Announcements

Please turn off your cell phone
Thank You!
Announcements

- **Course assignments:**
  - Over the course of the semester
    - 10 assignments
    - Drop 2 lowest scores
    - Graded ✔, ✔+, ✔- (modal grade is a check)
    - Schedule on p. 5 of syllabus
  - **Today**
    - Assignment 1 due before class today
    - Assignment 2 posted on Canvas by the end of class today, due on Monday, September 12 before the start of class

Harvard Behavioral Insights Group (BIG)

http://cpl.hks.harvard.edu/behavioral-insights-group
Behavioral Insights Group Kick-Off Event

Date: Thursday, September 8, 2016, 6:00pm to 7:30pm
See also: BIG Events
Location: Warren Auditorium

Join the Behavioral Insights Group for its annual kick-off event. Hear about curricular and co-curricular offerings from our staff and Behavioral Insights Student Group leaders, and about innovative research in diversity, public health, philanthropy, and education from Iris Bohnet (HKS), Maggie McConnell (HSPH), Mike Tobin (HKS), and Todd Higginson (HKS). Drinks and refreshments will be served.

Contact and Follow BIG

Join BIG’s Mailing List
Follow BIG on Twitter
Follow BIG-Related Job Postings on Tumblr

BIG’s staff are always happy to talk with students, faculty, and organizations about their interests and potential connections. Please feel free to reach out to us. You can also join our global mailing list, our mailing list for Harvard students, follow us on Twitter, or check out our jobs board, where we post behavioral science-specific jobs.

For more information on the Behavioral Insights Group, contact:
Abigail Dalton
Assistant Director, Behavioral Insights Group
617.496.4391
abigail.dalton@hks.harvard.edu

Shaneal O’Flaherty
Program Assistant, Behavioral Insights Group
617.496.2422
shaneal.oflaherty@hks.harvard.edu
Should your willingness to pay for this...

...depend on whether you pay with...

...this

...or this

### Willingness to Pay When Using Cash vs. a Credit Card

<table>
<thead>
<tr>
<th>Ticket Type</th>
<th>Cash Mean WTP</th>
<th>Cash Median WTP</th>
<th>Credit Card Mean WTP</th>
<th>Credit Card Median WTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>One pair 3rd row balcony tickets</td>
<td>$29</td>
<td>$25</td>
<td>$41</td>
<td>$8</td>
</tr>
<tr>
<td>for Celtics-Miami game, Sunday,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>April 19, 1 PM, at the Boston</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garden</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sold out game for Division Title</td>
<td>$9</td>
<td>$5</td>
<td>$12</td>
<td>$8</td>
</tr>
<tr>
<td>One pair of bleacher tickets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>for Red Sox-Toronto game, Sunday,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>April 19, 1 PM, at Fenway Park</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Prelec and Simester (2001) "Always Leave Home Without It"
Discounting and Inter-temporal Choice

- Many choices involve trade-offs between costs and benefits that occur at different points in time
- Most agents prefer
  - Current rewards to delayed rewards of a similar magnitude
  - Delayed costs to current costs of a similar magnitude
- This leads to the assumption of discounting in inter-temporal choice models
  - Individuals give less weight to the future than they do to the present

Standard Exponential Discounting

- $U = u_t + \delta u_{t+1} + \delta^2 u_{t+2} + \delta^3 u_{t+3} + ...$
- $\delta$ exponentially discounts all future periods.

![Present Value of $100 by Period of Receipt](chart.png)

- Standard exponential discounting ($\delta = 0.95$)
Present-Biased Preferences

Quasi-hyperbolic discounting (Phelps and Pollack, 1968; Laibson, 1997)

\[
U = u_t + \beta \delta u_{t+1} + \beta \delta^2 u_{t+2} + \beta \delta^3 u_{t+3} + \ldots
\]

\[
= u_t + \beta[\delta u_{t+1} + \delta^2 u_{t+2} + \delta^3 u_{t+3} + \ldots ]
\]

\[\beta\] uniformly discounts all future periods

\[\delta\] exponentially discounts all future periods

Standard vs. “Quasi-hyperbolic” Discounting

![Graph showing comparison between standard and quasi-hyperbolic discounting](image)
Present Biased Preferences, Payment Method, and WTP

- Come back to payment method (cash vs. credit) example
  - Assume $U(\text{game today}) = 50$ and is experienced today
  - Assume $\beta = 1/2$ and $\delta = 1$

- What is WTP for ball game tickets?
  - Potential fans are willing to pay up until the benefits of attending the game are equal to the cost of attending the game.
  - WTP: $U(\text{game today}) = \text{Cost today} + \beta\delta \times \text{Cost tomorrow}$
    - Pay cash: $\Rightarrow$ WTP=50 (Benefit of $50 = \text{Cost today}$)
    - Pay Credit card: $\Rightarrow$ WTP=100 (Benefit of $50 = \beta\times\text{Cost tomorrow}$)

Implications of Quasi-hyperbolic Discounting: Procrastination

- Assume
  - $\beta = 1/2$ and $\delta = 1$
  - Exercise generates an immediate cost of 6
  - Exercise generates a delayed benefit of 8
  - When will you exercise?
Implications of Quasi-hyperbolic Discounting: Procrastination and Dynamic Inconsistency

- Assume:
  - $\beta = \frac{1}{2}$ and $\delta = 1$
  - Exercise generates an immediate cost of 6
  - Exercise generates a delayed benefit of 8
- When will you exercise? Exercise if benefit $> $ cost!
  - Exercise today: $-6 + \frac{1}{2} \cdot 8 = -2$
  - Exercise tomorrow: $0 + \frac{1}{2} \cdot [-6 + 8] = 1$
- Agent would like to make plans today to exercise tomorrow
  - But when tomorrow comes, agent won’t follow through
- Preferences are dynamically inconsistent

Discounted utility function becomes

$$U_t = u_t + \frac{1}{2} [u_{t+1} + u_{t+2} + u_{t+3} + ...]$$

Discounted utility from the perspective of time $t+1$:

$$U_{t+1} = u_{t+1} + \frac{1}{2} [u_{t+2} + u_{t+3} + ...]$$

Discount function generates dynamic inconsistency

Preferences at date $t$ do not agree with preferences held at date $t+1$ about the tradeoff between utility in $t+1$ vs. $t+2$
Implications of Quasi-hyperbolic Discounting

- Note that procrastination doesn’t arise when $\beta = 1$
- Assume
  - $\beta = 1$ and $0 < \delta < 1$
  - Exercise generates an immediate cost of 6
  - Exercise generates a delayed benefit of 8
- When will you exercise? Exercise if benefit > cost!
  - Exercise today: $-6 + \delta \cdot 8 = Z$
  - Exercise tomorrow: $0 + \delta \cdot [-6 + \delta \cdot 8] = \delta Z$
- If it is optimal to exercise tomorrow, then it is optimal to exercise today! And vice versa.
- These preferences are dynamically consistent.

Pick a Food Option

- Pick a Food Option
- [Image of fruits]
- [Image of chocolate and nuts]
What to Eat: Fruit vs. Chocolate

If you were deciding today, would you choose FRUIT or CHOCOLATE for next week?

Fruit vs. Chocolate: Patient Choices for the Future

Today, subjects mostly choose FRUIT for next week.

51% Choose Fruit
Fruit vs. Chocolate:
Impatient Choices Today

Choose today for NOW

83%
Choose Chocolate

Today, subjects typically choose CHOCOLATE for NOW.

Present Bias and Movie Preferences

Choose among 24 movie videos
- Some “low brow” (e.g. Four Weddings)
- Some “high brow” (e.g., Schindler’s List)

What fraction choose the low brow movie?

Source: Read, Loewenstein & Kalyanaraman (1999)
Present Bias and Movie Choice

- In our model:
  - Suppose that “Weddings” has immediate benefit of 7.
  - Suppose that “Schindler” has immediate benefit of 4 and delayed benefit of 4.
  - Assume $\beta = \frac{1}{2}$ and $\delta = 1$

<table>
<thead>
<tr>
<th></th>
<th>Four Weddings and a Funeral</th>
<th>Schindler’s List</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Now</strong></td>
<td>7</td>
<td>$4 + \beta \times 4 = 6$</td>
</tr>
<tr>
<td><strong>Later</strong></td>
<td>$\beta \times 7 = 3.5$</td>
<td>$\beta \times (4 + 4) = 4$</td>
</tr>
</tbody>
</table>

Present-Biased Preferences Timeline

<table>
<thead>
<tr>
<th>TIME</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Discount factor</strong></td>
<td>$\beta \delta$</td>
<td>$\beta \delta^2$</td>
<td>$\beta \delta^3$</td>
<td>$\beta \delta^4$</td>
<td></td>
</tr>
<tr>
<td><strong>Exercise example</strong></td>
<td>$\beta = \frac{1}{2}$ and $\delta = 1$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise today</td>
<td>-6</td>
<td>$\beta \times (+8) = 4$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise tomorrow</td>
<td>$\beta \times (-6) = -3$</td>
<td>$\beta \times (+8) = 4$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Movie example</strong></td>
<td>$\beta = \frac{1}{2}$ and $\delta = 1$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four Weddings now</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four Weddings later</td>
<td>$\beta \times (+7) = 3.5$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schindler now</td>
<td>4</td>
<td>$\beta \times (+4) = 2$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schindler later</td>
<td>$\beta \times (+4) = 2$</td>
<td>$\beta \times (+4) = 2$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Many Ways to Model Present Bias

- Many ways to model how present bias can effect behavior:
  - Paying for sport tickets example:
    - Current benefit and current vs. future cost
  - Fruit vs. chocolate
    - Small vs. large current benefit and small vs. large future cost
  - Exercise
    - Current cost vs. future benefit
  - Which movie to watch
    - Current cost and immediate benefit vs. immediate and future benefits

Savings: What Are the Barriers

- Not worth it—the return isn’t large enough
- Present bias/procrastination
- Complexity—don’t know how to save
- Forget—want to, but don’t get around to it
Policy Application: Savings

- How does a model of present-biased preferences help explain savings behavior—why so many people are saving less than they think they should?
  - Current cost of enrollment, $C$
  - (Discounted) future benefits of enrollment
  - Dynamically inconsistent preferences and procrastination
    - Today’s self: I’ll enroll tomorrow
    - Tomorrow’s self: I’ll enroll tomorrow….etc.

Present Bias and Savings

- Decision rule: enroll in the savings plan if the cost is less than the benefit
  - $\text{Cost} < \beta \ast \text{Benefit}$
    - Less consumption today
    - Time
    - Figuring out what to do
    - Extent of present bias/tendency to procrastinate
    - More consumption in the future
    - Lower taxes
    - Match
Perceptions of Self: Current vs. Future Self and Retirement

Does Seeing Your Future Self Decrease Present Bias?

Fraction of Current Pay Allocated to Retirement

<table>
<thead>
<tr>
<th>Neutrals</th>
<th>Current Self</th>
<th>Future Self</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4%</td>
<td>6.2%</td>
<td>6.8%</td>
</tr>
<tr>
<td>5.2%</td>
<td>5.2%</td>
<td></td>
</tr>
</tbody>
</table>

Neutral faces | Emotional Faces
Face Aging in Practice

- The marketing arm of the financial services industry LOVES this!
  - Merrill Lynch “Face Retirement” web page lets you age your own photo (very realistic—aged photo will actually blink back at you)
  - Lincoln Financial
    - Future self on a plane: [https://www.youtube.com/watch?v=i34XRMLm9N0](https://www.youtube.com/watch?v=i34XRMLm9N0)
    - Future self with newborn baby in hospital nursery: [https://www.youtube.com/watch?v=HaUyVtNhFol](https://www.youtube.com/watch?v=HaUyVtNhFol)

The Marshmallow Test

- [https://www.youtube.com/watch?v=MDD4lkVZWTM](https://www.youtube.com/watch?v=MDD4lkVZWTM)
  - Many more marshmallow test videos on YouTube if you’re bored!!
- Stephen Colbert on the marshmallow test (you’ll have to sit through a commercial):
Main Take-Aways

- Present-biased preferences
  - An example of bounded self control (deviation from standard economic models)
  - $\beta, \delta$ model of time preference
    - The parameter $\beta$ measures the extent of present bias (lower $\beta$ implies greater present bias, $\beta=1$ implies no present bias)
    - $\Rightarrow$ dynamic inconsistency
    - $\Rightarrow$ procrastination (e.g. of behavior that is costly today but beneficial in the future)
- Many policy relevant domains where present-biased preferences may impact outcomes
- Behavioral approaches to reduce present bias
  - Help individuals "see" their future selves and better appreciate the consequences of the decisions of today’s self makes on the future self
  - We will discuss more approaches in future classes

Readings for Monday, 9/12

- *Thinking Fast and Slow.*
  - Chapter 11: “Anchors”
  - Chapter 25: “Bernoulli’s Errors”
  - Chapter 26: “Prospect Theory”
  - Chapter 27: “The Endowment Effect”
  - Chapter 28: “Bad Events”
  - Chapter 34: “Frames and Reality”