FRM Part I

FOUNDATIONS OF RISK MANAGEMENT

The Building Blocks of Risk Management

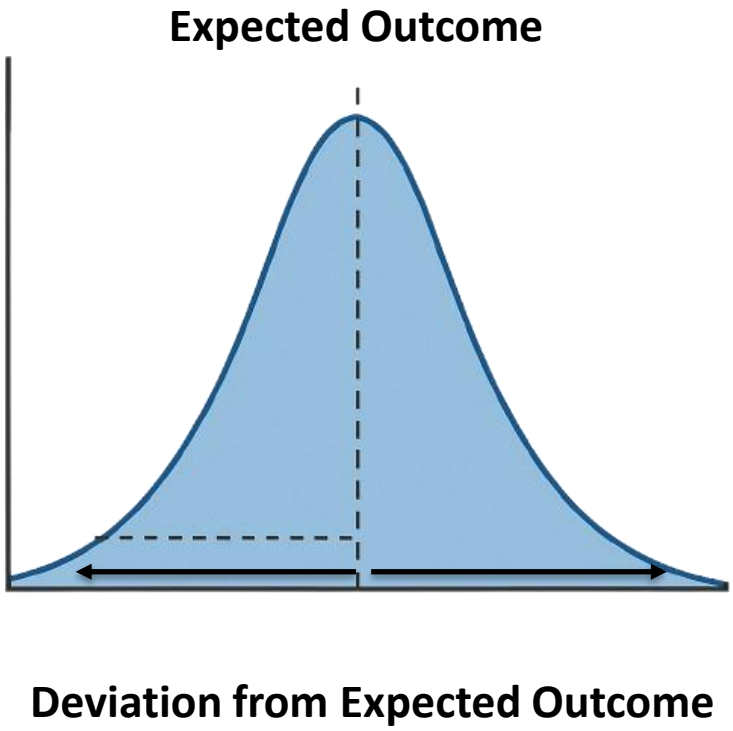
Learning Objectives

- ✓ Explain the **concept of risk** and compare risk management with risk taking.
- ✓ Evaluate, compare, and apply tools and procedures used to **measure and manage risk**, including quantitative measures, qualitative risk assessment techniques, and enterprise risk management.
- ✓ Differentiate between **expected loss** and **unexpected loss** and provide examples of each.
- ✓ Interpret the **relationship between risk and reward** and explain how conflicts of interest can impact risk management.
- ✓ Describe and differentiate between the **key classes of risks**, explain how each type of risk **can arise**, and assess the **potential impact** of each type of risk on an organization.
- ✓ Explain how risk factors can **interact** with each other and describe **challenges** in aggregating risk exposures

Defining Risk

Explain the concept of risk and compare risk management with risk taking.

- **Risk** is the **possibility** that actual outcomes **deviate** from expected outcomes.
- In finance, risk often implies **downside variability**, such as **losses** or **reduced returns**
- Risk is **inherent** in all decisions involving **uncertain outcomes**, including investments, lending, or underwriting.
- **Example:**
  A bond investor faces interest rate risk — if rates rise, the bond's price falls, even if credit quality is **unchanged**.



Key Dimensions of Risk

Probability: likelihood the adverse event occurs (e.g., PD = 0.4 %).

Severity/ impact: size of loss when it does (LGD, P&L).

Time horizon: daily trading vs multi-year project risk.

Correlation: interconnected exposures amplify systemic shocks.

Measurability: some risks quantified (market VaR), others qualitative (reputational).

What is Risk Management?

Risk management is the process of **identifying, assessing, controlling, and monitoring** risks

It aims to **reduce the likelihood** and/or **impact** of adverse events

Involves both **quantitative** tools (e.g., VaR, stress testing) and **qualitative** methods (e.g., risk registers)

Proactive rather than reactive; supports business strategy by **preserving value**

Example: A bank uses credit scoring models to screen borrowers before issuing loans

Risk Management vs. Risk Taking

- **Risk-taking** involves pursuing opportunities that carry **uncertainty and potential reward**
- Risk management seeks to ensure **risks taken are understood and aligned** with objectives and risk appetite
- **Not opposites** — effective organizations do **both in tandem**
- **Risk takers** focus on value creation; **risk managers** focus on risk preservation
- **Example:** A hedge fund takes directional bets (risk taking) but imposes exposure limits (risk management)

The Risk Management Cycle

1

Identify threats via KRIs, scenario workshops, horizon scanning.

2

Measure with VaR, stress tests, credit models, OR event data.

3

Monitor & report against board-approved limits & appetites.

4

Mitigate/ transfer through hedges, insurance, diversification, and capital buffers.

Example: Southwest Airlines Hedging

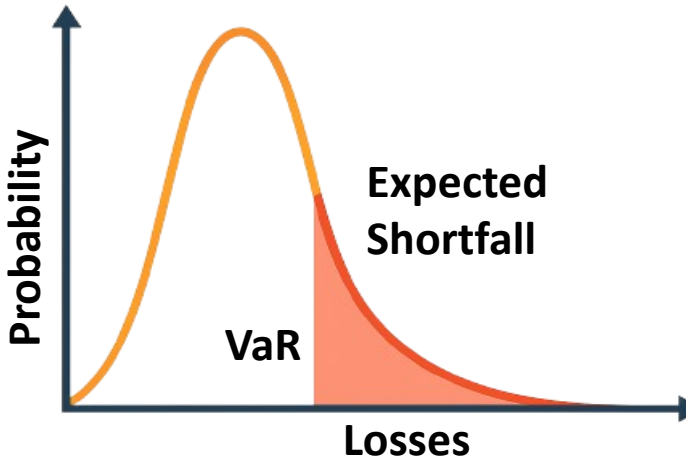
- Since **1998**, Southwest locked in **> 70 % of annual jet-fuel needs** using long-dated **options & swaps** priced around **$51 per barrel**.
- As crude spiked to **$147 in July 2008**, Southwest's average cost was **$1.98 / gal vs peers' $2.73,**
- Gains equaled **~83 % of the carrier's total profit** over the decade and helped finance **149 new aircraft** and route growth.
- Airline has **continued** with the practice to date.

Quantitative Risk Metrics – Core Concepts

Evaluate, compare, and apply tools and procedures used to measure and manage risk, including quantitative measures, qualitative risk assessment techniques, and enterprise risk management.

Value at Risk (VaR)

- Estimates the **worst expected loss** over a given time horizon at a specified **confidence level.**
- **Is a quantile measure**: A 99% 1-day VaR of $10M means there's a 1% chance the loss will exceed $10M in one day.



Expected Shortfall

- Also known as the CVaR, the ES calculates the **average loss** in the **worst-case tail** beyond the VaR cutoff
- Unlike VaR, ES is **subadditive**, making it a **coherent risk measure**
- **Example**: If 99% VaR is $10M, ES might estimate an **average loss of $14M** when losses exceed that threshold

Quantitative Risk Metrics – Core Concepts

Qualitative Risk Identification Techniques

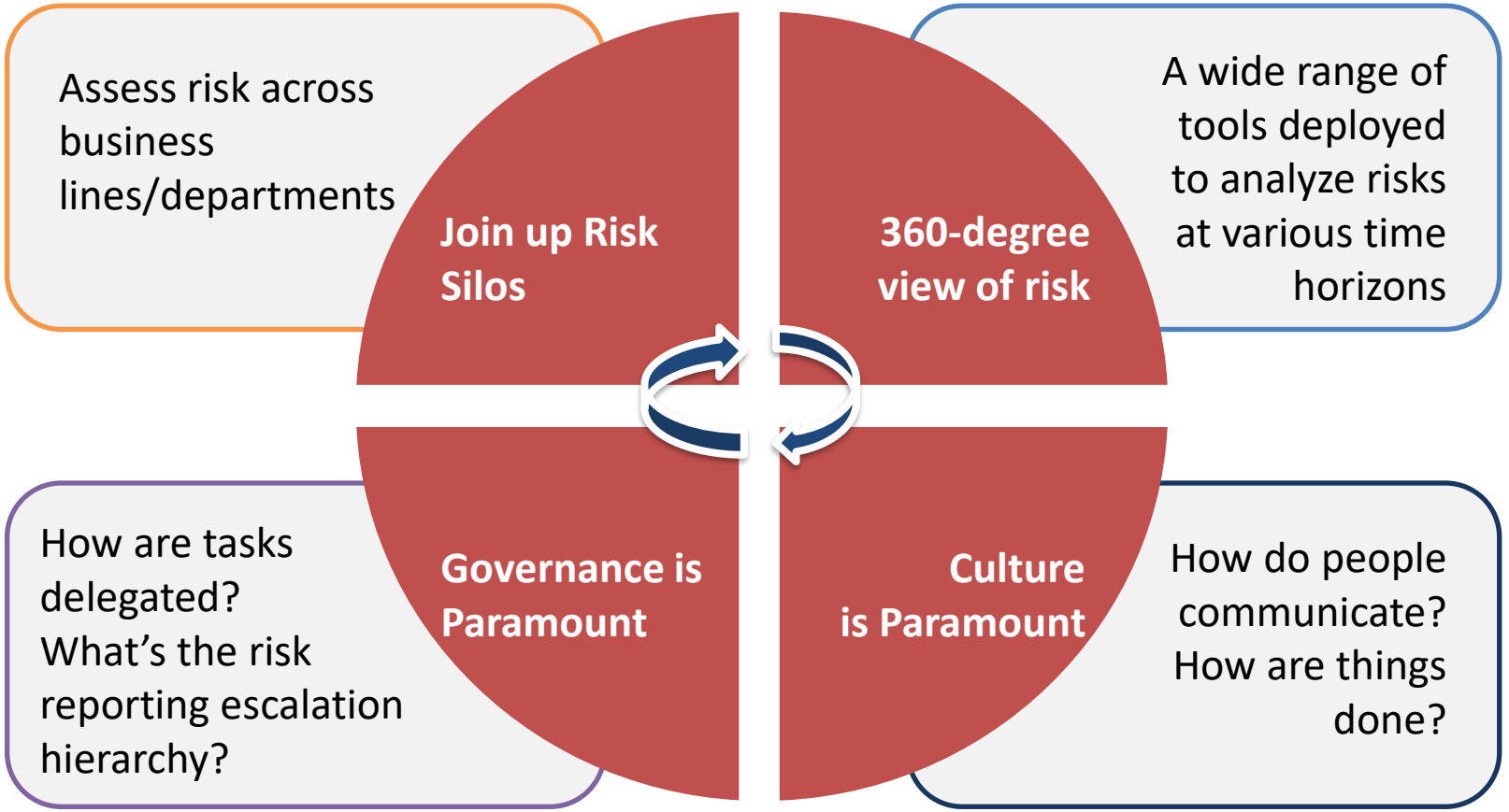
- Techniques include **brainstorming**, **surveys**, and **structured interviews.**
- Use **loss data**, **industry checklists**, and **scenario analysis** to enrich risk discovery.
- Helps capture **non-quantifiable or emerging risks** (e.g., cyber, legal).
- Effective for risks with **limited historical data** or **ambiguous outcomes.**
- **Example:** Asking, "What's your worst professional nightmare?" during risk workshops.

Quantitative Risk Metrics – Core Concepts

Enterprise Risk Management (ERM)

- ERM **integrates risk across divisions**, avoiding siloed approaches.
- Anchored by **risk appetite statements** and **firm-wide governance.**
- Relies on **committees, culture, reporting frameworks**, and cross-risk insights.
- Goes beyond metrics like VaR; focuses on **strategic and systemic risk.**
- **Example:** ERM flags that credit exposure in one unit correlates with commodity risk in another.

Enterprise Risk Management (ERM) Foundations

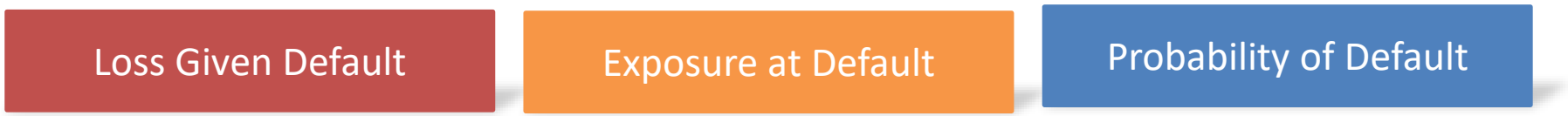


What is Expected Loss (EL)?

Differentiate between expected loss and unexpected loss and provide examples of each.

- **Expected Loss** is the **average loss** a firm **expects to incur** over a given period.
- It reflects **anticipated credit defaults**, **operational errors**, or **market moves** based on historical data.
- Typically factored into **pricing**, **loan provisioning**, and **insurance premiums.**

EL = **Probability of Default × Exposure at Default × Loss Given Default (LGD)**



Expected Loss

What is Unexpected Loss (UL)?

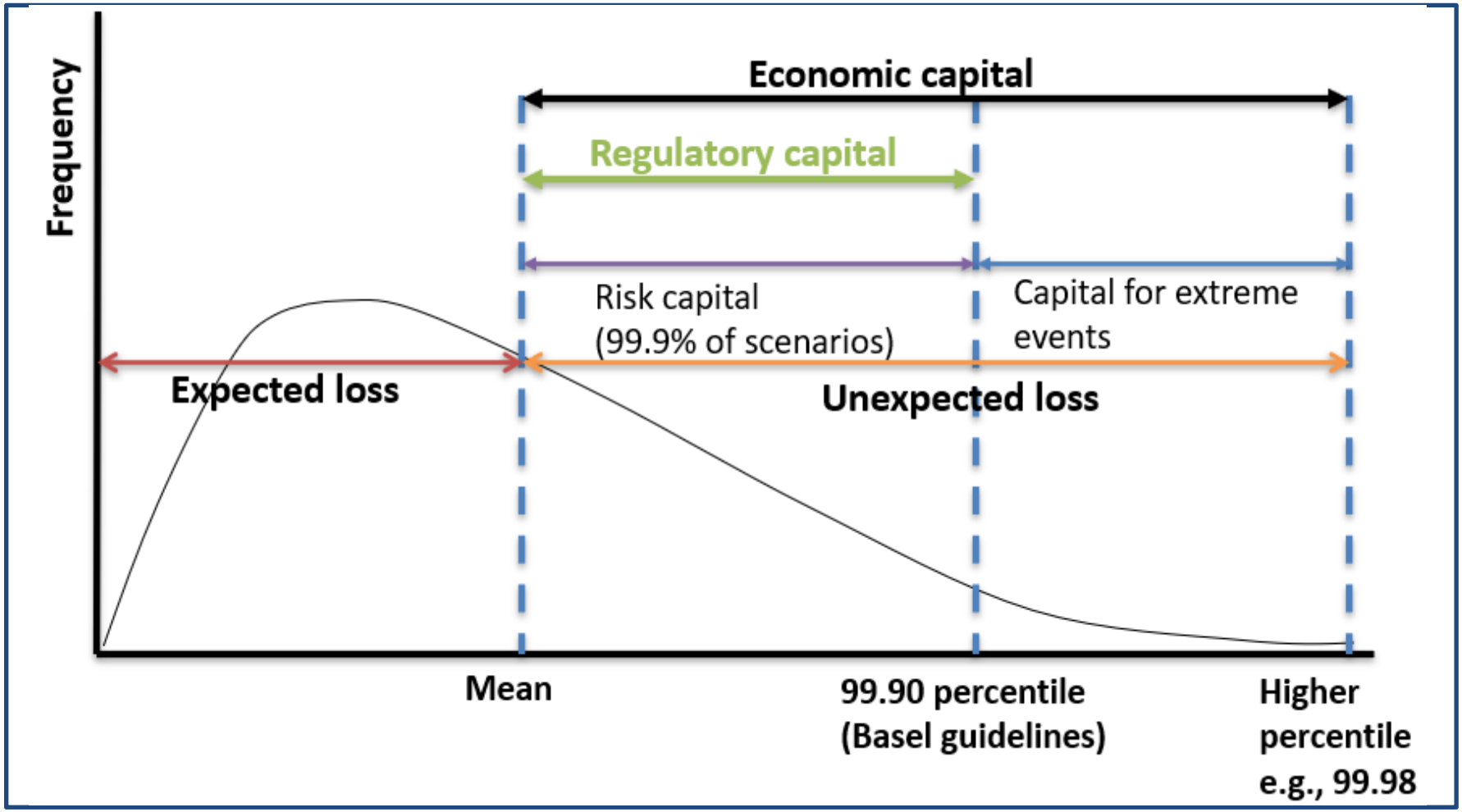
- Refers to the **volatility around expected loss**—the part that is **not predictable.**
- Reflects **tail risk**, arising from **unforeseen economic, legal, or systemic shocks.**
- **Cannot be priced in** directly—must be covered by **capital reserves** or **insurance.**
- Standard deviation is commonly used to **quantify UL.**
- Drives **stress tests** and **solvency limits.**

What is Unexpected Loss (UL)?

Comparing EL and UL

	Expected Loss, EL	Unexpected LOSS, UL
Frequency / Severity	Frequent, small losses	Rare, large shocks
Accounting vs Capital	Hits earnings via provisions	Consumes capital buffers
Predictability	Stable, data-driven	Model-sensitive, scenario-driven
Pricing / Limits	Built into spreads & premiums	Drives risk-appetite limits
Strategic View	Part of routine cost	Tests risk-bearing capacity

What is Unexpected Loss (UL)?



"EL is like the maintenance cost of a car; UL is the cost of a sudden accident"

Real-World Examples

JPMorgan 2024 credit cards: EL seen in a **3.30 % net charge-off rate**—budgeted and provisioned.

Source:https://www.sec.gov/Archives/edgar/data/19617/000019617250000040/a4q24erfexhibit991narrative.htm

Hurricane Ian 2022: insured losses **≈ $60 bn**, far above average annual cat-risk EL—insurers tapped capital for UL.

Source: https://www.munichre.com/en/company/media-relations/media-information-and-corporate-news/media-information/2023/natural-disaster-figures-2022.html

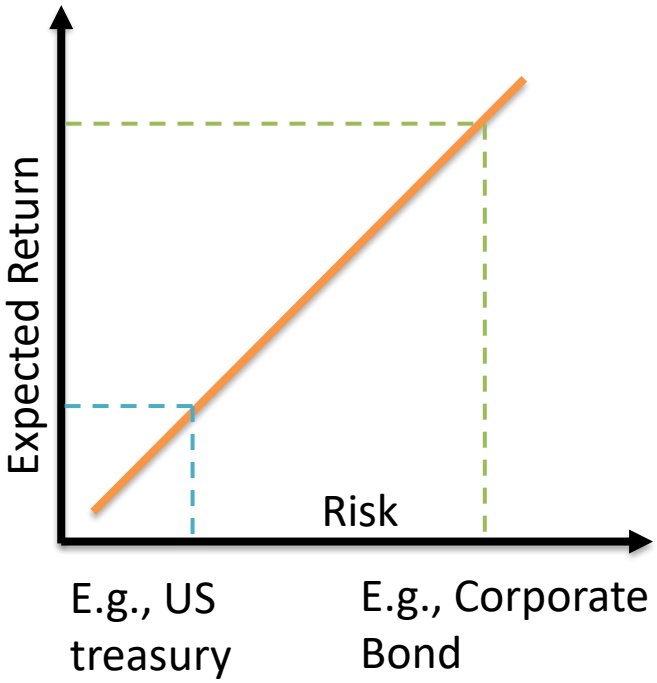
SocGen rogue-trader 2008: €4.9 bn operational loss obliterated UL capital, not anticipated in EL.

Source: https://en.wikipedia.org/wiki/2008_Soci%C3%A9t%C3%A9_G%C3%A9n%C3%A9rale_trading_loss

Understanding the Risk–Reward Tradeoff

Interpret the relationship between risk and reward and explain how conflicts of interest can impact risk management.

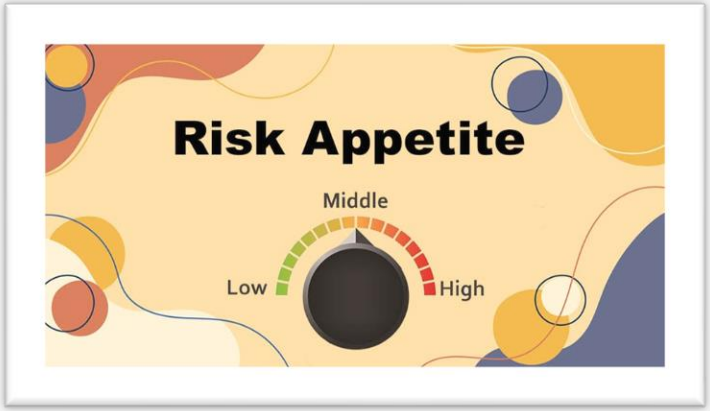
- Investors must accept **higher risk** to achieve **higher expected returns**
- Risk and reward are **positively correlated**, but returns are not guaranteed
- Financial theory (e.g., CAPM) links expected return to **systematic risk (beta)**
- **Diversifiable risk** offers no reward premium; only **non-diversifiable risk** does
- **Example:** Equities offer higher average returns than Treasury bills due to volatility and market risk exposure



Aligning Incentives with Risk Appetite

Aligning Incentives with Risk Appetite

- Institutions define a **risk appetite** to balance **profit pursuit with risk control**
- Business units must align **their strategies** with the organization's **tolerance** for loss
- Misalignment causes **excessive or insufficient risk-taking**
- Risk-adjusted performance metrics like **RAROC** and **economic capital** support this alignment
- **Example:** A trader may be capped on position size based on the firm’s VaR tolerance



Aligning Incentives with Risk Appetite

Risk vs Reward – It's a Balancing Act in Practice

- U.S. firms issued **$32 bn** in junk bonds (May 2025) before tariff talks could widen spreads, **grabbing reward** ahead of repricing. (*Source: https://www.ft.com/content/c1bec33a-b466-45d5-b89e-4442dff6a0f7*)
- Hedge funds lever portfolios until **marginal VaR cost** ≈ incremental alpha.
- Insurers hold **equities** within solvency capital limits for higher long-run return.
- Banks widen **loan spreads** in downturns to offset rising PDs.

How Conflicts of Interest Can Disrupt the Risk-Reward Tradeoff

Examples:

Wells Fargo 2016: sales goals → **2 m fake accounts**, $185 m fine; CEO forfeited **$41 m**.

Rating agencies granted **AAA** to sub-prime CDOs—issuer-pays model skewed judgment.

AIG FP 2008: CDS fees masked risk; unrealised losses hit **$26 bn** pre-bail-out.

London Whale 2012: VaR model tweaks hid build-up; loss **$6.2 bn**, $900 m fines.

Types of Risk

Describe and differentiate between the key classes of risks, explain how each type of risk can arise, and assess the potential impact of each type of risk on an organization.

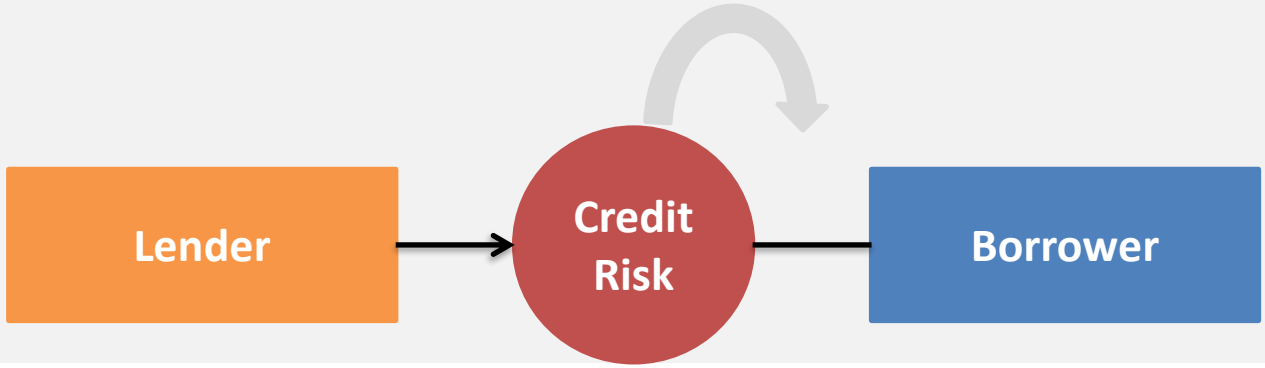
Market Risk

- Arises from **changes in market prices**: interest rates, equity prices, FX rates, commodity prices
- Affects firms with **trading books, derivatives, or foreign operations**
- Measured using **VaR**, **greeks**, and **scenario analysis**
- Amplified by **leverage** or poor hedging
- **Example**: A long EUR/USD position loses value when the dollar strengthens

Types of Risk

Credit Risk

- Arises when a **borrower or counterparty fails** to meet financial obligations
- Includes **default risk**, **credit migration**, and **counterparty risk**
- Common in **loans, bonds, OTC derivatives**, and **trade finance**
- Measured via **PD, LGD, and EAD**; modeled using credit scoring or structural models
- **Example**: A CDS seller faces risk if the reference entity defaults



Types of Risk

Operational Risk

- Arises from **internal process failures**, **human errors**, **fraud**, or **external events.**
- Often **underestimated** due to complexity and rare-event nature.
- Includes legal risk and IT risk; does not include **strategic or reputational risk.**
- Addressed via **controls, audits, and business continuity plans.**

Operational Risk

Types of Risk

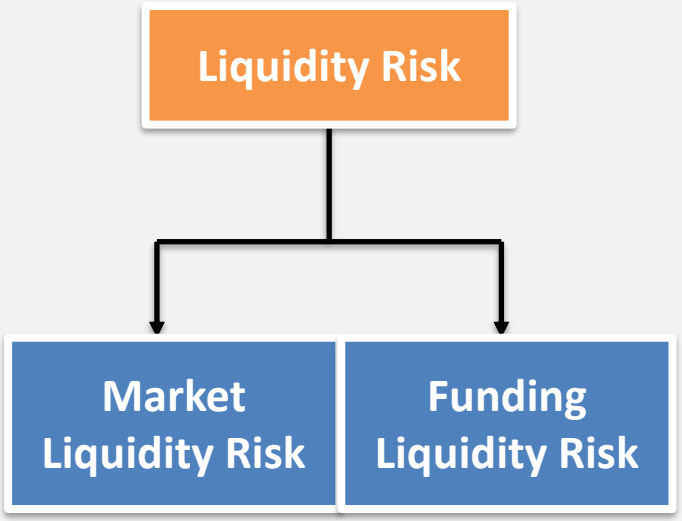
Example: Enron in 2001

- **Off-balance-sheet SPEs** masked debt and **faked profits**, exposing Enron's **weak controls** and **massive governance failure**.
- Stock plunged from **$90** (Aug 2000) to **<$1,** and Enron filed Chapter 11, erasing about **$74 billion** in shareholder value.
- Resulted in **settlements** ($7 billion), **indictments**, and **lost pensions**.

Types of Risk

Liquidity Risk

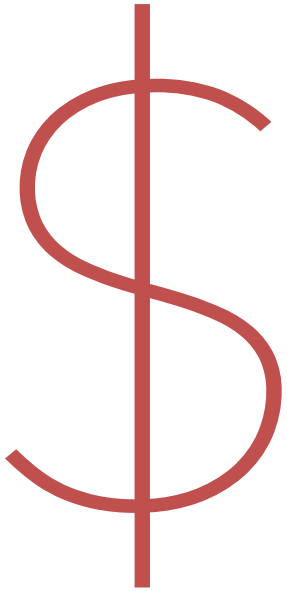
- **Liquidity Risk – Funding and Market Exit Challenges.**
- **Funding liquidity risk**: inability to meet obligations as they come due.
- **Market liquidity risk**: inability to sell assets without large price discounts.
- Affected by **market stress, fire sales**, and **maturity mismatches.**
- Stress tested using **LCR** and **NSFR** (Basel III).



Types of Risk

Example: SVB in 2023

- On March 9, 2023, **SVB** faced **$42 billion** in withdrawals in under 8 hours and was seized the next day.
- The bank held **long-duration securities** with **unrealized losses**, funded by **undiversified, uninsured tech deposits**.
- Regulators invoked the **systemic-risk exception**, protecting all deposits and launching the **Bank Term Funding Program**.



Types of Risk

Reputational and Legal Risk

- **Reputational risk** arises from negative **public perception.**
- Often triggered by **scandals, lawsuits, or ethical failures.**
- Cannot be insured or fully hedged - **very difficult to repair once damaged.**
- Affected by **market stress, fire sales**, and **maturity mismatches.**
- **Legal risks** include regulatory fines, lawsuits, and contract disputes.

Types of Risk

Example: Wells Fargo(2016)

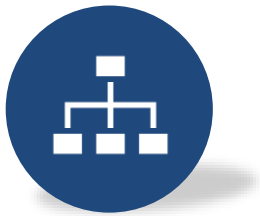
- Over **5,300** employees created **~2 million fake accounts** to meet **aggressive sales targets**, without customer consent.
- Bank was fined **$185 million** in 2016 and faced widespread **public backlash**, congressional hearings, and CEO resignation.
- Scandal caused **lasting reputational damage**, higher compliance costs, and erosion of customer trust and brand value.

Types of Risk

Business and Strategic Risk

Business risk refers to the **variability in earnings** due to external or industry-wide factors like **economic cycles or competition.**

Strategic risk stems from **decisions about long-term direction**, such as entering new markets or launching new products.



Firms must define a **coherent risk appetite** that includes business and strategic risks.

Risk teams can support with **scenario analysis** and **specialized insights** (e.g., credit experts aiding supply chain decisions)

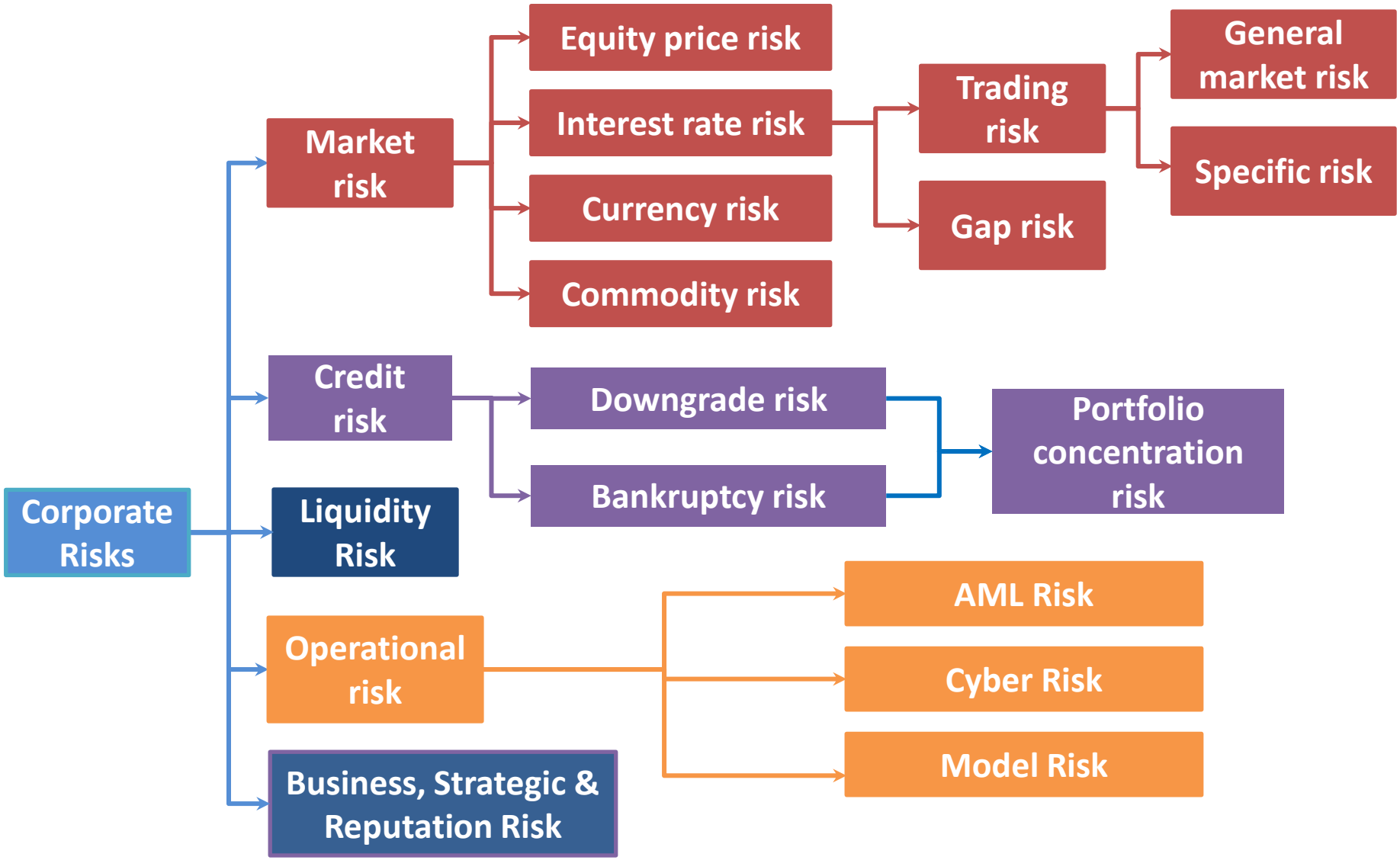
Strategic moves often trigger **other risks**, so risk managers must be involved **early** in planning.

Types of Risk

Example: Nokia's Decline

- **Delayed smartphone adoption** exposed Nokia to strategic decision risk, as it failed to respond to **disruptive innovations** from Apple and Android.
- **Ineffective execution** of its transition to new platforms (e.g., Windows OS) reflected strategy execution risk.
- The company's business model became **obsolete**, leading to sharp declines in **market share** and **earnings volatility**.

Risk Typology: Summary



Risk Class Interactions and Aggregate Impact

Explain how risk factors can interact with each other and describe challenges in aggregating risk exposures.

Risks often **interact and compound**, especially in crises.

Example: A market downturn causes defaults (credit risk), fire sales (liquidity risk), and reputational damage.

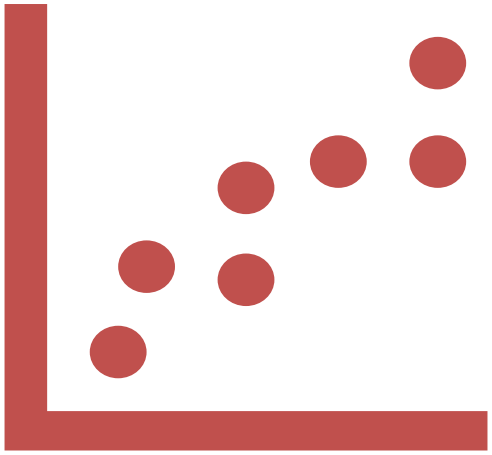
ERM frameworks aim to capture **correlation and contagion effects.**

Important to assess **aggregate risk** using **stress tests and capital planning.**

Example: 2008 crisis began as credit risk but triggered operational, market, and reputational losses.

Correlation Risk and Model Breakdown

- During crises, **correlations rise**—diversification **breaks down.**
- **Gaussian copula** models assumed static dependence, contributing to 2008 mispricing.
- **Structured products** (e.g., CDOs) failed due to underestimating joint defaults.
- Stress events often reveal **hidden correlations** not evident in calm markets.
- **Example**: Sovereign debt and bank solvency became highly linked in Eurozone crisis.

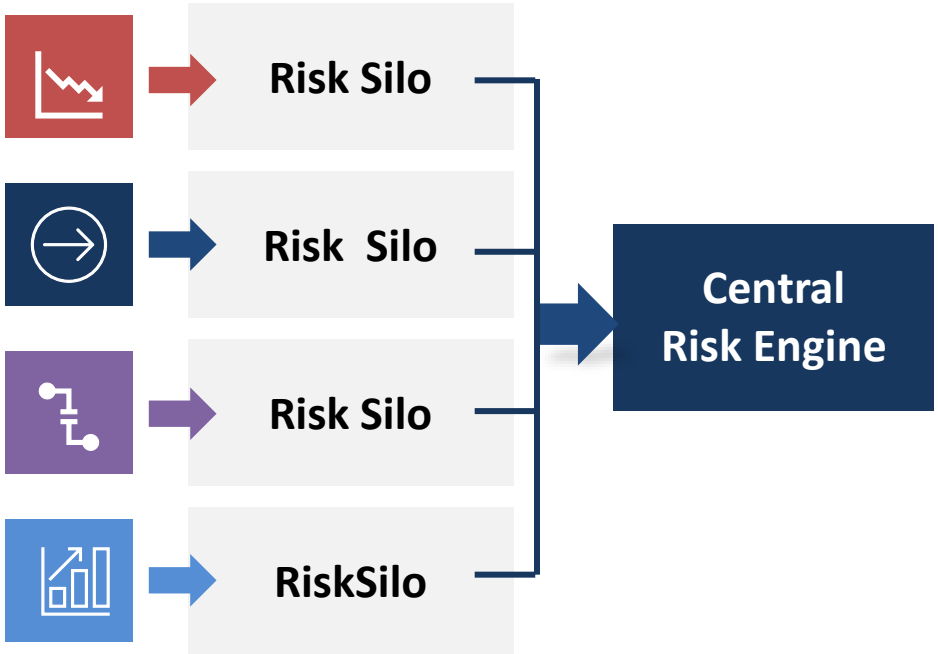


Structural Change: From Tail Risk to Systemic Crisis

- **Tail risks** are rare, extreme events, but **structural change** can make them **recurring and system-wide.**
- 2007–09 showed how **correlated exposures and market structures** turned isolated credit events into a **global crisis**
- Risk wasn't only in **assets**, but in the **structure of the system**: over-leverage, funding fragility, lack of transparency
- **Market mechanisms failed**: funding dried up, counterparties withdrew, and **contagion spread** rapidly
- **Lesson**: Risk managers must assess not just volatility, but **vulnerabilities embedded in financial architecture**

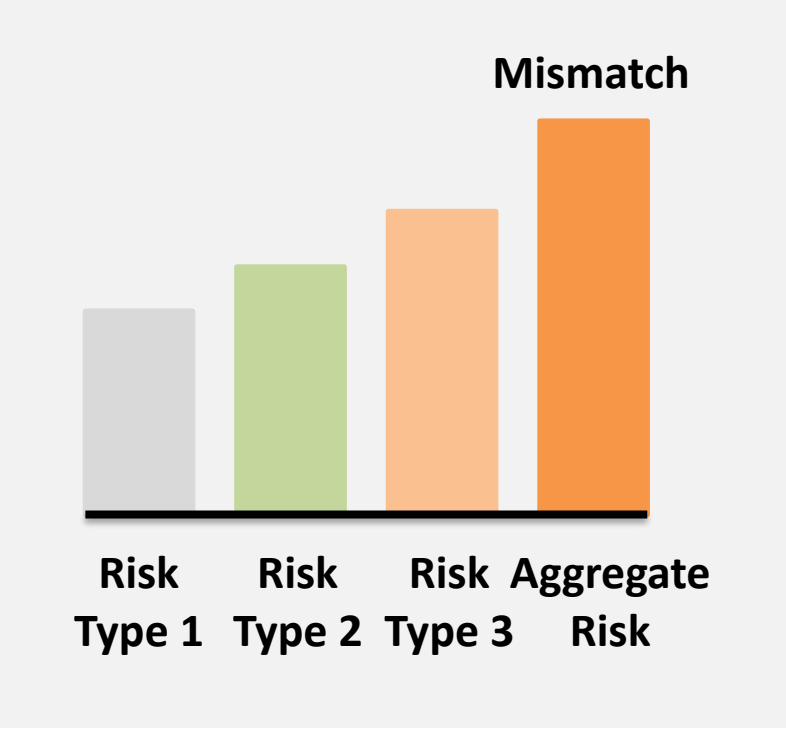
Challenges in Aggregating Risk Exposures

- Aggregation is difficult due to **non-linear risks**, **data silos**, and **model inconsistency**
- Different units measure risk with **incompatible metrics** (e.g., VaR, notional exposure, duration)
- **Risk aggregation across entities** is hindered by lack of centralization or group-level models
- Risk systems may miss **offsets or double-count** overlapping exposures
- **Example**: One desk's short position may be offset by another's long—missed if systems are siloed



Limits of Summation – Risk ≠ Simple Addition

- Total risk is **not the sum** of individual risks due to **interdependencies** and **non-linear effects**
- Must consider **joint distribution** of risks, not individual profiles
- Portfolio effects (e.g., hedging or amplification) change the risk profile
- Risk metrics like VaR are **not additive** across non-normal distributions
- **Key takeaway**: Use **simulation**, **stress testing**, and **scenario analysis** for aggregation



FRM Part I

Foundations of Risk Management

The Building Blocks of Risk Management

Learning Objectives Recap:

- ✓ Explain the concept of risk and compare risk management with risk taking.
- ✓ Evaluate, compare, and apply tools and procedures used to measure and manage risk, including quantitative measures, qualitative risk assessment techniques, and enterprise risk management.
- ✓ Differentiate between expected loss and unexpected loss and provide examples of each.
- ✓ Interpret the relationship between risk and reward and explain how conflicts of interest can impact risk management.
- ✓ Describe and differentiate between the key classes of risks, explain how each type of risk can arise, and assess the potential impact of each type of risk on an organization.
- ✓ Explain how risk factors can interact with each other and describe challenges in aggregating risk exposures