EFR summary

Introduction to Behavioral Economics, FEB12015X

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Lectures week 1 to 3

Details

Subject: Introduction to Behavioral Economics

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Introduction to Behavioural Economics - Week 1

What is behavioural economics?

In the course Microeconomics we have learned about the Homo Economicus.
The Homo Economicus is a traditional neoclassical economic agent. The economic agent:

- doesn't have any cognitive barriers to achieve and process information (no limited rationality)
- maximises it's expected utility
- knows how to deal with odds
- has consistent time preferences
- is egoistic and only cares about his own payoff.

The Homo Economicus however isn't a homo sapien. And the thing we are really interested in is us, humans. Behavioral economics enriches economics with insights of psychology. The challenge in this is making models realistic but also workable.
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 behavioral economics this isn't the case.

Experiments in Economics

Let's now look at different vocabulary used in experiments in economics.
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**, this 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 method 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 behavioral 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**, $x \succcurlyeq y$, means that x is at least as good as y.
A **strict preference**, $x \succ y$, 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: I will denote the relation for example a weak preference or strict preference as R
complete: for every x, y -> xRy or yRx (or both).
transitive: for every x, y, z -> if xRy, yRz then xRz.
reflexive: for every x applies that xRx.
symmetrical: for every x, y -> xRy and yRx.

When a preference relation is **complete and transitive** we call it a **weak order**. The weak preference, $\succcurlyeq$, 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: $W = \Sigma U_i$ in which W means welfare.
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.

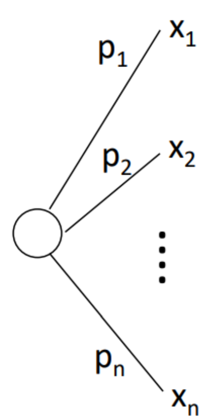
- **Peak-end rule** suggests that people judge experiences by their most intense moment and how they ended.
- **Diversification bias** happens when people believe they desire more variety in the future than they actually do.

Introduction to Behavioural Economics - Week 2

Risk and uncertainty

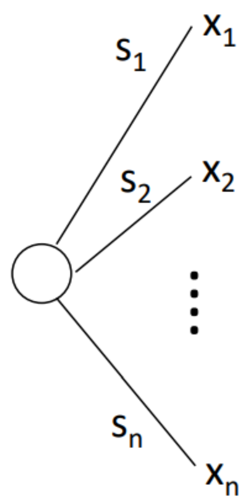
Uncertainty is when we don't know the exact odds of the outcomes (**states of the world)** are.
Risk is when we do know the exact odds of the outcomes (**states of the world)** are.
When tossing a coin we deal with risk. When we go outside for a walk and have to decide to bring an umbrella we deal with uncertainty.

We can describe dealing with uncertainty 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 risk 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 €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 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 prone**: $(1:\ EV(L)) \prec L$

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 prone: 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 we remove X and Y of two lotteries in which $P_1X=P_2Y$ the preference of which lottery to choose stays the same.

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.

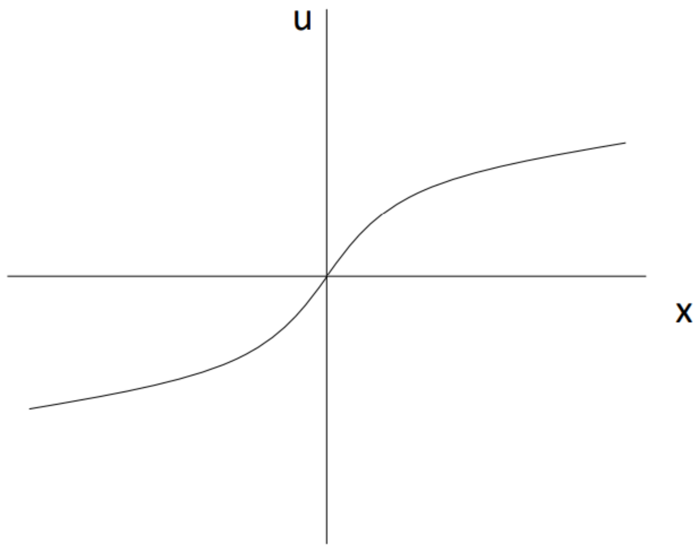
Which of the two programs would you favor

- 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.

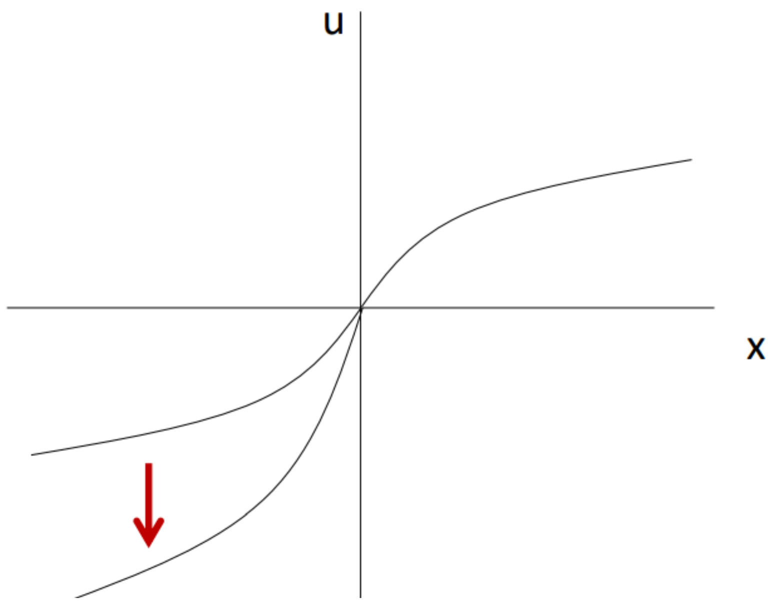
Which of the two programs would you favor?

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.

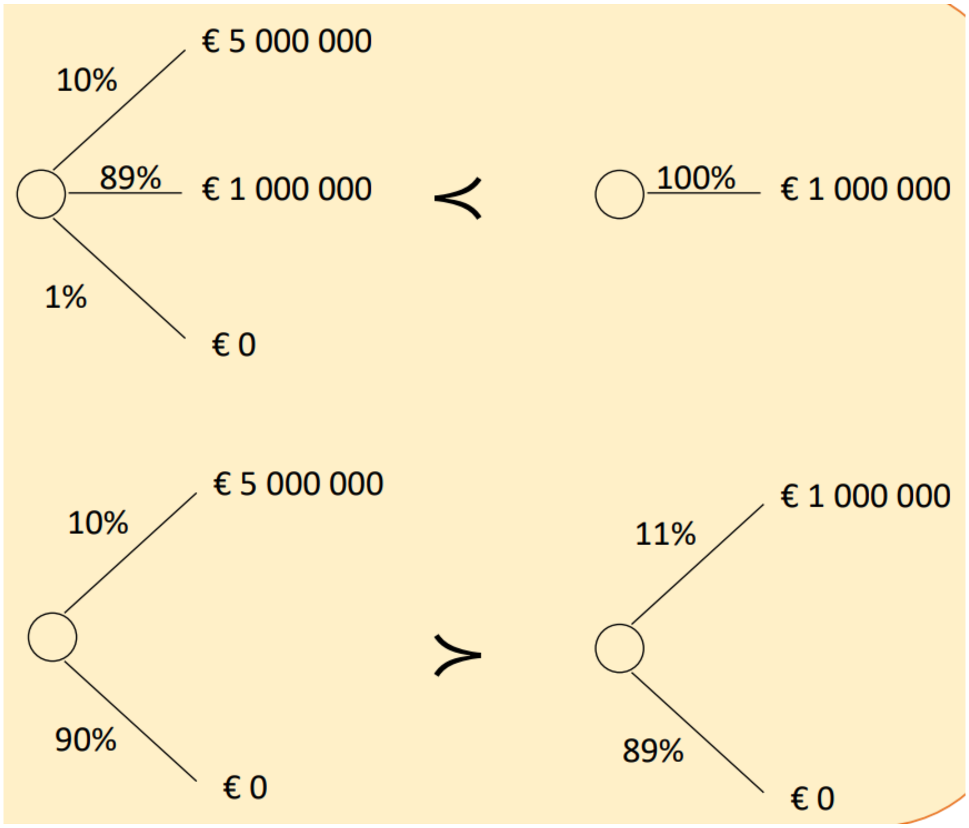
This can be explained via the **prospect theory**. Prospect theory says that people base their decision partly on their **reference points**. When reading the programs in the Asian Disease hypothesis we change our expectations, because in program A and B the program is described in amounts of people 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:

$A \prec B \Rightarrow EU(A) < EU(B)$

$\Rightarrow 0.89\ u(1mln) + 0.10\ u(5mln) + 0.01\ u(0) < u(1mln)$

$\Rightarrow 0.10\ u(5mln) + 0.01\ u(0) < 0.11\ u(1mln)$

$\Rightarrow 0.10\ u(5mln) + 0.01\ u(0) + 0.89\ u(0) < 0.11\ u(1mln) + 0.89\ u(0)$

$\Rightarrow 0.10\ u(5mln) + 0.90\ u(0) < 0.11\ u(1mln) + 0.89\ u(0)$

$\Rightarrow EU(C) < EU(D) \Rightarrow C \prec D$

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 gonna use expected utility or expected value.

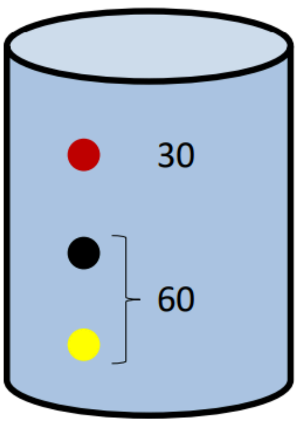
- **Maximin** is when you choose the alternative with the highest minimal utility.

- **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:
$EU(I) = P(R)*u(100) + P(B)*u(0) + P(Y)*u(0)$
$EU(II) = P(R)*u(0) + P(B)*u(100) + P(Y)*u(0)$
$\Rightarrow$ $I > II$ means that $P(R)*u(100) + P(B)*u(0) > P(R)*u(0) + P(B)*u(100)$

$EU(III) = P(R)*u(100) + P(B)*u(0) + P(Y)*u(100)$
$EU(IV) = P(R)*u(0) + P(B)*u(100) + P(Y)*u(100)$
$\Rightarrow$ $IV > III$ means that $P(R)*u(0) + P(B)*u(100) > P(R)*u(100) + P(B)*u(0)$
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.

Introduction to Behavioural Economics - Week 3

Discounted utility

The time when you make a decision is called the **decision time**. t=0 means today.
The time of consumption is called the **consumption time**.
The difference between the consumption time and the decision time is called the **temporal distance**.

Let's say we want to set up a discounted utility function:

- We have have a series of payoffs: $x = (x_0 + x_1 + ... + x_n)$
- Now let's transform these in a series of utility levels with the utility function $u_i = u(x_i) \Rightarrow u = (u_0 + u_1 + ... + u_n)$.
- Now let's put these utility levels into a discounted utility function: $DU(x) = u(x_0) + D(1)u(x_1) + ... + D(n)u(x_n)$

Now let's go over a bit of notation:

- $x = (x_0 + x_1 + ... + x_n)$ gives x_i on time i.
- $x = (s: x,\ t: y)$ gives x on time s and y on time t.

Impatience

Impatience means that people prefer to receive positive utility as quick as possible.
This gives that for every $x > 0$ and $s < t$ => $(s: x) \succ (t: x)$.
If we substitute impatience into the discounted utility model we get that **D(t) is a declining function**. Since the "weight" added to each payoff decreases the further into the future, i.e. a payoff of x now is preferred above a payoff of x in the future.
This implies that impatience for negative utility is the other way around. You prefer to receive this negative utility further into the future.

There can be multiple reasons for impatience:

- **Interest on financial markets**: 100 euros now is objectively worth more than 100 euros in the future.

- **Risk and uncertainty**: The future is full of risk and uncertainty. Risk averseness can make you impatient.
- **Pure time preferences**: we add more weight to the present than the future.

It is also found that impatience for example influences people's BMI, their job choices and lifestyle choices like the choice to consume alcohol or cigarettes.

Is impatience constant or decreasing?

Constant impatience:
For every σ applies that: if $(s: x) \succcurlyeq (t: y)$ then $(s + \sigma : x) \succcurlyeq (t + \sigma : y)$.
In other words this means that if you procrastinate all options with the same amount of time, the preferences won't change.

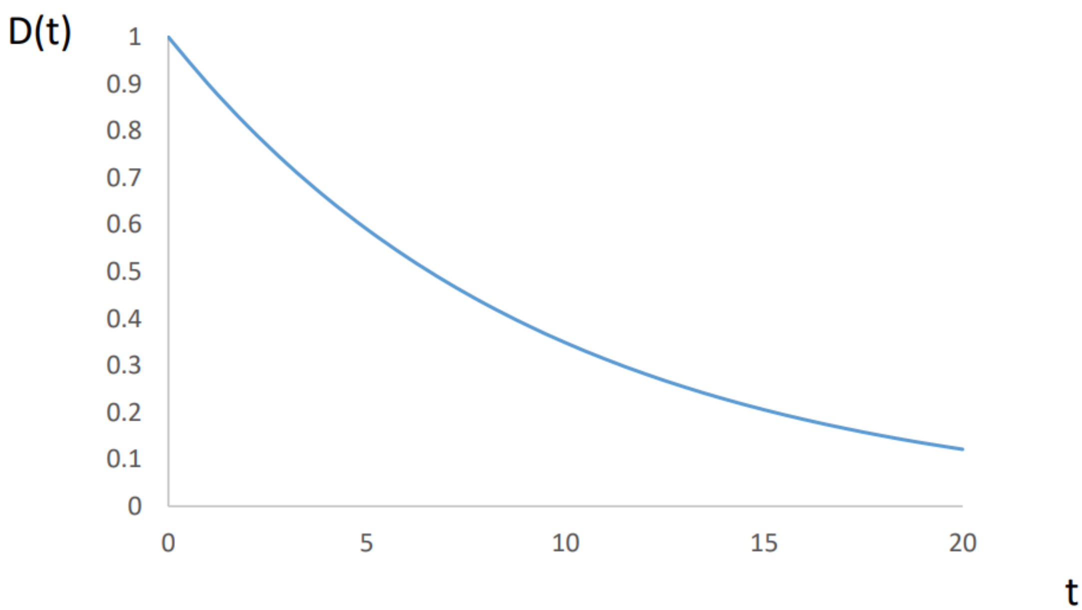
Decreasing impatience:
For s<t, $x \prec y$, and every σ : if $(s: x) \sim (t: y)$, then $(s + \sigma: x) \preccurlyeq (t + \sigma: y)$.
In other words this means that there is higher impatience for the present than for the far future.

Time consistency

Constant impatience leads to **time consistency**.
Time consistency means that preferences don't change over time. If we keep consumption constant, but change the time of decision the preferences should stay the same.

Exponential discounting

Exponential discounting gives a discounting function of $D(t) = \delta^t \ with\ 0 < \delta \leq 1$
In this discounting function δ is the **discount factor** and $\delta = \frac{1}{1+r}$ in which r is the **discount rate**. We can see that a higher discount rate leads to a lower discount factor.
An example of a exponential discounting function with delta = 0.9 is given below:



Keep in mind that a person who has an exponential discounting function has **constant impatience** and therefore **consistent time preferences**.

Quasi-hyperbolic discounting

Quasi-hyperbolic discounting is described as follows:

- D(0)=1
- D(t)=$\beta\delta^t$ IF t>0 (thus not equal to zero). And $0 < \delta \leq 1$, $0 < \beta < 1$.
- In this β is the **present-bias** parameter.

For quasi-hyperbolic discounting there is constant impatience if all payoffs are gained in the future, but there is decreasing impatience if you get your payoff today.

Rational discounting

We assume that time consistency is **rational**. In that case exponential discounting is rational. Although we don't really know which δ is rational. If someone has an extreme preference for the present it might not be "rational".

People who know they don't make rational choices (not time consistent), for example by saying they will study in one hour, but won't when the time is there. Those people can commit themselves with **self-commitment**: they commit themselves to a choice in the future. For example by saying they will study and if they don't, they will have to pay 25$ to a friend of theirs.

Violations of discounted utility

The **magnitude effect** says that bigger payoffs are discounted less than smaller payoffs. This means that for bigger payoffs there is a smaller discount rate.

The **sign effect** means that losses are discounted less than gains. You could combine this with prospect theory to get around this.

Another possibility is that there is **utility of anticipation**: you might want to go to the dentist today because you get negative utility of the anticipation of having to go to the dentist in a week.

Or you might **prefer improvement**. An example of this is that you might prefer this week to receive 50 dollars and next week 100 dollars instead of this week 100 dollars and next week 50 dollars. An explanation of this could be that receiving 50 dollars after 100 dollars feels like a loss and receiving 100 dollars after 50 dollars feels like a gain.

Or you might **prefer variation**:
DU(A) = D(0)u(It) + D(1)u(Th)
DU(B) = D(0)u(It) + D(1)u(It)
Lots of people would prefer A since there is more variation.

DU(C) = D(0)u(Th) + D(1)u(Th)
DU(D) = D(0)u(Th) + D(1)u(It)
In this case lots of people would prefer D since there is more variation.

$A \succ B \text{ implies that } C \succ D$. You can check this yourself.

Another example is that lots of people **prefer to spread**. This can also lead to inconsistencies in the discounted utility model.

It is also good to think about if we can predict future utility.

References

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