

## Economic Foundations and Applications of Risk, 2023

### Exercises for Foundations of Risk (Chapters 1–3)

#### 1. States of the world

Consider a risk-averse farmer confronted with two possible states of the world: Good weather (G) and bad weather (B). Let the yield of his cornfield be 10 in state G and 2 in state B.

- (a) Depict this situation in a “States of the World” diagram.
- (b) Find the farmer’s certainty equivalent in the diagram.
- (c) Assume that the farmer can trade state-dependent income: For one unit in state G,  $q$  units will be paid in state B ( $q$  can be larger or smaller than one). Draw the corresponding budget line into the diagram.
- (d) Denote the amount of traded income with  $T$ . Assume that the farmer trades exactly as much state-dependent income as to get a certain income, irrespective of the weather. How will  $T$  depend on  $G$ ,  $B$ , and  $q$  in this case?
- (e) Is the situation described in (d) optimal?

#### 2. Risk comparisons: Diversification

Let A possess a financial asset, worth 100 MU and additionally a house with a value of 80 MU. The probability of a fire that would destroy the house, which is not insured, is 10%. Let B own the same financial asset as A and 2 houses, worth 40 MU each. The probability of a fire for each of the two houses is also 10%, and the fires are assumed to be stochastically independent of each other.

- (a) Calculate the respective expected values of final wealth for A and B.
- (b) Draw the distribution functions of final wealth for A and B.
- (c) By using the risk comparisons from the lecture, demonstrate that A has the more risky housing portfolio than B.

#### 3. Risk comparisons: Motivational example from Chapter 3

Revisit the motivational example from Chapter 3 (lecture slide 4). Does Lottery 1 second-order stochastically dominate Lottery 2? Draw a suitable diagram to answer this question.