CHARTA LEARNING · LESSON NOTES

Introduction to risk management

CFA Level I · Portfolio Management

You will learn: How to describe a risk management framework, set a risk tolerance and share it out as a risk budget using contribution to risk, choose among the four responses to a risk, and change a portfolio's exposure with options and futures.

Running example: Examples follow Maple Ridge, a made-up pension fund. All numbers are invented for illustration.

1. The risk management framework

- A framework is the whole system an organisation uses to take the risks it meant to take, in the amounts it meant, and avoid the rest. Its goal is not the smallest possible risk: no risk taken means no return earned. It is about choice.
- Parts: risk governance (senior people set the tolerance and accountability); identification and measurement (every exposure named and sized); risk infrastructure (the people, data and systems); policies and processes (rules and limits); monitoring and reporting (compare holdings with limits); strategic risk analysis (are the limits about the right risks at all?).
- Governance must be independent: the people who watch risk must not report to the people who take it, like a referee paid by one team. Strategic analysis catches risks that are not positions, such as a change in the law.
- Every link must hold. If identification fails the breach is not seen; measurement, it is understated; infrastructure, it is late; governance, the manager cannot say no.

A BREACH AT MAPLE RIDGE: EQUITY DESK VALUE AT RISK (VAR) LIMIT SET BY THE BOARD

Limit approved in advance	set by governance	**2.0m**
Measured exposure	this morning's report	**2.6m**
Overshoot	2.6 − 2.0	**0.6m**
Utilisation of the limit	2.6 ÷ 2.0	**130%**

Watch out: Aiming for the smallest risk; letting the risk function report to the risk takers.

2. Risk tolerance

- Risk tolerance is the amount of risk an organisation is both willing and able to bear. Willingness (risk appetite) is how much loss the board is comfortable with: preference and attitude. Capacity (ability) is how much loss the organisation can take and still meet its obligations: a matter of facts.
- Tolerance is the lower of the two. A board comfortable with a loss bigger than its capacity has ignored the facts. It is set at senior level and then shared out.

> **Capacity = Assets − Minimum needed; Tolerance = lower of Willingness and Capacity**

MAPLE RIDGE: ASSETS 500M, MINIMUM NEEDED 410M

Capacity	500 − 410	**90m**
Board A willing to lose 60m	lower of 60 and 90	**tolerance 60m**
Board B willing to lose 120m	lower of 120 and 90	**tolerance 90m**

Watch out: Setting tolerance from willingness alone.

3. Risk budgeting and contribution to risk

- Risk budgeting allocates the total tolerance across activities (equities, bonds, alternatives), as a household budget splits income. It is set before the exposures are taken, when nobody has a stake in a position.
- It can be written in standard deviation, VaR or contribution to total risk; contribution is the most informative.
- Contribution asks how much a position adds to the risk of the whole portfolio, allowing for interaction. The contributions of all positions add up to the portfolio's standard deviation; divided by the total they give shares summing to 100%.
- Capital is not risk: equities are 50% of capital but 83.8% of risk. Two positions that look modest alone can be almost the same bet twice, so limits must allow for correlation.

> **Contribution = w × Cov(position, portfolio) ÷ σp; sum of contributions = σp**

WEIGHTS 50/40/10, RISKS 18%, 6%, 12%; CORRELATIONS E AND B 0.2, E AND A 0.5, B AND A 0.1

Covariance E and B	0.2 × 0.18 × 0.06	**0.00216**
Portfolio variance and risk	sum of weight × covariance with portfolio	**0.01082; √ = 10.40% (weighted average of risks 12.6%)**
Equities contribution	0.5 × 0.01814 ÷ 0.1040	**8.7 points (83.8%)**
Bonds contribution	0.4 × 0.00259 ÷ 0.1040	**1.0 points (9.6%)**
Alternatives contribution	0.1 × 0.00713 ÷ 0.1040	**0.7 points (6.6%)**
Two desks, each risk 4m: ρ = 0 / 0.9 / 1	√(16 + 16); √(16 + 16 + 2 × 0.9 × 16); 4 + 4	**5.66m / 7.80m / 8.00m**

Watch out: Budgeting by capital or by standalone risk, which ignore correlation.

4. The four responses to a risk

- Avoid: do not undertake the activity, so no exposure is left. Retain: take the risk on knowingly and hold capital against it.
- Transfer: pass the risk to another party for a fee, as with insurance. Shift: use derivatives (contracts whose value depends on another asset) to change the shape of the payoff.
- Transfer and shifting are easy to confuse. Insurance moves the risk to someone else's balance sheet. A derivative leaves the position with you but changes its payoff, and brings its own risk that the other side fails to pay.
- Choosing: if the organisation is paid to bear the risk and has an advantage (skill, information, diversification), keep it. Unrewarded risks or those outside its skill are better avoided, transferred or shifted. Every hedge costs money. Never hedge away the risk that is the business.

MAPLE RIDGE BUYS 100M OF FOREIGN COMPANY BONDS

Credit risk	extra yield 1.2% = 1.2m; paid and skilled	**retain**
Currency risk	9% of 100m = 9.0m swing, no reward; forward costs 0.4m	**shift**
Operational risk (custody failure)	no reward; insurance, reliable custodian	**transfer**
What is left		**the intended risk, credit**

5. Changing exposure: options and futures

- A protective put gives the right to sell at a set price (the strike). It cuts off the losses while the gains stay open: the shape of the outcomes has changed.
- Futures let you gain or lose with a market without selling the holdings, a quick, cheap way to dial exposure up or down. Beta measures how strongly the portfolio moves with the market. A negative notional means sell futures, a positive one means buy.

> **Futures notional = (β wanted − β now) ÷ β futures × Portfolio value**

PUT ON A 100M PORTFOLIO: STRIKE 90M, PREMIUM 2M (FLOOR 88M)

Ends at 70	sell at 90, less 2	**88m**
Ends at 90	90 − 2	**88m**
Ends at 100	100 − 2	**98m**
Ends at 120	120 − 2	**118m**
Futures: 200m equities, beta 1.0, target 0.6, futures beta 1.0	(0.6 − 1.0) ÷ 1.0 × 200	**sell 80m**
Test, market falls 10%	−10% × 200 = −20m; +10% × 80 = +8m	**net −12m = 0.6 × 10% × 200**

Key takeaways

- The aim is intended risks in intended amounts, not the smallest risk.
- Risk governance must be independent of the risk takers.
- Tolerance is the lower of willingness and capacity; capacity = assets − minimum needed.
- Set the risk budget before exposures are taken, and measure it by contribution to total risk, which adds up to the portfolio risk.
- Four responses: avoid, retain, transfer, shift. Keep the risks you are paid for and have an edge in.
- Futures notional = (β wanted − β now) ÷ β futures × value; negative means sell.

Quick check

1. Which framework part sets tolerance? Independent of whom?
   Answer: Risk governance; independent of the risk takers
2. Assets 300m, minimum needed 255m, board willing to lose 60m. Tolerance?
   Answer: Capacity 45m is lower than 60m: 45m
3. 50m portfolio, beta 1.0, want 0.5, futures beta 1.0. Trade?
   Answer: (0.5 − 1.0) × 50 = −25: sell 25m