

Uncertainty

Seminar Handout

Dr. Simona Montagnana
ES20011 Intermediate Microeconomics 1

November 27, 2019

Problem 1. Suppose an individual consumer, i possesses a utility function $u_i(x) = \sqrt{x}$. There are two financial assets; both cost £100. The consumer is going to buy one of these. Each asset will pay off after a short time. Asset 1 pays £103 with certainty. Asset 2 pays £110 with probability 0.95 and £0 with probability 0.05.

- i. Which asset does she buy?
- ii. Suppose another consumer j 's preferences are expressed by the utility function $u_j(x) = x^2$. Which asset should he buy?
- iii. In each case, work out the value of the probability of a positive return at which the initial decision is overturned.

Solution 1.

- i. Compare the utility of £103 for certain:

$$u_i(103) =$$

with the expected utility of £110 with probability 0.95 and £0 with probability 0.05

$$Eu_i =$$

Consequently, individual i will choose the the asset.

ii. Similarly

$$u_j(103)$$

$$Eu_j =$$

Consequently, individual j will choose the asset.

iii. The value of the probability (π) of a positive return at which the initial decision is overturned, is calculate as:

$$10.15 \leq$$

$$\pi \geq$$

Thus for a probability above individual i will now choose the asset.

$$10609 \geq \pi$$

$$\pi \leq$$

Thus for a probability below individual i will now choose the asset.

Problem 2. Anna is on a game show. She has equal probabilities of winning £5, £50 and £500. Her utility function is given by $u(x) = \frac{1}{2}x^2$, where x denotes winnings.

- i. Calculate the expected value of the lottery.
- ii. Calculate Anna's expected utility from the lottery.
- iii. Calculate her certainty equivalent of the lottery. Explain what it means.
- iv. Suppose Anna's utility is denoted by $u(x) = x$ instead, recalculate (i) – (iii) above.

Solution 2.

The expected value of the lottery is:

The expected utility from the lottery is:

Denote the certainty equivalent by p .

Where the certainty equivalent is defined as the amount which makes the consumer indifferent between that amount for certain and the lottery.

$$u(p) = Eu(x) \Rightarrow$$

$$p =$$

If we think of p as a potential payment for Anna to give up the lottery, since Anna is risk loving she requires more than the expected value of the lottery, more than .

Part (i):

The expected value of the lottery is:

In part (ii)

$$Eu(x) =$$

Part (iii) now becomes:

$$u(p) = Eu(x) \rightarrow p =$$

Since Anna values the lottery at its expected value she would accept

In other words she views the expected gain to a certain gain.