

LM06 · PORTFOLIO MANAGEMENT · CFA LEVEL I

Introduction to Risk Management

Risk vs. exposure vs. appetite; the risk management framework; risk governance; risk tolerance & budgeting; financial vs. non-financial risks; risk metrics (VaR, the Greeks, beta, duration); and the five risk-modification responses.

What This Reading Covers

Risk is the **effect of uncertainty** on objectives. Risk management is *not* about minimising risk or preventing losses — it is the process by which risk *exposure* is compared to risk *appetite* and the two are brought into congruence. Returns above the risk-free rate can be earned only by accepting risk.

Learning Outcome Statements

- LOS a** Define risk management
- LOS b** Describe features of a risk management framework
- LOS c** Define risk governance and describe elements of effective risk governance
- LOS d** Explain how risk tolerance affects risk management
- LOS e** Describe risk budgeting and its role in risk governance
- LOS f** Identify financial and non-financial sources of risk and describe how they may interact
- LOS g** Describe methods for measuring and modifying risk exposures and factors to consider in choosing among the methods

Exam Tip: The curriculum's core message: *risk management is about taking the right risks, not eliminating risk*. Eliminating all risk is undesirable — it prevents erosion of value but also prevents value creation.

LOS A · DEFINING RISK

Risk, Risk Exposure, Risk Appetite, Risk Management

Risk	The effect of uncertainty on objectives — a deviation from expectations. A measure of uncertainty / volatility. Can be decomposed into risk of an event, $P(E)$, and risk of a consequence given the event, $P(A E)$.
Risk Exposure	How much risk are we currently taking? Includes acceptable/planned <i>and</i> unacceptable/unplanned risks.
Risk Appetite	The subset of risk exposure that is acceptable and planned .
Risk Management	The process by which the level of risk that should be taken is compared to the level of risk actually being taken and the two are brought into congruence.

Example: The FX Hedge

A Canadian jeweller enters a USD 3.60 September 16 zero-coupon forward to buy gold. **Price risk** = acceptable (part of the business). **FX risk (USD/CAD = 1.2650)** = unacceptable.

Exposure: price + FX. *Appetite:* price only. *Risk management:* hedge the FX.

Key Insights

- Eliminating all risk is undesirable — no risk = no return.
- Risk management **does not prevent losses**; the losses that do occur should be *acceptable* losses.
- Not about predicting risk — about being **prepared for unplanned risks**.
- Four steps: ① **Identify** ② **Assess** ③ **Mitigate** ④ **Monitor**. Assessment is rooted in probability.

LOS B · RISK MANAGEMENT FRAMEWORK

The Seven Features of a Risk Management Framework

A risk management framework is the **infrastructure, processes, and analytics required to support the risk management function** — a formal way to respond to risk (ISO 31000 provides codified standards).

#	FEATURE	WHAT IT DOES
1	Risk Governance	Board → Risk Management Committee → defines "risk appetite" in alignment with organisational goals (enterprise risk management)
2	Risk Identification & Measurement	Ongoing: identify risk exposures, calculate risk metrics, scan for potential risk drivers
3	Risk Infrastructure	People, systems, technology required to track risk exposures; databases, models; risk capture (historical data)
4	Policies & Processes	Translate risk governance into day-to-day operations: "if X, then Y by doing Z" (mitigation); "check W every Q hours" (updating); "do A every B units of time" (backups)
5	Monitoring, Mitigating, Managing	Risks evolve — come and go; ongoing process
6	Communications	Governance parameters <i>down</i> ; risk metrics <i>up</i> ; issues reviewed/discussed; feedback loop
7	Strategic Analysis / Integration	Governance body defines goals and risk tolerance; management executes within the RM framework; may lead to reallocation of capital

Benefits of a RM Framework

- Lower probability of being surprised by an event.
- Less defence, fewer errors.
- More discipline, better consideration of risk-return tradeoffs.
- Faster response, smaller losses.

LOS C · RISK GOVERNANCE

Risk Governance

Risk governance is the **top-down process and guidance from the Board** that keeps management actions and organisational goals in alignment.

What Governance Does

- 1 Determines the organisation's **goals and priorities**.
- 2 Determines the organisation's **risk appetite and tolerance** — what risks are acceptable, what needs to be mitigated, what is unacceptable.
- 3 **Risk-management oversight** — typically via a Risk Management Committee (akin to an audit committee) and a Chief Risk Officer (CRO).

Desirable Properties of Effective Risk Governance

- Provides a sense of the **worst loss that can be managed**.
- **Clear guidance** balanced with *execution flexibility*.
- Focuses on **enterprise risk management** — the objectives, health, and value of the whole organisation.

Enterprise-Level Thinking

Example: should a pension fund hold shares of the *sponsor's* stock? All employees already have exposure to the company through their employment — additional concentration in the pension plan compounds that risk. Proper governance addresses these **whole-enterprise interactions**.

LOS D · RISK TOLERANCE

Risk Tolerance

Risk tolerance is the **extent to which the entity is willing to experience losses or opportunity costs** and fail to meet its objectives — it *defines the entity's risk appetite*.

Internal Factors

Shortfalls **within the organisation** that would cause it to fail to achieve critical goals (e.g., liquidity, experience/expertise).

External Factors

Environmental forces — forex, interest rates, regulatory changes.

Once internal and external factors are identified, the organisation defines the dimensions of risk it is **unwilling to accept**.

Factors That Increase Risk Tolerance

- Stronger competitive position.
- Greater the loss that can be sustained.
- Greater response agility — speed, expertise, flexibility.

What Risk Tolerance Should *Ignore*

Personal motivations and beliefs of individual managers — tolerance is an **entity-level** characteristic based on the entity's capacity and strategic position.

Exam Tip: Risk tolerance → risk appetite → risk budget. Tolerance is the *capacity*; appetite is the *stated willingness*; the budget is the *allocation*.

LOS E · RISK BUDGETING

Risk Budgeting

Risk budgeting **quantifies and allocates tolerable risks** to various activities / investments. The goal is to allocate the overall amount of acceptable risk to the mix of assets or investments with the greatest expected returns.

Two Approaches to Measuring Risk in the Budget

- 1 **Single-dimensional risk measures** — standard deviation, beta, VaR (marginal, component, incremental, relative).
- 2 **Multi-dimensional risk approaches** — consider multiple risk factors simultaneously.
- 3 **Portfolio margining** — risk is evaluated based on the risk profiles of the underlying classes.

Risk Budgeting vs. Capital Budgeting

Risk Budgeting: portfolio weights based on each security's *risk contribution*.

Capital Budgeting: portfolio weights based on each security's *return contribution*.

The risk budget may be a single metric — portfolio beta, VaR, portfolio duration, or returns variance — depending on what best captures the dominant risks of the activity.

KNOWLEDGE CHECK — QUIZ 1

Framework, Governance, Tolerance & Budget

Q1. Risk management is *best* described as:

Q2. Effective risk governance *most likely*:

Q3. Which of the following would *least* likely increase an organisation's risk tolerance?

Q4. Risk budgeting differs from capital budgeting primarily because:

Q5. Which is *not* a feature of a risk management framework?

LOS F · FINANCIAL SOURCES OF RISK

Financial Sources of Risk

Financial risks arise from **exposure to financial markets**.

Market Risk

Changes in **interest rates, stock prices, forex, commodity prices**. Drivers: fundamental economic conditions, industry or company events.

Credit Risk (Default / Counterparty)

One party **fails to pay or perform** an obligation. Drivers: economic weakness, drops in demand.

Liquidity Risk (Transaction Cost)

Having to **sell an asset below fair value**. Drivers:

- Widening bid-ask spreads in times of market strain.
- Changes in market conditions or the market for the specific asset.
- Size of the position.

Exam Tip: Liquidity risk here is *asset/market* liquidity — being unable to sell at fair value. Don't confuse it with *funding* liquidity / solvency (covered under non-financial).

LOS F · NON-FINANCIAL SOURCES OF RISK

Non-Financial Sources of Risk

RISK	DESCRIPTION
Settlement (Herstatt) risk	A party fails to deliver <i>even though it has been paid</i> . Named after the failure of German bank Herstatt.
Legal	Being sued; not making the legal argument (vicarious liability).
Compliance (regulatory, accounting, tax)	Includes "injurious reliance" — relying on incorrect tax or accounting advice.
Model	Valuation errors from a mis-specified or mis-used model. Includes tail risk — events in the tail occurring more frequently than the model expects (Taleb's Black Swan).
Operational	Internal — people & processes. Example: just-in-time inventory break-downs.
Solvency	Running out of cash — unable to secure financing or roll over debt.

Individuals Face Additional Risks

Theft, health, mortality, accident, wealth — many addressed via **insurance**.

Interactions: Risks Combine

Risks do not stay in silos. Examples from the curriculum:

- **Wrong-way risk** — credit risk worsens precisely when market risk worsens.
- **Systemic risk** — distress in one institution spreads through the system.
- **Concentration** — owning a home in a one-factory town, employed at that factory, and holding company stock in the pension plan (the "GM & Flint, MI" example).
- **Minsky / Financial Instability Hypothesis** — stable periods encourage risk-taking that eventually destabilises the system.

LOS G · MEASURING RISK EXPOSURES

Risk Metrics

Asset Risk Metrics

- **Probability** of loss.
- **Standard deviation** — assumes normal distribution, no fat tails; use *portfolio* σ , not asset σ .
- **Beta** — systematic risk; appropriate for equities held in a well-diversified portfolio.

Bonds

- **Duration** — price sensitivity of debt securities to changes in interest rates.

Derivatives Risks — the Greeks

GREEK	SENSITIVITY OF DERIVATIVE VALUE TO
Delta	Price of the underlying asset (P_a)
Gamma	Changes in delta (i.e., second derivative w.r.t. P_a)
Vega	Volatility of the underlying price
Rho	Changes in the risk-free rate

LOS G · TAIL-RISK MEASURES

Value at Risk & Related Measures

Value at Risk (VaR)

A **minimum extreme loss metric** — measures financial risk across all asset classes. Expressed in three parts:

4M@34M today"

- **Currency amount · probability · period of time.**
- **No maximum loss is stated** — VaR is a floor on the extreme loss, not a ceiling.
- Subject to **model error** — must assume a distribution of profit.

Conditional VaR (CVaR)

Expected loss given that the loss exceeds VaR — the average of the tail.

Extreme Value Theory (EVT)

Attempts to overcome the **left-tail shortcomings of the normal distribution** by fitting a separate distribution to extreme outcomes.

Scenario Analysis & Stress Testing

Used to **complement VaR**.

- **Stress testing** — effects of a specific (usually extreme) change in a *single* key variable.
- **Scenario analysis** — what-if analysis incorporating specific changes in *multiple* inputs.

Credit & Non-Quantitative Metrics

Credit ratings and CDS pricing inform credit markets. Operational, compliance, and legal risks are **difficult to quantify** — use subjective measures.

WORKED EXAMPLE · INTERPRETING VaR

Reading & Using VaR

EXAMPLE

One-Day VaR of \$4M at 3%

GIVEN

A trading desk reports a 1-day VaR of **\$4M at the 3% level**. Management wants to know: (a) What does this mean? (b) Does it tell us the worst possible outcome? (c) How should it be supplemented?

INTERPRETATION

1. **Meaning.** There is a 3% probability of a loss of *at least 4M over one day. Equivalently, 974M.*
2. **Ceiling?** No — VaR is a *minimum* extreme-loss measure. It does not tell us the worst-possible loss; the loss in the remaining 3% of cases could be far larger.
3. **Supplement with.** (i) *Conditional VaR* to estimate the expected loss *given* a tail event; (ii) *Stress tests* on single variables (e.g., a 200-bp rate shock); (iii) *Scenario analysis* across multiple variables simultaneously (e.g., 2008-style crisis inputs).

TAKEAWAY

VaR is useful because it aggregates financial risk into a single number, but it depends on the assumed distribution and says nothing about *how bad* the tail is. **EVT, CVaR, stress tests, and scenario analysis** are the standard complements.

Exam Tip: Watch for the distractor: "VaR tells us the maximum loss." False — it tells us the *minimum* loss on the X% of worst days.

KNOWLEDGE CHECK — QUIZ 2

Sources of Risk & Measurement

Q6. Herstatt risk is *best* described as a type of:

Q7. A portfolio's 1-day VaR is \$2M at the 5% level. Which statement is *most* accurate?

Q8. Which of the following *best* measures the sensitivity of a derivative's value to changes in the volatility of the underlying asset?

Q9. A "what-if" analysis that examines portfolio outcomes under simultaneous changes in multiple inputs (e.g., a replay of the 2008 crisis) is *most* consistent with:

Q10. Wrong-way risk is *best* described as an example of:

LOS G · MODIFYING RISK EXPOSURES

The Five Responses to Risk

Once risks are measured, management may **avoid, prevent, accept, transfer, or shift** them.

RESPONSE	WHAT IT MEANS	TYPICAL TOOLS
Risk Prevention / Avoidance	The associated activities are <i>not worth pursuing</i> . Do not engage in the activity with the uncertain outcome.	Exit the business line (e.g., jewellery maker stops speculating on gold; hedges production gold only).
Risk Acceptance	Keep the exposure but manage internally.	<i>Self-insurance</i> (loan-loss reserves); <i>Diversification</i> to reduce non-systematic risk.
Risk Transfer	Pass the risk to another party — typically an insurance policy.	Insurance (pay premium → protect against loss); re-insurance; CAT bonds; surety bonds; fidelity bonds; indemnity clauses. (A "bond" here is a promise, not debt.)
Risk Shifting	Changes the <i>distribution</i> of risk outcomes.	Derivatives — forwards, futures, swaps, options (e.g., buying index puts).

Key Distinctions

- **Insurance = transfer** (third party absorbs the risk); **derivatives = shifting** (the payoff distribution is reshaped).
- Insurers can further **re-insure** or use CAT bonds to transfer risk onward.
- **Diversification** only reduces non-systematic risk — systematic risk cannot be diversified away.

Exam Tip: A surety bond, fidelity bond, indemnity clause, and insurance policy are *all* risk-transfer devices. Derivative hedges are *risk-shifting*. Know the vocabulary distinction.

LOS G · FACTORS IN CHOOSING RISK MODIFICATION METHODS

Choosing How to Modify Risk

Factors to Consider

- 1 **Is the risk core to the activity?** Core risks (e.g., market risk for an investment bank) are typically borne; peripheral risks (e.g., FX for a domestic manufacturer) are hedged.
- 2 **Cost vs. benefit.** Insurance and derivatives have premiums / margin costs; self-insurance preserves cash but consumes capital.
- 3 **Tolerance and capacity.** Entities with strong competitive position, large loss-bearing capacity, and high response agility can accept more risk internally.
- 4 **Counterparty reliability.** Transfer is only as good as the counterparty (insurer creditworthiness; CCP in derivatives).
- 5 **Basis risk and model risk.** Hedges are rarely perfect — residual basis risk and model error remain.

How the Responses Combine in Practice

Organisations rarely use only one response. A firm may **diversify** core exposures (accept), **transfer** catastrophic risks via insurance, **shift** FX and rate risks via derivatives, and **avoid** activities that fall outside its expertise.

What Risk Management Cannot Do

- Prevent all losses (only make them *acceptable*).
- Eliminate systematic risk through diversification.
- Remove model risk and tail risk — especially in reliance on normal-distribution assumptions.

KNOWLEDGE CHECK — QUIZ 3

Modifications & Integration

Q11. A firm funds a loan-loss reserve rather than buying credit insurance. This is *best* described as:

Q12. Buying index put options to protect a long equity portfolio is *best* described as:

Q13. Which of the following is *least* likely to be considered a financial risk?

Q14. An organisation's risk budget:

Q15. Which is *most* consistent with effective risk governance?

MODULE COMPLETE

Your Scorecard

0 / 15

LM06 Key Takeaways

Definitions

- 1 **Risk** = effect of uncertainty on objectives. **Exposure** = risk currently taken. **Appetite** = acceptable/planned exposure. **Management** = align exposure with appetite.
- 2 Four steps: Identify · Assess · Mitigate · Monitor.

Framework (7 Features)

- 3 Governance · ID & Measurement · Infrastructure · Policies & Processes · Monitoring/Mitigation · Communications · Strategic Analysis.

Governance, Tolerance, Budget

- 4 **Governance** = top-down, enterprise-wide; defines worst manageable loss and provides clear-yet-flexible guidance.
- 5 **Tolerance** ↑ with competitive position, loss capacity, response agility. Ignore personal beliefs.
- 6 **Risk budget** allocates by risk contribution (vs. capital budget by return contribution).

Sources of Risk

- 7 **Financial:** market, credit, liquidity. **Non-financial:** settlement (Herstatt), legal, compliance, model, operational, solvency.

- 8 Risks *interact*: wrong-way, systemic, concentration (GM/Flint), Minsky FIH.

Measurement

- 9 σ , β , duration. Greeks: Δ (price), Γ (Δ -change), vega (volatility), rho (rf).
- 10 **VaR** = minimum extreme-loss metric (\$, probability, time). **CVaR** = expected loss given VaR is exceeded. Supplement with stress tests (single variable) and scenario analysis (multiple).

Modifications (5 Responses)

- 11 **Avoidance** · **Prevention** · **Acceptance** (self-insure, diversify) · **Transfer** (insurance, surety/fidelity bonds, CAT bonds) · **Shifting** (derivatives).

Last-Minute Exam Checklist

RM steps: Identify, Assess, Mitigate, Monitor

7 framework features: governance, ID/measurement, infrastructure, policies, monitoring, communication, strategic analysis

Financial risks: market, credit, liquidity

Non-financial: settlement (Herstatt), legal, compliance, model, operational, solvency

VaR: \$, probability, time — minimum extreme loss (no ceiling)

Greeks: Δ , Γ , Vega, Rho

Responses: Avoid · Prevent · Accept (self-insurance, diversify) · Transfer (insurance) · Shift (derivatives)