BEEM109 Experimental Economics and Finance

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Course information

Course information (slides, notes, some readings, etc) is available on WebCT

There is no main textbook for this course. One book which will pop up occasionally is:

- *Markets, Games & Strategic Behavior*, C.A. Holt, 2006
- Available in the library

Each week will have assigned readings

Coursework and evaluation

Every week I will propose one or more discussion questions

These questions will be the basis of one of your assignments:

- You must pick one and write a 1,000 word essay;
- The deadline of the essay is tba
- The essay counts for 10% of your final mark.

Coursework and evaluation

Dieter Balkenborg will have another assignment in the last 5 weeks of the course.

This assignment will also be worth 10% of your mark.

There will be a final exam, which will determine the remaining 80% of the mark for the course.

Economic theory: normative or positive?

Economics is an axiomatic theory of decision-making

Most modern economics results we know are based on a set of principles

These principles are thought to be desirable from a decision-making point of view.

Economic theory: normative or positive?

As such, modern economics tries to do two jobs:

- Describe the rational decision-maker
- Predict behavior in the real world

Understandably, this is a tough thing to accomplish, and there are tensions between the two aspects

Economic theory: normative or positive?

As experimental methods became part of the mainstream, it became possible to systematically stdy behavior in controlled settings.

A series of consistent anomalies from rational choice paradigm started to appear

- See dedicated column in the *Journal of Economic Perspectives* 1987-2001.

In response to this, a number of theories were developed to account for these deviations from the normative model

Economic theory: normative or positive?

These theories were not meant to have axiomatic foundations (although some have been axiomatized)

We will cover some of the more important theories, as well as some new fields of research within behavioral economics

Rational Choice Fundamentals

At the core of every phenomenon studied by Economics lies a choice problem.

Choice theory assumes individuals preferences can be fully described by a preference relation $\succeq$ which can be applied to any two objects.

$A \succeq B$ should read: "A is as least as good as B" or "A is weakly preferred to B"

Rational Choice

From this relationship we can derive two more important relations:

Strict preference : $\succ$

- $A \succ B$ if $A \succeq B$ but not $B \succeq A$
- $A \succ B$ should be read as “A is strictly preferred to B”

Indifference: $\sim$

- $A \sim B$ if $A \succeq B$ and $B \succeq A$
- $A \sim B$ should be read as “A is equally preferred to B”

Rational Choice

An individual is rational if his/her preference relation possesses the four following properties:

Completeness: $A \succeq B$ or $B \succeq A$ or both

Transitivity: If $A \succeq B$ and $B \succeq C$, then $B \succeq C$

Independence: If $A \succeq B$, then $pA + (1-p)C \succeq pB + (1-p)C$

Continuity: Let A, B and C such that $A \succ B \succ C$. Then there is a probability p such that $B \sim pA + (1-p)C$.

Rational Choice

If preferences are rational, it can be shown that there is a function, $u(x)$ for which the following is true:

If $A \succeq B$, then $u(A) \geq u(B)$.

This is to say that our choices can be analyzed AS IF we were maximizing a utility function

Common sense and your experience should tell you that we don't actually maximize functions in our heads when making choices!

Rational Choice

However, utility functions are the building block for analysing choice, either individually or in a strategic setting.

However, are our choices compatible with the axioms of rationality?

Completeness

Completeness basically requires an individual to always be able to state a preference between two objects.

It is tough because a rational agent should be able to state a preference between any pair of objects in order to make a choice, even if that choice is purely hypothetical.

Importantly and implicitly, the order in which the objects are presented should not matter! (invariance principle)

Framing effects

A large experimental literature emerged showing that people violate invariance regularly.

Consider the following example:

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 estimates of the consequences of the programs are as follows:

Framing effects

If program A is adopted, 200 people will be saved.

If program B is adopted, there is a one-third probability that 600 people will be saved and a two-thirds probability that no people will be saved.

Which of the two programs would you favor?

Framing effects

If Program C is adopted, 400 people will die.

If Program D is adopted, there is a one-third probability that nobody will die and a two-thirds probability that 600 people will die.

Which of the two programs would you favor?

Framing effects

If program A is adopted, 200 people will be saved (72%).

If program B is adopted, there is a one-third probability that 600 people will be saved and a two-thirds probability that no people will be saved. (28%)

Which of the two programs would you favor?

Framing effects

If Program C is adopted, 400 people will die. (22%).

If Program D is adopted, there is a one-third probability that nobody will die and a two-thirds probability that 600 people will die. (78%).

Which of the two programs would you favor?

Framing effects

The treatment in which the options were framed as *gains* (lives saved) led to respondents choosing in a risk-averse fashion.

The treatment in which the options were framed as *losses* (deaths) led to respondents choosing in a risk-seeking fashion.

However, the two problems are fundamentally the same!

Therefore, framing a problem in a particular way can lead to different answers!

Preference reversals

However, this is not the end of the story....

Lichtenstein and Slovic first discovered that the way individuals report their preferences depends on *how* the choices are elicited.

Economic theory states that $A \succ B$ if:

- A is chosen over B when both are available, or
- A has a higher reservation price than B

Preference reversals

Consider the following two gambles:

H: win \$4 with probability $8/9$ and 0 otherwise

L: win \$40 with probability $1/9$ and 0 otherwise.

Preference reversals

Consider the following two gambles:

H: win \$4 with probability $8/9$ and 0 otherwise

L: win \$40 with probability $1/9$ and 0 otherwise.

When asked to choose between the two gambles, the large majority chooses H.

When asked to *price* the two gambles, the majority gives higher value to L!

Preference reversals

Lichtenstein and Slovic found that prices of gambles were highly correlated with payoffs rather than probability of winning...

... but choices between gambles were more highly correlated with probability of winning rather than payoff!

If this is indeed the case, one can construct pairs of gambles such that the same individual would

- choose one element of the pair
- but place a higher value on the other element!

Transitivity

Transitivity is the toughest requirement for rationality. Why is it necessary?

Suppose John's preferences are such that he:

Apples $\succ$ oranges,

oranges $\succ$ pears and

pears $\succ$ apples.

Transitivity

This means that:

John would pay 1p to trade an orange for an apple;

He would then pay 1p to trade an apple for a pear;

He would then pay 1p to trade a pear for an orange!

John would end up paying 3p for his original orange!

Transitivity

One of the explanations proposed in the literature for preference reversals we saw was from a violation of transitivity:

Let C_H be the cash equivalent to gamble H;

and C_L be the cash equivalent to gamble L.

Then the preference reversal could be explained as the following intransitive preference ordering:

$$C_H \sim H \succ L \sim C_L \succ C_H$$

Independence Axiom

The Independence Axiom can be perhaps understood with the following example:

- Note: this is just an example, I don't have any views on UK politics!

Suppose you must invest £1M in the UK, the outcome of which depends on the outcome of the upcoming election.

Your expected payoff is higher under the Tories than Labour: $T \succ L$

Independence Axiom

Therefore you should still prefer the T gamble, if there is a small probability that the Lib Dems may win the election:

$$pT + (1-p)LbD \succ pL + (1-p)LbD$$

Allais Paradox

Consider the following choices:

Choice 1:

A		B	
Probability	\$	Probability	\$
1	100	0.1	500
		0.89	100
		0.01	0

Allais Paradox

Choice 2:

C		D	
Probability	$	Probability	$
0.1	500	0.11	100
0.9	0	0.89	0

Allais Paradox

If you picked A in choice 1, then:

- $U(100) > 0.1U(500) + 0.89U(100) + 0.01U(0)$
- Which means $0.11U(100) > 0.1U(500) + 0.01U(0)$

Picking C in choice 2 means

- $0.1U(500) + 0.9U(0) > 0.11U(100) + 0.89U(0)$
- Which means $0.1U(500) + 0.01U(0) > 0.11U(100)$

So, picking A **and** C is inconsistent w/ rational decision-maker.

- Can you show why the same is true for B and D?

Independence of Irrelevant Alternatives

Independence of Irrelevant Alternatives Axiom: Preferences should not be a function of the choice set

Suppose If $A \succeq B$, when only A and B are feasible.

Suppose we add option C. A should still $\succeq B$.

Independence of Irrelevant Alternatives

IIA is a pretty strong assumption, and unsurprisingly it is violated by individuals.

Such violations are often called *decoy effect*

Independence of Irrelevant Alternatives: Decoy effect

Choice 1:

Brand	Price ($)	Quality
A	4.45	75
B	4.25	65

Independence of Irrelevant Alternatives: Decoy effect

Choice 2:

Brand	Price ($)	Quality
A	4.45	75
B	4.25	65
C	4.75	70

The introduction of option C typically makes option A more attractive relative to B

Ellsberg Paradox

Another critique of (subjective) expected utility came from Ellsberg

A critique of expected utility theory was that often individuals are not aware of the probability of a given event.

Knight had already distinguished between risk (well-defined probabilities) and uncertainty (undefined probabilities) when talking about decision-making.

However the subjectivist approach (Keynes, de Finnetti, Savage) argues that individuals may form subjective beliefs about an event an behave accordingly.

Ellsberg Paradox

In this sense, even though you may not know with which probability it will rain tomorrow, you will form some subjective belief (i.e. a number between 0 and 1) about it and based on that, you will decide whether to take an umbrella with you.

Ellsberg argued that this was not true.

He argued that if probabilities were not exactly known, individuals would violate expected utility.

Ellsberg Paradox

Consider the following case:
An urn contains three types of balls, yellow, red and black such that:

- There are 30 red balls;
- There are 60 balls which may be yellow or black.

Now, you must choose one of two gambles:

- I) Pick a ball: if it is red you earn 100;
- II) Pick a ball: if it is black you earn 100.

Ellsberg Paradox

Suppose now I offer you a different proposition:

- III) Pick a ball; if it is either red or yellow, you get 100;
- IV) Pick a ball; if it is either black or yellow, you get 100;

Ambiguity aversion

A very common outcome is that individuals pick gambles I and IV or II and III.

This is a violation of expected utility:

If $I \succ II$, then $p(red) > p(black)$

If $IV \succ III$ then $p(black) + p(yellow) > p(red) + p(yellow)$

But this is only possible if $p(black) > p(red)$!!

Ambiguity aversion

The evidence from this experiment points to the fact that people are ambiguity averse.

That is, they dislike situations in which they are unable to assign concrete probabilities.