

Lecture 2f: Choice over Time

Anticipatory Utility and Beliefs

EC 404: Behavioral Economics
Professor: Ben Bushong

March 22, 2022

Motivating Experiment

Based on Loewenstein (*EJ* 1987)

Motivating experiment: Ask subjects

- ▶ (1) their *WTP* for a kiss from a movie star of their choice at date x .
- ▶ (2) their *WTP* to avoid a 110-volt shock at date x .

He uses a within-subjects design, and uses $x = \text{now}, 3 \text{ hrs}, 24 \text{ hrs}, 3 \text{ days}, 1 \text{ yr}, \text{ and } 10 \text{ yrs}$.

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Let's denote the *WTP* for c at date x by $WTP(c, x)$.

Under the “standard” discounted-utility interpretation,

$$WTP(c, x) = D(x) * v(c)$$

- ▶ $v(c)$ is the instantaneous utility from c .
- ▶ $D(x)$ is discounting associated with delay x .

Normalizing $D(0) = 1$, this implies:

$$\frac{WTP(c, x)}{WTP(c, 0)} = \frac{D(x)v(c)}{D(0)v(c)} = D(x)$$

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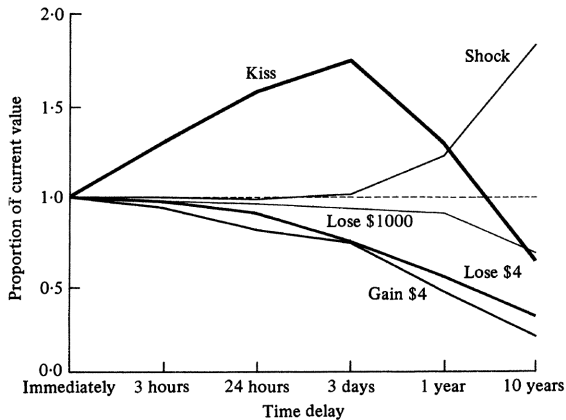
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Motivating Experiment: Results



Interpretation: Anticipatory Utility

Loewenstein interprets as evidence of “anticipatory utility”:

- ▶ Leading up to the kiss, you get positive utility from anticipating it; hence, you may prefer to delay the kiss so that you can properly anticipate it.
- ▶ Leading up to the shock, you get negative utility from anticipating it; hence, you may prefer to accelerate the shock so that you do NOT need to anticipate it.

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A Model with Utility from Anticipation

Instantaneous utility in period t given by

$$u(c_t, c_{t+1}) = v(c_t) + w^A(c_{t+1}).$$

- ▶ $v(c_t)$ is utility from current consumption.
- ▶ $w^A(c_{t+1})$ is utility from anticipating future consumption.

In period 1, the person chooses (c_1, c_2, \dots) to maximize

$$U^1 \equiv \sum_{\tau=1}^{\infty} \delta^{\tau-1} u(c_{\tau}, c_{\tau+1}).$$

What is $w^A(c_{t+1})$? Let's assume

$$w^A(c_{t+1}) = \phi * v(c_{t+1})$$

- ▶ Anticipatory utility is proportional to consumption utility, where $\phi < 1$ reflects the “vividness”.

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Example: The “Kiss”

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Period-1 intertemporal utility of “kiss”:

- Kiss in period 1: $v(\text{kiss})$
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If $\phi + \delta < 1$, optimal to have kiss now (in period 1).

If $\phi + \delta > 1$, optimal to have kiss in near future (in period 2).

More Examples of Anticipatory Utility

Suppose you're thinking about going on vacation:

- ▶ For a long time, you thought probably no time for a 3-day vacation.
- ▶ Then one day find out that probably will have time off (80%).
... and then confirmed as 100% likely when it happens.
- ▶ Belief evolution:



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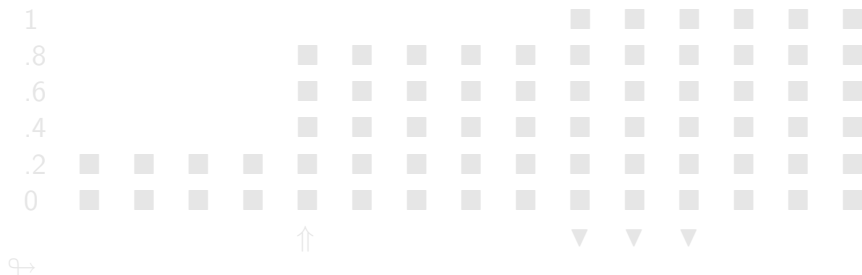
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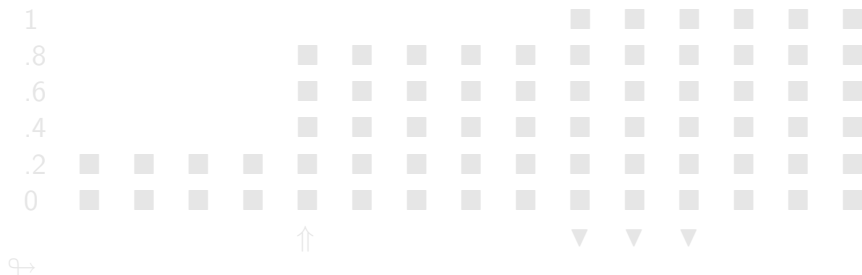
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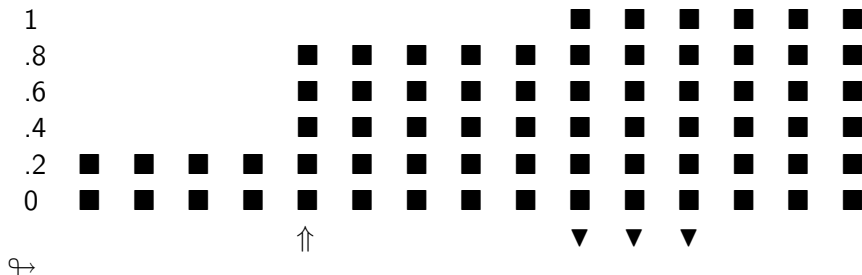
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As with other parts of this course, we'll discuss utility in time.

- ▶ That is, we will talk about real-time “happiness” without choice.

This isn't radical, even though it might seem even farther from mainstream. Stay calm.

- ▶ As before, this will have implications for choice.

So let's consider the utility of a person who has the beliefs from previous slide. Could be:



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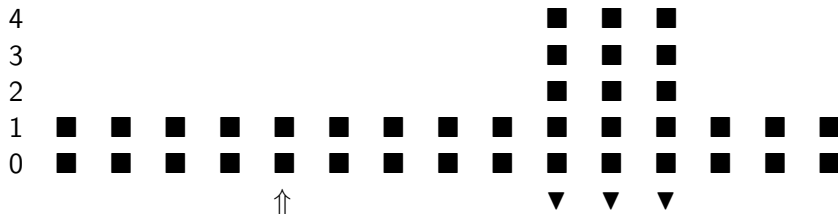
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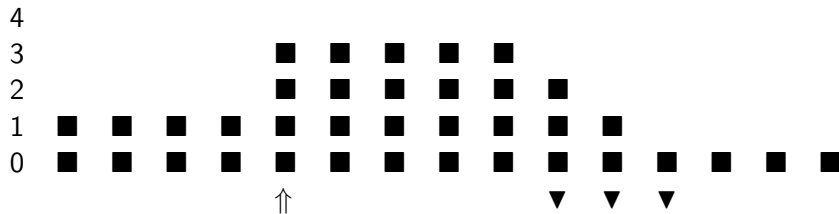
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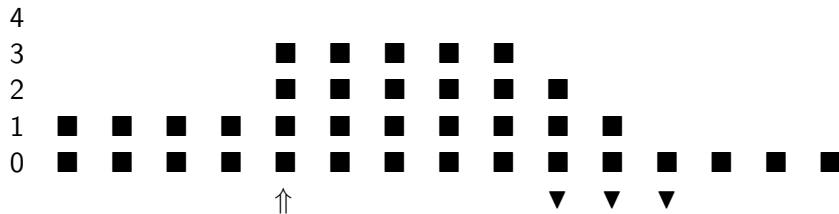


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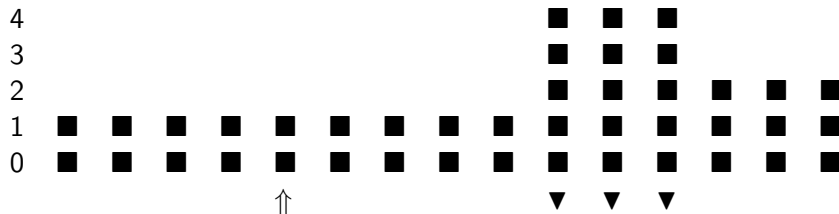


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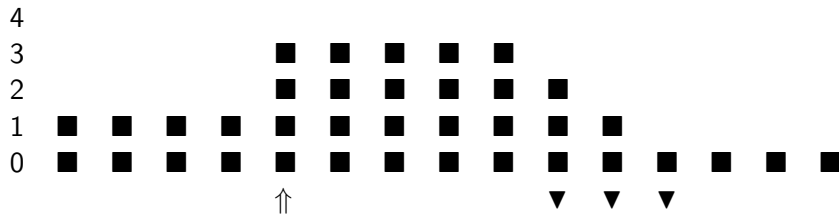


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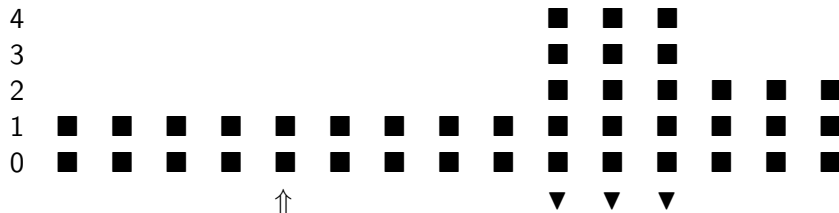


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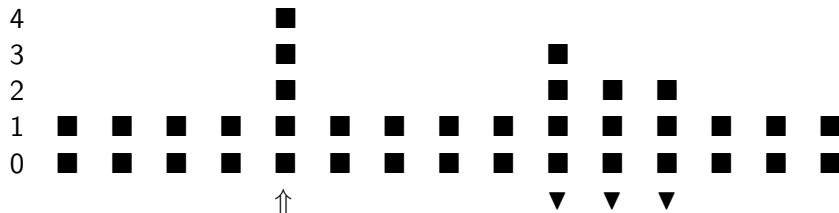
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↗

Belief-Based Utility

Or could be (my personal vote):



So what?

- ▶ Why care about the timing or reason for enjoying a vacation?
- ▶ Often: We don't. All captured by $u(\text{vacation})$.
 - ▶ Reduced form probably best for “remembered utility”.

But can matter for various reasons. Three are:

- ▶ Use direct happiness data if and only if our theories specify timing of utility.
 - ▶ (Not a topic of this course, but interesting to think about).
- ▶ Beliefs/information matter even when behavior is unaffected.
- ▶ Affects choice: including time inconsistency, commitment, etc.

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Belief-Based Utility

Suppose planning vacation:

- ▶ Have anticipatory preferences *for holiday-making only*.
- ▶ Club Cococabana holiday package, *total* anticipatory utility plus consumption and remembered utility well worth \$10,000.
- ▶ But without anticipatory utility, *not* nearly worth it.
- ▶ Can/must buy months in advance.

Situation A: All but \$50 is fully refundable if 24 hours in advance.

- ▶ What would a fully rational (sophisticated) person do?
- ▶ She **would/would not** (cross out one) buy the package, and then she **would/would not** (cross out one) go on the vacation.
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⇒ She **would not** buy the package, then **would not** go on the vacation.

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Suppose planning vacation:

- ▶ Have anticipatory preferences *for holiday-making only*.
- ▶ Club Cococabana holiday package, *total* anticipatory utility plus consumption and remembered utility well worth \$10,000.
- ▶ But without anticipatory utility, *not* nearly worth it.
- ▶ Can/must buy months in advance.

Situation A: All but \$50 is fully refundable if 24 hours in advance.

- ▶ What would a fully rational (sophisticated) person do?
- ▶ She **would/would not** (cross out one) buy the package, and then she **would/would not** (cross out one) go on the vacation.
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If **fully rational** and have the specified preferences

- ▶ You won't sign up under Situation A,
 - ▶ because you'll cancel, *and know you'll cancel*.
- ▶ Won't get anticipatory utility after all.

"Fully rational" defined (or, sophisticated):

- ▶ Dynamically optimal, anticipating correctly own conduct.
- ▶ But **not** the beliefs that make you happiest.
- ▶ With belief-based preferences, the two are *different*.

Situation B: Contract allows no refunds.

- ▶ What would a person do?
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Instead be interested in realism, insight, and importance of assumptions.
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Consumption & Savings with Anticipatory Preferences

Setting and Preferences

Yugi will live for 3 periods, has $\$Y$ to spend over that time (no interest), seeks to maximize his (undiscounted) lifetime utility $U^1 = u_1 + u_2 + u_3$.

- ▶ In period t , “consumption utility” m_t that depends on c_t .
- ▶ Also gets utility from anticipating his future consumption utility.
- ▶ Why from anticipating solely his future consumption utility?
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Attempt to model this:

$$u_1 = m(c_1) + \phi[m(c_2) + m(c_3)]$$

$$u_2 = m(c_2) + \phi[m(c_3)]$$

$$u_3 = m(c_3)$$

- ▶ where $\phi \geq 0$ is relative concern for anticipatory utility.

Question: what is *incoherent* about such preferences?

- ▶ u_1 cannot depend on c_2 or c_3 . Only **beliefs** about c_2, c_3 .

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where $E_t\{m(c_\tau)\}$ is period- t expectations of period- τ consumption.

- ▶ Would want more complete version of this if there is uncertainty.

When beliefs deterministic, shorthand:

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- ▶ $u_2 = m(c_2) + \phi E_2\{m(c_3)\}$
- ▶ $u_3 = m(c_3)$

where $E_t\{m(c_\tau)\}$ is period- t expectations of period- τ consumption.

- ▶ Would want more complete version of this if there is uncertainty.

When beliefs deterministic, shorthand:

- ▶ $u_1 = m(c_1) + \phi[m(\tilde{c}_2^1) + m(\tilde{c}_3^1)]$
- ▶ $u_2 = m(c_2) + \phi[m(\tilde{c}_3^2)]$
- ▶ $u_3 = m(c_3)$

where \tilde{c}_τ^t are Yugi's period- t beliefs about period- τ consumption.

- ▶ **What will Yugi do?**

Candidate solution: Yugi solves

$$\text{Max}_{c_1, c_2} = m(c_1) + (1 + \phi)m(c_2) + (1 + 2\phi)m(Y - c_1 - c_2).$$

► E.g., if $m(x) = \ln(x)$, then:

$$\text{► } c_1^{**} = \frac{1}{3+3\phi} Y, \quad c_2^{**} = \frac{1+\phi}{3+3\phi} Y, \quad c_3^{**} = \frac{1+2\phi}{3+3\phi} Y$$

► How do these depend on ϕ ?

- Respectively decreasing, independent of, and increasing in ϕ .
- Intuition?

► If $\phi = 1$, then:

$$\text{► } c_1^{**} = \frac{3}{18} Y, \quad c_2^{**} = \frac{6}{18} Y, \quad c_3^{**} = \frac{9}{18} Y$$

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Is this what Yugi will do?

Claim: We have under-specified features of the environment.

- ▶ We need to say when Yugi is making (committed) choices.
- ▶ Situation 1:
 - ▶ Yugi fully rational and can commit, then yes.
- ▶ Situation 2:
 - ▶ Yugi fully rational and *cannot* commit, then only c_1^* is right.

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	Can Commit	Cannot Commit
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What is interesting?

- ▶ Consumes more period 2 with commitment than without!
- ▶ Why does commitment increase period-2 consumption?
 - ▶ Because assumed anticipation is over future consumption utility alone (and not future anticipatory utility), happier looking forward to smoothed consumption than back-weighted consumption.
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Reasons increased consumption profiles besides anticipatory utility?

- ▶ Precautionary savings.
- ▶ Backward-looking habit formation.

Reasons we may rarely see increasing consumption?

- ▶ Present bias: consumption smoothing may be self-control problem.
- ▶ Because: anticipatory model isn't quite right.
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Stepping (well) outside the rational framework:

- ▶ What if Yugi can fool himself into believing lifetime income Y is something else?
- ▶ What might he tell himself?
 - ▶ Choose to be optimistic to consume anticipation.
 - ▶ But trades off against induced under-saving.
 - ▶ See, e.g., Brunnermeier and Parker (2005).
- ▶ But ... what if Yugi can tell himself other stories?
 - ▶ Like that he earns lots of interest on his savings?
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- ▶ Fundamental Theorem of Optimal Distortion of Anticipatory Prefs:
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- ▶ Psychological realism?
- ⇒ Need a model of what are the limits to distortions.

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