

Reading:

- COSO (2012) *Understanding and Communicating Risk Appetite*
- S&P (2006) *Evaluating Risk Appetite:*
- IAA: Chapter 4 + references throughout to risk appetite ...
- Sweeting: Section 15.2
- Institute of Risk Management (IRM): *Risk Appetite and Tolerance*
- Lam: pages 393-394.
- Handout: *Coherent risk measures*

- Unit 6.1: Introduction
- Unit 6.2: Key Concepts
- Unit 6.3: Details: Risk Appetite and Risk Tolerances
- Unit 6.4: Risk Limits

Unit 6.1: Introduction

Introduction: What is Risk Appetite?

COSO:

Risk appetite is an expression of *the amount of risk, on a broad level, an entity is willing to accept in pursuit of value.*

Abbreviations:

- RA = Risk Appetite
- RT = Risk Tolerance
- RP = Risk Profile
- RC = Risk Capacity
- RL = Risk Limits

Warning: these terms mean different things to different people – HOWEVER: it is the concepts that matter

Why do we need the concepts of risk appetite and risk tolerances?

- No RA/RT statements \Rightarrow we can only *measure* risk
- Well formulated means that, *in a quantitative setting*:
we have a clear mathematical **objective function** with **constraints** that is to be **optimised**
- Optimisation \Rightarrow risk **management**
- No RA/RT statements \Rightarrow unable to optimise

S&P Criteria → culture indicator

“... clearly articulated risk tolerance ... consistent with goals and resources of the firm and expectations of board and shareholders”

“Resources” ⇒

Assets, number of staff, relevant expertise amongst staff, computing power,

Summary

- Begin to understand the concepts of risk appetite and risk tolerances

Unit 6.2: Key Concepts

Risk Appetite and Risk Tolerance

Different people use different language. [Here:](#)

- RA: relatively brief, Board-level statement on risk
e.g. an expression of the overall level of risk the company is prepared to take in order to achieve its objectives
- RT: more detailed set of statements (examples later)
Top priority: clearly articulated set of RT's; comprehensive

Simple approach to RA versus RT

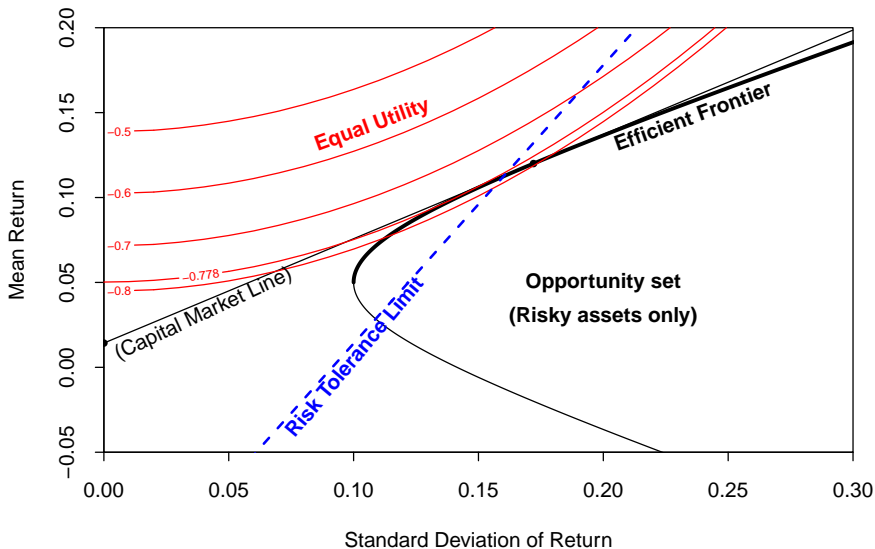
- This example mixes ideas in IRM + Sweeting
- Start with universe of all possible strategies (good and bad)
- Risk tolerance \Rightarrow
 - **Constraints** on what strategies are acceptable
 - What is the company *not allowed* to do?
- Risk appetite \Rightarrow
 - What does the company *want* to do?
 - Concerns the pursuit of risk in hope of good returns
 - High level statements on balance between risk and reward
 - Shareholders' reasonable expectations on risk taking

Portfolio Theory as an example

Example:

- Returns on different assets have a multivariate normal distribution
- Assets combined into a buy-and-hold portfolio, held for 1 year
 $R = \sum_{i=1}^n w_i R_i =$ portfolio return per £1 invested
- $W(0)$ = current wealth; $W(1) = (1 + R)W(0)$ = wealth at time 1
- The company seeks to optimise its utility function $u(W(1))$
- Objective: maximise $E[u(W(1))]$
- Risk tolerances: constraints on what portfolios are suitable
E.g. we require $Pr(R \geq r_{min}) \geq \alpha$

Utility Function => Risk Appetite



Features: 1: risk-return diagram; 2: opportunity set; 3: efficient frontier; 4: capital market line with risk free asset; 5: RT boundary; 6: acceptable portfolios meeting RT; 7: lines of equal utility; 8: Optimal portfolio with $E[u(W(1))] = -0.778$.

Risk Profile (RP)

- An inventory of current and emerging risks
- Quantifiable and non-quantifiable
- Awareness of dependencies and interactions
- Development over time following current strategy

- The Risk Profile should (normally) satisfy the constraints imposed by the Risk Tolerance statements

Risk Capacity (RC)

- Financial capacity to deal with current Risk Profile
 - economic capital + additional shareholders' capital
 - allocation of economic capital to business lines
- Operational capacity
 - ⇒ staff numbers; staff capabilities and locations;
buildings and computers
- Reputational capacity
 - operational risks
 - risk of fall in credit rating ⇒
damage to reputation; loss of shareholder value
- Development over time

Summary

- Begin to understand the concept of risk appetite and risk tolerance
- Risk appetite is a broad heading
- Risk tolerance is a more specific set of constraints on risk taking
- Understand that the risk profile must sit comfortably with a company's risk appetite and risk tolerances
- Understand what is meant by risk capacity

Unit 6.3: Details: Risk Appetite and Risk Tolerances

6.3: Details: Risk Appetite and Risk Tolerances

Things to consider when you are formulating a company's risk appetite statement:

- Existing behaviour and risk profile (RP) (past development)
- Current risk capacity (RC)
- Key stakeholders
- Strategic objectives (3 or 5 year targets)
- Be realistic
- What is not acceptable?
- What is acceptable subject to limits?

Quantitative viewpoint

IF you have been doing STRONG ERM for a few years, how would you rank RP, RC, RT?

$$RP < RT < RC$$

- Ideally equality, but evolution over time plus time lags in implementing decisions etc. means this is impossible
- In reality, ERM is complex and the inequalities should not be considered literally as a mathematical inequality
- In reality, this is also multi-dimensional

RT statements

- RA/RT \Rightarrow high level (group)
 - Specific and well focused
 - Quantitative and qualitative
 - Consistent with 3 or 5 year strategy
 - Specific time horizons
 - Relevant and up to date
 - Appropriate for the type of business (Acceptable/not acceptable)
 - Realistic rather than unattainable
 - Can you determine if you are satisfying a given criterion?
-
- SMART: Specific; Measurable; Appropriate; Realistic; Time-limited
 - SMART: Specific; Measurable; Achievable; Relevant; Time-limited

Possible components of RT statements

To have a SMART RT statement we typically need the following elements, especially for quantitative risks:

- M: a Metric (e.g. a random variable that can be observed at some future date; or a quantity that can be measured now)
- T: a Time horizon
- L: a Limit or target or threshold (1 or 2) that the metric should not exceed
- RM: a risk measure (e.g. a probability or expected value)

Where a risk is not quantifiable (NQ) we still need RT statements that can be verifiable.

Possible components of RT statements (cont.)

Components (M/T/L/RM/NQ):

- Specific time horizon
- Desired credit rating (e.g. AA)
- Volatility of earnings or financial position
- Dividend-paying capacity
- Ability to meet supervisory criteria
- Maximum aggregate risk
- Mandate and scale:
 - Types of business that will not be accepted
 - Acceptable levels in each of the major risk categories
- Minimum acceptable risk-adjusted return
- Economic capital criteria: e.g. RORAC, $Pr(\text{bankrupt})$, time horizon
- Buffer capital over supervisory capital

Possible components of RT statements (cont.)

- Maximum catastrophe losses in next year
- Unacceptable operational risk scenarios
- Risk of damage to reputation
- Economic value/shareholder value

- Constraints linked to policyholders, customers, regulators
- Quantifiable \Rightarrow probabilistic statements (e.g. Value-at-Risk (VaR); Expected Shortfall)
- Non-quantifiable \Rightarrow statements of what is or is not acceptable
or: e.g. constraints on existing business
- Clear and understandable
- Comprehensive

Examples of RT statements

- The solvency level, X , should stay above the threshold y with probability 0.995 over the next 3 years.
- Prob. credit rating falls from AAA to A (or worse) over the next 12 months no more than 0.01.
- Earnings volatility over the next 5 years no more than $y\%$ per annum.

Examples of RT statements (cont.)

- 1-in-100 *probable maximum loss* (PML) over the next year is less than 10% of capital.
plus 1/250 PML, 1 year, less than 15% of capital
Due to single event or aggregate

- Market risk losses over the next year:
10% or more loss with probability of no more than 0.01

Summary

- Understand what elements are required for a clear set of risk tolerances

Unit 6.4: Risk Limits

Risk limits are very similar to risk tolerances but are more comprehensive and more detailed, and apply further down the management chain down to the level of the individual.

6.4: Risk Limits (RL)

- Defined for:
 - Risk categories
 - Business units
 - Down to individuals
- Consistent with risk tolerance statements
(Recall coherent risk measures – see handout/PDF)
- Risk limits must be written in a way that can be easily understood by the people who have to work within the stated limits.
And it must be clear who is responsible for adherence to each risk limit.

Risk Limits: Examples

- Counterparty credit limits
- Minimum counterparty credit quality
- Concentration limits (be specific)
- Minimum strength of reserves on individual business units against adverse events
- Underwriting and pricing principles and limits (e.g. limits on mortgage authorisation)
- Investment mandates:
 - Acceptable asset classes
 - Constraints on asset mix
 - e.g. Cash 5% to 10%; UK equity 40% to 60%; ...
- Limits on the use of financial derivatives

Risk Limits: Examples (cont.)

- Policies designed to limit operational risk
 - DO this
 - DON'T DO that
- Types of activity that a specific business unit can or cannot engage in
- Flexibility
Guidance or rules on developing new or currently authorised business

Key Risk Indicators (KRI's)

- Management tools
- Designed to help monitor adherence to risk limits

Ensure consistency between remuneration/promotion policy and RA, RT, RL
AVOID reward structure that encourages employees to exceed limits

RC and RT interaction

For a specific, complex risk:

Group level RT and allocation to business units should depend on the expertise of key staff.

You might need to invest in more Risk Capacity in order to relax RT and unlock potential opportunities and profit.

Quantifiable risk: Consistency between RT and RL

- Losses: $L = L_1 + L_2 + \dots + L_N$
- $\rho(\cdot)$ = risk measure \Rightarrow required risk capital
- RT statement: $\rho(L) \leq R_{max}$
- RL statements: $\rho(L_i) \leq R_i$ for each i
- If $\rho(\cdot)$ is coherent then:
$$\rho(L) \leq \rho(L_1) + \dots + \rho(L_N) \leq R_1 + \dots + R_N$$
- Coherent risk measure + adherence to RL's \Rightarrow adherence to group RT

Risk Strategy (S&P Insurance Criteria)

- Group: maximise expected return subject to $\rho(L) \leq R_{max}$
- Good risk strategy \Rightarrow
Optimise over: L_1, \dots, L_N and R_1, \dots, R_N
subject to $\rho(L_i) \leq R_i$ and $R_1 + \dots + R_N \leq R_{max}$

Considerations

- Actively manage the **volume** of business in each line
- Engage in risk mitigation activities to alter the profile of losses on individual lines
- Potential cost (\$ and reputation) of changes in volumes of business

Summary

- Understand the similarities and differences between risk limits and risk tolerances
- Propose risk limits in given scenarios
- Demonstrate how the use of a coherent risk measure helps to ensure consistency between group risk tolerance and risk limits by e.g. business unit