FOUNDATIONS OF FINANCE: EXPECTED UTILITY THEORY?

EE 434 Behavioral Finance, SEM1/2022

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CONTENT

01

ALLAIS PARADOX

Allais Paradox

https://www.menti.com/ive7tt3i4m

Question 1: Which do you prefer between A and A*?

Prospect A		Prospect A*	
$1,000,000	100%	$ 0	1%
		$ 1,000,000	89%
		$ 5,000,000	10%

Question 2: Which do you prefer between B and B*?

Prospect B		Prospect B*	
$0	89%	$ 0	90%
$1,000,000	11%	$5,000,000	10%

Allais Paradox

A large number of people choose A over A* and B*over B.

$$A \succ A^*$$
$$E\big(U(A)\big) > E(U(A^*))$$
$$U(\$1M) > 0.89U(\$1M) + 0.1U(\$5M)$$
$$0.11U(\$1M) > 0.1U(\$5M)$$

$$\mathrm{B}^* \succ B$$
$$E\big(U(B^*)\big) > E(U(B))$$
$$0.1U(\$5M) > 0.11U(\$1M)$$

Allais Paradox

https://www.menti.com/3jqphyrwj8

Question 1: Which do you prefer between A and A*?

Prospect A		Prospect A*	
$1,000,000	89%	$ 1,000,000	89%
		$ 0	1%
$1,000,000	11%	$ 5,000,000	10%

Question 2: Which do you prefer between B and B*?

Prospect B		Prospect B*	
$0	89%	$ 0	89%
		$ 0	1%
$1,000,000	11%	$5,000,000	10%

Allias paradox

After removing commonalities, the choices between prospects A and A* or B and B* are exactly the same.

Thus, people should choose A and B or A* and B*.

An axiom known as “context independence” is contradicted by the Allais paradox.

Allias paradox

Suppose a person is indifferent between two prospects, A and B. If we consider another prospect, C, independence implies that this person should also be indifferent between one gamble that combines A with C and another that combines B with C with fixed probability.

02

RABIN'S CALIBRATION

Rabin's calibration(Rabin, Econometrica 2000)

People tend to dislike risky prospects even when they involve an expected gain.

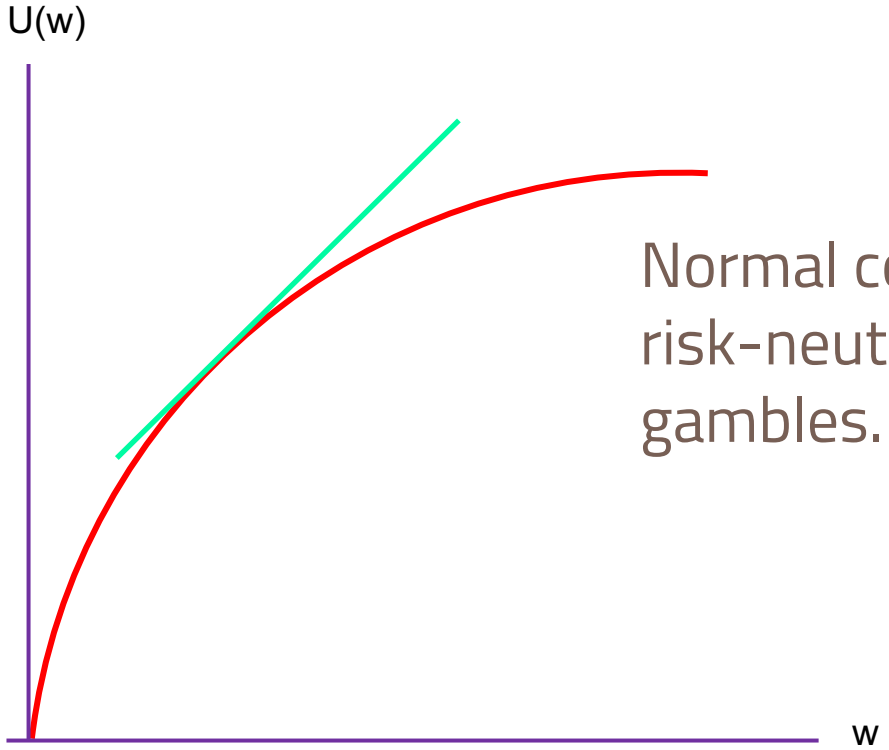
For example, Will you turn down a 50-50 gamble of losing $100 vs. gaining $105 ?

Rabin's calibration (Rabin, Econometrica 2000)

Standard explanation:

EU theory with a concave utility function.

Rabin's calibration(Rabin, Econometrica 2000)



Normal concave utility function is risk-neutral for very small stake gambles.

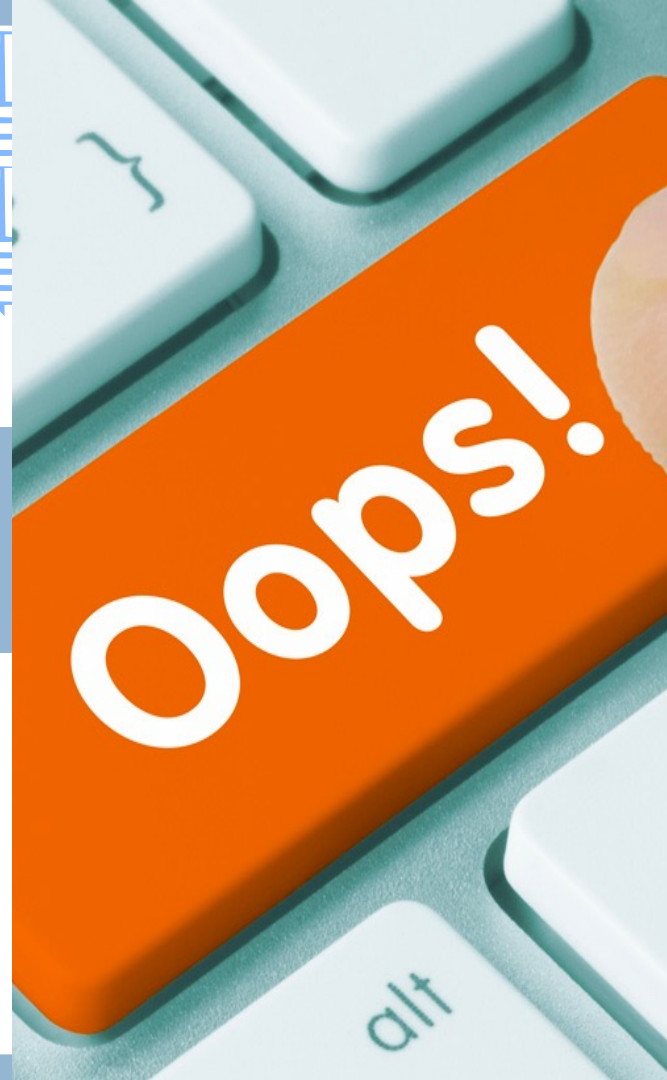
Rabin's calibration(Rabin, Econometrica 2000)

Rabin's Point:

This explanation doesn't work, because according to EU theory, anything but virtual risk neutrality over modest stakes implies manifestly unrealistic risk aversion over large stakes.

03

Bernoulli's Error



Bernoulli's Error

One way to evaluate a prospect is to calculate expected value. In 1738, Daniel Bernoulli noted that there was a difference between the actual value of money and the psychological value of money. Bernoulli noticed that people dislike risk, and want to avoid the worst outcomes at great cost, that is, they are risk-averse.

This can be explained by diminishing marginal utility of wealth. Hence, a concave utility function is implicitly assumed in EUT.

Expected Utility Theory has been widely accepted and used for many years, but it has its own issues.

Bernoulli's Error

Consider this example:

Today **Wanda** and **Loki** each have a wealth of $5 million.

Yesterday, Wanda had $1 million and Loki had $9 million.

Are they equally happy?

Bernoulli's Error

The expected utility model only takes into account final states of wealth, not changes in wealth.

Wanda and Loki both have final wealth of $5 mil (same final state). But they had different initial wealth (different changes).

04

Thought experiments

Thought experiment A

https://www.menti.com/y4radnvp3i

Problem 1: Choose between...
Sure thing: win $900
Gamble: 90% win $1000, 10% win $0

Problem 2: Choose between...
Sure thing: lose $900
Gamble: 90% lose $1000, 10% lose $0

Thought experiment A

In Problem 1, most people...
Choose sure thing
Explained by risk aversion

In Problem 2, most people...
Choose the gamble
Explained if people are risk-loving

Thought experiment B

https://www.menti.com/6cgw7m1exa

Problem 3: In addition to whatever you own, you have been given $1000.
Choose between...
Sure thing: win $500
Gamble: 50% win $1000, 50% win $0

Problem 4: In addition to whatever you own, you have been given $2000.
Choose between...
Sure thing: lose $500
Gamble: 50% lose $1000, 50% lose $0

Thought experiment B

In this thought experiment, the final payoffs in problem 3 and 4 are exactly the same.

Sure thing: $1500
Gamble: 50% win $1000 and 50% win $2000

Findings suggest that people are risk-averse over potential gains, and risk-loving over potential losses.

HOW CAN YOU BE BOTH RISK AVERSE/NEUTRAL IN GAINS AND RISK SEEKING IN LOSSES?

Thought experiments C

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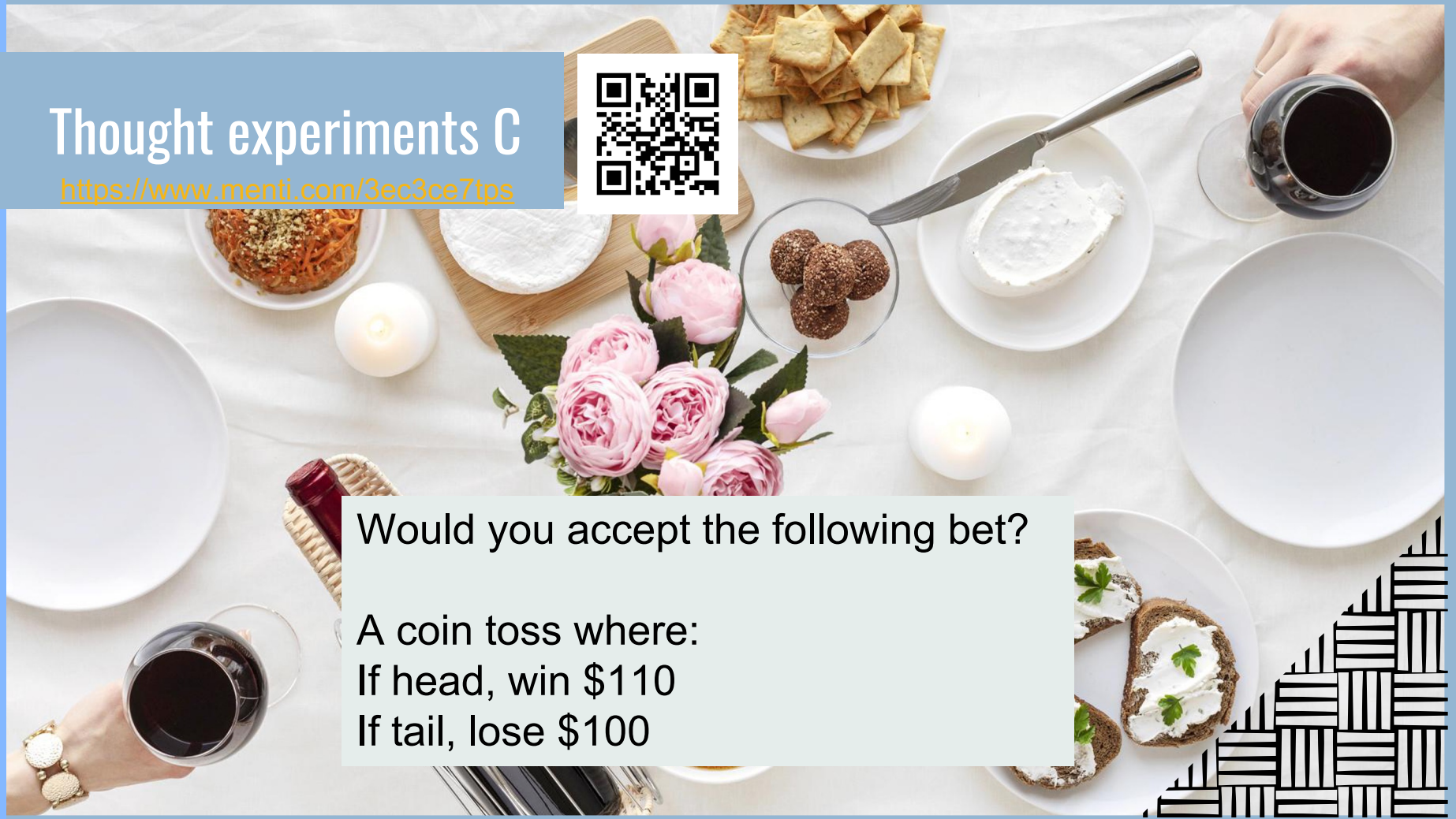
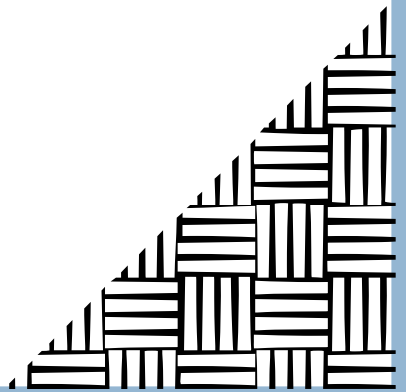


Would you accept the following bet?

A coin toss where:
If head, win $110
If tail, lose $100

Thought experiments C

People feel the pain of a loss more strongly than the desire of an equally-sized gain.



DANKE!

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