# Context Dependent Preferences

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# Context Dependent Preferences

- So far, we have assumed that utility comes from the *final outcome* they receive
- People make choices based on these utilities
- However, there is evidence that choices may be affected by *context* in a way that is incommensurate with this model
- Broadly speaking we will consider two (possibly related) classes of phenomena
  - Reference point effects (today)
  - Choice set effects (later)

- Reference dependent preferences
    - Keep set of available options the same
    - Change the 'reference point'
    - $\Rightarrow$ Change choices
- Clearly a violation of 'standard model' of utility maximization
- Has lead to a huge body of empirical and theoretical literature
- Which we will do a brief tour of in this lecture

# Caveat 1

- Reference dependence is (most likely) an umbrella term
  - Covers many different phenomena
  - With many different causes (?)
- For example
  - Transaction costs
  - Loss aversion
  - Perceptual coding

  can all lead to reference dependence in choice
- It is likely that all three have a role to play
- Can make it hard to interpret both theory and models
  - Should two different example or reference dependence be treated as examples of the same phenomenon?
  - Should one model be able to explain all the empirical examples of reference dependence?

# Caveat 2

- You may, at this stage, be thinking 'what is a reference point'?
- Good question!
- There are many possibilities
  - What you currently have
  - What you get if you do nothing
  - What you expect
- Different notions of reference point may be more applicable to different models of reference dependence
- To begin with, we will assume that we know what the reference point is
- Come back to this issue later in the lecture

- Examples of reference dependence
  - Endowment effect
  - Status quo bias
  - Reference dependence in risky choice
- Models of reference dependent preferences
  - Loss aversion and prospect theory
  - A model of status quo bias
  - Models without ‘status quo conditional consistency’
- Where do reference points come from?
  - A model of personal equilibrium
- Applications

# Three Examples of Reference Dependent Preferences

1. The Endowment Effect
2. Status Quo Bias
3. Reference Points in Risky Choice

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# Endowment Effect

Kahneman, Knetch and Thaler [1990]

- 44 subjects
- 22 subjects given mugs
- The other 22 subjects given nothing
- Subjects who owned mugs asked to announce the price at which they would be prepared to sell mug
- Subjects who did not own mug announced price at which they are prepared to buy mug
- Experimenter figured out 'market price' at which supply of mugs equals demand
- Trade occurred at that market price using Becker-DeGroot-Marschak procedure

- Prediction: As mugs are distributed randomly, we should expect half the mugs (11) to get traded
  - Consider the group of 'mug lovers' (i.e. those that have valuation above the median), of which there are 22
  - Half of these should have mugs, and half should not
  - The 11 mug haters that have mugs should trade with the 11 mug lovers that do not
- In 4 sessions, the number of trades was 4,1,2 and 2
- Median seller valued mug at $5.25
- Median buyer valued mug at $2.75
- Willingness to pay/willingness to accept gap
- Subject's preferences seem to be affected by whether or not their reference point was owning the mug

- Buying and selling a lottery

  *This lottery is yours to keep (if this is one of the questions that is selected at the end of the experiment). However, you will be offered the opportunity to exchange this lottery for certain amounts of money (for example $5)*

  *...you will be offered the opportunity to buy a lottery ticket. That is, you will be offered the opportunity to use some of this additional $10 in order to buy a lottery ticket. If you choose to do so (and that question is selected as one that will be rewarded), then you will pay the specified cost for the lottery, and you would keep the remaining amount of money and the lottery.*

- Willingness to pay/Willingness to accept gap for a 50% $10, 50% $0 lottery
    - Willingness to Pay: $3.76
    - Willingness to Accept: $4.59
- Endowment effect widely observed
    - But see Plott and Zeller [2005]

# Three Examples of Reference Dependent Preferences

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2. Status Quo Bias
3. Reference Points in Risky Choice

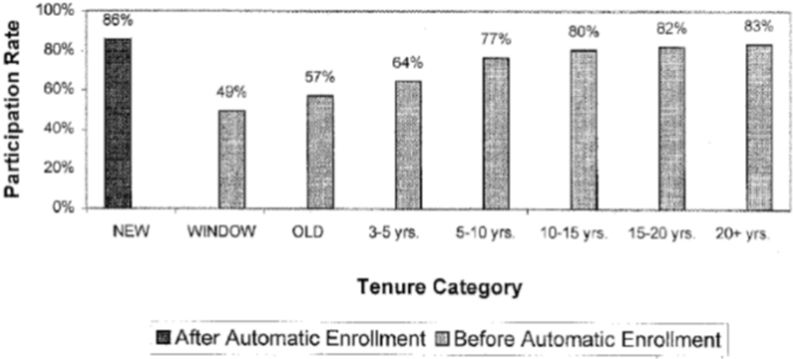
# Status Quo Bias

Madrian and Shea [2001]

- Observe behavior of workers in a firm that offer 401k plans
- Workers enrolled under two types of plan
  - Opt in: if no action is taken when joining firm , then do not take part in the plan
  - Opt out: if no action is taken when joining firm, then are automatically enrolled in scheme
- Compare uptake in different plans

# Status Quo Bias

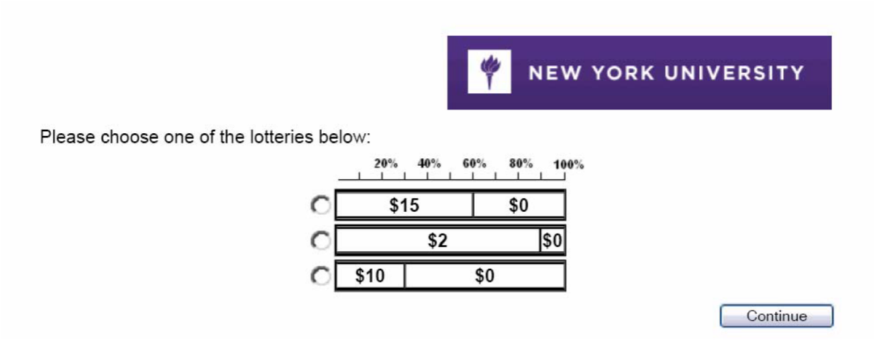
Madrian and Shea [2001]



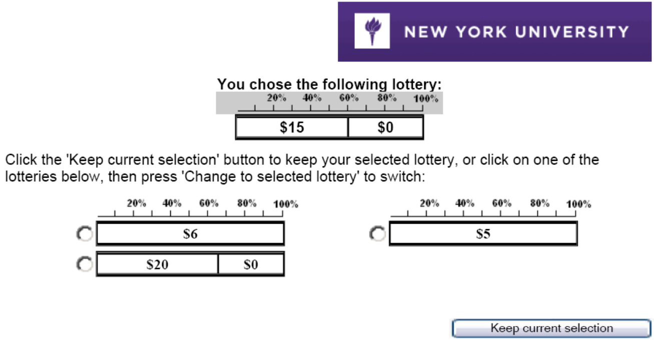
- Those in the opt in plan significantly more likely to take up 401k
- More likely than some under the old regime with a tenure of 20+ years
- Also, those who were no automatically enrolled but chose to take up the plan more likely to select the 'default' option

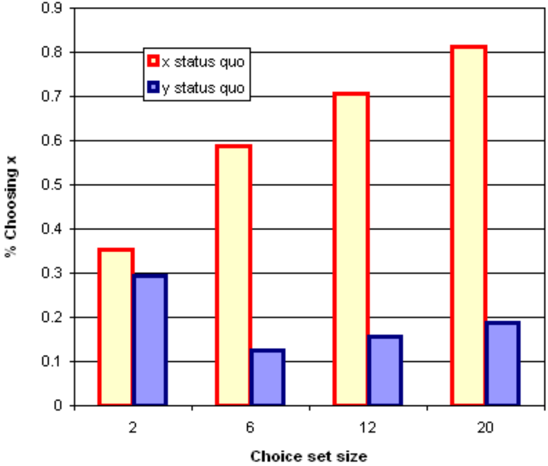
- Experimental Design: Setting the Status Quo
- Subjects make decisions in two stages
  - First stage: choose between ‘target’ lottery and two ‘dummy’ lotteries
  - Second stage: can either
    - Keep lotteries selected in first stage
    - Switch to one of the alternatives presented

# Stage 1 Choice



# Stage 2 Choice





x status quo
y status quo
% Choosing x
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
2
6
12
20
Choice set size

## Three Examples of Reference Dependent Preferences

1. The Endowment Effect
2. Status Quo Bias
3. Reference Points in Risky Choice

# The Rare Disease Problem

- The US is expecting an outbreak of a rare disease that is expected to kill 600 people.
- Two alternative programs are considered
  - Program A: 200 people will be saved
  - Program B: 1/3 chance that 600 people will be saved, 2/3 chance that no-one will be saved
- Or: Two alternative programs are considered
  - Program C: 400 people will die
  - Program D: 1/3 chance that nobody will die, 2/3 chance that 600 people will die

# The Rare Disease Problem

- The US is expecting an outbreak of a rare disease that is expected to kill 600 people.
- Two alternative programs are considered
  - Program A: 200 people will be saved - **72%**
  - Program B: 1/3 chance that 600 people will be saved, 2/3 chance that no-one will be saved - **28%**
- Or: Two alternative programs are considered
  - Program C: 400 people will die – **22%**
  - Program D: 1/3 chance that nobody will die, 2/3 chance that 600 people will die - **78%**

# Reference Points in Risky Choice

- People tend to be very risk averse for lotteries that contain both gains and losses

  *Imagine that you have the opportunity to play a gamble that offers a 50% chance to win $2000 and a 50% chance to lose $500. Would you play the gamble?*

- Redelmeier and Tversky (1992)
  - Only 45% of subjects played the gamble
- Loss of $500 viewed as more important than gain of $2000
- Is this a sign of 'reference dependence'?
  - Not necessarily
  - Could be risk aversion/probability weighting
  - Though would have to be very large
  - Gain of $2000 does not offset loss of $500

# Reference Points in Risky Choice

- A better experiment: Manipulate the reference point
- Two groups:
- Group 1: Given 3500 'Agoras': Choose between
  - An additional 500 Agoras with certainty
  - 50% chance of additional 1500 Agoras and 50% chance of losing 500 Agoras
- Group 2: Given nothing up front: Choose between
  - 4000 Agoras with certainty
  - 50% chance of 5000 Agoras and 50% chance of 3000 Agoras
- Notice that these give the same probabilities over final outcomes
  - Group 1 chose risky option 38% of the time
  - Group 2 chose risky option 54% of the time

# Modelling Reference Dependence

- Likely that there are many different causes of reference dependence
  - As we discussed in the introduction
- Broadly speaking two classes of models

1. Preference-based reference dependence
   - Reference points affect preferences which affect choices
2. 'Rational' reference dependence
   - Reference dependence as a rational response to costs
     - Effort costs
     - Attention Costs

- This week we will talk about 1, next week about 2.

# Loss Aversion

- In 1979 Kahneman and Tversky introduced the idea of 'Loss Aversion'
- Basic idea: Losses loom larger than gains
    - The magnitude of the utility loss associated with losing $x$ is greater than the utility gain associated with gaining $x$
- Initially applied to risky choice
- Later also applied to riskless choice [Tversky and Kahneman 1991]
- Can explain
    - Endowment effect
    - Increased risk aversion for lotteries involving gains and losses
    - Status quo bias

# A Simple Loss Aversion Model

- World consists of different dimensions
  - e.g cash and mugs
- Will be asked to choose between alternatives that provide different amount of each dimension

$$\begin{pmatrix} x_c \\ x_m \end{pmatrix}$$

- Has a reference point for each dimension

$$\begin{pmatrix} r_c \\ r_m \end{pmatrix}$$

- **Key Point: Utility depends on changes, not on levels**

# A Simple Loss Aversion Model

- Utility of an alternative comes from comparison of output to reference point along each dimension

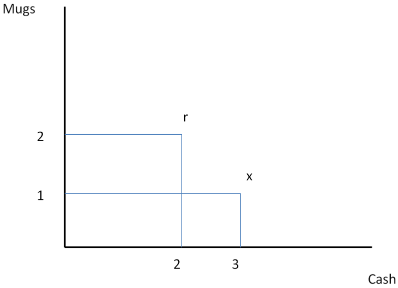
$$\begin{pmatrix} x_c \\ x_m \end{pmatrix}, \begin{pmatrix} r_c \\ r_m \end{pmatrix}$$

- Utility for gains relative to $r$ given by a utility function $u$

$$\begin{aligned} u_c(x_c - r_c) \text{ if } x_c &> r_c \\ u_m(x_m - r_m) \text{ if } x_m &> r_m \end{aligned}$$

- Utility of losses relative to $r$ given buy $u$ of the equivalent gain multiplied by $-\lambda$ with $\lambda > 1$

$$\begin{aligned} -\lambda u_c(r_c - x_c) \text{ if } x_c &< r_c \\ -\lambda u_m(r_m - x_m) \text{ if } x_m &< r_m \end{aligned}$$




- $x$ is a gain of \$1 and loss of 1 mug relative to $r$
- Utility of $x$

$$u_c(1) - \lambda u_m(1)$$

# Loss Aversion and the Endowment Effect

- How can loss aversion explain the Endowment Effect (i.e. WTP/WTA gap)
- Willingness to pay:
  - Let $(r_c, r_m)$ be the reference point with no mug
  - How much would they be willing to pay for the mug?
  - i.e. what is the $z$ such that

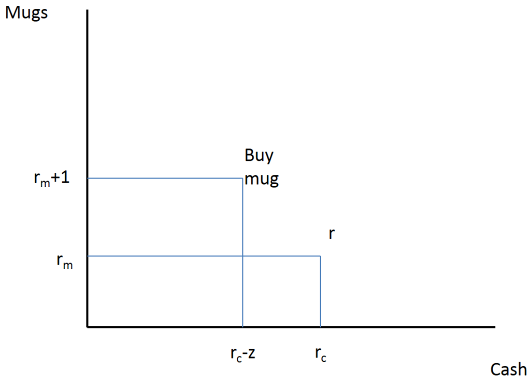
$$0 = U\left( \begin{array}{c} r_c \\ r_m \end{array}, \begin{array}{c} r_c \\ r_m \end{array} \right) = U\left( \begin{array}{c} r_c - z \\ r_m + 1 \end{array}, \begin{array}{c} r_c \\ r_m \end{array} \right)$$

- Assume linear utility for money
- Utility of buying a mug given by

$$U\left( \begin{array}{c} r_c - z \\ r_m + 1 \end{array}, \begin{array}{c} r_c \\ r_m \end{array} \right) = u_m(1) - \lambda z$$

- Break even buying price given by $z = \frac{u_m(1)}{\lambda}$

# A Simple Loss Aversion Model




- Buying is a loss of \$z and gain of 1 mug relative to $r$
- Utility of buying

$$u_m(1) - \lambda z$$

- Willingness to accept:
  - Let $(r_c, r_m)$ be the reference point with mug
  - How much would they be willing to sell your mug for?
  - i.e. what is the $y$ such that

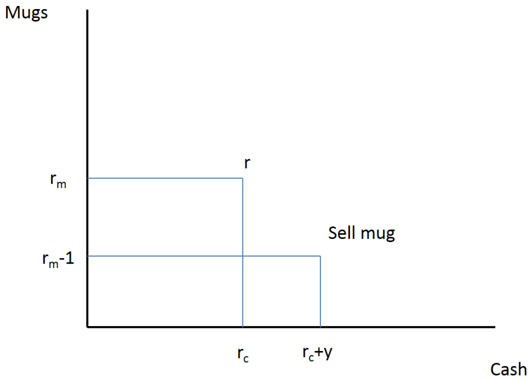
$$0 = U\left(\begin{array}{c} r_c \\ r_m \end{array}, \begin{array}{c} r_c \\ r_m \end{array}\right) = U\left(\begin{array}{c} r_c + y \\ r_m - 1 \end{array}, \begin{array}{c} r_c \\ r_m \end{array}\right)$$

- Assume linear utility for money
- Utility of selling a mug given by

$$U\left(\begin{array}{c} r_c + y \\ r_m - 1 \end{array}, \begin{array}{c} r_c \\ r_m \end{array}\right) = -\lambda u_m(1) + y$$

- Break even selling price given by $y = \lambda u_m(1)$

# A Simple Loss Aversion Model




- Selling is a gain of \$y and loss of 1 mug relative to $r$
- Utility of selling

$$-\lambda u_m(1) + y$$

- Willingness to pay

$$z = \frac{u_m(1)}{\lambda}$$

- Willingness to accept

$$y = \lambda u_m(1)$$

- WTP/WTA ratio

$$\frac{z}{y} = \frac{1}{\lambda^2}$$

- Less that 1 for $\lambda > 1$

- Tversky and Kahneman [1991] provide an axiomatization of a (closely related) model

Axiom 1: Cancellation if, for some reference point

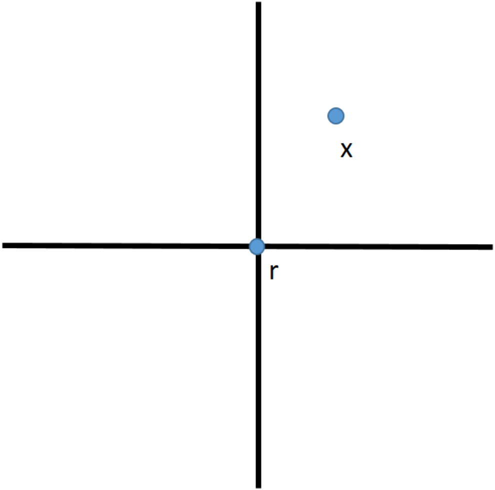
$$\begin{pmatrix} x_1 \\ z_2 \end{pmatrix} \succeq \begin{pmatrix} z_1 \\ y_2 \end{pmatrix} \text{ and } \begin{pmatrix} z_1 \\ x_2 \end{pmatrix} \succeq \begin{pmatrix} y_1 \\ z_2 \end{pmatrix}$$

then

$$\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} \succeq \begin{pmatrix} y_1 \\ y_2 \end{pmatrix}$$

- (guarantees additivity)

- Define the 'quadrant' that $x$ is in relative to $r$



**Axiom 2: Sign Dependence** Let options $x$ and $y$ and reference points $s$ and $r$ be such that

1. $x$ and $y$ are in the same quadrant with respect to $r$ and with respect to $s$
2. $s$ and $r$ are in the same quadrant with respect to $x$ and with respect to $y$

Then $x \succeq y$ when $r$ is the status quo $\iff$ $x \succeq y$ when $s$ is the status quo

- Guarantees that only the 'sign' matters

Axiom 3: Preference Interlocking Say that, for some reference point $r$, we saw that

$$\begin{pmatrix} x_1 \\ x_2 \end{pmatrix} \sim \begin{pmatrix} w_1 \\ w_2 \end{pmatrix} \text{ and } \begin{pmatrix} z_1 \\ z_2 \end{pmatrix} \sim \begin{pmatrix} y_1 \\ y_2 \end{pmatrix}$$

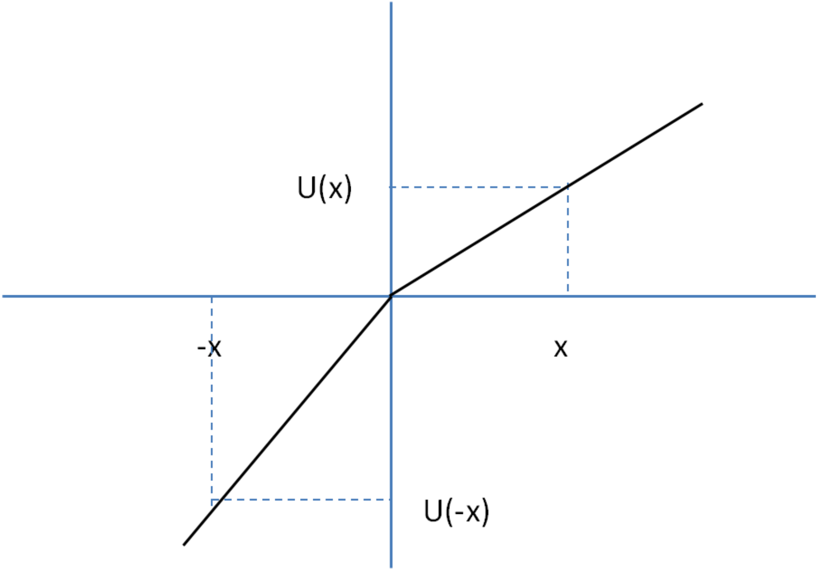
And, for another reference point $s$ (that puts everything in the same quadrant, but maybe a different quadrant to $r$)

$$\begin{pmatrix} x_1 \\ \bar{x}_2 \end{pmatrix} \sim \begin{pmatrix} w_1 \\ \bar{w}_2 \end{pmatrix} \Rightarrow$$
$$\begin{pmatrix} z_1 \\ \bar{x}_2 \end{pmatrix} \sim \begin{pmatrix} y_1 \\ \bar{w}_2 \end{pmatrix}$$

- Ensures that the same trade offs that work in the gain domain also work in the loss domain

# Loss Aversion in Risky Choice

- Loss aversion can also lead to increased risk aversion for lotteries that involve gains and losses
- Now there is only 1 dimension (money)
- Lotteries evaluated as gains/losses relative to some reference point
- See also Kosegi and Rabin [2007]
- Again, assume linear utility for money
    - Utility of winning $x$ is $x$
    - Utility of losing $x$ is -$\lambda x$


U(x)
-x
x
U(-x)

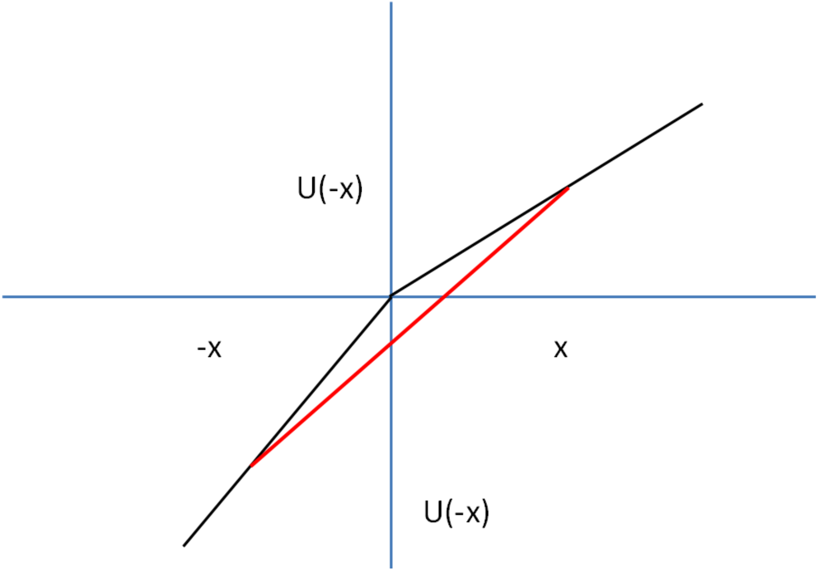
# Loss Aversion in Risky Choice

- What is the certainty equivalence of
  - 50% chance of gaining \$10
  - 50% chance of gaining \$0
- $x$ such that

$$\begin{aligned} u_c(x) &= 0.5 \times u_c(10) + 0.5 \times u_c(10) \\ x &= 0.5 \times 10 + 0.5 \times 0 \\ &= \$5 \end{aligned}$$

- What is the certainty equivalence of
  - 50% chance of gaining \$5
  - 50% chance of losing \$5
- $y$ such that

$$\begin{aligned} -\lambda u_c(-y) &= 0.5 \times u_c(5) + 0.5 \times (-\lambda)) \, u_c(5) \\ -\lambda y &= 0.5 \times 5 - \lambda 0.5 \times 5 \\ y &= \frac{(1-\lambda)}{\lambda} < 0 \end{aligned}$$


U(-x)
-x
x
U(-x)

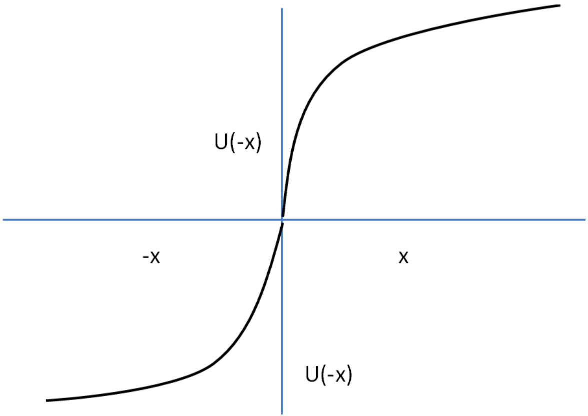
# A Unified Theory of Loss Aversion?

- We have claimed that loss aversion can explain
  - Increased Risk aversion for 'mixed' lotteries
  - Endowment Effect
- Is the same phenomena responsible for both behaviors?
- If so we would expect to find them correlated in the population
- Dean and Ortoleva [2014] estimate
  - $\lambda$
  - WTP/WTA gap

  In the same group of subjects
- Find a correlation of 0.63 (significant p=0.001)
- See also Gachter et al [2007]

## Prospect Theory

- Prospect Theory: Kahneman and Tversky [1979]
- 'Workhorse Model' of choice under risk
- Combines
  - Loss Aversion
  - Cumulative Probability Weighting
  - Diminishing Sensitivity




- Diminishing sensitivity:
  - Differences harder to distinguish as you move away from reference point (similar to perceptual psychology)
  - Leads to risk aversion for gains, risk loving for losses

# Loss Aversion in Risky Choice

- Let $p$ be a lottery with (relative) prizes

$$x_1 > x_2..x_k > 0 > x_{k+1} > .. > x_n$$

- $p_i$ probability of winning prize $x_i$
- Utility of lottery $p$ given by

$$\begin{aligned}
&\pi(p_1)u(x_1) \\
&+ (\pi(p_2) - \pi(p_1))\, u(x_1) \\
&+... \\
&+ (\pi(p_1 + .. + p_k) - \pi(p_1 + .. + p_{k-1}))\, u(x_k) \\
&- (\pi(p_1 + .. + p_{k+1}) - \pi(p_1 + .. + p_k))\, \lambda u(-x_{k+1}) \\
&-... \\
&- (\pi(p_1 + .. + p_n) - \pi(p_1 + .. + p_{n-1}))\, \lambda u(-x_n)
\end{aligned}$$

## A Model of Status Quo Bias

- Kahneman and Tversky start with a model of behavior, and then derive axioms
- Arguably, model is compelling, axioms not so much
- An alternative approach is taken by Masatlioglou and Ok [2005]
- Start with some axioms, and see what model obtains

# Primitives

- $X$: finite set of alternatives
- $\diamond$: Placeholder for no status quo
- $\mathcal{D}$ : set of decision problems $\{A, x\}$ where $A \subset X$ and $x \in A \cup \diamond$
- $C : \mathcal{D} \rightrightarrows X$ : choice correspondence

Axiom 1: Status Quo Conditional Consistency For any $x \in X \cup \diamond$, $C(A, x)$ obeys WARP

Axiom 2: Dominance If $y = C(A, x)$ for some $A \subset B$ and $y \in C(B, \diamond)$ then $y \in C(B, x)$

Axiom 3: Status Quo Irrelevance If $y \in C(A, x)$ and for every $\{x\} \neq T \subset A, x \notin C(T, x)$ then $y \in C(A, \diamond)$

Axiom 4: Status Quo Bias If $x \neq y \in C(A, x)$, then $y = C(A, y)$

- These axioms are necessary and sufficient for two representations
- Model 1: There exists
  - Preference relation $\succeq$ on $X$
  - A completion $\trianglerighteq$
    such that

$$\begin{aligned} C(A, \diamond) &= \{x \in A | x \trianglerighteq y \ \forall \ y \in A\} \\ C(A, x) &= x \text{ if } \nexists \ y \in A \text{ s.t } y \succ x \\ &= \{y \in A | y \trianglerighteq z \ \forall \ z \succ x\} \text{ otherwise} \end{aligned}$$

- Interpretation:
  - $\succeq$ represents 'easy' comparisons
  - If there is nothing 'obviously' better than the status quo, choose the status quo
  - Otherwise think more carefully about all the alternatives which are obviously better than the status quo

- An equivalent representation (as you should know from your homework!)
- Model 2: there exists
  - $u : X \to \mathbb{R}^N$
  - A strictly increasing function $f : u(X) \to \mathbb{R}$

  such that

$$
\begin{aligned}
C(A, \diamond) &= \arg\max_{x \in A} f(u(x)) \\
C(A, x) &= x \text{ if } U_u(A, x) \text{ is empty} \\
&= \arg\max_{x \in U_u(A,x)} f(u(x)) \text{ otherwise}
\end{aligned}
$$

Where $U_u(A, x) = \{y \in A | u(y) > u(x)\}$

- Existing models of SQB are preference-based
- A status quo generates a set of preferences:

$$\succeq_s \text{ for all } s \in X \cup \Diamond$$

- Decision Maker chooses to maximize these preference

$$C(A, s) = \{z \in A | z \succeq_s y \text{ for all } y \in A\}$$

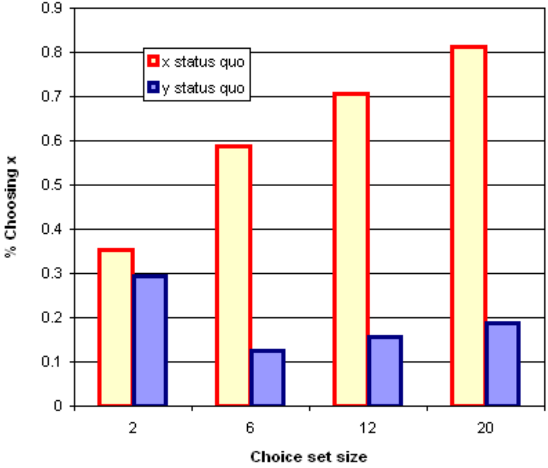
## Behavioral Implications of Preference-Based Models

- For a *fixed* status quo, DM maximizes a *fixed* set of preferences
- Looks like a 'standard' decision maker
- **Status Quo Conditional Consistency (SQCC):**
- *For any* $(A, s)$, $(B, s)$
    - *Independence of Irrelevant Alternatives: If* $x \in A \subset B$ *and* $x \in C(B, s)$ *then* $x \in C(A, s)$

# The Problem with Preference-Based Models

- People switch to choosing the status quo in larger choice sets
- Violates Independence of Irrelevant Alternatives for a fixed status quo
  - Status quo chosen in bigger choice set
  - Still available in smaller choice set
  - Yet not chosen in smaller choice set
- Example 1: Iyengar and Lepper

# Example 2



0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
x status quo
y status quo
% Choosing x
2
6
12
20
Choice set size

# What to Do?

- Two classes of solution

1. Models of decision avoidance (this week)
2. Models of attention (homework)

# Decision Avoidance

- 'Easy' choice:
  - Make an active decision to select an alternative
  - May move away from the status quo
- 'Difficult' choice
  - May avoid thinking about the decision
  - End up with the status quo
- May cause switching to the SQ in larger choice sets
  - If this leads to more difficult choices

# Models of Decision Avoidance

- What makes choice difficult?
- Conflict model
  - Difficulty in comparing two alternatives
- Information overload model
  - Ability to compare objects reduces with the size of the choice set

# Decision Conflict

- Choose status quo to avoid selecting between two options that are difficult to compare
- Example:
  - Choose between buying one of two mattresses
  - One mattress is nice, but expensive
  - Other is less nice but cheap
  - May end up not buying either mattress
- See Tverskey and Shafir [1992]

# The Conflict Model

- DM endowed with a possibly incomplete preference ordering
- In any given choice set
  - If one alternative is preferred to all others, the DM chooses it
  - If not, may avoid decision by choosing the status quo
- If no suitable status quo, uses other decision making mechanism
  - ‘Think harder’ about the problem
  - Complete their preference ordering

- **Formal Representation:**

1. Choice is defined for any $\{Z, s\}$ by
   1. $C(Z, s) = \{x \in Z | x \succeq y \ \forall \ y \in Z\}$ if such set is non-empty
   2. otherwise $C(Z, s) = s$ if $s \in Z / T(Z)$
   3. otherwise $C(Z, s) = \{x \in Z | x \trianglerighteq y \ \forall \ y \in Z\}$

- **Compares objects using a preference relation**

1. Choice is defined for any $\{Z, s\}$ by
   1. $C(Z, s) = \{x \in Z | x \succeq y \; \forall \; y \in Z\}$ if such set is non-empty
   2. otherwise $C(Z, s) = s$ if $s \in Z / T(Z)$
   3. otherwise $C(Z, s) = \{x \in Z | x \trianglerighteq y \; \forall \; y \in Z\}$

# The Conflict Decision Avoidance Model

- **If one alternative is preferred to all others, choose that**

1. Choice is defined for any $\{Z, s\}$ by
   1. $C(Z, s) = \{x \in Z | x \succeq y \ \forall \ y \in Z\}$ if such set is non-empty
   2. otherwise $C(Z, s) = s$ if $s \in Z / T(Z)$
   3. otherwise $C(Z, s) = \{x \in Z | x \trianglerighteq y \ \forall \ y \in Z\}$

- **If not, the DM avoid decision by choosing the status quo**

1. Choice is defined for any $\{Z, s\}$ by
   1. $C(Z, s) = \{x \in Z | x \succeq y \ \forall \ y \in Z\}$ if such set is non-empty
   2. otherwise $C(Z, s) = s$ if $s \in Z / T(Z)$
   3. otherwise $C(Z, s) = \{x \in Z | x \trianglerighteq y \ \forall \ y \in Z\}$

- **If no suitable status quo available, will ‘complete’ preferences**

1. Choice is defined for any $\{Z, s\}$ by
    1. $C(Z, s) = \{x \in Z | x \succeq y \ \forall \ y \in Z\}$ if such set is non-empty
    2. otherwise $C(Z, s) = s$ if $s \in Z / T(Z)$
    3. otherwise $C(Z, s) = \{x \in Z | x \trianglerighteq y \ \forall \ y \in Z\}$

# A Multi-Utility Representation

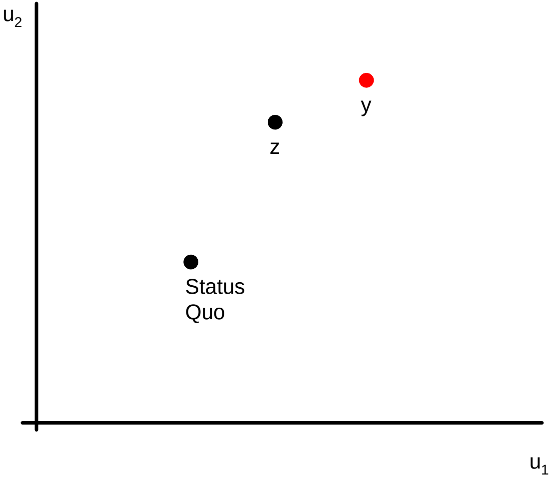
- Incomplete preference ordering $\succeq$ can be represented by a vector-valued utility function:

$$u(z) = \begin{pmatrix} u_1(z) \\ \vdots \\ u_n(z) \end{pmatrix}$$

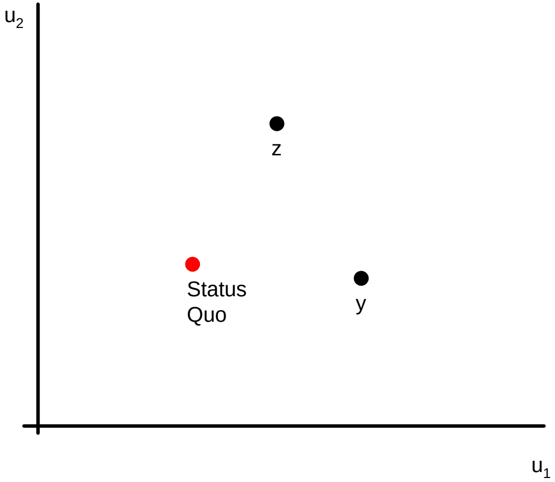
- Such that

$$\begin{aligned} z &\succeq w \\ \text{if and only if } u_i(z) &\geq u_i(w) \ \forall \ i \in 1..n \end{aligned}$$

# A Multi-Utility Representation




- Choose $y$ as $y$ is best object along all dimensions




- Choose status quo to avoid having to decide between $z$ and $y$

# Information Overload

- Alternative hypothesis: Information Overload
  - Large choice sets are inherently more difficult than small choice sets
    - Iyengar and Lepper [2000]
  - DM can compare all available options on a bilateral basis,
  - May still find large choice set difficult

- Modify Conflict model to allow for information overload
- Preferences may become less complete in large choice sets
- Replace fixed preference relation of Conflict model with nested preference relation
- **Nested Preferences:**
  - For every $Z$ a preference relation $\succeq_Z$
  - Such that, for every $W \subset Z$

$$x \succeq_Z y \Rightarrow x \succeq_W y$$

  - but not

$$x \succeq_Z y \Longleftarrow x \succeq_W y$$

- Modifies the Conflict Decision Avoidance Model....

1. Choice is defined for any $\{Z, s\}$ by
    1. $C(Z, s) = \{x \in Z | x \succeq y \; \forall \; y \in Z\}$ if such set is non-empty
    2. otherwise $C(Z, s) = s$ if $s \in Z / T(Z)$
    3. otherwise $C(Z, s) = \{x \in Z | x \trianglerighteq y \; \forall \; y \in Z\}$

- To allow for preferences to become less complete....

1. Choice is defined for any $\{Z, s\}$ by
   1. $C(Z, s) = \{x \in Z | x \succeq_Z y \ \forall \ y \in Z\}$ if such set is non-empty
   2. otherwise $C(Z, s) = s$ if $s \in Z / T(Z)$
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# Behavioral Implications of Decision Avoidance Models

- Information overload model and conflict model:
  - **A1:** Limited status quo dependence
  - **A2:** Weak status quo conditional consistency
- Conflict model only
  - **A3:** Expansion

# Limited Status Quo Dependence

- Choice can only depend on status quo in a limited way
- Making an object $x$ the status quo can lead people to switch their choices to $x$...
- ...but cannot lead them to choose another alternative $y$
- **A1: LSQD:** *In any choice set, choice must be either*
  - *The status quo*
  - *What is chosen when there is no status quo*
- Note - not implied by preference-based models

# Weak Status Quo Conditional Consistency

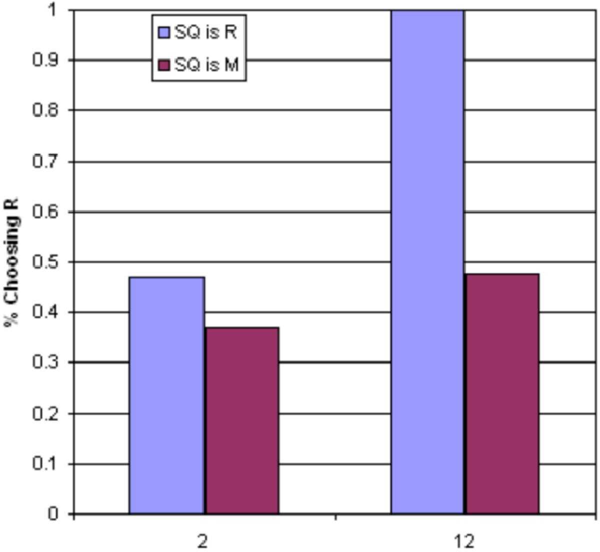
- Decision avoidance models allow for violations of SQCC, but only of a specific type
  - People may switch to choosing the status quo in larger choice sets
- **A2: Weak SQCC:** *For a fixed status quo*
  - *if $x$ is chosen in a larger choice set*
  - *must also be chosen in a subset*
  - *unless $x$ is the status quo*

- **A3: Expansion:** *Adding dominated options cannot lead people to switch to the status quo*
- Say $x$ is chosen in a choice set $Z$ when it is not the status quo
- Add option $y$ to the choice set that is *dominated* by some $w \in Z$
  - $w$ is chosen over $y$ even when $y$ is the status quo
- $x$ must still be chosen from the larger choice set

# Expansion

- Conflict model implies expansion
  - Adding dominated options does not make choice any more ‘difficult’
- Information overload model does not imply expansion
  - DM may ‘know’ their preferred option in smaller choice set
  - Adding dominated options to the choice set degrades preferences
  - Can no longer identify preferred option in the larger choice set

# An Experimental Test of Expansion



# Where do Reference Points Come From?

- Up until now, we have assumed that we get to observe what reference points are observable
- Where do they come from?
  - What you are currently getting?
  - What happens if you do nothing?
  - What you expect to happen in the future?
- Often (but not always) these things may be highly correlated

# Where do Reference Points Come From?

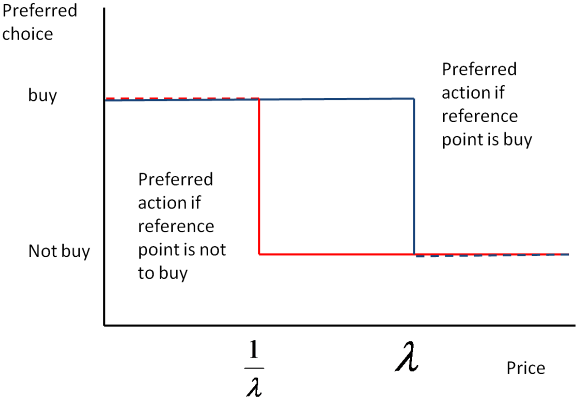
- There is some experimental work trying to differentiate these different effects
- e.g. Ritov and Baron [1992], Schweitzer [1994]
- Try to separate between
  - Pure status quo bias (Preference for the current state of affairs)
  - Omission bias (preference for inaction)
- Former study found only omission bias, latter found both
- There is a problem if we think that the reference point should be what we expect
- What we expect should depend on our actions!
- This problem was taken up by Koszegi and Rabin [2006]
  - Introduce the concept of 'personal equilibrium'

# Personal Equilibrium

- Consider an option $x$
- What would I choose if $x$ was my reference point?
- If it is $x$, then I will call $x$ a *personal equilibrium*
- If I expect to buy $x$ then it should be my reference point
- If it is my reference point then I should actually buy it

# Example

- Consider shopping for a pair of earmuffs
  - The utility of the earmuffs is 1
  - Prices is $p$
  - Again, assume that utility is linear in money
- What would you do if reference point was to buy the earmuffs?
  - Utility from buying earmuffs is 0
  - Utility from not buying earmuffs is $p - \lambda$
  - Buy earmuffs if $p < \lambda$
- What would you do if reference point was to not buy the earmuffs?
  - Utility from not buying the earmuffs is 0
  - Utility from buying earmuffs is $1 - \lambda p$
  - Would buy the earmuffs if $p < \frac{1}{\lambda}$


Preferred choice
buy
Not buy
Preferred action if reference point is buy
Preferred action if reference point is not to buy
$\frac{1}{\lambda}$
$\lambda$
Price

- In applications, loss aversion is often combined with *Narrow Bracketing*
- Decision makers keep different decisions separate
- Evaluate each of those decisions in isolation
- For example, evaluate a particular investment on its own, rather than part of a portfolio
- Evaluate it every year, rather than as part of lifetime earnings

# Applications: Loss Aversion and Narrow Bracketing

- Equity Premium Puzzle [Benartzi and Thaler 1997]
  - Average return on stocks much higher than that on bonds
  - Stocks much riskier than bonds - can be explained by risk aversion?
  - Not really - calibration exercise suggests that the required risk aversion would imply

$$\begin{aligned} & 50\% \;\; \$100,000 + 50\% \; \$50,000 \\ \sim \;\; & 100\% \; \$51,329 \end{aligned}$$

  - What about loss aversion?
  - In any given year, equities more likely to lose money than bonds
  - Benartzi and Thaler [1997] calibrate a model with loss aversion and narrow bracketing
  - Find loss aversion coefficient of 2.25 - similar to some experimental findings

# Applications: Evaluation Period, Risk Aversion and Information Aversion

- Imagine that you have linear utility with $\lambda = 2.5$
- Say you are offered a 50% chance of 200 and a 50% chance of -100 repeated twice
- Two treatments:
  - The result reported after each lottery
  - The result reported only after both lotteries have been run.
- What would choices be?
- In the first case

$$\begin{aligned} & \frac{1}{4}(200+200)+\frac{1}{2}(200-\lambda 100)+\frac{1}{4}(-\lambda 100-\lambda 100) \\ = & -200 \end{aligned}$$

- In the second case

$$\begin{aligned} & \frac{1}{4}(400)+\frac{1}{2}(100)+\frac{1}{4}(-\lambda 200) \\ = & 25 \end{aligned}$$

# Applications: Evaluation Period, Risk Aversion and Information Aversion

- With loss aversion and narrow bracketing, risk aversion depends on evaluation period
- The longer period, the less risk averse
- This prediction holds up experimentally
  - Gneezy and Potters [1997]
- This also provides an 'information cost'
- A similar argument shows that if you owned the above lottery, you would prefer only to check it after two flips rather than every flip
- May explain why people check their portfolios *less* in more turbulent times
  - See Andries and Haddad [2015] for a discussion

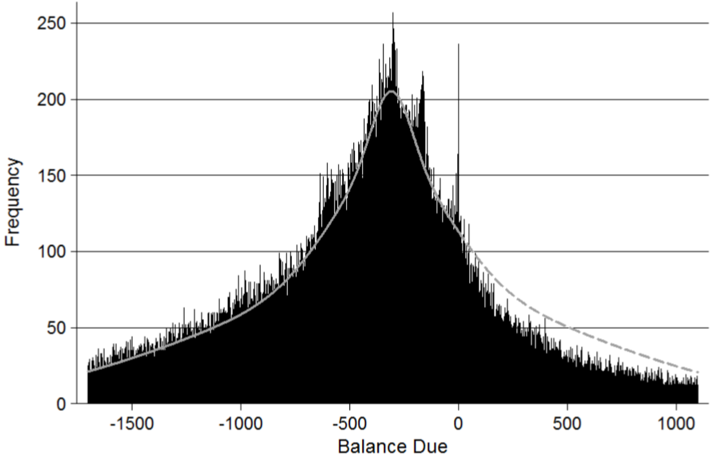
# Applications: Diminishing Sensitivity

- Disposition Effect [Odean 1998]
  - People are more likely to hold on to stocks which have lost money
  - More likely to sell stocks that have made money
- Losing stocks held a median of 124 days, winners a median of 104 days
  - Is this rational?
- Hard to explain, as winners subsequently did better
  - Losers returned 5% on average in the following year
  - Winners returned 11.6% in subsequent year
- Buying price shouldn't enter into selling decision for rational consumer
- But will do for a consumer with reference dependent preferences
  - Diminishing sensitivity

# Applications: Loss Aversion and Narrow Bracketing

- Taxi driver labor supply [Camerer, Babcock, Loewenstein and Thaler 1997]
  - Taxi drivers rent taxis one day at a time
  - Significant difference in hourly earnings from day to day (weather, subway closures etc)
  - Do drivers work more on good days or bad days?
  - Standard model predicts drivers should work more on good days, when rate of return is higher
  - In fact, work more on bad days
  - Can be explained by a model in which drivers have a reference point for daily earnings and are loss averse

# Applications: Reported Tax Balance Due [Rees-Jones 2014]



# Reference Dependent Preferences

- Strong evidence that people evaluate options relative to some reference point
- Change in reference point can change preferences
  - Endowment Effect
  - Risk aversion
- One robust finding is loss aversion
  - Losses loom larger than gains
  - Can explain the endowment effect and increased risk aversion for mixed choice
- One open question is where reference points come from
- Prospect theory is a workhorse model of choice under risk
  - Loss Aversion
  - Probability Weighting
  - Diminishing Sensitivity
- Has been used to explain many 'real world' phenomena
  - Choice of financial asset
  - Labor supply