Risk Rough Notes

- See 221204 Microeconomic Analysis > 230129 Decision Theory > 230719 Decision Theory Notes v1.md > Stochastic Setting.

Miscellaneous Notes

- Always relate risk-pooling to mean-preserving contraction and second-order stochastic dominance. Compute the pooled lottery and plot the CDFs to show SOSD.
- Where insurers are risk neutral, their payoff is their expected profit. Where, in addition, insurers are competitive, their payoff, hence their expected profit in the long run equilibrium, is equal to their outside option (payoff from exit) which is zero.
- An explanation of the form of the Arrow-Pratt measure is examinable and important. Explain the significance of concavity of Bernoulli utility to risk-aversion.
- Surveys include offering alternative lotteries, asking how much a person would pay to avoid some risk (this gives the risk premium, then compute Arrow-Pratt using the $RP = \frac{1}{2}\sigma^2 A(x)$).
  - Ask for α such that $[\alpha, 1-\alpha; \underline{y}, \overline{y}] \sim [1; y]$.
- The risk premium of a mean-zero gamble with variance σ^2 at initial wealth w is approximately equal to $\frac{1}{2}A(w)\sigma^2$, where $A(w)$ is the absolute Arrow-Pratt measure of risk-aversion at w.
- Certainty equivalent $CE(L)$ of lottery L to some agent with preference relation $\succeq$ (which imply $\sim$ and $\succ$) is such that this agent participates in L iff the certain final wealth in the event of non-participation is no greater than $CE(L)$.
- $DARA$ implies that higher indifference curves (in x_1, x_2 space) are less steep, then the distance between two indifference curves measured along a 45 degree line decreases with increasing distance from the certainty line. Selling a lottery can be understood as having a lottery removed and being compensated by a movement up a 45 degree line to the original indifference curve. Buying a lottery can be understood as having a lottery bestowed and being compensated by a movement down a 45 degree line to the original indifference curve.
- As the number of participants sharing a favourable but individually irrational gamble increases, the risk premium initially falls faster than expected value, hence the certainty equivalent increases, and each participant is more willing to participate. For gambles with small magnitude relative to initial wealth, risk premium is approximately proportionate to variance, which is inversely proportionate to the square of the number of participants, whereas expected value is inversely proportionate to the number of participants. Beyond a certain number of participants, expected value decreases faster than risk premium which is already small.

Risk

- The key conceptual components are largely the familiar concepts from Microeconomic Analysis. The key conceptual components are: lotteries, expected value, expected utility, certainty equivalent, risk-aversion, Arrow-Pratt measures, stochastic dominance, risk pooling, and risk sharing.
- Definition (Risk Pooling)
  - Risk pooling describes the situation where agents facing independent risks mutually insure to reduce each agent's risk exposure. Risk pooling mitigates risk faced by the participating agents.
- Definition (Risk Sharing)
  - Risk sharing describes the situation where agents share a single risky gamble. Risk sharing mitigates risk faced by the participating agents.
- The primary solution technique is to formulate a lottery and maximise expected utility.