

Making Trade-offs Under Risk Explicit

Practice Exercises

Control field	Value
Module	EP-M02 Making Trade-offs Under Risk Explicit
Asset	EP-M02-A03
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Source	Former Book 6 Chapter 2 Utility and Value
Terminal artifact	Value Consequence and Risk Profile
Decision	ACCEPT, REVISE or ESCALATE
Date	16 September 2026

Purpose and instructions

These exercises assess technical understanding and executive judgment together. Show calculations, identify assumptions, keep hard constraints separate from compensable trade-offs, and state the governance consequence of each result. Use the companion notebook where indicated, but explain the result in your own words.

Assessment component	Weight
Technical calculations	35%
Interpretation and uncertainty	25%
Rights, safety and distribution	20%
Decision and accountability	20%

Case context

A public agency is considering an AI-supported inspection system. Alternative A offers larger average operational savings but a higher probability of serious service disruption. Alternative B offers lower savings and lower disruption risk. Alternative C delays deployment to obtain additional evidence. The agency must protect equal access, minimum service continuity and due process.

Exercise 1 Outcomes values and utility

List three measurable outcomes, three value judgments and one possible utility representation for the case. Explain why these categories are not interchangeable. Identify the legitimate authority for each value judgment.

Exercise 2 Expected value benchmark

A prospect has outcomes 0, 50 and 100 with probabilities 0.20, 0.50 and 0.30. Verify the probability invariant and calculate expected value. Give two reasons this number is insufficient for authorization.

Exercise 3 Linear expected utility

Use normalized linear utility $u(x) = x / 100$ over 0 to 100. Calculate utility for each outcome and expected utility. Explain why the ranking will coincide with expected value in this specific setting.

Outcome x	Probability p	$u(x)$	$p u(x)$
0	.20		
50	.50		
100	.30		
Total			

Exercise 4 Concave utility and risk premium

Suppose an authorized risk-averse utility model gives the prospect a certainty equivalent of 44. Calculate the risk premium. Interpret it carefully and identify two conditions that must be checked before leaders rely on it.

Exercise 5 Constraint classification

Classify each item as a compensable trade-off, a non-compensatory constraint, or a matter requiring escalation. Justify each classification.

Item	Classification	Justification
Moderate budget overrun		
Prohibited discrimination		
Two-week implementation delay		
Mandatory service-continuity threshold		
Reputational discomfort		
Unresolved conflict over who may define acceptable harm		

Exercise 6 Distributional visibility

The aggregate benefit is positive, but a vulnerable subgroup experiences twice the service-denial rate of other groups. State what additional evidence is needed and whether the subgroup effect may be offset by aggregate savings.

Exercise 7 Value of information

Additional evidence can improve optimized decision value from 76 to 84. Acquisition costs 5 units and delay costs 2 units. Calculate gross and net value. Recommend whether to acquire the evidence, then identify one reason the arithmetic might still be insufficient.

Exercise 8 Sensitivity design

Design a minimum sensitivity plan for an exponential utility analysis. Include the severe-loss probability, risk parameter, catastrophe consequence, valid outcome range, information delay and subgroup result. State how you will report a recommendation reversal.

Input	Plausible range or scenarios	Decision response if ranking reverses
Severe-loss probability		
Risk parameter r		
Catastrophe consequence		
Outcome range		
Information delay		
Subgroup harm		

Exercise 9 Complete the executive profile

Using the supplied Value Consequence and Risk Profile, complete all mandatory fields for the inspection-system case. Your profile must include affected groups, hard constraints, a utility-model owner, expected value, expected utility, certainty equivalent, risk premium, information value, sensitivity findings and review triggers.

Exercise 10 Final decision defence

Choose ACCEPT, REVISE or ESCALATE. Prepare a 300-word decision defence that answers all four questions below.

1. What does the technical evidence support?
2. Which assumptions remain uncertain or contested?
3. Which harms or constraints cannot be traded away?
4. Who must approve the decision and when must it be reviewed?

Submission checklist

- Calculations are shown and units are stated.
- Probabilities satisfy invariants.
- Utility form, range, parameter and authority are declared.
- Hard constraints are not converted into weighted scores.
- Affected-group consequences remain visible.
- Sensitivity includes ranking-reversal conditions.
- The final decision names an accountable human approver.