University of California – Berkeley
Department of Economics
ECON 201A Economic Theory
Choice Theory
Fall 2025

Introduction

Aug 28, 2025

Prologue

Many people think that economists view people as being super-rational and find the material to be highly theoretical and not very "realistic".

... theories do not have to be realistic to be useful...

Even though the assumptions are pretty unrealistic, the theory predicts behavior well and is quite useful.

A theory can be *useful* in three ways:

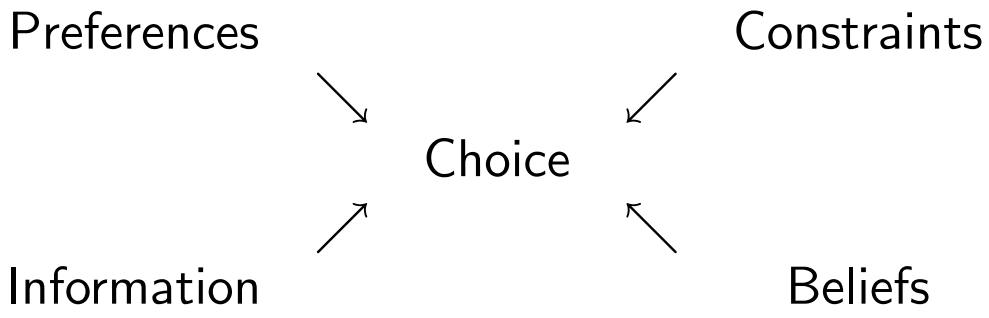
A. descriptive (how people actually choose)

B. prescriptive (as a practical aid to choice)

C. normative (how people ought to choose)

Decision making under certainty and uncertainty

The "standard" theory of the economic agent (consumer, manager, policy maker) is best understood as follows:



The fundamental tradeoffs in life

People's attitudes towards risk, time and other people enter every realm of (financial) decision-making:

$$\begin{aligned} \text{risk} &\iff \text{return} \\ \text{today} &\iff \text{tomorrow} \\ \text{self} &\iff \text{others} \end{aligned}$$

Risk, time and social preferences are thus important inputs into any broader measure of welfare and enter virtually every field of economics.

Four types of (fundamental) questions concerning preferences

Consistency

- Is behavior consistent with the utility maximization model?

Structure

- Is behavior consistent with a utility function with some special structural properties?

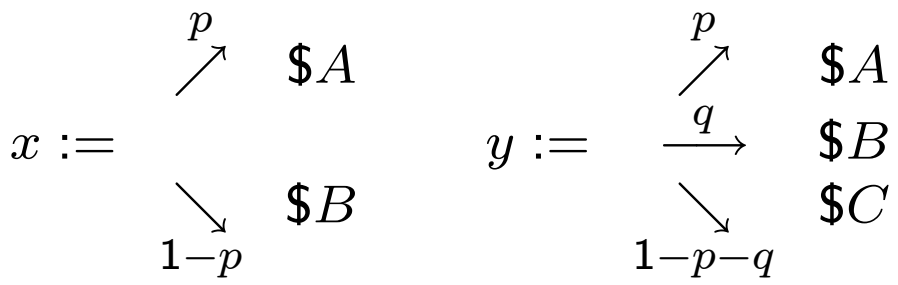
Recoverability

- Can the underlying utility function be recovered from observed choices?

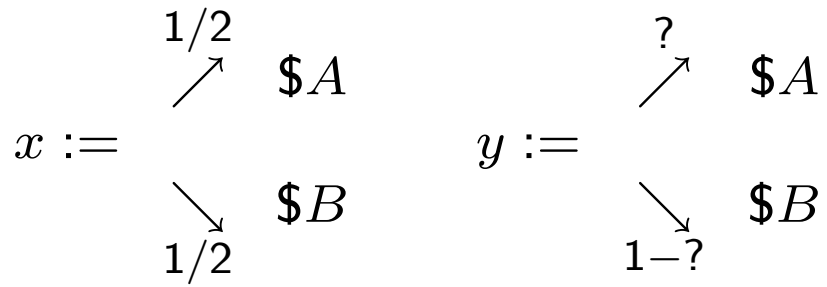
Extrapolation

- How can we forecast behavior in other circumstances?

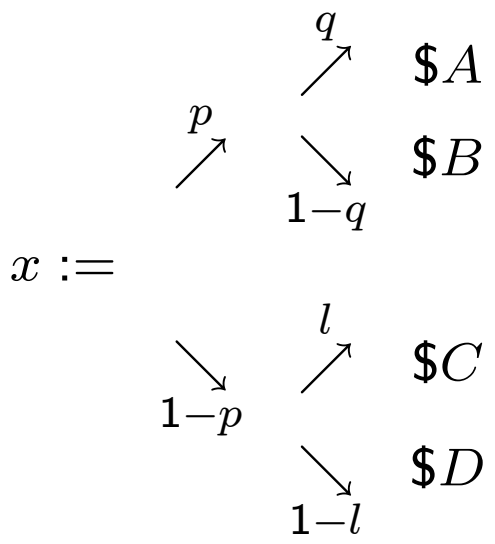
Life is full of lotteries :-(



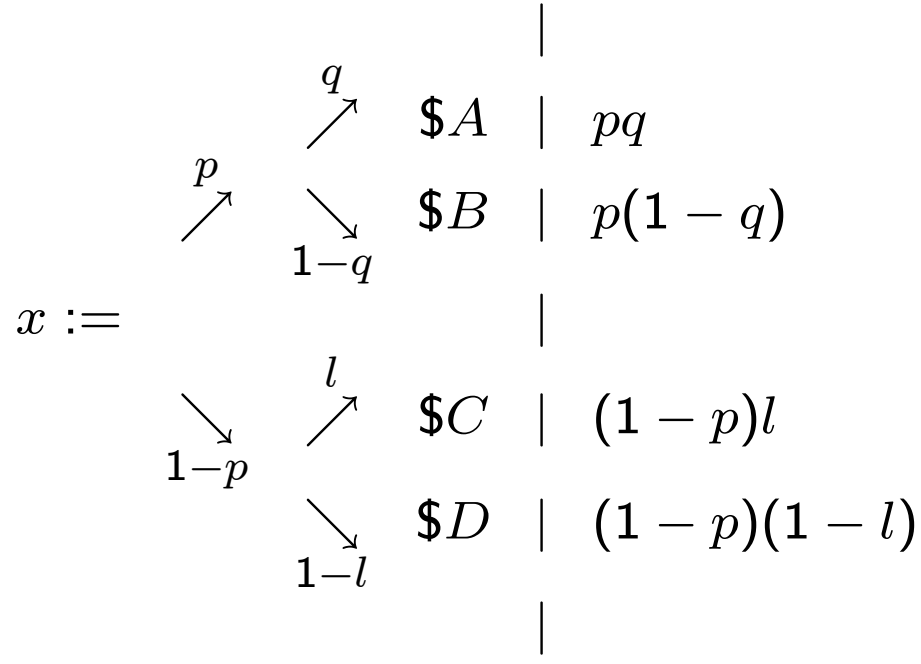
A risky lottery (left) and an ambiguous lottery (right)



A compounded lottery



The reduction of a compounded lottery



The hypotheses (axioms) about (risk) preferences

All theories (EU and non-EU) begin with three assumptions about preferences:

I. Completeness

For any pair of lotteries or gambles (outcomes and probabilities) x and y

$$x \succsim y \text{ or } y \succsim x.$$

The hypotheses about (axioms) about (risk) preferences

All theories (EU and non-EU) begin with three assumptions about preferences:

II. Transitivity

For any three lotteries x, y, z

if $x \succsim y$ and $y \succsim z$ then $x \succsim z$.

The hypotheses about (axioms) about (risk) preferences

All theories (EU and non-EU) begin with three assumptions about preferences:

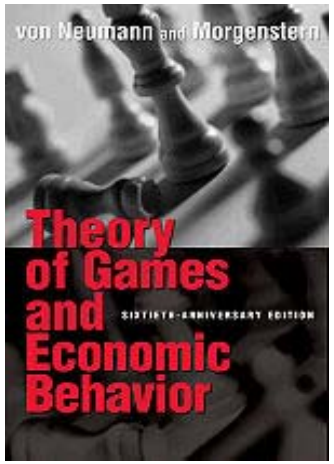
III. Monotonicity (with respect to first-order stochastic dominance)

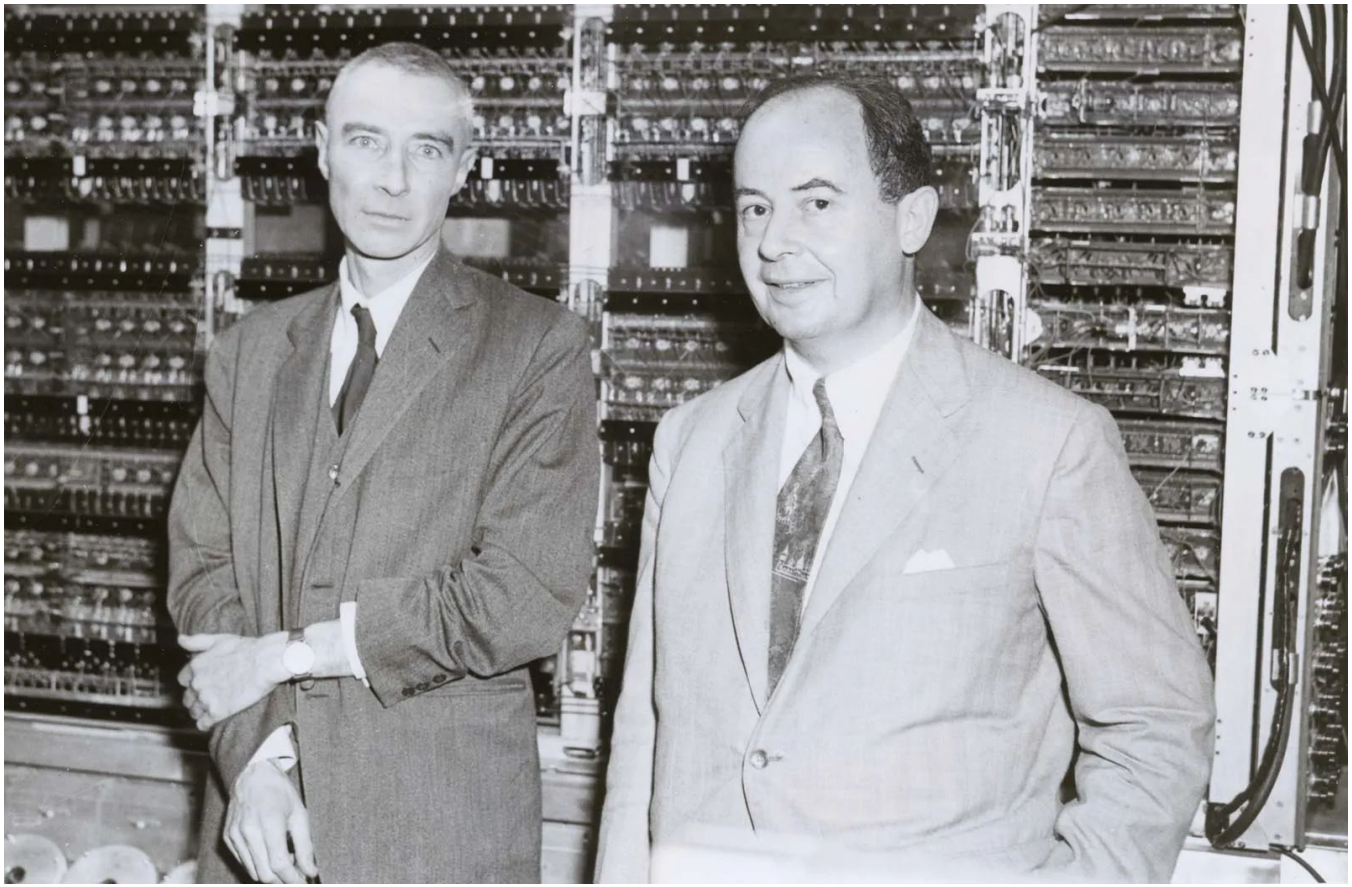
For any pair of lotteries x and y with resulting payoff distributions F_x and F_y

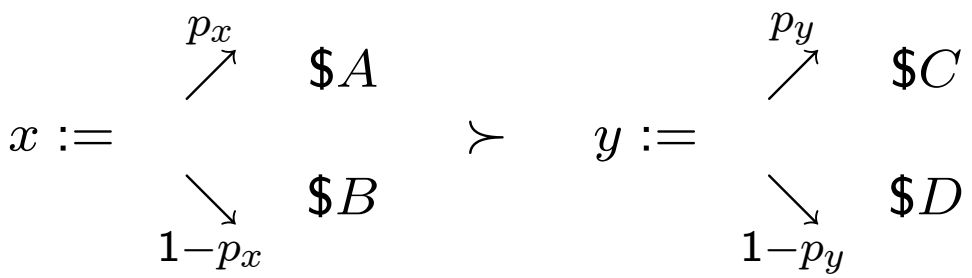
$$\text{if } F_x \geq F_y \text{ then } x \succsim y.$$

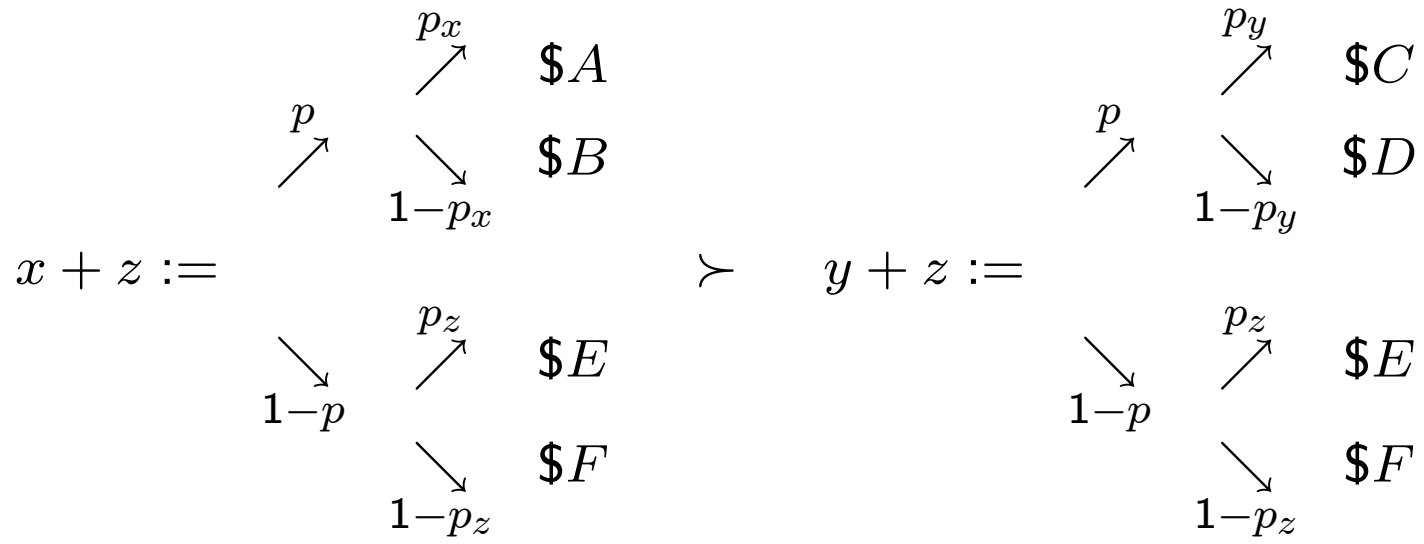
$\Rightarrow$ The preferences can be represented, or summarized, by a well-behaved (increasing) utility function.

The paternity of decision theory and game theory (1944)






p_x
$\$A$
$x :=$
$\succ$
$y :=$
p_y
$\$C$
$\$B$
$\$D$
$1-p_x$
$1-p_y$


$x + z :=$
p
p_x
$\$A$
$1-p_x$
$\$B$
$1-p$
p_z
$\$E$
$1-p_z$
$\$F$
$\succ$
$y + z :=$
p
p_y
$\$C$
$1-p_y$
$\$D$
$1-p$
p_z
$\$E$
$1-p_z$
$\$F$

The hunt for a descriptive theory of choice under risk (Starmer, 2000)

The 'standard' model of decisions under risk is based on von Neumann and Morgenstern Expected Utility (EU):

Independence

For any three lotteries x, y, z and $0 < \alpha < 1$

$$\text{if } x \succ y \text{ then } \alpha x + (1-\alpha)z \succ \alpha y + (1-\alpha)z.$$

$\Rightarrow$ Empirical violations of independence generated the development of various theoretical alternatives, and the investigation of these theories has led to new empirical regularities, and so on...

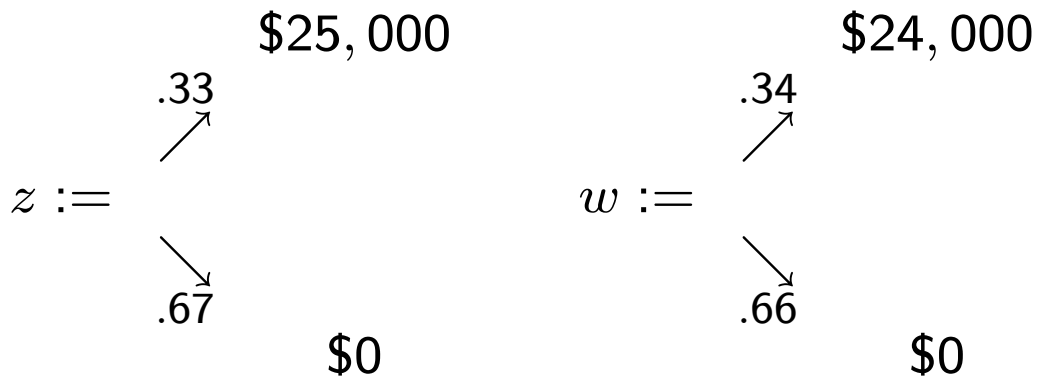
Allais (1953) I

– Choose between the two gambles:

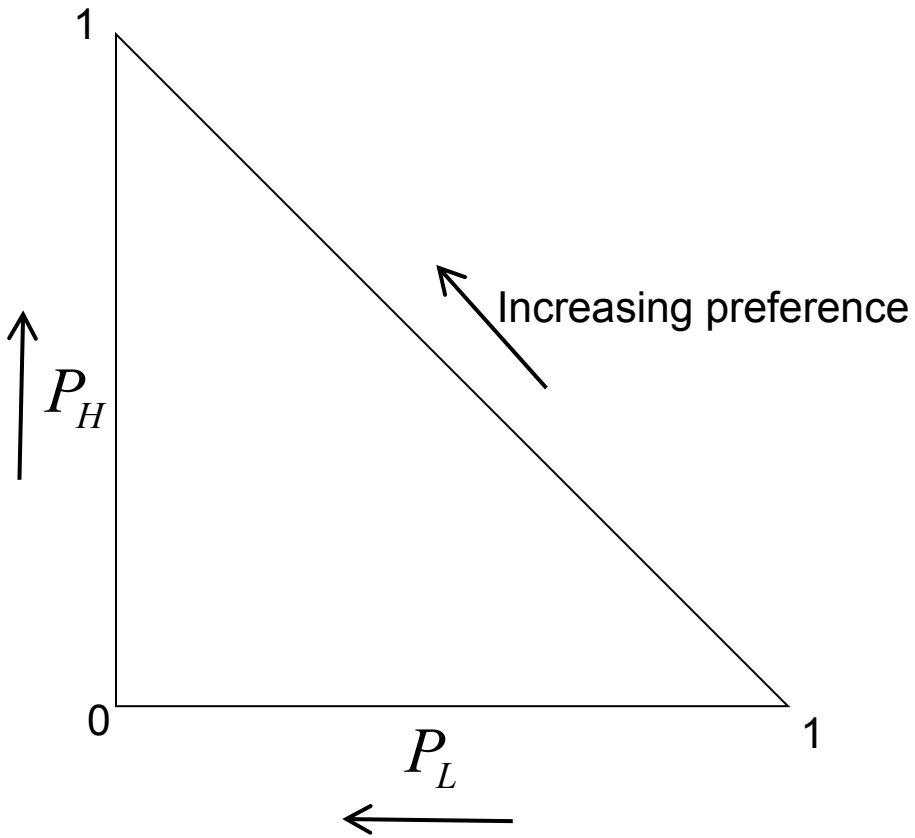
$$x := \begin{array}{l} \\ \overset{.33}{\nearrow} \\ \xrightarrow{.66} \\ \underset{.01}{\searrow} \end{array} \begin{array}{l} \$25,000 \\ \\ \$24,000 \\ \\ \$0 \end{array} \qquad y := \xrightarrow{1} \$24,000$$

Allais (1953) II

– Choose between the two gambles:

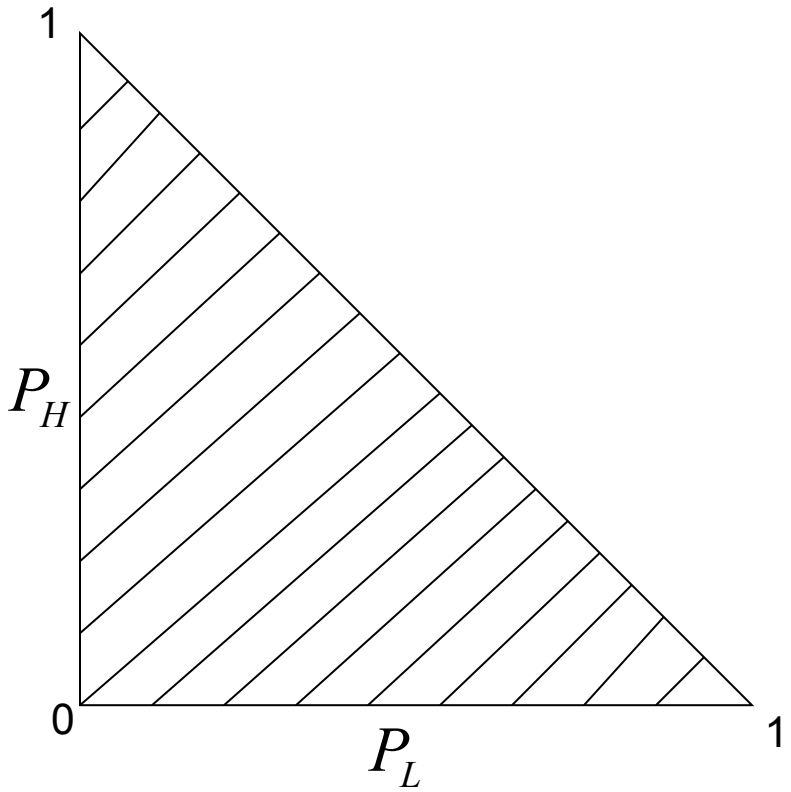


The (Marschak-Machina) probability triangle



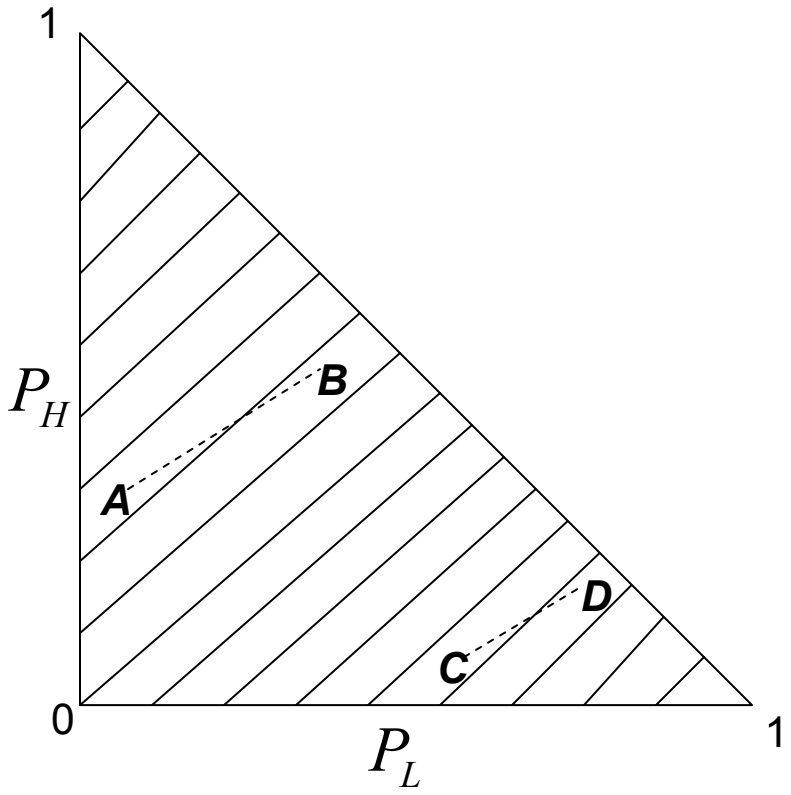
Consider three monetary payouts H, *M*, and *L* where *H>M>L*

An indifference map of a loss-neutral (expected utility) individual



Expected Utility Theory (EUT) requires that indifference lines are parallel

A test of Expected Utility Theory (EUT)



EUT requires that indifference lines are parallel so one must choose either ***A*** and ***C***, or ***B*** and ***D***.

What have we learned from à la Allais experiments (Camerer, 1995)?

- *...EU violations are much smaller (though still statistically significant) when subjects choose between gambles that all lie inside the triangle...*
- *...due to nonlinear weighting of the probabilities near zero (as the rank dependent weighting theories and prospect theory predict)...*
- *...the only theories that can explain the evidence of mixed fanning, violation of betweeness, and approximate EU maximization inside the triangle...*

In a classic sketch from the television show *Monty Python's Flying Circus*, a customer attempts to return a parrot (a "Norwegian Blue") he bought from a pet shop earlier in the day, complaining the parrot was dead when he bought it. The sketch consists of a series of more and more surreal claims by the shopkeeper that the parrot is still alive—that it is merely resting, that it is shagged out after a long squawk, that it prefers resting on its back, and that it is pining for the fjords of Norway. To prove the parrot is dead, the customer takes it out of the cage and starts beating it against the countertop. The shopkeeper repeatedly tries to distract the angry customer from the fact that the parrot is dead by pointing out the parrot's "beautiful plumage." The customer responds that "the plumage don't enter into it," and proceeds to list numerous different ways of saying that the parrot is dead, the most famous of which is the declaration: "This is an ex-parrot."

Although this practice is understandable, it limits the usefulness of the data:

[1] While these experiments reveal that violations exist, they give us little sense of how important they are or how frequently they occur.

[2] The analysis builds on ad hoc assumptions about an error generating process and lacks any substantive econometric methodology.

[3] Choice scenarios are not very important to the applications of theories of choice under uncertainty in economics.

The study of choice under uncertainty should proceed in a manner similar to standard consumer theory (Machina, 2009).