Experimental Economics

- **Loss Aversion**
  - Loss aversion and decision-making under risk
    - Looking inside the brain
    - Looking at close relatives
  - Endowment effect (loss aversion when not under risk)
    - Experience
  - Loss aversion in risky and riskless situations
  - Myopic loss aversion
- **Probability Weighting**
  - A non-parametric estimate of probability weighting functions

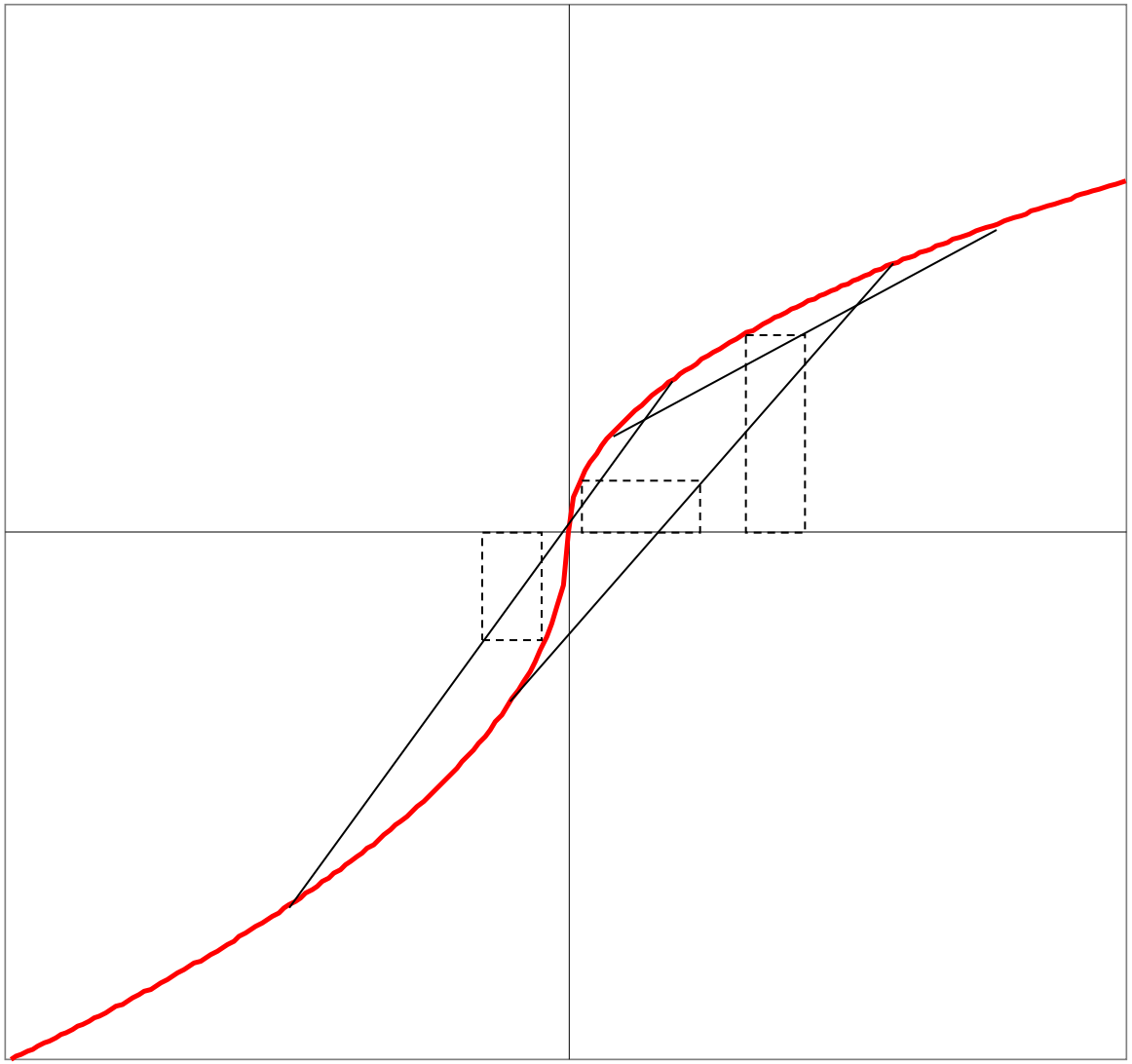
Loss aversion

- **Loss aversion**
  - 'The response to losses is consistently much more intense than the response to corresponding gains' Kahneman 2003
  - Two persons get their monthly report from a broker:
    - A is told that her wealth went from $900,000 to $750,000.
    - B is told that her wealth went from $200,000 to $250,000.
    - Who has more reason to be satisfied with her financial situation?
    - Who is happier today?

	Lottery Win (50%)	**Lottery Lose (50%)**	**Safe Option**
Choice A	**$50**	**$10**	**$25**
Choice B	**$30**	**–$10**	**$5**

Value function

- **Prospect theory** Kahneman and Tversky, 1979
- **Descriptive model of risky choice in which the carriers of utility are gains and losses relative to a neutral reference point.**
  - Risk aversion for gains
  - Steeper slope for losses than for gains (λ)
  - Risk loving for losses

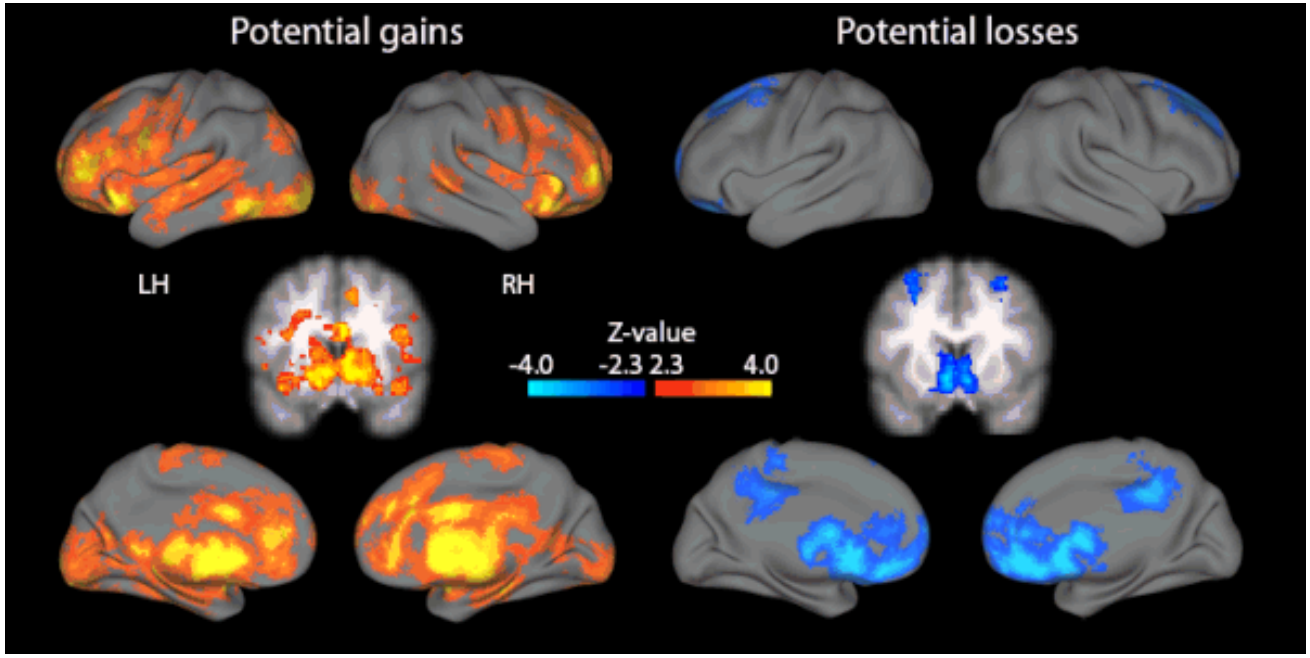


Losses inside the brain

- **Losses hurt** Breiter et al. 2001
  - Subjects are given a gamble (no choice). Scanned (fMRI) before and after the gamble is resolved.
    - 12 subjects
    - 2 treatments: experiencing losses and anticipating losses
  - Experiencing (anticipating) losses produce activation in the anterior insula.
    - this region is associated with negative emotions (fear)

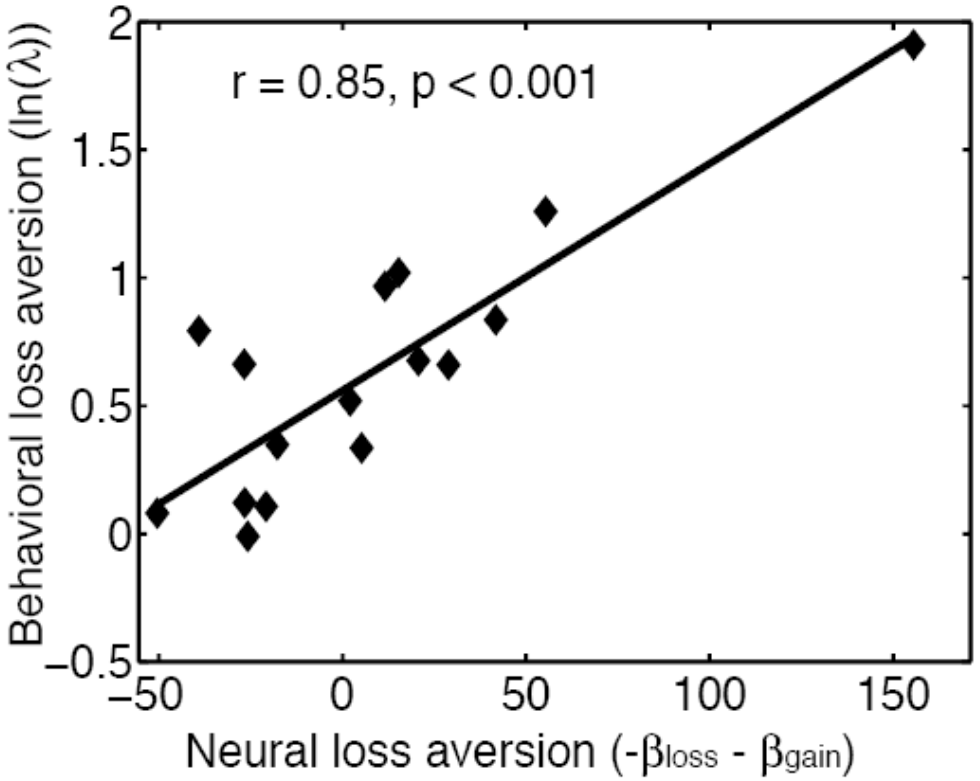
Losses inside the brain

- **Losses are less exciting** Tom et al. 2007
  - Subjects accept/reject gambles. Scanned (fMRI) while deciding.
    - 16 subjects
    - 2 treatments: increasing losses and increasing gains
  - Increasing losses produce decreasing activation in the ventral striatum (and in prefrontal cortices).
    - this region is associated with the assignment of value



Losses inside the brain

- **Neural loss aversion** Tom et al. 2007
  - The decrease in activation due to losses is larger then the increase in activation due to equivalent gains
  - Correlated with behavioral loss aversion



Close relatives

- **Capuchin monkeys** Chen et al. 2006
  - Strong preference for a gamble with gains over an equivalent gamble with a loss

- **1st treatment (2 choices)**

13% ▪ 1 apple

87% ▪ 2 apples – 0.5 × 1 apple

- **2nd treatment (2 choices)**

29% ▪ 2 apples – 0.5 × 1 apple

71% ▪ 1 apple + 0.5 × 1 apple

Endowment effect

- **Endowment effect**
  - Willingness to pay is greater than willingness to accept
- **Market for coffee mugs** Kahneman et al. 1990
  - 44 students
  - 2 treatments:
    - trading tokens (3 rounds) for training
    - trading mugs (4 rounds)
  - subjects randomly assigned to the role of buyer or seller

Tokens	**Expected trades**	**Actual trades**	**Expected price**	**Actual price**
Round 1	**11**	**12**	**$3.75**	**$3.75**
Round 2	**11**	**11**	**$4.75**	**$4.75**
Round 3	**11**	**10**	**$4.25**	**$4.25**

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Mugs	Expected trades	Actual trades	Med. Asking price	Med. Selling price
Round 1	**11**	**4**	**$2.75**	**$5.25**
Round 2	**11**	**1**	**$2.25**	**$5.25**
Round 3	**11**	**2**	**$2.25**	**$5.25**
Round 4	**11**	**2**	**$2.25**	**$5.25**

Endowment effect

- **Endowment effect in the field** List 2004
- **Trading candy for coffee mugs**
  - 253 (124 non-dealers, 129 dealers)
  - 4 treatments:
    - Endowed with candy (can trade for mug)
    - Endowed with mug (can trade for candy)
    - Endowed with neither (must choose mug or candy)
    - Endowed with both (must give up mug or candy)

Endowment	Expected candy	Candy (non-dealers)	Candy (dealers)
Candy	**50%**	**81%**	**47%**
Mug	**50%**	**23%**	**44%**
None	**50%**	**45%**	**51%**
Both	**50%**	**60%**	**44%**

Endowment effect

- **Endowment effect in the field** List 2004
  - Trading experience: non-dealers who trade often (top 10%) do not exhibit an endowment effect.
  - But … Haigh and List (2005) finds that dealers exhibit more myopic loss aversion

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Both	**50%**	**60%**	**44%**

Risky and riskless loss aversion

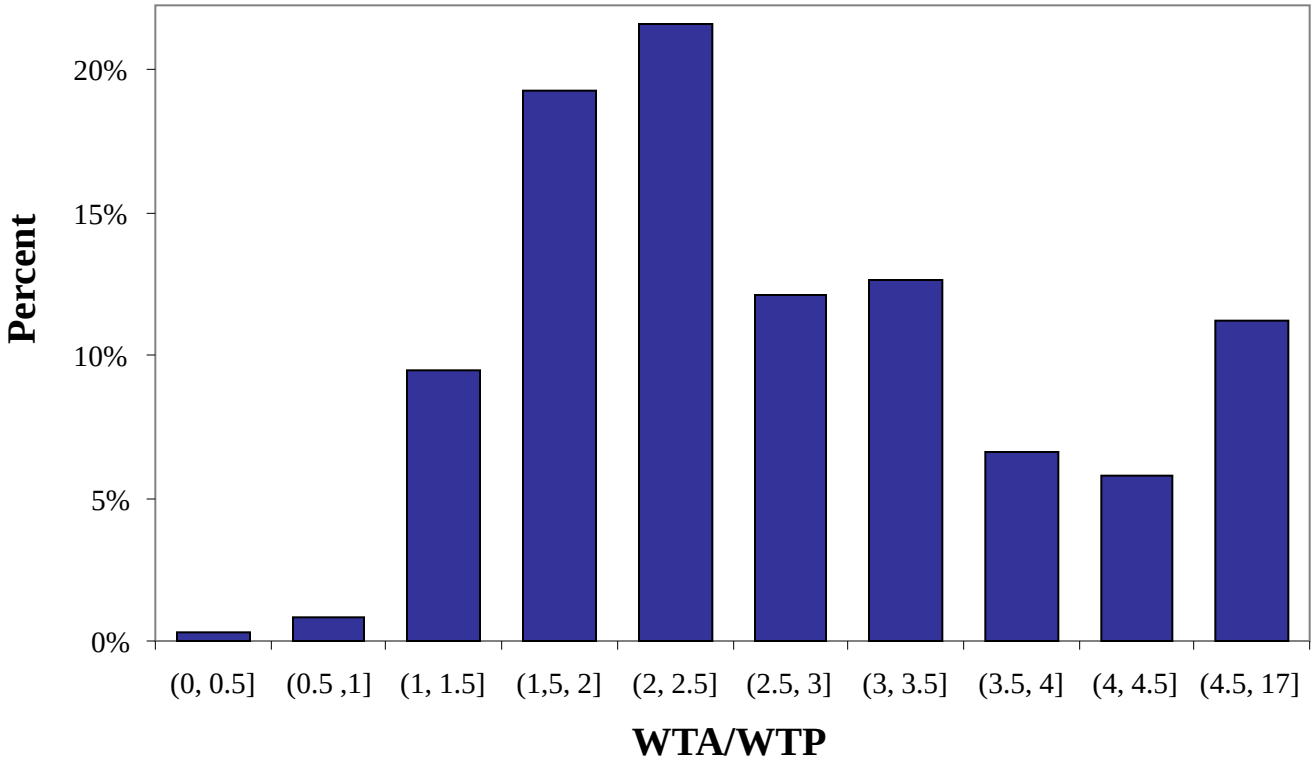
- **Combining measures of loss aversion** Gächter et al. 2007
  - 660 Audi A4 owners
  - 2 treatments:
    - Between-subjects measure of loss aversion (control)
    - Within-subjects measure of loss aversion
  - Risky loss aversion:
    - if the coin turns up heads, then you lose €*x*; if the coin turns up tails, you win €6.
    - €*x* varies from 2 to 7

Risky and riskless loss aversion

- **Combining measures of loss aversion** Gächter et al. 2007
  - 660 Audi A4 owners
  - 2 treatments:
    - Between-subjects measure of loss aversion (control)
    - Within-subjects measure of loss aversion
  - Riskless loss aversion:
    - Sell or buy a miniature Audi A4 model
      - If the price is €*x*, I am ready to sell (buy): yes/no
      - €*x* varies from 0 to 10
      - Becker, DeGroot and Marschak mechanism to determine outcome
    - Between-subjects: endowed with the car or not
    - Within-subjects: endowed with the car with $p = ½$, use strategy method

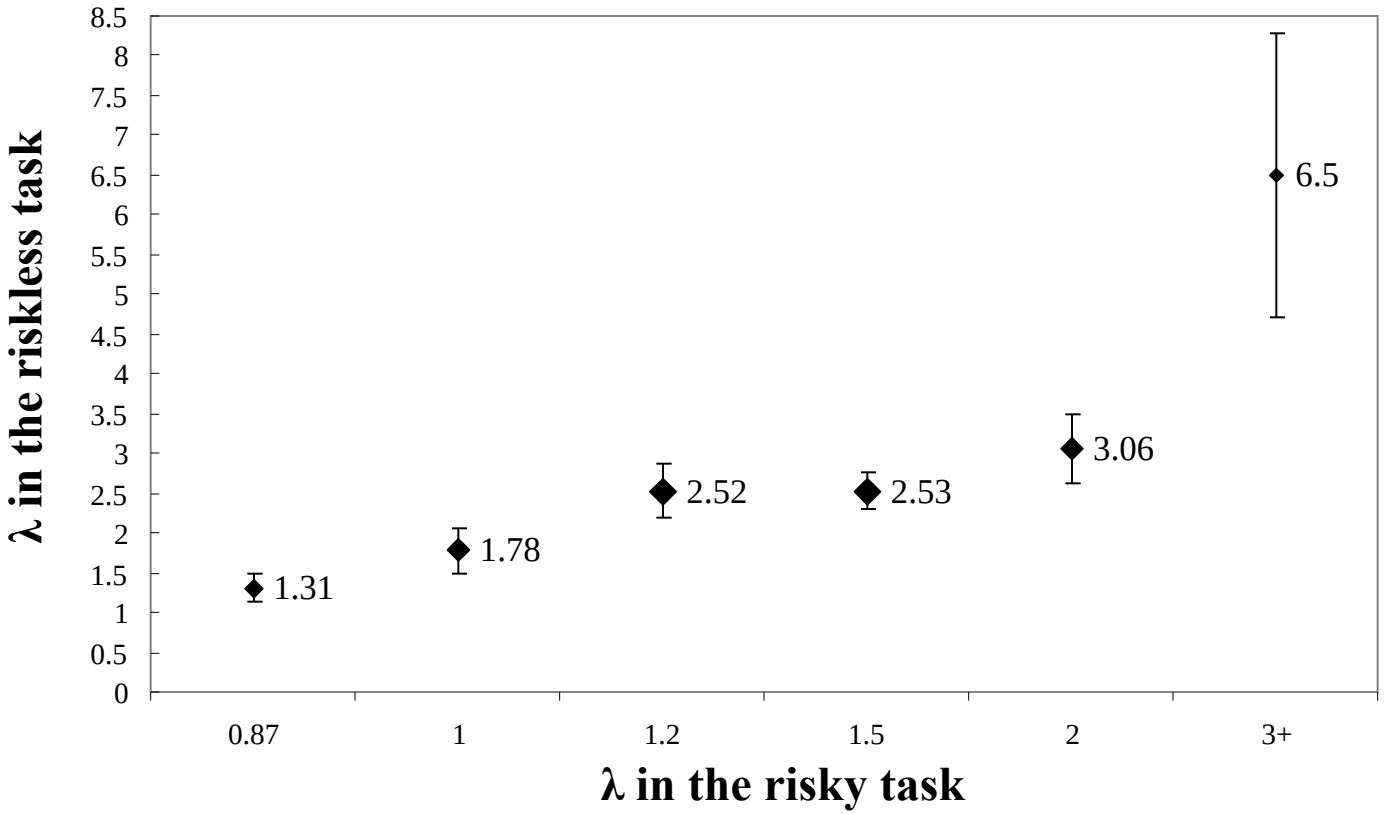
Risky and riskless loss aversion

- **Combining measures of loss aversion** Gächter et al. 2006, 2007
  - No difference in elicited values due to the strategy method
- **Between: WTA = €6.03, WTP = €2.68 Within: WTA = €5.83, WTP = €2.96**
  - Distribution of individual loss aversion (riskless)



Risky and riskless loss aversion

- **Combining measures of loss aversion** Gächter et al. 2007
  - The measures of loss aversion are significantly positively correlated



Risky and riskless loss aversion

- **Combining measures of loss aversion** Gächter et al. 2007
  - Risky λ is also correlated with other hypothetical λ's elicited using different goods.
  - But … the correlation between the hypothetical λ's is not significant
    - Subjects hypothetical loss aversion was correlated to how 'important' the subject considered the good

	Fuel	**Comfort**	**Safety**	**Information**
λ Fuel Consumption	**1**			
λ Comfort	**0.05**	**1**		
λ Safety	**–0.07**	**0.03**	**1**	
λ Information Systems	**0.00**	**–0.05**	**–0.08**	**1**
λ Risky	0.34	**0.14**	0.35	**0.11**

Myopic loss aversion

- **Myopic loss aversion**
  - Would you accept this gamble?
    - \$20 with $p = 0.50$, –\$10 with $p = 0.50$
  - How about this one?
    - \$40 with $p = 0.25$, \$10 with $p = 0.50$, –\$20 with $p = 0.25$
  - And this one?
    - \$80 with $p = 0.0625$, \$50 with $p = 0.25$, \$20 with $p = 0.375$, –\$10 with $p = 0.25$, –\$40 with $p = 0.0625$
  - Loss aversion + short evaluation period
    - Explanation for the equity premium puzzle? Benartzi and Thaler 1995

Myopic loss aversion

- **Myopic loss aversion** Gneezy and Potters 1997
  - 84 students
  - 2 treatments (between-subjects):
    - High frequency of feedback
    - Low frequency of feedback
  - Subjects bet $0 \leq x \leq 200$ cents on a lottery
    - Probability 1/3 win 2.5x
    - Probability 2/3 lose x
    - Earnings equal 200 cents + lottery earnings
    - 12 rounds
    - High frequency of feedback
      - Draw one round at a time
    - Low frequency of feedback
      - Draw three rounds at once

Myopic loss aversion

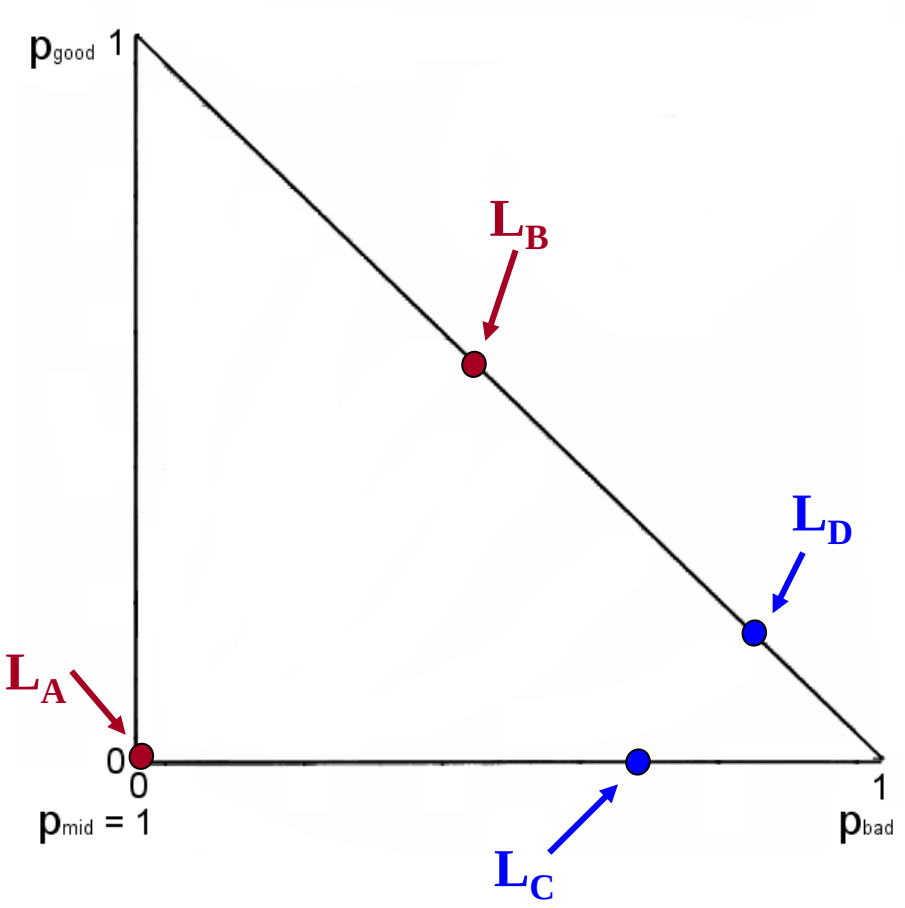
- **Myopic loss aversion** Gneezy and Potters 1997

Investment in lottery	High	Low
Rounds 1-3	**52.0**	**66.7**
Rounds 4-6	**44.8**	**63.7**
Rounds 7-9	**54.7**	**71.9**
Rounds 1-9	50.5	67.4
Rounds 10-12	**39%**	**48.9%**

- **Myopic loss aversion in the market** Gneezy et al. 2003
  - Trade asset that pays 200 cents with $p = 1/3$ and 0 with $p = 2/3$
  - Average price:
    - High frequency of feedback: 49.3 cents
    - Low frequency of feedback: 58.4 cents
  - Low evaluation periods → more risk taking

Probability Weighting

The Marshak-Machina probability triangle



- **The common ratio effect**
  - Three outcomes
    - Bad = \$0
    - Middle = \$300
    - Good = \$400
  - Choice 1
    - L_A: \$300 for sure
    - L_B: p = 0.20 of \$0, p = 0.80 of \$400
  - Choice 2
    - L_C: p = 0.75 of \$0, p = 0.25 of \$300
    - L_D: p = 0.80 of \$0, p = 0.20 of \$400

Probability Weighting

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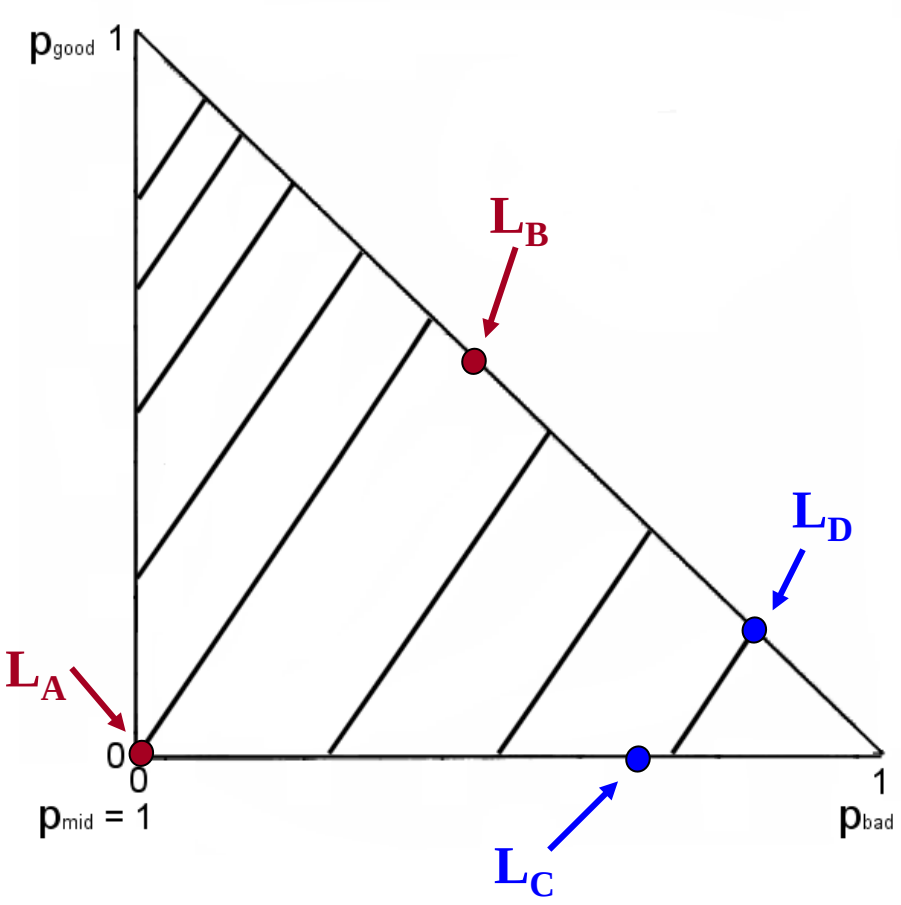

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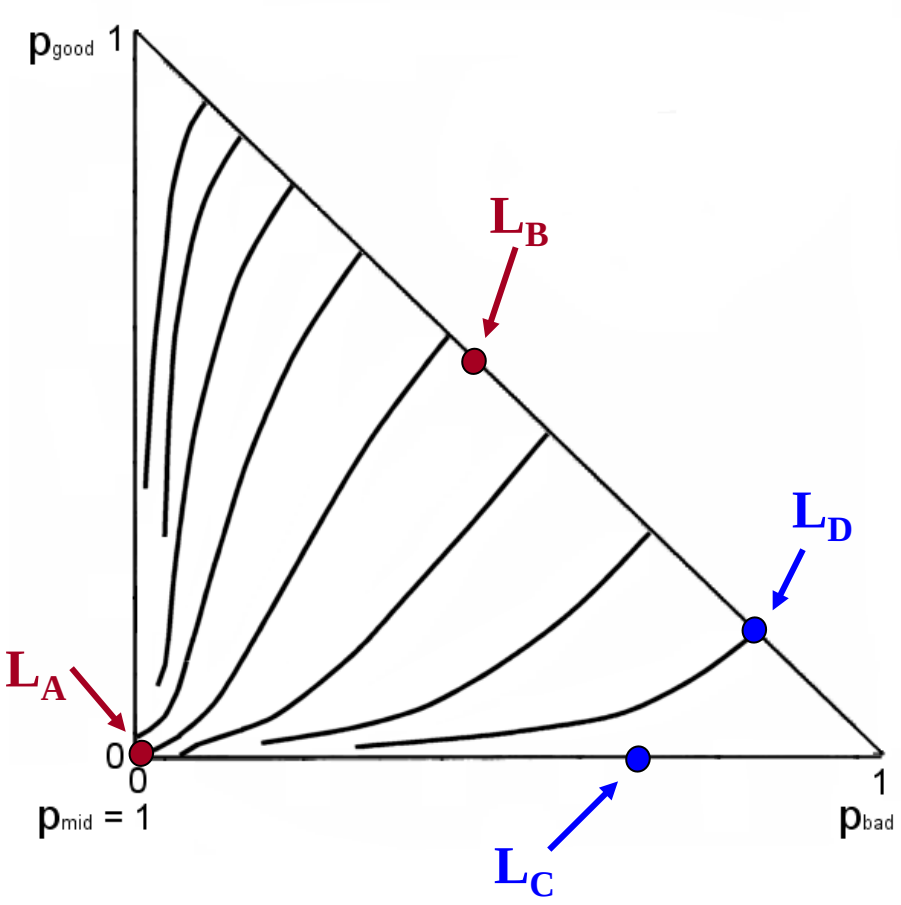

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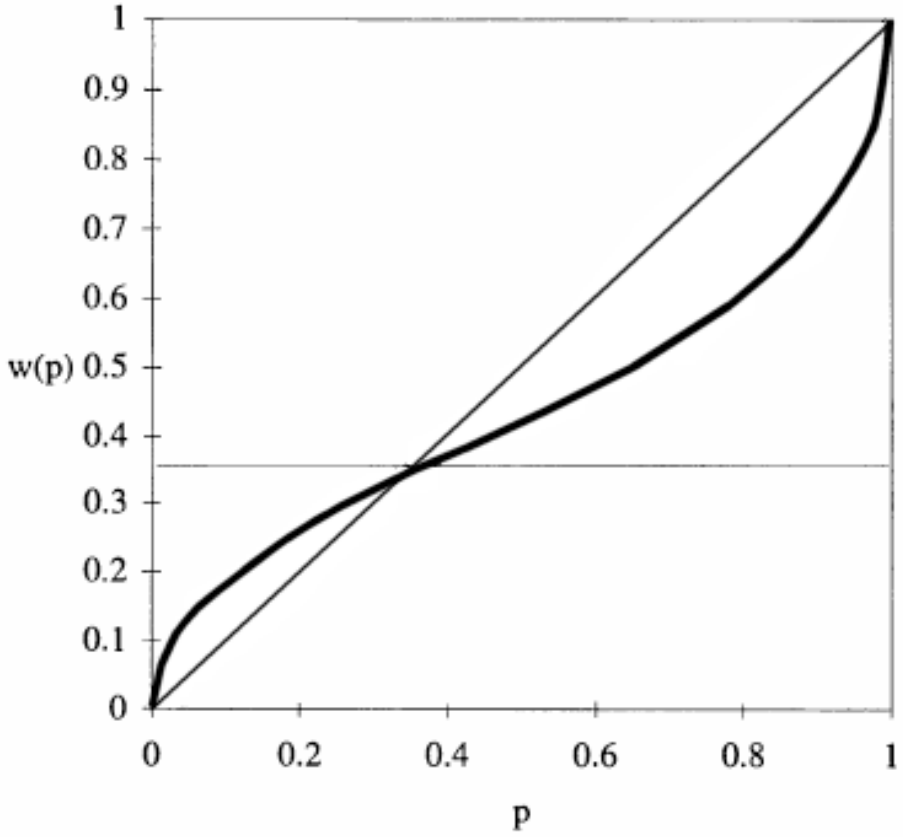
Explained by probability weighting

Probability Weighting

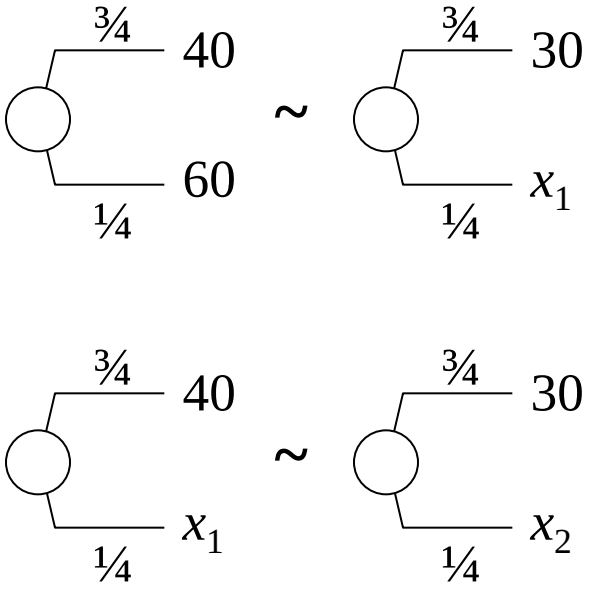
S-shaped probability weighting function

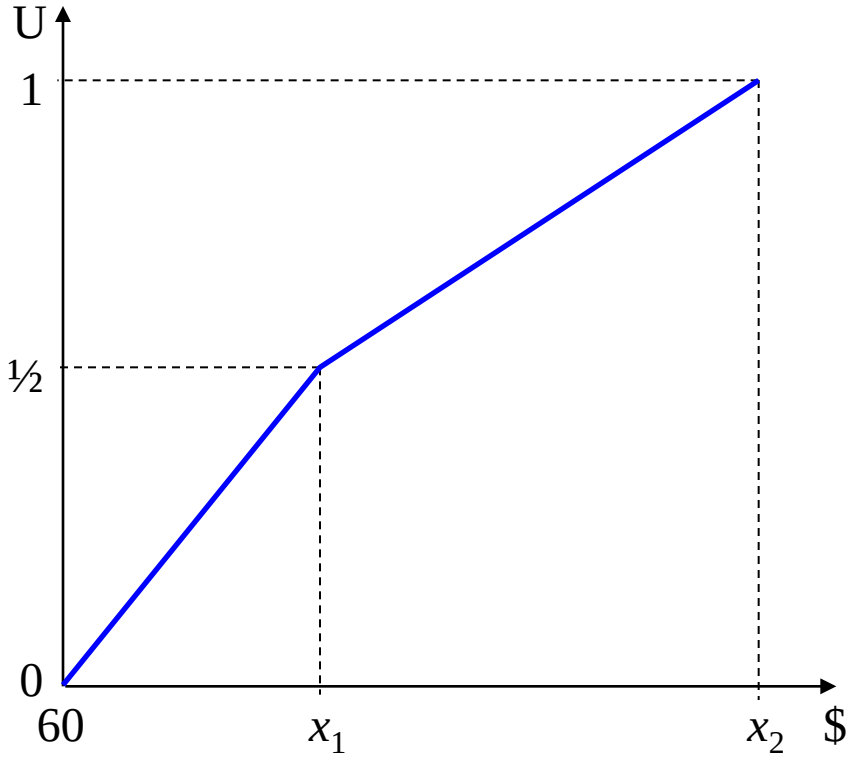


- **Eliciting Probability Weighting Functions**
- **Usually done with parametric estimations**
  - Assumes a functional form
  - Joint estimation of utility function and probability weights
- **An inverted S-shape is usually found**
  - Underestimation of high probabilities (insure TV)
  - Overestimation of low probabilities (buy lotto)

Probability Weighting

- **Eliciting Probability Weighting Functions** van de Kuilen et al. 2006
  - Step 1: Elicit utility function





Note that

$U(x_2) - U(x_1) = U(60) - U(x_1)$

Probability Weighting

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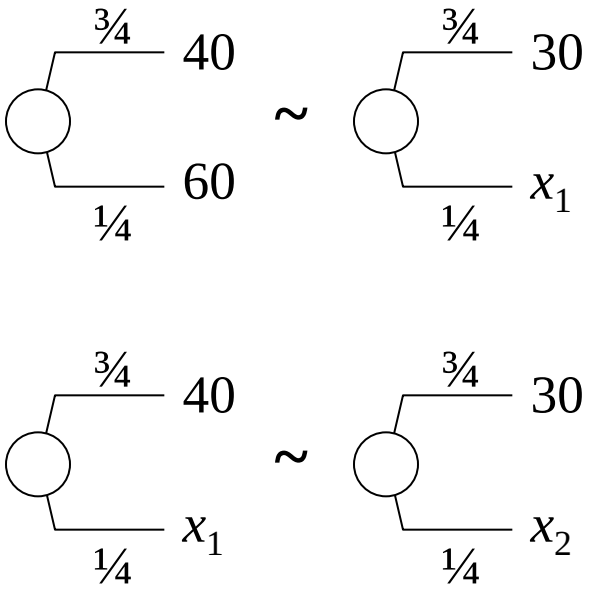

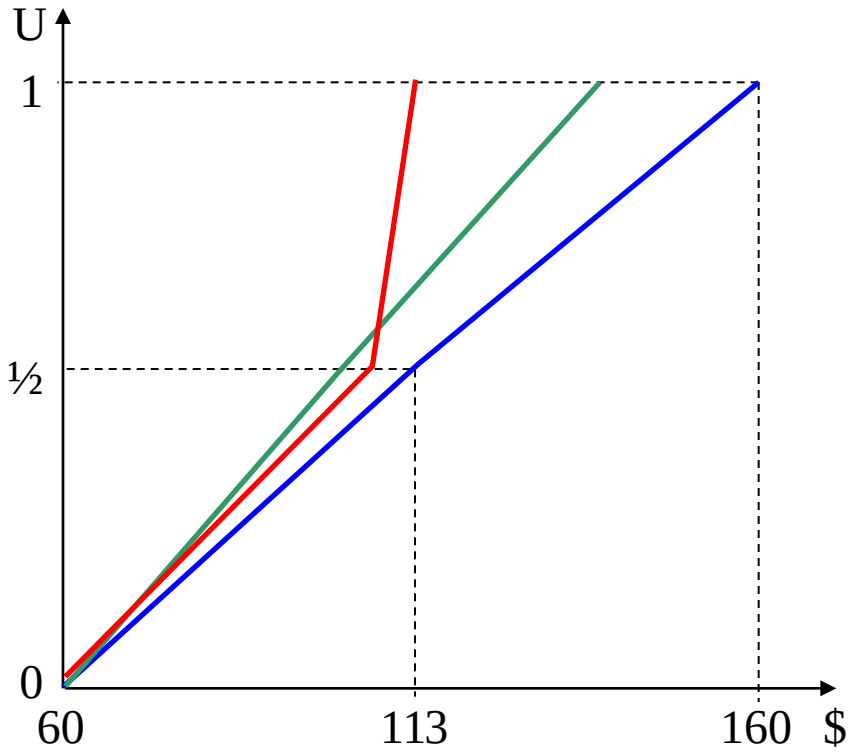

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Probability Weighting

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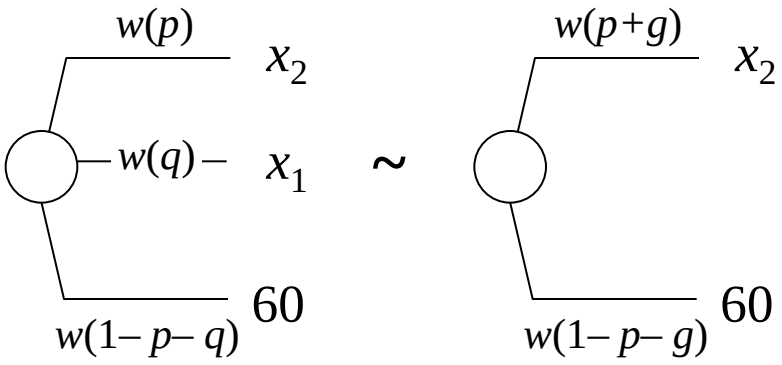
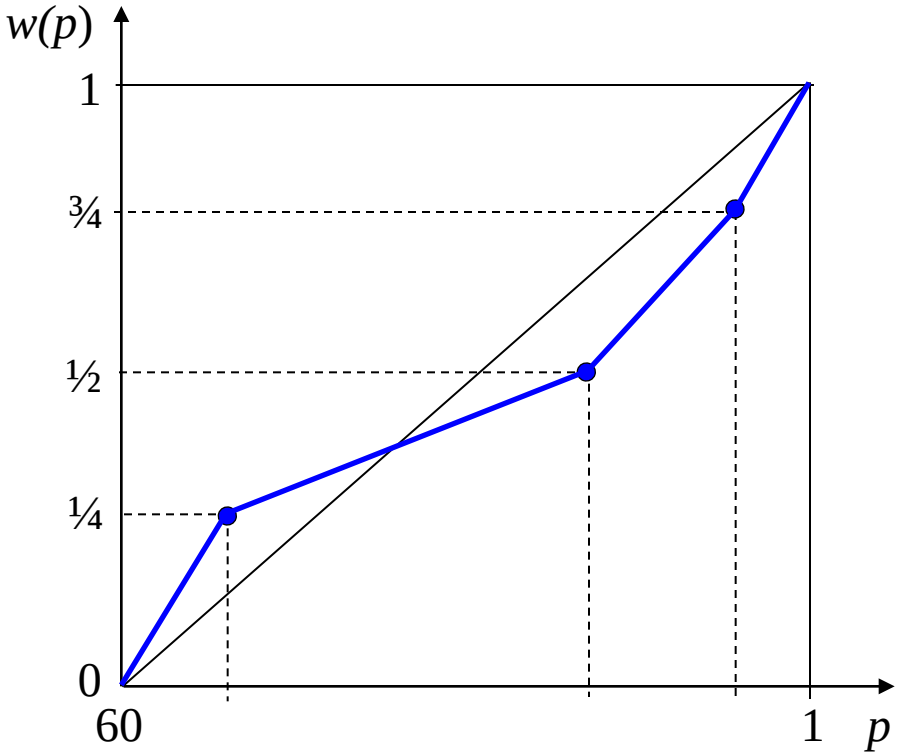
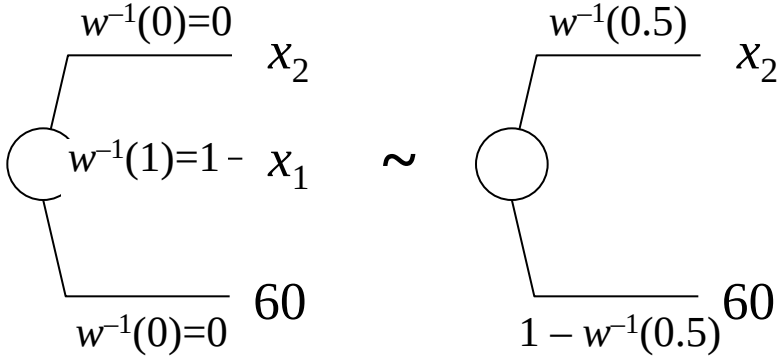
  - Step 2: Elicit probability weighting function





E.g., to find $w^{-1}(0.5)$: $p = 0$ and $q = 1$



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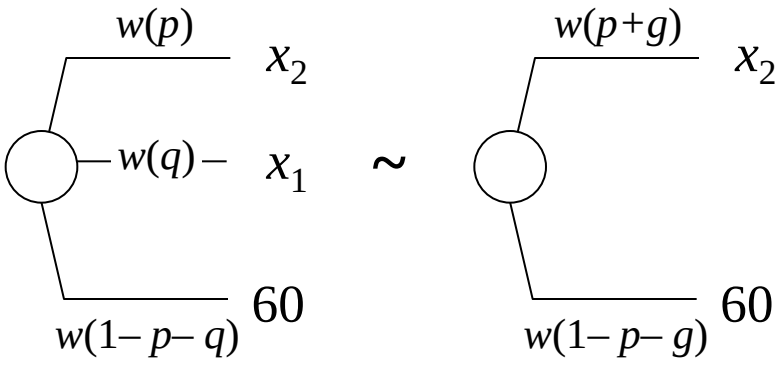

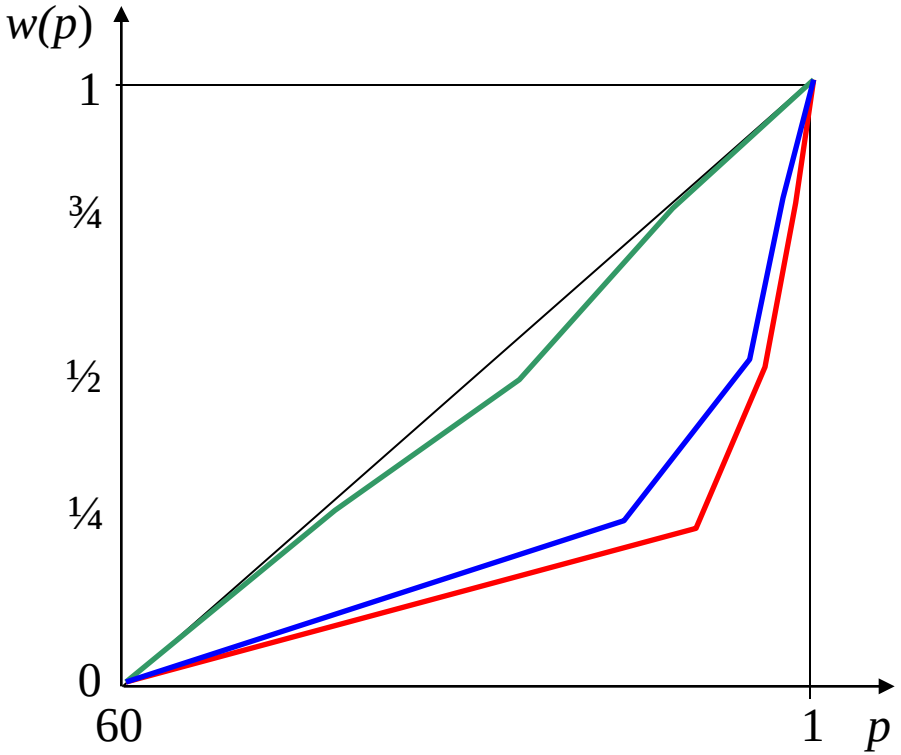

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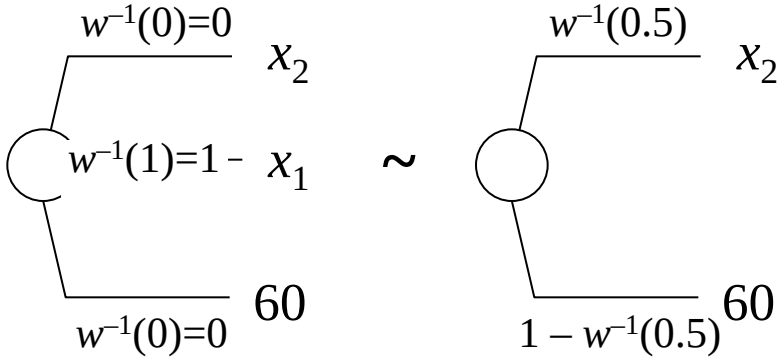
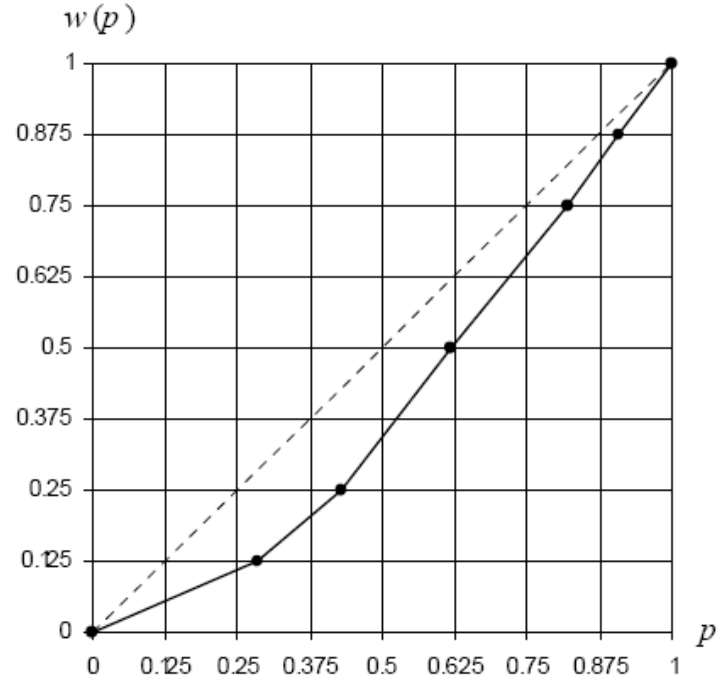


Probability Weighting



$w^{-1}(p)$	Mean	Median	St Dev
0.125	0.33	0.285	0.228
0.250	0.441	0.430	0.223
0.500	0.608	0.620	0.193
0.750	0.793	0.820	0.150
0.875	0.872	0.910	0.132

- **Results** van de Kuilen et al. 2006
  - Mostly convex functions
  - Usual parametric tests do not perform that well