



Risk Preferences

PROSPECT THEORY V:

Fourfold patterns of choices under risk

EE416 SEM1/2020

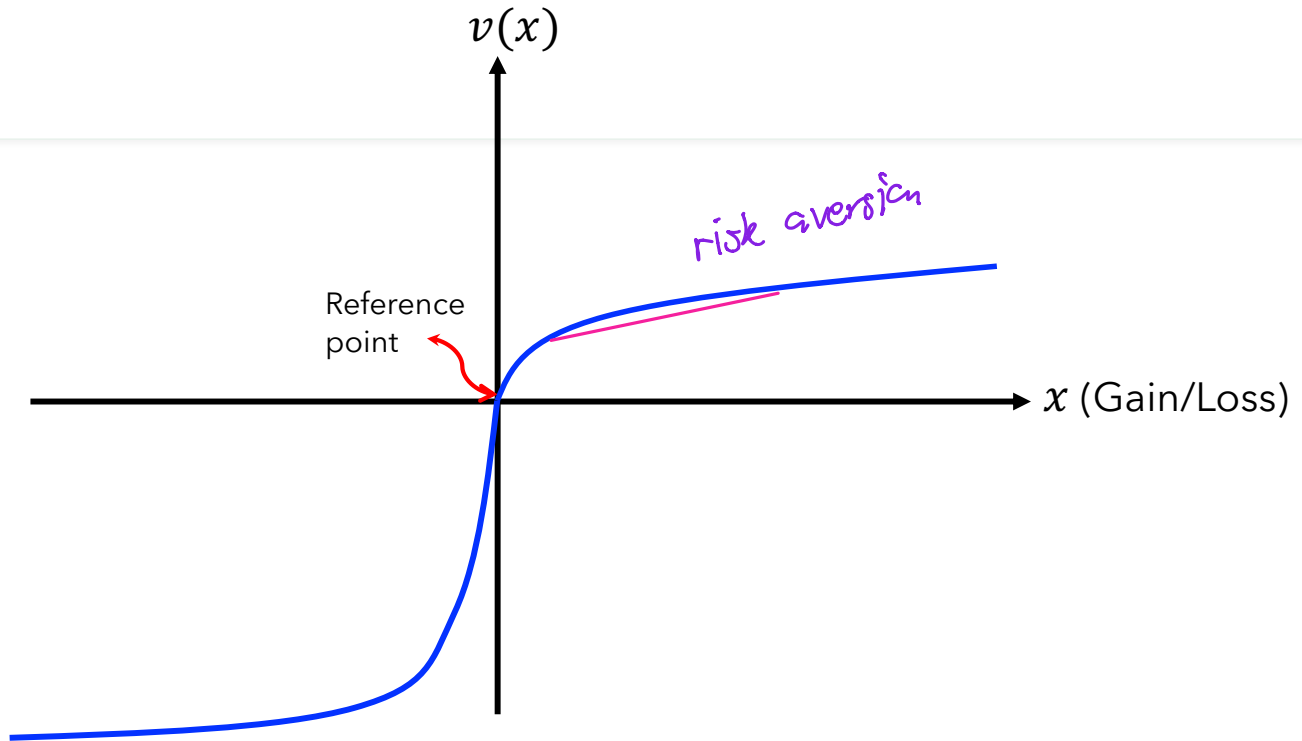
A photograph of a chessboard with several pieces. The pieces are dark wood, and the board is light and dark squares. The background is blurred with bokeh lights.

Recall: Prospect theory

- A prospect can be written as $(x, p; y, q)$ with $p + q \leq 1$.
- Note: $p + q < 1$ implies prospect yields 0 with probability $1 - p - q$.
- A person evaluates a prospect $(x, p; y, q)$ according to the functional

$$V(x, p; y, q) = \pi(p)v(x) + \pi(q)v(y)$$

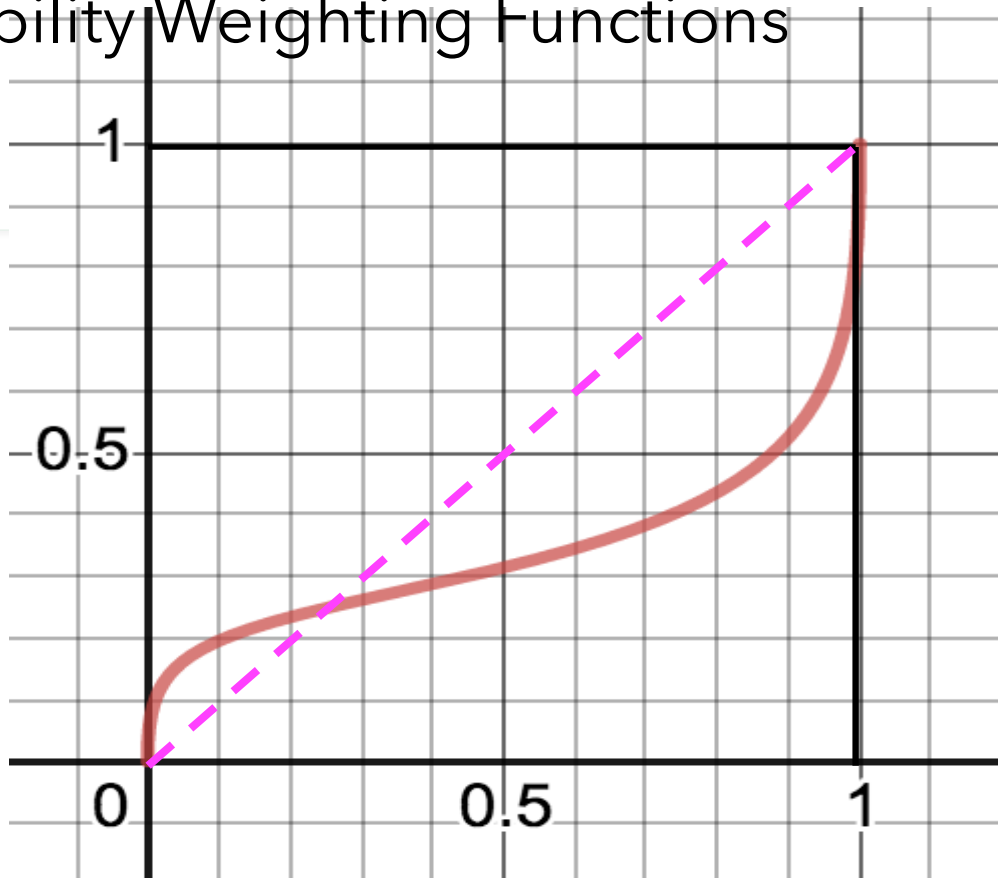
Recall: Value function $v(\cdot)$



Recall: Probability Weighting function $\pi(p)$

- The probability-weighting function $\pi(p)$ will have several features such as:
 - Overweighting of small probabilities $\pi(p) > p$,
 - Underweighting of large probabilities $\pi(p) < p$,
 - Subcertainty $\pi(p) + \pi(1 - p) < 1$,

Probability Weighting Functions



The Fourfold pattern of risk preferences: The core achievement of prospect theory

	① GAINS	② LOSSES (-10\$K, 95%; 0, 5%)
HIGH PROBABILITY Reinforcing forces	95% chance to win \$10,000 Risk averse + Underweighting Fear of disappointment <u>RISK AVERSE</u> Accept unfavorable settlement Ex: refusing low-risk high return business opportunity	95% chance to lose \$10,000 Risk seeking + Underweighting Hope to avoid loss <u>Risk seeking</u> Reject favorable settlement Ex: taking desperate gambles for a small hope of avoiding large loss
LOW PROBABILITY Competing forces	5% chance to win \$10,000 Risk averse + Overweighting Hope of large gain <u>Risk seeking</u> ↑ win Reject favorable settlement Ex: buying lottery tickets	5% chance to lose \$10,000 Risk seeking + Overweighting Fear of large loss <u>Risk averse</u> ↑ win Accept unfavorable settlement Ex: buying insurance policies

Choices are:

risk averse if sure thing (corresponding to the expected value) is preferred,
 risk seeking if the gamble is preferred.

The Fourfold pattern of risk preferences

- For intermediate/large probabilities, we have risk-averse behavior over gains and risk-loving behavior over losses.
 - For small probabilities, we have risk-loving behavior over gains and risk-averse behavior over losses.
- ↗ underweighting*

The background features a dark grey area on the left and a red area on the right, separated by a white diagonal line. A thick yellow line starts from the left edge, peaks, and then descends across the center. A white line with a crossbar is positioned in the upper right. A purple horizontal bar is at the bottom.

Narrow vs. Broad framing

Narrow framing vs. Broad framing

- Examine following decisions and make your choices:

- Decision (i): Choose between

- A. sure gain of \$240 ←

- B. 25% chance to gain \$1,000 and 75% chance to gain nothing

- Decision (ii): Choose between

- C. sure loss of \$750

- D. 75% chance to lose \$1,000 and 25% chance to lose nothing

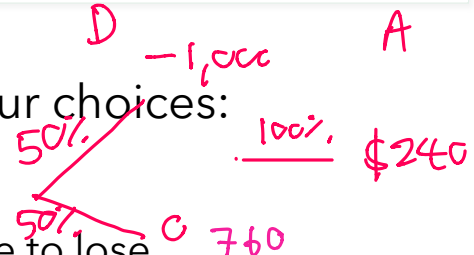
Narrow framing vs. Broad framing

- Examine following decisions and make your choices:
- Decision (iii): Choose between

• AD. ~~25%~~^{50%} chance to win 240 and ~~75%~~^{50%} chance to lose 760

• BC. ~~25%~~^{50%} chance to win 250 and ~~75%~~^{50%} chance to lose 750

choose
forgo



Narrow framing vs. Broad framing

- Majority of respondents chose:
 - A. in decision (i);
 - D. in decision (ii).
- AD is dominated by BC.
- It is costly to be risk averse for gains and risk seeking for losses.

Narrow framing vs. Broad framing

- Two ways of understanding decisions (i) and (ii):
 - Narrow framing: a sequence of two simple decisions, considered separately

Think about A vs. B

Think about C vs D

- Broad framing: a single comprehensive decision, with four options

Think about A, B, C, D together : AC vs AD vs BC vs BD

Narrow framing vs. Broad framing

- A rational agent will engage in broad framing.
- A rational agent will use mental efforts to enforce consistency. Econs will be coherent in their choices.
- Humans are naturally narrow framers.
- We are susceptible to WYSIATI *what you see is all there is* That is, we use the information we have as if it is the only information.
- We are averse to using mental effort.

Inducing to use broad framing

- "To think like a trader"
 - helps with loss aversion and endowment effect
- "Treat this problem as one of many monetary decisions, which will sum together to produce a portfolio"
- Broad framing blunt the emotional ^{reaction} to losses



Blindspot of Prospect theory

Blindspots of Prospect theory

- Prospect theory doesn't address how the reference point is formed.

Blindspots of Prospect theory

- Prospect theory doesn't allow the value of an outcome to change when the alternative is very valuable.
- Prospect theory assumes that available options in a choice are evaluated separately and independently, and the choice with the highest value is selected.
- Consider following problems
 - Choose between 90% chance to win \$1 million or \$50 with certainty
 - Choose between 90% chance to win \$1 million or \$150,000 with certainty
- $v(x_1)$ doesn't _____.
- Prospect theory doesn't allow for regret.

Blindspots of Prospect theory

- Prospect theory doesn't allow the value of an outcome to change when it is highly unlikely.
- Consider following prospects
 - A. 1 in 1,000,000 to win \$1,000,000
 - B. 90% chance to win \$1 million and 10% chance to win nothing
- $v(\cdot)$ doesn't_____.