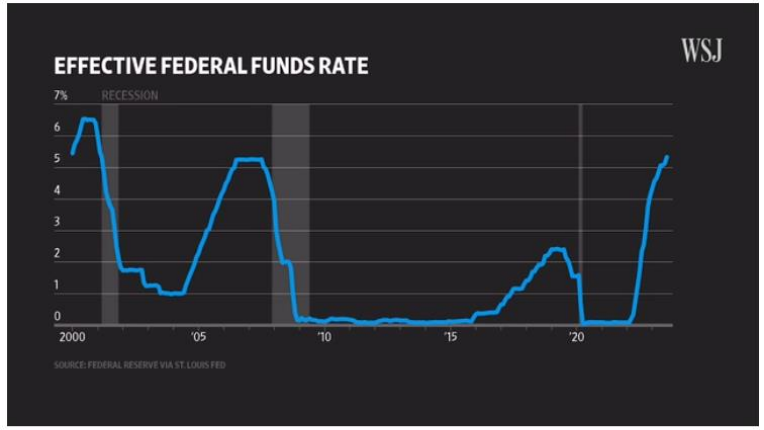
Stronger growth prompts officials to project that rates will stay higher for longer in 2024

By Nick Timiraos Follow

Updated Sept. 20, 2023 7:50 pm ET

WASHINGTON—Federal Reserve officials voted to hold interest rates steady at a 22-year high and revealed a divide over whether they should raise them once more this year, with most leaning toward another increase.

Fed Chair Jerome Powell sa
lift rates again after a histo
months and as they await e
sustained.



The Fed released its summary of economic projections at the latest FOMC meeting. What does it say about the current state of the economy and what will policy makers do next? Photo: Al Drago/Bloomberg News

https://www.wsj.com/economy/central-banking/federal-reserve-powell-interest-rates-ba600bf0

Sep 12, 13:17

Martin Arnold in London

ECB cuts interest rates to 3.5%

The European Central Bank has cut interest rates by a quarter percentage point to 3.5 per cent in response to falling Eurozone inflation and signs that the bloc's economy risks grinding to a halt.

Thursday's decision to lower the ECB's benchmark deposit rate for the second time this year comes as the US Federal Reserve is expected to start cutting borrowing costs next week.

Major central banks have begun lowering rates in response to indications that the biggest rise in inflation for a generation has faded. Some analysts think the ECB is likely to cut rates again at both its remaining meetings this year.

2024

ECB to cut interest rate in October, economists predict

Weak growth likely to lead central bank to lower rates by 0.25% next month rather than in December

The ECB building in Frankfurt. Bond prices, which at the start of the week pointed to a 40% probability of a rate cut at the next ECB meeting on October 18, on Friday priced in a 80% likelihood, according to Bloomberg data © AFP via Getty Images

Olaf Storbeck in Frankfurt 6 HOURS AGO 36

A recent string of indicators pointing to the Eurozone's slowing growth will probably lead to a 0.25 per cent interest rate cut by the European Central Bank next month, economists predict.

Federal Reserve cuts rates by half a point and signals era of easing has begun

US central bank's decision marks milestone in two-year fight against inflation

2024

Colby Smith in Washington, **Nicholas Megaw** in New York and **Arjun Neil Alim** in Hong Kong SEPTEMBER 19 2024

318

Fed chair Jay Po

The Federal Reserve cut its benchmark interest rate by half a percentage point on Wednesday and signalled more reductions would follow, launching its first easing cycle since the onset of the pandemic.

The US central bank's first cut in more than four years leaves the federal funds rate at a range of 4.75 per cent to 5 per cent. Michelle Bowman, a member of the Federal Open Market Committee, voted in favour of a quarter-point cut — the first Fed governor since 2005 to dissent from a rate decision.

The bumper half-point cut suggests the US central bank is seeking to pre-empt any weakening of the US economy and labour market after more than a year of holding rates at their highest level since 2001.

The last time the Fed cut rates by more than a quarter point was when Covid-19 tore across the global economy in 2020.

U.S. Markets

Fed seen cutting rates another 50 bps in November

By **Reuters**

September 27, 2024 2:17 PM GMT+1 · Updated 2 days ago

Federal Reserve Board Chair Jerome Powell holds a press conference following a two-day meeting of the Federal Open Market Committee on interest rate policy in Washington, U.S., September 18, 2024. REUTERS/Tom Brenner/File Photo Purchase Licensing Rights

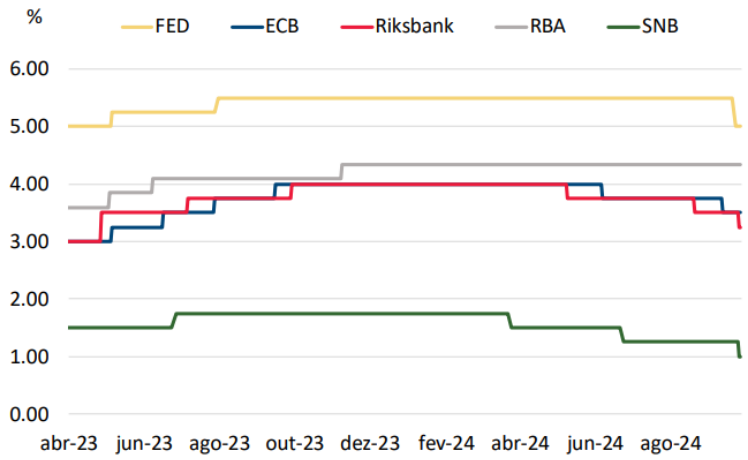
Sept 27 (Reuters) - The Federal Reserve is likelier than not to deliver a second 50-basis-point interest rate cut in November, traders bet on Friday, after a government report showed U.S. inflation has cooled to a pace nearer to the central bank's 2% goal.

Inflation by the Fed's targeted measure, the year-over-year rise in the personal consumption expenditures price index, was 2.2% in August, the Commerce Department reported.

https://www.reuters.com/markets/us/traders-bet-second-straight-50-bps-fed-rate-cut-november-2024-09-27/

Interest rates in the current juncture: Reference rates

Reference rates also for other jurisdictions



Reference rates	level (%)	Weekly change (pp)	Annual change (pp)
USD Fed Funds	3.75 - 4.00	0	375
EUR MRO	2	0	200
EUR DFR	1.5	0	200
BoE Policy Rate	3.00	0	275
JPY Discount Rate	-10	0	0

Dated 22nd september 2023

Reference rates	level (%)	Weekly change (pp)	Annual change (pp)
USD Fed Funds	4.75 - 5.00	-50	-50
EUR MRO	3.65	0	-85
EUR DFR	3.5	0	-50
BoE Policy Rate	5.00	0	-25
JPY Discount Rate	0.25	0	35

Dated 27th september 2024

Interest rates in the current juncture: Reference rates

Reference rates for the Euro Area

The Governing Council of the ECB sets the key interest rates:

- **MRO**: the interest rate on the main refinancing operations - provides the bulk of liquidity to the banking system.
- **DFR**: the rate on the deposit facility – used by banks to make overnight deposits with the Eurosystem.
- The rate on the **marginal lending facility**, offers overnight credit to banks from the Eurosystem.

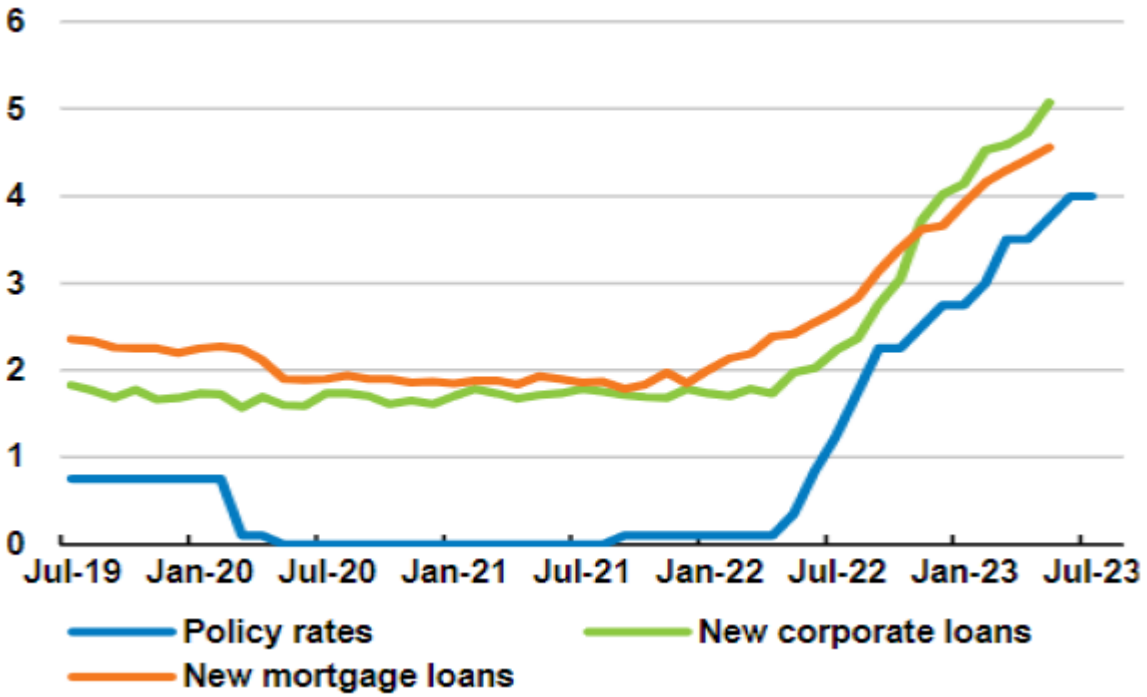
ECB reference rates	Level (%)	Weekly change (pp)	Annual change (pp)
MRO	3.65	0.00	-85
DFR	3.50	0.00	-50
Marginal lending facility	3.90	0.00	-85
EUR STR	3.42	0.00	-47

Monetary policy operations	Amount	Weekly change (pp)	Rate (%)
MRO (EUR bn.)	12.45	7	3.65
LTRO (EUR bn.)	6.82	84	average MRO
Non-euro operations (EUR bn.)	0.16	7	5.08

Dated 27th september 2024

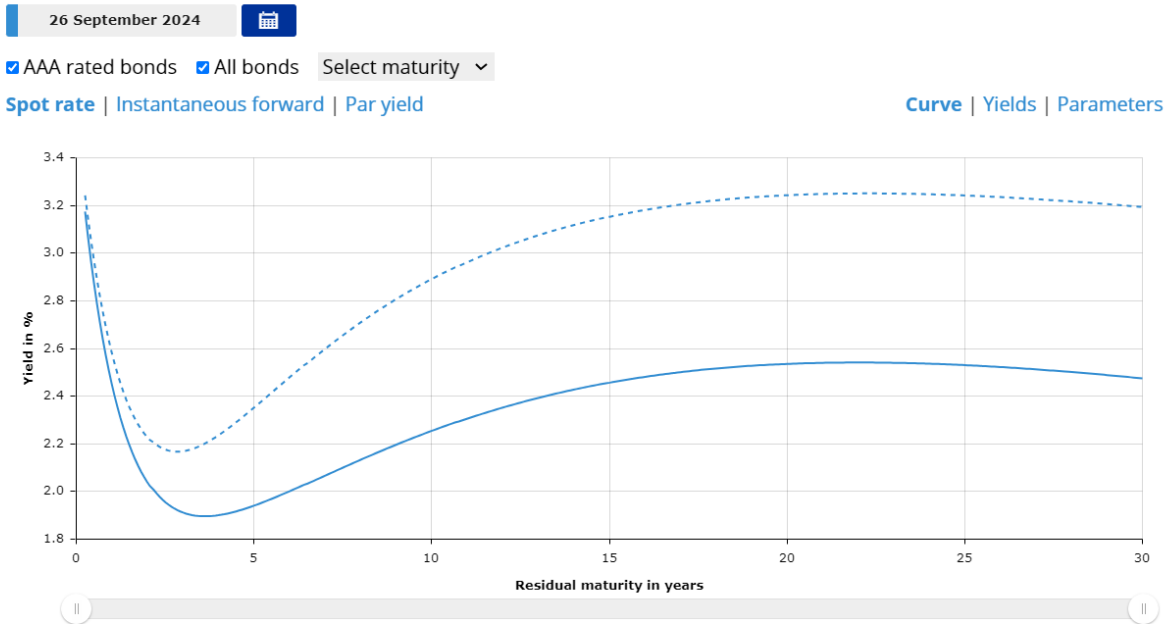
Interest rates in the current juncture: Loans rates

Financial conditions in advanced economies: loan rates *versus* reference rates



Interest rates in the current juncture

The yield curve!



Dashed lines indicate the spot rate based on all government bonds; solid lines on AAA-rated bonds only.

	9/27/2024	9/26/2024	9/25/2024
Euribor 1 week	3.369 %	3.367 %	3.355 %
Euribor 1 month	3.365 %	3.378 %	3.375 %
Euribor 3 months	3.326 %	3.345 %	3.352 %
Euribor 6 months	3.152 %	3.162 %	3.155 %
Euribor 12 months	2.771 %	2.755 %	2.776 %

https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/euro_area_yield_curves/html/index.en.html

https://www.euribor-rates.eu/en/current-euribor-rates/

- Interest Rates at the current juncture

- Interest Rate Risk

Interest rate risk

- Interest rate risk arises from mismatches in the maturities and repricing of assets and liabilities
- **Interest rate risk refers to the current or prospective risk to a bank's capital and to its earnings, arising from the impact of adverse movements in interest rates on its banking book.**
- **It is one of the most important risks financial institutions are exposed to.**

Adapted from the Basel definition of the interest rate risk in the banking book (IRRBB)

Interest rate risk

Unexpected changes in interest rates affect :

1. The value of the bank (or net worth)

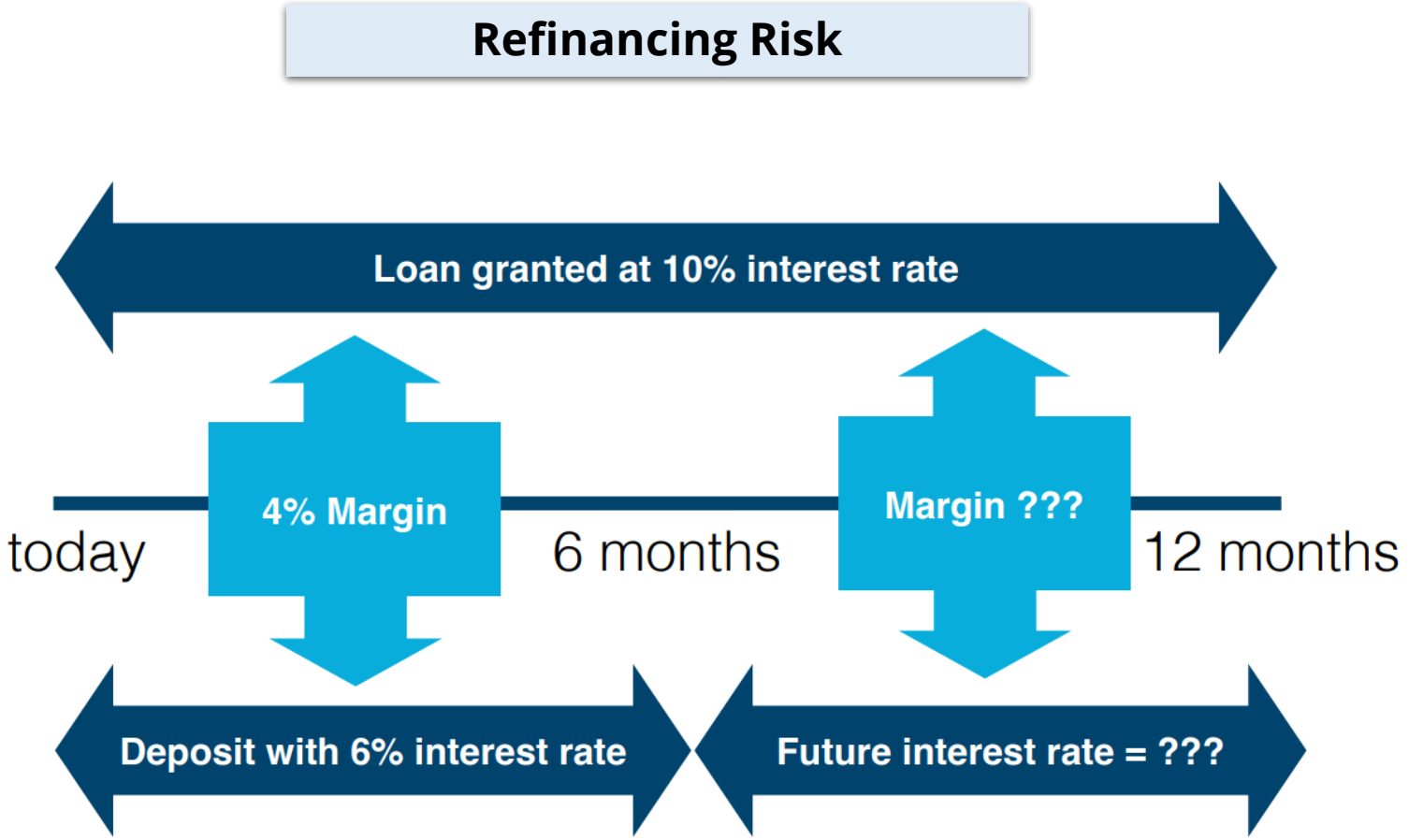
- [negative sign] the net present value of future cash flows of maturity-transforming banks might decrease when interest rates rise, due to the higher maturity of assets compared to liabilities.

2. The earnings (or the net interest income)

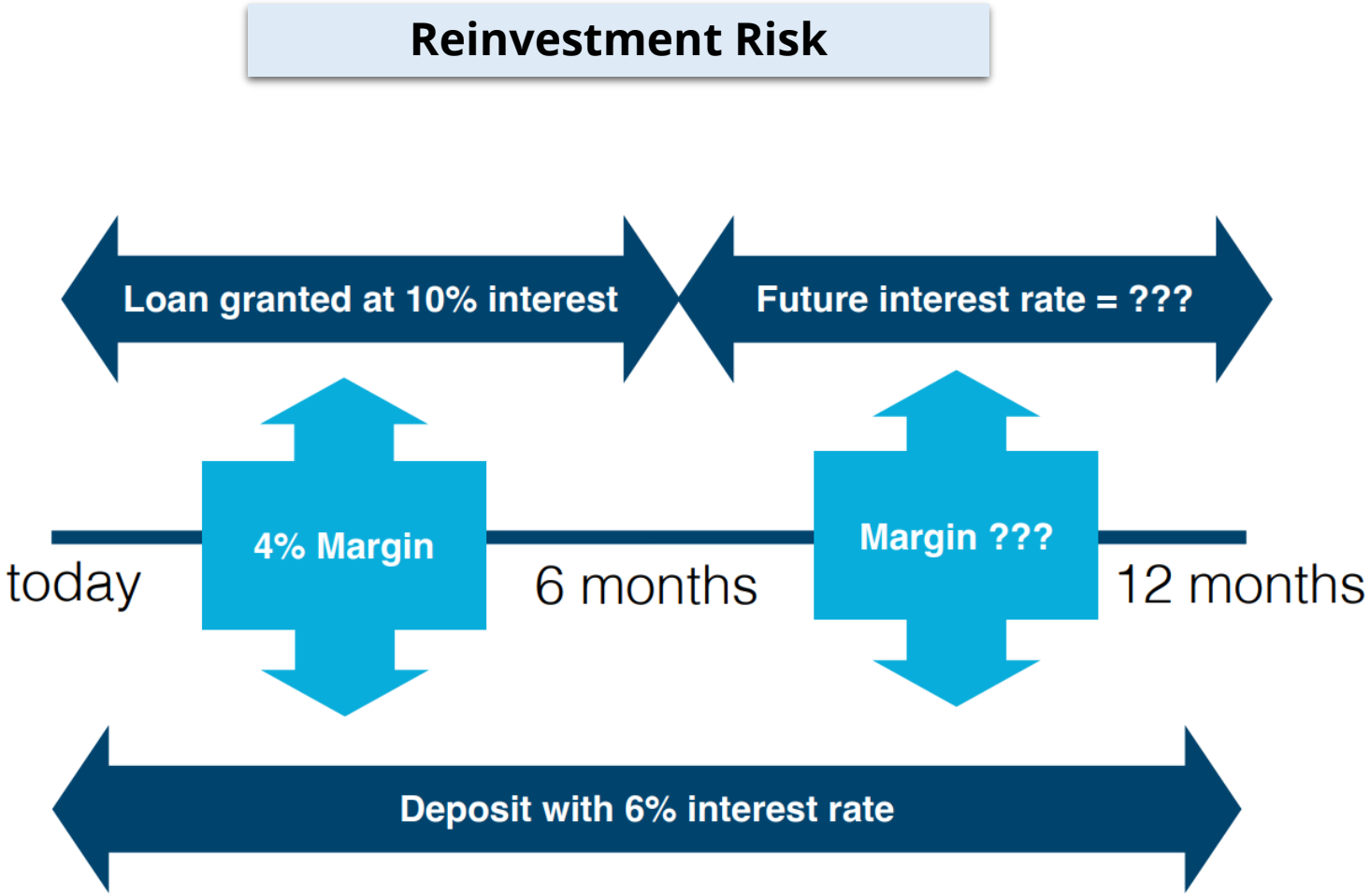
- [positive sign] the proportion of an interest rate change which is passed through on the current interest revenue earned with banks' assets is usually higher than the pass-through on interest expenses paid for banks' liabilities.

+ indirect effects….

Repricing risk



Repricing risk



Interest rate risk sub-components

Repricing risk	Related to the timing mismatch in the maturity and repricing of assets and liabilities and off-balance sheet short and long-term positions
Yield curve risk	Arises from changes in the slope and the shape of the yield curve
Basis risk	Arises from hedging exposure to one interest rate with exposure to a rate that reprices under different conditions
Options risk	Arises from options, includding embedded options, e.g. consumers redeeming fixed rate products when market rates change

Interest rate risk sub-componentes: examples

Repricing risk

- A parallel shift of 200pb in the interest rate curve (inT+1)

	T	T+1
10Y fixed rate loan	2%	2%
1Y deposit	0,5%	2,5%
NII Spread	**1,5%**	**-0,5%**

Yield curve risk

- A change in the shape of the curve: the short term rate increases 200pb while the long term 100 pb (inT+1)

	T	T+1
15 Y loan (at LT rate)	2%	3%
1Y deposit	0,5%	2,5%
NII Spread	**1,5%**	**0,5%**

Interest rate risk sub-componentes: examples

Basis risk

Euribor and **LIBOR** are comparable base rates. Euribor is the average interbank interest rate at which European banks are prepared to lend to one another. LIBOR is the average interbank interest rate at which a selection of banks on the London money market are prepared to lend to one another. Just like Euribor, LIBOR comes in different maturities. The main difference is that LIBOR rates come in a different currency.

Reference rate basis risk – 3M Euribor vs 3M EONIA

- Two instruments with repricing dates T and T+1
- Different change EURIBOR rates (different tenors):
  - 1) EURIBOR 3M 1%, 2) EURIBOR 6M 2%

Cross currency basis risk – 3M Euribor vs 3M USD Libor

- Two instruments with repricing dates T and T+1
- Different change for curves with 3M tenor:
- 1) EURIBOR 3M 1% 2) LIBOR 3M 2%

	T	T+1
Loan benchmark 1)	2%	3%
Deposit benchmark 2)	0,5%	2,5%
NII Spread	**1,5%**	**0,5%**

Interest Rate Risk

The most used methods to measure and manage interest rate risk incorporate these two impacts:

1. The **repricing gap model** deals with the effect on interest margin;

2. The **duration gap model** deals with the effect on net worth, or capital.

3. A third model is Value at Risk, or VaR, as the interest rate is a price. We will not explore VaR in this context.

Repricing Gap Model

- Every asset and liability is classified by its sensitivity to interest rate fluctuations in a given period (the gap period):
    - **Sensitive Assets (SA) and Sensitive Liabilities (SL):** will mature or be repriced during the gap period;
    - **Non Sensitive Assets (NSA) and Non Sensitive Liabilities (NSL):** will not be repriced during the gap period.

Examples for a 6-month gap period

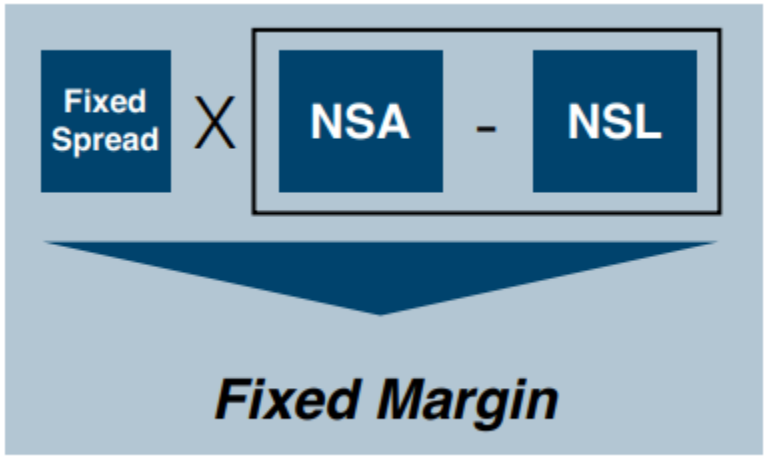
- a mortgage loan indexed to 3-month Euribor is a Sensitive Asset (even if it has a 30 year maturity);
- a 1-year term deposit is a Non Sensitive Liability;

Repricing Gap Model – NII Impact during the gap period

Interest rate fluctuations only impact on Sensitive Assets and Liabilities

Repricing Gap Model – NII Impact during the gap period

- The Fixed Margin refers to the margin associated with the gap on the non-sensitive assets/liabilities.
- During a given gap period, the Fixed Margin is not sensitive to changes in interest rates; it is constant.



Repricing Gap Model – Repricing Gap

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		

Repricing Gap Model: Combined NII Impact

Net Reinvestment

Net Refinancing

	Positive Gap	Negative Gap
Higher rates	NII increases	NII decreases
Lower Rates	NII decreases	NII increases

Repricing Gap Model: How to hedge a marginal gap

Period	SA	SL	Marginal Gap	Cumulative Gap
…	…	…	…	…
3 to 6 months	200	80	120	90
…	…	…	…	…

We can use derivatives to shape the risk.

Example:

- The bank can enter into a 4 month **Interest Rate Swap** with:
  - notional 120,
  - paying variable and receiving fixed
- Impact: increases SL (the paying side) with no impact on SA, reducing the 3 to 6 month marginal gap to zero

Repricing Gap Model: Why swaps?

Financial ratios look better

- since income from swaps goes to the P&L without any position on BS, ratios like ROA, ROE and NIM become higher;

Capital requirements

- swaps call for less capital than a similar position on fixed or floating rate instruments to shape the exposure;

Liquidity

- banks need less money invested using swaps to shape the risk;

Resources management

- swaps can be used only at the treasury desk. However, if the bank prefers to use long term deposits, for instance, the entire organization must be coordinated to make the change, and the timing would be much slower

Repricing Gap Model: Limitations

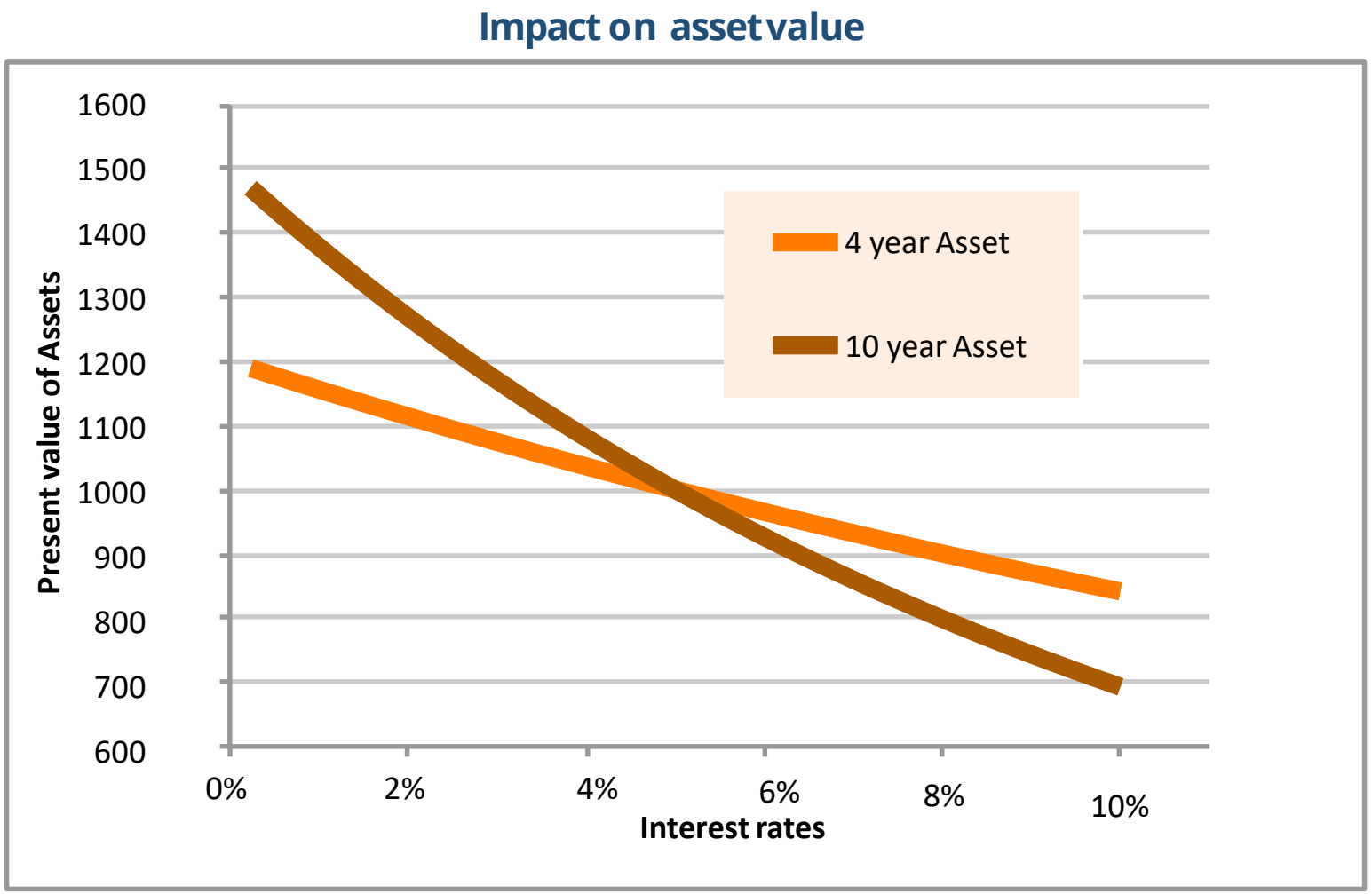
- The model assumes **parallel shifts in interest rates** (a 1% increase in interest rates on assets comes with an increase of 1% in interest rates on liabilities - which is a strong one!);
- No matter how you aggregate the time periods, **you will always miss something in between**;
- **Demand deposits and credit lines are not adequately treated by the model**, as it considers immediate repricing, which is not true;
- **The model does not consider any stock impact due to the price fluctuation**. A decrease in interest rate may trigger time deposit withdrawals, and fixed rate loans may be early paid and refinanced;
- **No off-balance sheet contingencies are considered**. However, interest rate fluctuations trigger the exercise of derivatives, for instance;
- **This is an income-based model**, ignoring impact on the value of assets and liabilities and thus on capital.

Duration Gap Model

- To overcome the limitations of the Repricing Gap model, we can use a **Duration Gap model**;
- It is an **equity-based model** that assesses the impact of interest rate fluctuations on the capital value of financial institutions;
- Focuses on the equity aspect, enhancing the understanding of interest rate risk.

- Let's explore and gain a deeper understanding of the concept of **duration.**

Duration Gap Model



Duration Gap Model: understanding duration

- Duration is the **weighted average maturity** of the cash flows. The maturity of each cash flow is weighted by the present value of that cash flow.
- Duration represents the number of years it will take for you to be repaid the price of the bond through its total cash flows (interest and principal).
- For those who prefer mathematical terminology, duration is the first derivative of the value of the bond with respect to (1 + interest rate), or the discount factor.
- This concept is particularly relevant: duration measures the **impact on the value of the bond** when the **interest rate changes by 1%.** This reflects the sensitivity to interest rates and indicates the level of interest rate risk!
- A convenient feature: the **duration of a portfolio** is the average duration of the assets in the portfolio, weighted by the value of each asset!

Duration Gap Model: Duration as average maturity

- What makes Duration higher, and so higher interest rate risk?
  - Higher maturity, as cash flows are longer in time
  - Lower coupon, as the next cash flows are smaller
- A Bank has assets behaving like bonds (loans) and also liabilities behaving like bonds (deposits).
- The **interest rate risk of a Bank** depends on the **combined effect** of duration of assets and duration of liabilities!
  - We can call it the **Duration of Capital**.

Duration Gap Model: Estimation of impact

Assets = Liabilities + Capital or **A = L + C**

Duration of A = Duration of L x L/A + Duration of C x C/A

Dur C x C/A = Dur A - Dur L x L/A → **Duration Gap**

Dur C = A/C x Duration Gap → **Leverage**

Duration Gap Model: An example

- Assets = 1000
- Liabilities = 900 (thus capital = 100)
- Duration of Assets is 2 years and Duration of Liabilities is 1,5 years.
- Duration Gap is 2 - 1,5 x (900 / 1000) = 0,65
- Duration of Capital is 0,65 x (1000 / 100) = 6,5 years.

Duration Gap Model: Cross-checking - example

An increase of 1% in interest rates has the following impacts:

- Assets lose 1% x Duration = 2% of its value, and so the new value is 980;
- Liabilities lose 1% x Duration = 1,5% of its value, and so the new value is 886,5;
- The new value of capital is Assets - Liabilities = 980 - 886,5 = 93,5;
- And we can confirm that the value of capital decreased 6,5% of its previous value, a duration of 6,5 years.

Duration Gap Model: A more integrated example

Assets	Value	Duration	Liabilities	Value	Duration
Cash	100	0	Demand Deposits	14 500	0
Deposits with Banks	400	0,5	Time Deposits	15 000	0,8
T-Bills and T-Bonds	12 000	6	Deposits from Banks	300	0,3
Loan to corporates	10 000	2	Junior Bonds	5 000	4
Consumer loans	1 000	1	**Total Liabilities**	**34 800**	**0,92**
Mortgage loans	15 000	0,4	Capital	4 000	
Fixed assets	300				
Total	**38 800**	**2,56**	**Total**	**38 800**	

Duration Gap Model: A more integrated example

Computing the duration of capital….

Assets	Value	Duration	Liabilities	Value	Duration
Cash	100	0	Demand Deposits	14 500	0
Deposits with Banks	400	0,5	Time Deposits	15 000	0,8
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Fixed assets	300				
Total	**38 800**	**2,56**	**Total**	**38 800**	

Capital Duration = 38 800 / 4000 x [2,56 - 0,92 x 34 800 / 38 800] = 16,8

Duration Gap Model: Limitations

- Duration assumes parallel shifts for all time periods.
  - However, it it not too hard to adapt the model to different changes by time period.
- Duration is a mathematical derivative, and as such it works for infinitesimal changes in interest rates.
  - Interest rates are already very small numbers, but not infinitesimal anyway.
  - When changes are not so small, we have to consider the effect of **convexity**…
- After every change in interest rates, durations must be recalculated, and all positions managed again.
  - … can you imagine the transactions costs incurred?
- We need to take "**optionality**" into account. Customers can refinance loans when rates go down or withdraw time deposits when rates go up. Either way, the bank suffers!

Banking

Ana Lacerda

Fall Semester 2024

Course: Banking [2206]

Class 4