Course Evaluations

1. **More examples**
    - Worked examples on whiteboard?
    - Concrete examples of settings
2. **Too fast**
    - Too much material for time available
    - More time on math parts, proofs
    - Awkwardly placed midterm
    - Too many details, not enough big picture (utility theory right away?)

Course Evaluations

3. **Liked recaps, fun games**
4. **Slides with answers**
    - Would make reviewing easier
5. **Disliked: Physical classroom**
    - I couldn't agree more :(

Going Forward

- **Framing example** for each lecture
- Second section will be more **student-driven**
    - Zero in on the parts of the papers that people have trouble with
- I'll **update slides** with answers to in-lecture questions

Behavioural Economics Intro

CMPUT 654: Modelling Human Strategic Behaviour

Kahneman & Tversky (1979)

Lecture Outline

1. Midterm Course Evaluations
2. Recap
3. Anomalies
4. Prospect Theory

Recap: Game theory!

- **Game theory:** Interactions among **rational agents**
    - "Rational" means
      "Preferences representable by **expected utility maximization**"
- Every game can be represented as a **normal-form game**
    - Richer representations for sequential action (extensive-form games), uncertainty about actions (imperfect information games), uncertainty about payoffs (Bayesian games), uncertainty about when the game ends (repeated games)
- **Nash equilibrium** as the main solution concept
    - Rational expectations: Every agent correctly forecasts others' strategies
    - Rational action: Every agent maximizes own utility subject to others' strategies

Kahneman & Tversky (1979)

- Paper structure:
    1. Present behavioural anomalies
    2. Present model of behaviour that accounts for them
- This paper's model is restricted to **2-outcome** prospects
    - Later extension (Cumulative Prospect Theory) is what is often cited
    - Neither model is used much in application
    - One of the **first widely-accepted** papers to present these ideas

Allais (1953)

ECONOMETRICA

VOLUME 21 OCTOBER, 1953 NUMBER 4

LE COMPORTEMENT DE L'HOMME RATIONNEL DEVANT LE RISQUE: CRITIQUE DES POSTULATS ET AXIOMES DE L'ECOLE AMERICAINE[1]

PAR M. ALLAIS[2]

EDITOR'S NOTE: The problem discussed in Professor Allais' paper is of an extremely subtle sort and it seems to be difficult to reach a general agreement on the main points at issue. I had a vivid impression of these difficulties at the Paris colloquium in May, 1952. One evening when a small number of the prominent contributors to this field of study found themselves gathered around a table under the most pleasant exterior circumstances, it even proved to be quite a bit of a task to clear up in a satisfactory way misunderstandings in the course of the conversation. The version of Professor Allais' paper, which is now published in ECONOMETRICA, has emerged after many informal exchanges of views, including work done by editorial referees. Hardly anything more is now to be gained by a continuation of such procedures. The paper is therefore now published as it stands on the author's responsibility. The editor is convinced that the paper will be a most valuable means of preventing inbreeding of thoughts in this important field.—R.F.

Problem 1

Choose between:

A. 2,500 with probability .33
   2,400 with probability .66
   0 with probability .01

B. 2,400 with probability 1

- Most people (82%) choose **A**
- **Question:**
  What is implied under utility theory?

Problem 2

Choose between:

C. 2,500 with probability .33
0 with probability .67

D. 2,400 with probability .34
0 with probability .66

- Most people (83%) choose **D**
- **Question:**
What is implied under utility theory?

Problem 3

Choose between:

A. 4,000 with probability .80
   0 with probability .20

B. 3,000 with probability 1

- Most people (80%) choose **B**

Problem 4

Choose between:

C. 4,000 with probability .20
0 with probability .80

D. 3,000 with probability .25
0 with probability .75

- Most people (65%) choose **C**
- C=[.2:4000] > D=[.25:3000], but
  B=[1:3000] > A=[.8:4000]
- But D=[.25:B], and C=[.25:A]
- These preferences violate the **Substitutability** axiom

Certainty Effect

- **Certainty Effect:** People overweight outcomes that are **certain** relative to outcomes that are **close to certain**
- Example of **substitutability** failure
    - Many utility anomalies are of this kind

Reflection Effect

	Positive prospects				Negative prospects			
Problem 3:	(4,000, .80)	<	(3,000).		Problem 3′:	(−4,000, .80)	>	(−3,000).
$N = 95$	[20]		[80]*		$N = 95$	[92]*		[8]
Problem 4:	(4,000, .20)	>	(3,000, .25).		Problem 4′:	(−4,000, .20)	<	(−3,000, .25).
$N = 95$	[65]*		[35]		$N = 95$	[42]		[58]
Problem 7:	(3,000, .90)	>	(6,000, .45).		Problem 7′:	(−3,000, .90)	<	(−6,000, .45).
$N = 66$	[86]*		[14]		$N = 66$	[8]		[92]*
Problem 8:	(3,000, .002)	<	(6,000, .001).		Problem 8′:	(−3,000, .002)	>	(−6,000, .001).
$N = 66$	[27]		[73]*		$N = 66$	[70]*		[30]

- Switching the **sign** switches the **preferences**
- Modal subject is risk-averse in **gains**, and risk-seeking in **losses**

Reference Dependence

Problem 11: After being given **1,000**, choose between:

A. [.5: 1,000]

B. [500]

Problem 12: After being given **2,000**, choose between:

C. [.5: -1,000]

D. [-500]

- Most subjects: B > A, but C > D
- But A=C and B=D in final outcomes
- **Reference dependence:** People evaluate **changes**, not final outcomes.

Prospects

- Paper proposes a model of how people choose among risky **prospects** (aka **lotteries**)
  - **Strictly positive** or **strictly negative** prospects: all outcomes are the **same sign**
  - **Regular** prospects: **neither** strictly positive nor negative

Prospect Theory

- People choose the prospect that maximizes **V**
  - For **regular** prospects:
    $V(p:x, q:y) = \pi(p)v(x) + \pi(q)v(y)$
  - For **strictly** positive or negative prospects where $|x| > |y|$:
    $V(p:x, q:y) = v(y) + \pi(p)[v(x) - v(y)]$
- π is the **decision weight** function
- v is the **subjective value** function

Subjective Value Function

(i) **Reference dependence:**
Defined on **changes**

(ii) **Loss aversion:**
Steeper for losses than gains

(iii) **Reflection effect:**
Concave in gains, **convex** in losses

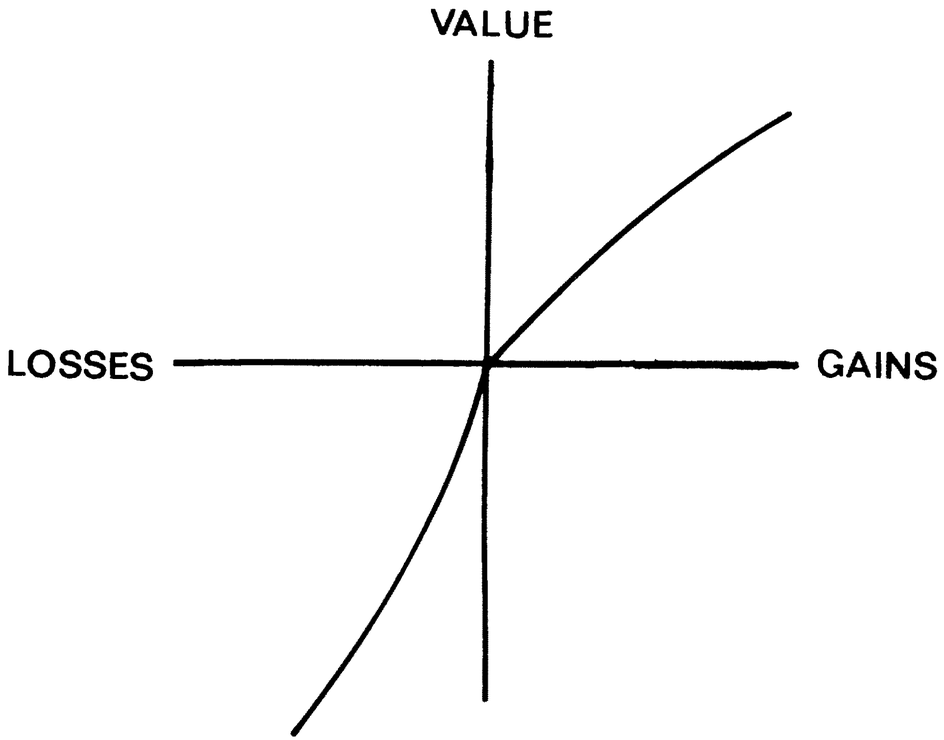

FIGURE 3.—A hypothetical value function.

Decision Weight Function

Certainty effect:
High probability uncertain events **underweighted**;
Low probability uncertain events **overweighted**

- **Nonlinear** (often S-shaped in later work)
- Not well-behaved at **endpoints:**
  - $\pi(0)=0,\ \pi(1)=1$

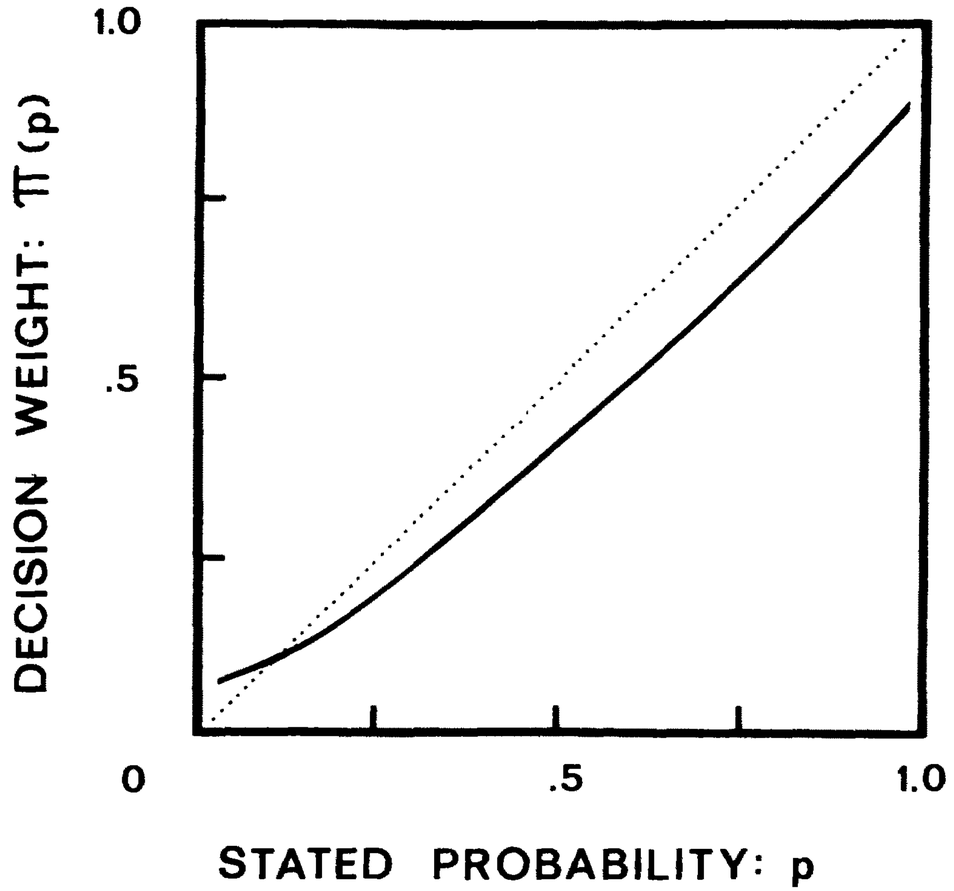

FIGURE 4.—A hypothetical weighting function.

Issues

- Nonlinear **decision weight** function is hard to operate with
- Extension to **more than 2 outcomes** is nontrivial
    - (see Cumulative Prospect Theory)
- Specifying the **reference point** is nontrivial
    - It can change remarkably quickly
    - It's not always just status quo