NOVA SCHOOL OF BUSINESS & ECONOMICS

Risk in Banking

2206 - Banking | 2025S2 | Session 5 | Carla Rebelo

NOVA SCHOOL OF BUSINESS & ECONOMICS

WRAP-UP FROM SESSION 4

How to value a client

RAROC (II)

RAROC
Risk Ajdusted Return on Capital

A.		B.		C.		D.		E.		F.		G.
Net interest received	−	**Cost of funding**	+	**Capital benefit**	+	**Net fees and commissions**	−	**Operational costs**	−	**Expected loss**	+	**Cross-sell**
Interest received, calculated based on contracted spread		Funding interest expenses		Allocated capital remuneration		Client commission income, net of paid commissions		Direct costs allocation		Exposure at default X probability of default X loss given default		Quantifiable potential to increase sales of adjacent services to a customer

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I. Allocated capital: Capital allocated to the transaction

Source: McKinsey & Company.

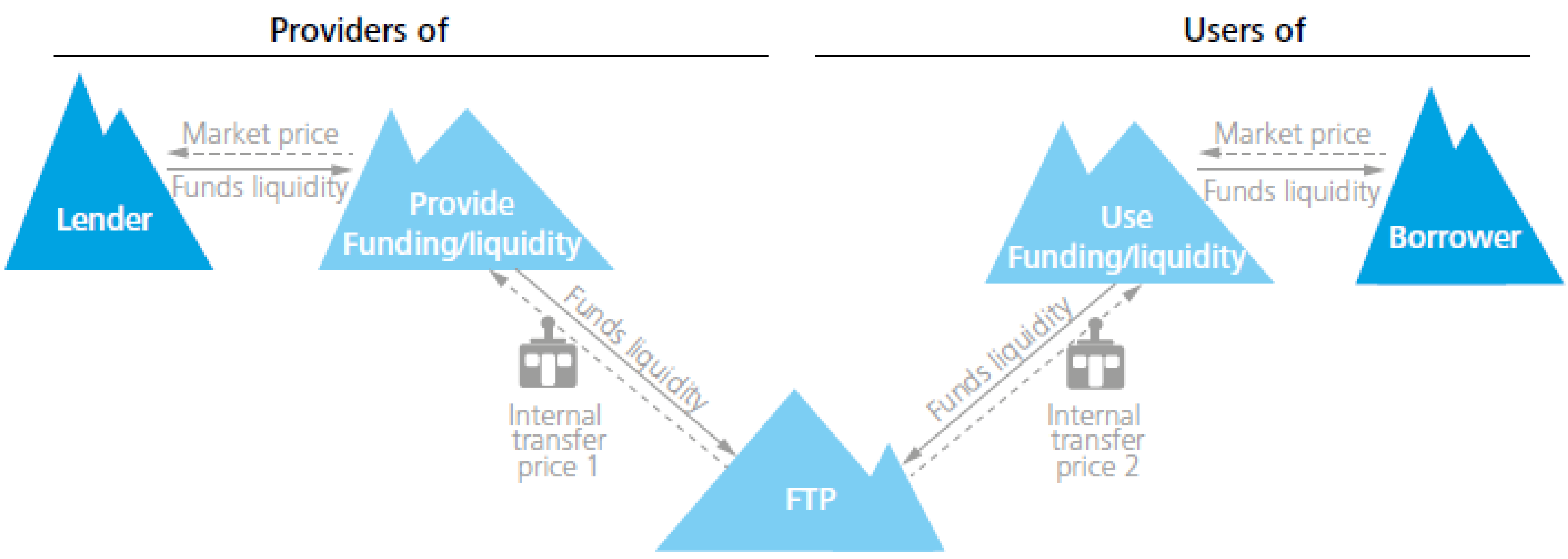
How to value a client

Basics I: FTP concept

FUNDS TRANSFER PRICING

Internal mechanism via which funds are sold or purchased between the Bank's several units / segments at certain pre-determined prices (normally derived from the Bank's funding cost curve)

Most common case relates to retail Segment with Loan-to-Deposit < 100% (= excess deposits) selling liquidity to Corporate segment with Loan-to-Deposits > 100% (= own-generated deposits are insufficient to fund 100% of corporate loan book).



Source: Deloitte, 'Funds Transfer Pricing: a gateway to enhanced business performance', March 2015.

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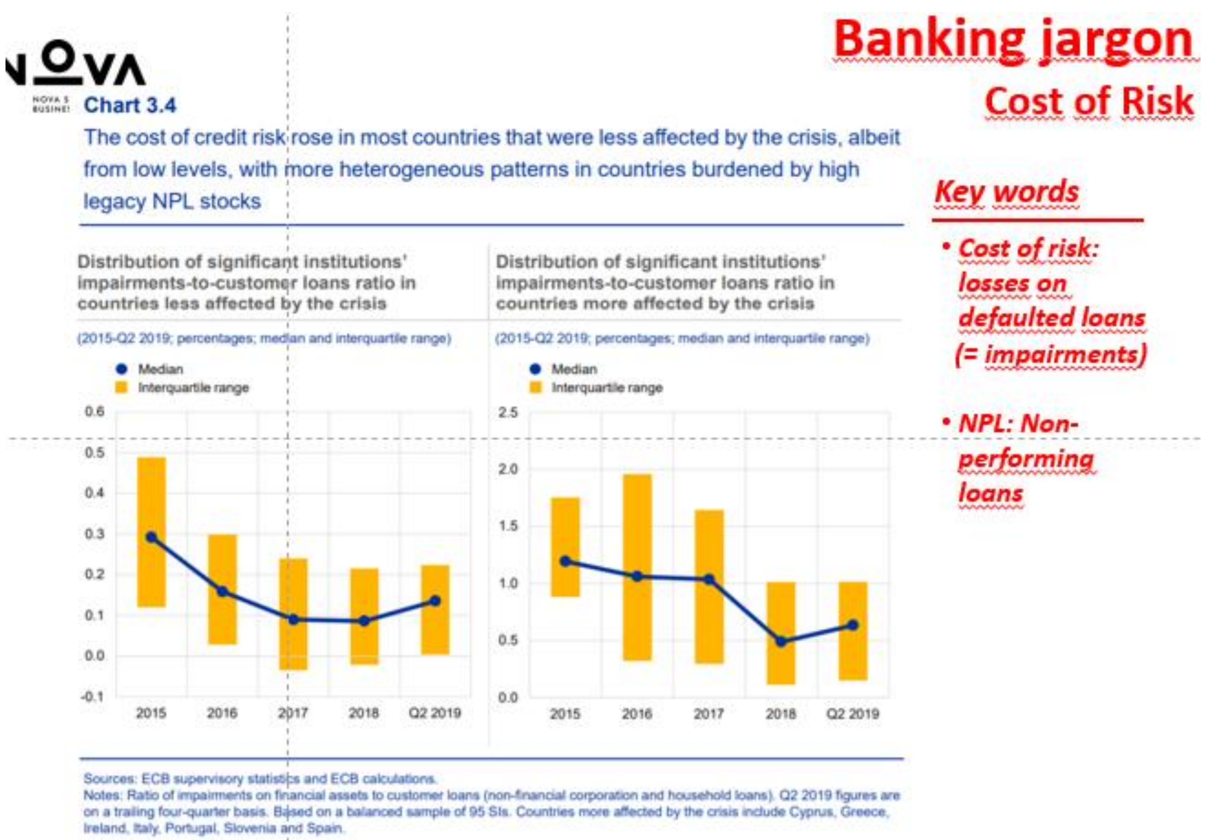
WRAP-UP FROM SESSION 4

How to value a client

Basics II: Expected loss

REMINDER from Session 1



Cost of Risk
(EL: expected loss)

=

Probability of default (PD)

×

Loss given default (LGD)

Probability of default (PD): Average percentage of obligors that default per rating grade in the course of one year.

Loss given default (LGD): Percentage of exposure the bank might lose in case the borrower defaults (as a percentage).

ING

Questions & Group distribution

1. How has the digital disruption revolutionized the banking sector?	Group 16
2. What are the advantages and disadvantages of new digital technologies for banks?	Group 16
3. What are ING's current strengths and weaknesses? What opportunities and threats is the bank facing?	Group 1
4. What should ING do to respond to and take advantage of the radical changes that will likely further disrupt the banking sector in the future? Which specific initiatives should Hamers prioritize in relation to the investment of €800 million that he recently revealed to investors?	Groups 1 / 16
5. How will the digital disruption affect ING's further internationalization?	Group 1

Strategic mergers

When does merging make sense?

Local Market

- Excess capacity
- Opportunity
- Avoid takeover

New Markets

- Opportunity
- Diversification

Plus

- Scale economies (IT, marketing, risk management, branches, etc.)
- Scope economies
- More clients to sell our products
- Market power / reduced competition
- Better management

Plus

- Do you have the skills?
- Culture (market, bank)
- Integration (IT, people)
- Distraction, de-motivation
- Downsizing (branches, people)
- Customer overlap (1 + 1 = 1,5)
- Lower cost savings

Strategic mergers
About to happen?

Live blog from September 11 2024

Italy's UniCredit buys 9% of Commerzbank, opening door to consolidation of German banking

Italian lender UniCredit has bought a 9 per cent stake in its German rival Commerzbank and is taking regulatory steps to increase its stake further, i...

Olaf Scholz says Germany opposes a Commerzbank takeover

Italian lender raised its stake in German rival from about 9 per cent to 21 per cent through derivatives

UniCredit on Monday said it had taken a position in a further 11.5 per cent of Commerzbank's shares © Dado Ruvic/Reuters

Owen Walker in London, **Olaf Storbeck** in Frankfurt, **Silvia Sciorilli Borrelli** in Milan and **Guy Chazan** in Berlin

Published SEP 23 2024 | Updated SEP 23 2024, 16:46 166

European banking union 19 min listen

Could Italy's UniCredit reignite European banking?

Italy's UniCredit pursues a stake in Germany's Commerzbank

OCTOBER 9, 2024

Banco BPM

Banco BPM rejects UniCredit takeover bid

Italy's third-largest bank says value of offer is 'completely unusual' and fails to reflect its prospects

NOVEMBER 26, 2024

Banco BPM

Crédit Agricole lifts stake in Italy's Banco BPM in blow to UniCredit bid

French lender's stake-building comes in wake of €10.1bn takeover offer from Andrea Orcel's bank

DECEMBER 6, 2024

Risk

An alternative approach

‘Reports that say that something hasn't happened are always interesting to me, because as we know, there are **known knowns**; there are things we know we know.

We also know there are **known unknowns**; that is to say we know there are some things we do not know.

But there are also **unknown unknowns** **-** the ones we don't know we don't know. And if one looks throughout the history of our country and other free countries, it is the latter category that tend to be the difficult ones.’

Donald Rumsfeld, US Secretary of Defence, 2001-2006

Risk & Uncertainty

The concept

RISK

Probability of an event being different from "expected" (in the sense of "most probable"):

- the outcome is not certain, it can change;
- the variance of the outcome is measurable.

UNCERTAINTY

Unmeasurable possibility of an unexpected event taking place:

- the outcome is unexpected;
- the probability cannot be measurable.

To say that something is 'unthinkable'…

Is it about the event? This is pure uncertainty and there is nothing we can do

Is it about the probability? We cannot forecast the timing of occurrence or the cause but we may be prepared to deal with the effects.

Risk inducing behaviours

Herd behaviour

When investors prefer to simply follow wider market trends instead of carrying an adequate risk assessment

- An investor buying stock just because everybody else is buying.

Adverse selection

When there is asymmetric information between buyers and sellers (most of the times) allowing one of the parties to be better off at the expense of the other.

- A person with a risky profession getting a life insurance without fully disclosing his/her situation.

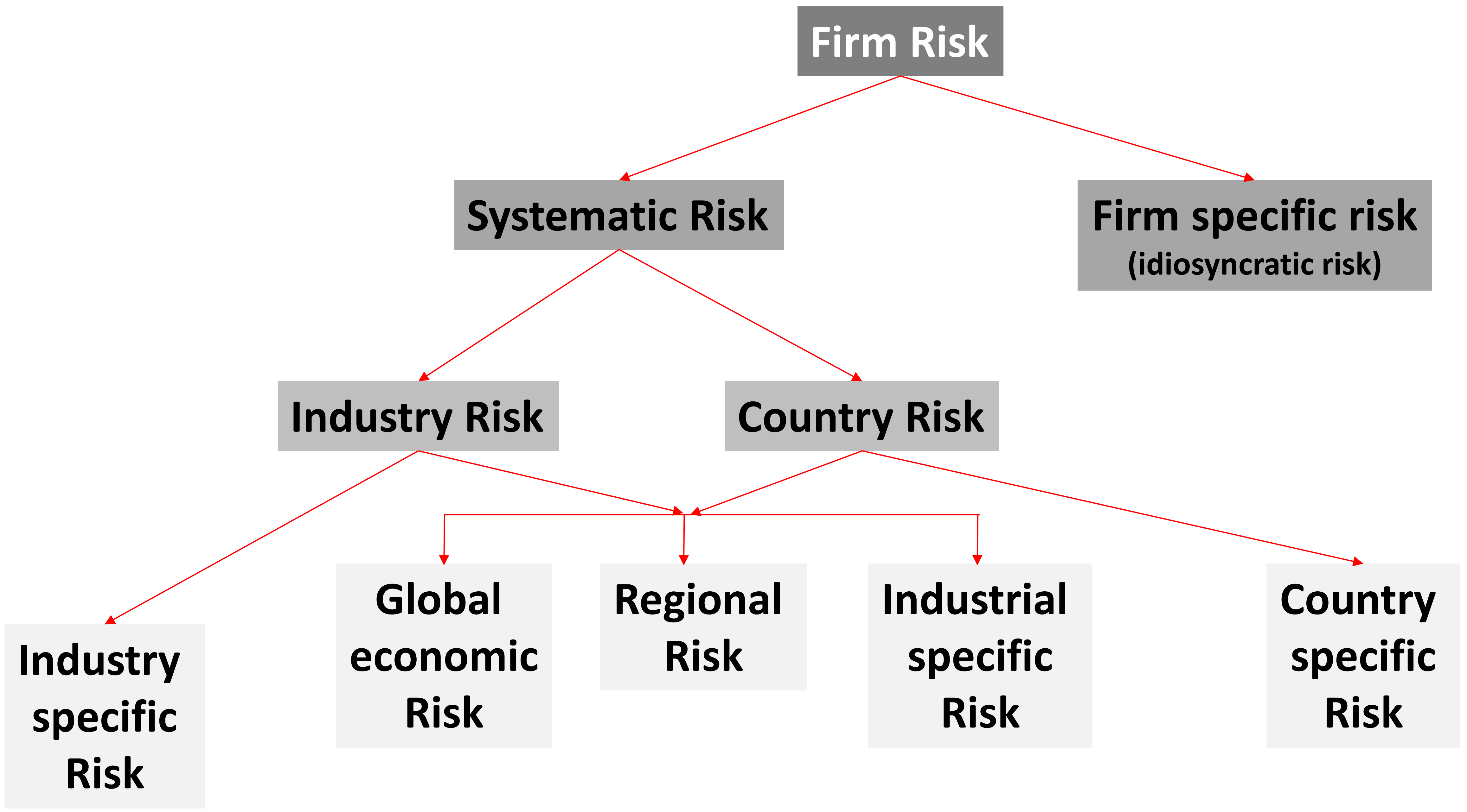
Moral hazard

Aggressive risk taking driven by the knowledge that others rather than oneself will bear the potential cost of one's actions.

- An entrepreneur with a significant leveraged business tends to invest in riskier projects.

Risk & Correlation

How it may unfold



Source: Moody's Analytics Asset level correlation, in Saunders & Cornett, page 339.

REMINDER !!

Banking
Money creation role

'Money creation' role

Banks' funding

DEPOSITORS

- *Families*
- *Companies*
- *Investors*

Savings

Trust

BANKS

Credit / Funds

Support

Banks' assets

COMPANIES & FAMILIES

- *Investment & Consumption funding requirements*

Short term

Leverage

Long term

Risk

Maturity transformation process

A bank makes money by incurring risks.

Success requires superior risk management.

Credit Risk

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- **Credit**
- Interest Rate
- Market
- Liquidity
- Foreign Exchange
- Off-Balance
- Operational
- Sovereign
- Insolvency

- **Credit risk means that a claim may not be paid as expected (in full).**
- **Credit risk can be split in individual credit risk and portfolio credit risk.**
- **A well diversified loan portfolio suffers from systematic risk whereas every single loan bears systematic and idiosyncratic risk.**

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Credit Risk

An example

Greek bank Alpha offloads €10.8bn bad loan book to Davidson Kempner

Drive among European lenders to ditch toxic debt creates opportunity for fund managers

The deal with the US hedge fund will reduce Alpha Bank's non-performing loans ratio from 29 per cent to 13 per cent © Kostas Tsironis/Bloomberg

22 Feb 2021

Brussels seeks to help banks offload rising tide of bad loans

Paper will set out ideas for how to tackle forecast increase in corporate distress

European banks are facing a surge in pandemic-related corporate insolvencies © Yves Herman/Reuters

29 Nov 2020

Interest rate Risk

- Credit
- **Interest Rate**
- Market
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- Sovereign
- Insolvency

- **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

An example

Lloyds warns profitability to fall as low interest rates take toll

Bank chief António Horta-Osório faces 29% pay cut as part of shift to new remuneration model

Nicholas Megaw in London FEBRUARY 20 2020 27

Lloyds Banking Group has warned its profitability will drop in the next year despite signs of an improvement in the UK's economic outlook, as competiti in the mortgage market and low interest rates weigh on revenues.

William Chalmers, chief financial officer, said: "There's no question that the environment presents its challenges, principally in the context of the low interest rate environment. But we do see our business model being the right one."

European banks promise €120bn of shareholder returns on interest rate gains

Returns via buybacks and dividends higher than any year since before the financial crisis

Four years ago, the European Central Bank ordered lenders to halt their capital return policies at the start of the Covid-19 outbreak © Cavan Images/Alamy

26 February 2024

Market Risk

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- Credit
- Interest Rate
- **Market**
- Liquidity
- Foreign Exchange
- Off-Balance
- Operational
- Sovereign
- Insolvency

- Market risk is the possible fluctuation in the price of held securities (or sold short).
- This risk assumes a trading purpose (a bond held to maturity does not incur market risk).
- Even with no trading, sometimes from the flow of business with clients might generate market risk, as the bank may have some exposure to commodities.

Market Risk
An example

'Humbling' week in bond markets leads to fears of paradigm shift

Investors question whether a lasting and destabilising rise in yields is at hand

26 Feb 2021

US stocks jump as Treasury yields retreat from recent highs

S&P 500 ends three-week losing streak as investors prepare for all-important jobs report

3 Mar 2023

Liquidity Risk

- Credit
- Interest Rate
- Market
- **Liquidity**
- Foreign Exchange
- Off-Balance
- Operational
- Sovereign
- Insolvency

- **Liquidity risk occurs when debt holders (deposit owners) use their right to immediate payment and the bank may not have sufficient liquid assets to honor that commitment.**
- **When a bank faces the need to sell assets quickly (fire-sale), this will pressure prices and very often ends in an insolvency.**

How Jamie Dimon came to rue his Bear Stearns deal, FT March 15, 2018

Ten years after Northern Rock: has UK banking changed?

Lenders have strengthened their defences but risky practices remain

Northern Rock's collapse in September 2007 alerted the British public to the oncoming financial crisis © FT montage; Getty Images

FT September 13, 2017

Foreign Exchange Risk

- Credit
- Interest Rate
- Market
- Liquidity
- **Foreign Exchange**
- Off-Balance
- Operational
- Sovereign
- Insolvency

- **Foreign exchange risk arises with the portfolio or direct investment in foreign currency markets.**
- **The stock of foreign currency for trading in a bank suffers from market risk, not foreign exchange risk.**
- **The visible effect of this type of risk is the "translation risk", the accounting effect of disclosing earnings made abroad in home currency.**

Off-balance Risk

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- Credit
- Interest Rate
- Market
- Liquidity
- Foreign Exchange
- **Off-Balance**
- Operational
- Sovereign
- Insolvency

- **In many banks, off-balance sheet items are very significative in the bank's business.**
- **Contingent assets and liabilities, like derivatives, have a notional value sometimes larger than the underlying business.**
- **Since derivatives are leveraged products (a call can be replicated as a long position on the asset financed by debt), they magnify the risk vis-a-vis an identical position in an on-balance sheet asset.**

Off-balance Risk

	31 December 2023					
	EUR million					
	Within 3 months	3 to 12 months	1 to 3 years	3 to 5 years	More than 5 years	Total
Memorandum items						
Loans commitment granted	125,083	31,658	55,344	47,204	20,300	279,589
Financial guarantees granted	7,870	4,734	1,654	686	491	15,435
Other commitments granted	81,146	17,448	9,699	3,386	1,594	113,273
MEMORANDUM ITEMS	**214,099**	**53,840**	**66,697**	**51,276**	**22,385**	**408,297**

11. Trading derivatives

The detail of the notional amounts and the market values of the trading derivatives held by the Group in 2023, 2022 and 2021 is as follows:

EUR million

	2023		2022		2021	
	Notional amount	Market value	Notional amount	Market value	Notional amount	Market value
Trading derivatives						
Interest rate risk						
Forward rate agreements	829,913	3	100,579	22	147,603	(11)
Interest rate swaps	5,381,966	5,514	4,844,043	2,387	3,920,945	1,931
Options, futures and other derivatives	398,519	(51)	495,994	(1,261)	508,723	(228)
Credit risk						
Credit default swaps	22,462	(86)	16,185	(6)	13,571	436
Foreign currency risk						
Foreign currency purchases and sales	471,955	33	384,024	423	329,781	(664)
Foreign currency options	77,934	288	54,967	150	49,680	(114)
Currency swaps	586,405	(581)	496,441	(245)	430,644	(1,293)
Securities and commodities derivatives and other	68,664	619	71,237	641	69,850	669
Total	**7,837,818**	**5,739**	**6,463,470**	**2,111**	**5,470,797**	**726**

Source: Santander 2023 Annual report

Operational Risk

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- Credit
- Interest Rate
- Market
- Liquidity
- Foreign Exchange
- Off-Balance
- **Operational**
- Sovereign
- Insolvency

- Operational risk deals with potential losses arising from failures due to systems, people (incompetence, negligence or fraud), suppliers, procedures, reputation.
- Every single day you can expect operational failures in a bank.
- Management of this type of risk depends on frequency and severity.

Operational Risk
An example

Citigroup erroneously credited client account with $81tn in 'near miss'

Incident comes as US bank seeks to assuage regulatory concerns over its risk management processes

© Michael Nagle/Bloomberg

Stephen Gandel and **Joshua Franklin** in New York

Published FEB 28 2025

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Sovereign Risk

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- Credit
- Interest Rate
- Market
- Liquidity
- Foreign Exchange
- Off-Balance
- Operational
- **Sovereign**
- Insolvency

- **Sovereign risk arises from expropriations, capital export restrictions, difficulty to deal with foreign legal systems…**
- **Foreign operations of a client may expose a bank to sovereign risk.**
- **The client may have the will and the money to pay but is restricted to do so due to foreign capital flow rules.**

Sovereign Risk

An example

Argentina imposes currency controls

Government moves to prevent capital flight after peso slides in spiralling economic crisis

Demonstrators march in Buenos Aires against the economic policies of the government of President Mauricio Macri ©

Benedict Mander in Buenos Aires and **Colby Smith** in New York SEPTEMBER 1 2019

Javier Milei's quest to defuse Argentina's currency control bomb

Libertarian president aims to secure IMF deal to help prepare for end of fixed exchange rate

Javier Milei has managed to tame the country's inflation crisis with a severe austerity package © AP

Ciara Nugent in Buenos Aires

Published FEB 6 2025

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Insolvency Risk

- Credit
- Interest Rate
- Market
- Liquidity
- Foreign Exchange
- Off-Balance
- Operational
- Sovereign
- **Insolvency**

- This risk happens when the value of the assets goes below the value of liabilities (and so capital is fully depleted).
- However, financial distress is a previous stage where losses are already substantial (loss of trust):

  - severe difficulty to attract deposits and other funding;

  - even before a severe situation, some investments might already been postponed, threatening the future competitiveness of the bank.

Market Risk
Concept

Definition

Risk of losses due to unexpected movements in market prices

Drivers

General Risk

Risk of a price change caused by a change in the level of interest rates in the case of debt securities or derivatives, or by a general movement of the stock market.

Specific risk

Includes the risk that an individual debt or equity security moves by more or less than the general market in day-to-day trading and event risk (eg. shock event, risk of default).

Calculation approaches

Standard

Internal Models

For the purpose of calculating capital requirements

REMINDER
From session 3

Solvency
The capital ratio

Minimum Capital Required

Regulatory Asset base

$$\frac{\text{COMMON EQUITY TIER 1}}{\text{RISK WEIGHTED ASSETS}} > 8\,\%$$

(Credit + $\boxed{\text{MARKET}}$ + Operational Risks)

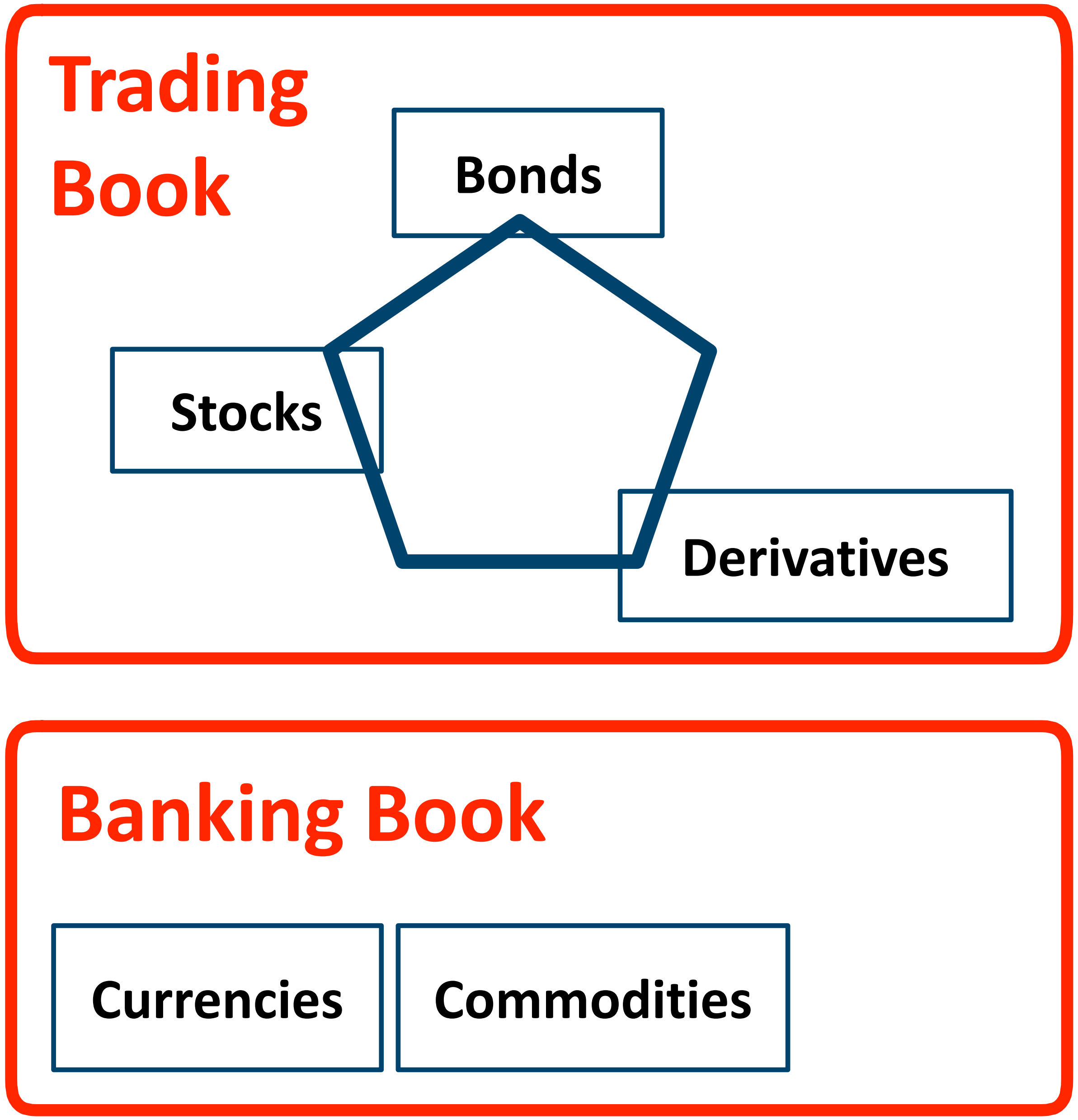
Note: 8% should be seen as the minimum regulatory requirement according to Basel III regulation. However, regulation also forces banks to add additional capital to cover for conservation, countercyclical and systemic risks. Additionally, the regulator is allowed to impose specific capital charges depending on each bank's balance sheet. Overall, European banks' capital ratios rarely stand below 10-11%.

Market risk

In the last decade, market risk is emerging as one of the most important risks to measure and manage:

- because even “long term” positions are being converted into marketable securities (securitization of loan book);
- the incredible growth of financial derivatives, with value linked to market prices of underlying assets;
- the widespread of IFRS (International Financial Reporting Standards) that claim for mark-to-market instead of the traditional book value.

Market risk
Trading book



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

Market risk

Components

DELTA
Absolute price risk

Impact on the position value by a change in the price of some asset.

GAMMA
Convexity risk

Added risk on top of the linear delta risk when the price change is not infinitesimal.

VEGA
Volatility risk

Impact of value due to changes in underlying asset's volatility.

THETA
Time decay risk

Impact of value due to the reduction of time to maturity - uncertainty is given by optionality.

RHO
Discount rate risk

Associated with changes in the discount rate.

What is the maximum loss which could be suffered over a certain time period so that there is a very low probability that the actual loss will exceed that amount?

Value at Risk

VaR

- The maximum loss you can have on your portfolio in given period.
- The average loss you can have on your portfolio in a given period.
- With 1% probability you will lose more than the VaR in a given period.
- The expected loss you can have on your portfolio, in the 1% worse cases in a given period.

Value at Risk
Limitations

VaR

Amount of potential loss from adverse market movements over a defined time period that cannot be exceeded in x% of cases.
Ex: one day 99% VaR is the maximum potential loss that a portfolio may undergo over a period of one day and a confidence level of 99%.

- ✓ VaR assumes that returns follow a random normal distribution, where the volatility coefficient is stable over time. However:
  - *empirical studies point to the existence of fat tails;*
  - *financial asset returns tend to have more extreme losses than extreme gains (negative skewness);*
- ✓ Short term interest rates are influenced by monetary policy, which is not random. The model assumes no serial autocorrelation.
- ✓ The computed figure is the loss by selling immediately the portfolio at the prevalent market prices. Is that possible?

Beyond the confidence level, we have a black hole…

Market Risk

Internal Models Approach

VaR

Amount of potential loss from adverse market movements over a defined time period that cannot be exceeded in x% of cases.

Ex: one day 99% VaR is the maximum potential loss that a portfolio may undergo over a period of one day and a confidence level of 99%.

Own funds regulatory requirement = [**MAX**

- VaR (99% to 10 days of holding positions) of the previous day
- Average daily VaR from the last 60 days, multiplied by a factor.]

\+ [**MAX**

- Last VaR in a stressed situation
- Average of the stressed VaR of the last 60 days, multiplied by a factor.]

Note: the multiplier factor equal to 3 + the additional factor of the table in the left side. The additional factor is determined by the number of excesses obtained through the back testing.

# excesses	Additional Factor
Less than 5	0
5	0,40
6	0,50
7	0,65
8	0,75
9	0,85
10 or more	1,00

Note: Regulators allow banks to use the Internal Ratings based approach once a series of requirements has been complied with (eg: clear risk management strategy, robust backtesting, regular stress testing, independent model validation). Otherwise, capital requirements are calculated through fixed risk factors provided by the regulator (standard approach).

Market Risk

VaR model types

Methods depending on assumptions on the distribution of the risk factors

Methods depending on the returns & history of the measured portfolio

- Variances and Covariances Method
- Historical Simulation
- Monte Carlo Simulations

Market Risk
Approaches compared

	Advantages	Disadvantages
Variances and Covariances Method	•Sets of reduced data; •Variance and covariance matrices may be obtained externally; •Incorporates portfolio diversification effects through correlations; •Fast calculation.	•Assumes that the portfolio is composed of assets with a linear delta and does not include non-linear products; •Assumes stable correlations and variances; •Assumes a normal distribution for the assets' price return; •Not able to predict anything that is not in the variance and covariance matrix.
Historical Simulation	•Does not assume stability of the correlations, since it does not make any assumptions; •Due to the fact that it includes historical sets of data, it considers that all the relevant information is in the set. •Does not assume any probability distribution shape for the returns.	•Not able to predict anything that is not in the set of data; •Needs profound historical data; •Possibility of performance problems.
Monte Carlo Simulations	•Better treatment and measurement of non-linear risks; •Easier and more flexible for sensitivity analysis; •Considers path-dependent effects; •Possibility to incorporate trends and volatilities not considered in price behaviour models.	•Needs great computational capacity; •Difficulty in real-time valuation; •Needs to pre-fix price behaviour models.

Market Risk
A practical example

Value-at-risk (VaR)

The benchmark market risk measurement is VaR, with a confidence level of 99% and a two-week (10 business days) time horizon based on a parametric model where the return on the risk factors considered follow a zero average normal distribution and the standard deviation is obtained from an historical series of values observed over one year. The diversification effect is considered based on correlations between the returns of the various factors considered (interest rates, exchange rates, equity prices). Total VaR results from the aggregation of VaR arising from fluctuations in interest rates, exchange rates and equity prices, taking into account the diversification effect.

The table below shows the values of average VaR at 99% with a time horizon of two weeks (10 business days) in accordance with BPI's different risk factors. The consumption levels are immaterial, with the highest risk being concentrated in equities. The risk values for the remaining factors are less significant. Compared to the previous year, VaR decreased due to a global reduction in the trading book.

	Total	**Interest Rate**	**Exchange Rate**	**Share prices**
Average VaR 2018	264	58	48	245
Average VaR 2017	526	240	109	459

In 2018 the average and the maximum value of the VaR at 99% with a time horizon of one day (adjusted for root of 10) in BPI's trading activities was 0.264 and 0.571 million euros, respectively.

Capital requirements for market risk are determined based on the standardised approach. The values calculated are insignificant, given the low representativeness of the portfolio. It should be noted that BPI's foreign-exchange risk mainly derives from its equity holdings in financial institutions outside the Eurozone.

Source: BPI 2018 Annual report.

Guest Speaker

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Risk in Banking