

EFR summary

Introduction to Behavioral
Economics, FEB12015X

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Lectures Week 1-2

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Introduction to Behavioural Economics – Week 1

What is behavioural economics?

The Homo Economicus is a traditional neoclassical economic agent. The economic agent:

- doesn't have any cognitive barriers to achieving and processing information (no limited rationality)
- maximises its expected utility
- knows how to deal with probabilities
- has consistent time preferences
- is purely selfish and only cares about his own payoff.

The Homo Economicus however isn't a homo sapiens. And the thing we are really interested in is us, humans. Behavioural economics enriches economics with insights of psychology. The challenge in this is making models realistic but also workable. We want to be able to understand, predict and/or influence behaviour.

Models can be:

- **normative** - describes how people **should make** decisions.
- **descriptive** - describes how people **really make** decisions

In Neoclassical economics, descriptive models are normative. This means that people make the decisions they should make. In behavioural economics, a clear distinction is made between descriptive and normative.

Experiments in Economics

Let's now look at the different vocabulary used in economics experiments

Correlation: a mutual relationship or connection between two or more things.

Causation: the relationship between cause and effect; causality.

It is important to note that **correlation doesn't equal causation.**

Experiments in economics to study causation can make use of a **control group** and a **treatment group**. The **control group has no treatment** and is purely to compare the group with a treatment to see if there is any difference.

These experiments can be done in a **lab**, which is a controlled environment, for example, making people fill in a survey in a computer room on campus. It is also possible to do **field** experiments, these are in a natural environment. You lose a bit of control when executing a field experiment instead of a lab experiment.

There is also a difference between the methods of applying treatments. **Between-subjects** means that every subject is in exactly 1 treatment. **Within-subjects** means that every subject is in multiple treatments.

Most of the time, there is a payoff to the subjects in research. Most of the time, economists want to make use of **real incentives**: payment via their decisions made in research. It is also possible to pay off a **flat fee**: this is a fixed amount for participation.

Economists also have to choose between making use of **deception** versus **no deception**. Most of the time, economists want to make use of no deception. A short example of deception in a behavioural economics experiment is the "anchoring effect". In one experiment, participants are shown a random number (like the last two digits of their phone number) before being asked to estimate the price of a bottle of wine. Those who saw a higher number tended to give a higher estimate, even though the number shown was irrelevant. This demonstrates how irrelevant information can deceive participants into making biased economic decisions.

Most of the time, **economists use no deception and real incentives**.

Preferences in economics

In Microeconomics, we have learnt that people make decisions based on preferences and achievability, i.e., the budget curve and utility curve.

A **weak preference**, $x \geq y$, means that x is at least as good as y .

A **strict preference**, $x > y$, means that x is better than y .

Indifference, $x \sim y$, means that x is just as good as y .

These relations are called **preference-relations**.

Preference conditions

complete: for every $x, y \rightarrow x \geq y$ or $y \geq x$ (or both).

transitive: for every $x, y, z \rightarrow$ if $x \geq y, y \geq z$ then $x \geq z$.

reflexive: for every x applies that $x \geq x$.

symmetrical: for every $x, y \rightarrow x \sim y$ and $y \sim x$.

When a preference relation is **complete and transitive**, we call it a **weak order**. The weak preference, \geq , is a weak order. You can check this for yourself by filling in the weak preference for R in the preference conditions.

Ordinal utility u :

- can be written as $v(x)=f(u(x))$ in which $v(x)$ is a strictly increasing function. V reflects u .
- higher utility is preferred.
- differences in utility have **no meaning**.

Cardinal utility u :

- can be written as $v(x)=f(u(x))$ in which $v(x)$ is a strictly increasing linear function. V reflects u .
- higher utility is preferred.
- a bigger difference in utility **for the same person means a stronger preference**.

Pareto: when 1 person is better off all other things being held equal, this is a **better outcome**. This works for ordinal and cardinal utility.

Utilitarianism: $W = \sum U_i$ which means welfare is the sum of all individuals' utility in society.

We will learn in this course that utility as a function helps us with decisions under uncertainty, decisions over time, and decisions in a social context.

Revealed preference refers to assessing utility based on the choices individuals make. By observing their decisions, you can uncover their underlying preferences.

Pitfalls of revealed preference:

- **Projection bias** occurs when people assume their current preferences will remain the same in the future.
- **Duration neglect** means that people tend to overlook the length of an activity when evaluating their experience.

- **Peak-end rule** suggests that people judge experiences by their most intense moments and how they ended.
- **Diversification bias** happens when people believe they desire more variety in the future than they actually do.

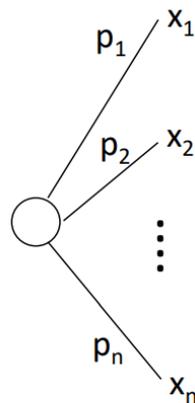
Introduction to Behavioural Economics – Week 2

Risk and uncertainty

Uncertainty is when we don't know the exact odds of the outcomes (**states of the world**) are.

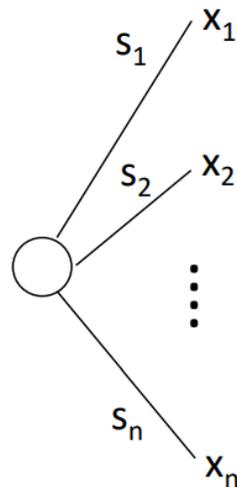
Risk is when we do know the exact odds of the outcomes (**states of the world**) are. When tossing a coin we deal with risk. When we go outside for a walk and have to decide to bring an umbrella we deal with uncertainty.

We can describe dealing with risk via **lotteries**. Lotteries are described as: $L = (P_1: X_1, \dots, P_n: X_n)$. In which P stands for the chance and X for the outcome. This is illustrated below.



$$L = (p_1: x_1, \dots, p_n: x_n)$$

When we want to describe uncertainty, we work with different **acts**. Each act describes a state of the world. This is illustrated below. Keep in mind that the odds aren't given.



$$A = (s_1: x_1, \dots, s_n: x_n)$$

Working with risk

We can calculate the **expected value** of a lottery via the following formula: $EV(L) = P_1X_1 + \dots + P_nX_n$

As we saw in microeconomics, **expected utility** isn't the same as expected value.

Expected value of a lottery is calculated as follows: $EU(L) = P_1U(X_1) + \dots + P_nU(X_n)$

Keep in mind that the utility in expected utility is cardinal. Expected utility is part of traditional economics.

St. Petersburg paradox:

A fair coin is flipped until we get heads.

If it takes n flips, you receive $\text{€}2^n$ (2 to the power of n).

Now follows the question: How much are you willing to pay to play this game?

If humans made decisions based on expected value, people would like to pay an infinite amount of money to play this game. You can check this yourself. When working with expected utility, this isn't the case. Take, for example, $u(x) = \ln(x)$.

Therefore, it provides expected utility a better explanation in some cases.

Risk attitudes:

- **Risk averse:** $(1: EV(L)) \succ L$
- **Risk neutral:** $(1: EV(L)) \sim L$
- **Risk seeking:** $(1: EV(L)) \prec L$

Let's say we have a lottery, $L = (p:A, 1-p:B)$, and we remove all risk to get $(1:EV(L))$. Then we change the expected value until the utility of playing the lottery equals the

Certainty equivalent $CE(L)$, i. e. $L = (p:A, 1-p:B) \sim (1:CE(L))$, then:

- Risk averse: $CE(L) < EV(L)$
- Risk neutral: $CE(L) = EV(L)$
- Risk seeking: $CE(L) > EV(L)$

We also know that for risk aversion, there is concave utility, for risk neutrality there is linear utility, and for risk proneness, there is convex utility.

The **sure thing** principle says that if the probability and the outcome for an event is the same in two situations, changing either the probability or the outcome by the same amount will not have any affect on the individual's preference towards it.

Violations of expected utility

Imagine that the US is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows:

- A: If program A is adopted, 200 people will be saved.
- B: If program B is adopted, there is a $1/3$ probability that 600 people will be saved and a $2/3$ probability that no people will be saved.

Which of the two programs would you favor

- C: If program C is adopted, 400 people will die.
- D: If program D is adopted, there is a $1/3$ probability that nobody will die and a $2/3$ probability that 600 people will die.

Which of the two programs would you favor?

In a lot of cases, people prefer program A over B and program D over C. This is inconsistent with expected utility since program A is the same as program C and Program B is the same as Program D. Therefore, the preferences should be the same.

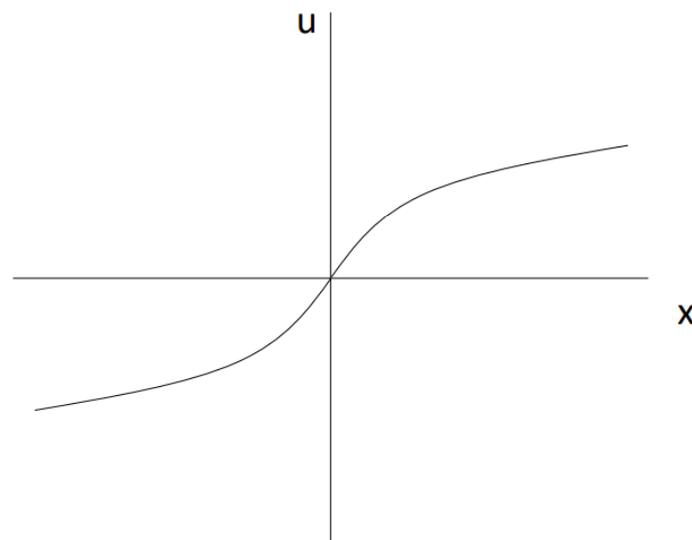
This can be explained via the **prospect theory**.

Prospect theory says that people base their decisions on their:

- Reference points
- Diminishing sensitivity & reflection effect
- Loss aversion
- Probability weighting (in later courses)

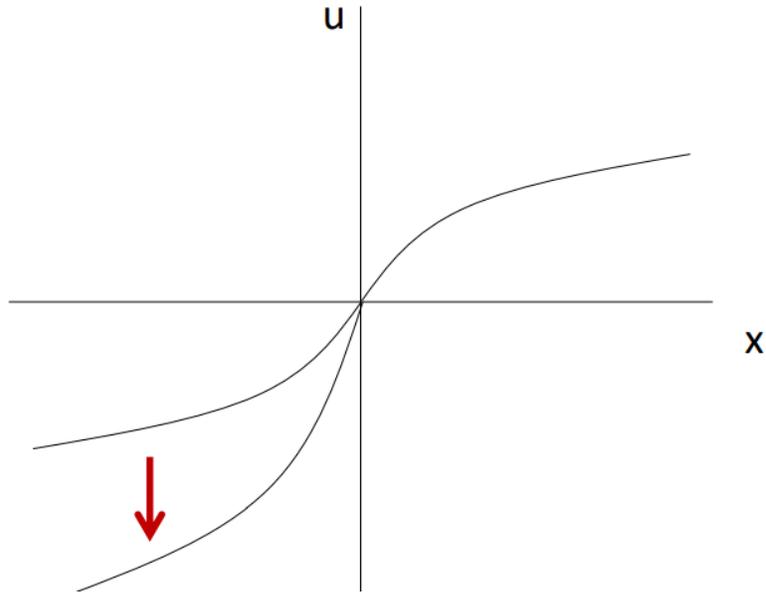
Reference point plays a big role in the Asian disease example. When reading the programs in the Asian Disease scenario, it is hypothesised that we change our expectations because in program A and B the program is described in amounts of people saved, while in program C and D the program is described in amounts of deaths.

We assume that people have **diminishing sensitivity**: utility is concave for gains and convex for losses. This is illustrated below in the vertical line is the reference point.

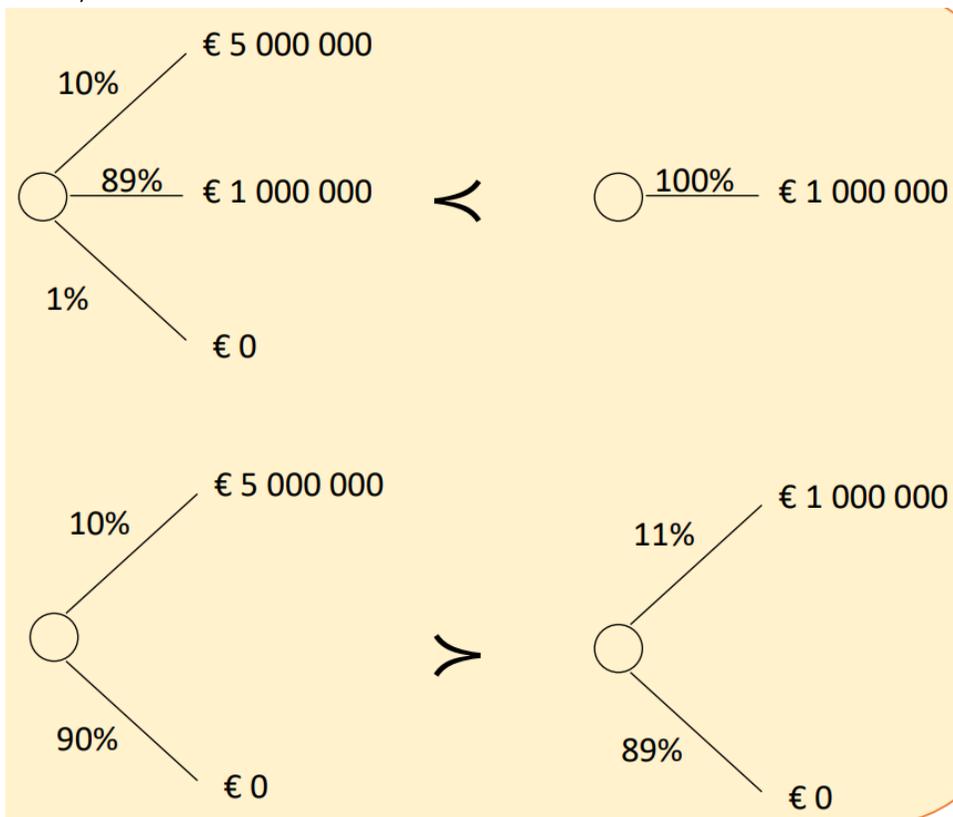


The **Reflection effect** means that risk attitudes are the opposite for gains as for losses. Risk attitudes are risk aversion for gains and risk proneness for losses.

Loss aversion means that losses weigh heavier than gains. This is illustrated below:



Another example of a violation of expected utility and of the sure thing principle is the **Allais paradox**, which is illustrated below:



Mathematically, the violation is illustrated as follows:

$$\begin{aligned}
 A < B &\Rightarrow EU(A) < EU(B) \\
 &\Rightarrow 0.89 u(1\text{mln}) + 0.10 u(5\text{mln}) + 0.01 u(0) < u(1\text{mln})
 \end{aligned}$$

$$\begin{aligned} &\Rightarrow 0.10 u(5\text{mln}) + 0.01 u(0) < 0.11 u(1\text{mln}) \\ &\Rightarrow 0.10 u(5\text{mln}) + 0.01 u(0) + 0.89 u(0) < 0.11 u(1\text{mln}) + 0.89 u(0) \\ &\Rightarrow 0.10 u(5\text{mln}) + 0.90 u(0) < 0.11 u(1\text{mln}) + 0.89 u(0) \\ &\Rightarrow EU(C) < EU(D) \Rightarrow C < D \end{aligned}$$

The Allais paradox is consistent with the **certainty effect**: people give too much weight to outcomes which are 100% certain.

Decision making under uncertainty

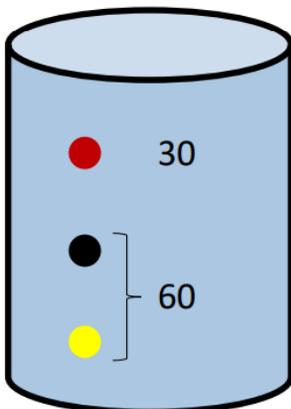
In this course we learn about a few methods of making decisions under uncertainty. Since we don't know the odds of the different states of the world, we are not going to use expected utility or expected value.

- **Maximin** is when you choose the alternative with the highest minimal utility.
- **Maximax** is when you choose the alternative with the highest maximal utility.
- **Minimax-regret** is when you choose the alternative with the lowest maximum regret level.

Maximin, maximax and minimax-regret don't account for the odds of the states of the worlds. Therefore, there is also the method of **Subjective Expected Utility**: set subjective odds to all the states of the world and then use expected utility. This is consistent with the sure thing principle.

Violations of expected utility under uncertainty

The **Ellsberg paradox** is illustrated below:



	●	●	●
I	100	0	0
II	0	100	0
III	100	0	100
IV	0	100	100

Lots of people would prefer bet 1 over bet 2 and bet 4 over bet 3. This is inconsistent with expected utility. This is mathematically written below:

$$EU(I) = P(R) \cdot u(100) + P(B) \cdot u(0) + P(Y) \cdot u(0)$$

$$EU(II) = P(R) \cdot u(0) + P(B) \cdot u(100) + P(Y) \cdot u(0)$$

$$\Rightarrow I > II \text{ means that } P(R) \cdot u(100) + P(B) \cdot u(0) > P(R) \cdot u(0) + P(B) \cdot u(100)$$

$$EU(III) = P(R) \cdot u(100) + P(B) \cdot u(0) + P(Y) \cdot u(100)$$

$$EU(IV) = P(R) \cdot u(0) + P(B) \cdot u(100) + P(Y) \cdot u(100)$$

$$\Rightarrow IV > III \text{ means that } P(R) \cdot u(0) + P(B) \cdot u(100) > P(R) \cdot u(100) + P(B) \cdot u(0)$$

Which is inconsistent. The Ellsberg paradox is consistent with **ambiguity aversion**: people don't like when odds aren't certain and therefore, the certainty effect occurs.