Lecture 2f: Choice over Time
Anticipatory Utility and Beliefs

EC 404: Behavioral Economics
Professor: Ben Bushong

March 28, 2023

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 = now, 3 hrs, 24 hrs, 3 days, 1 yr, and 10 yrs.

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Motivating Experiment

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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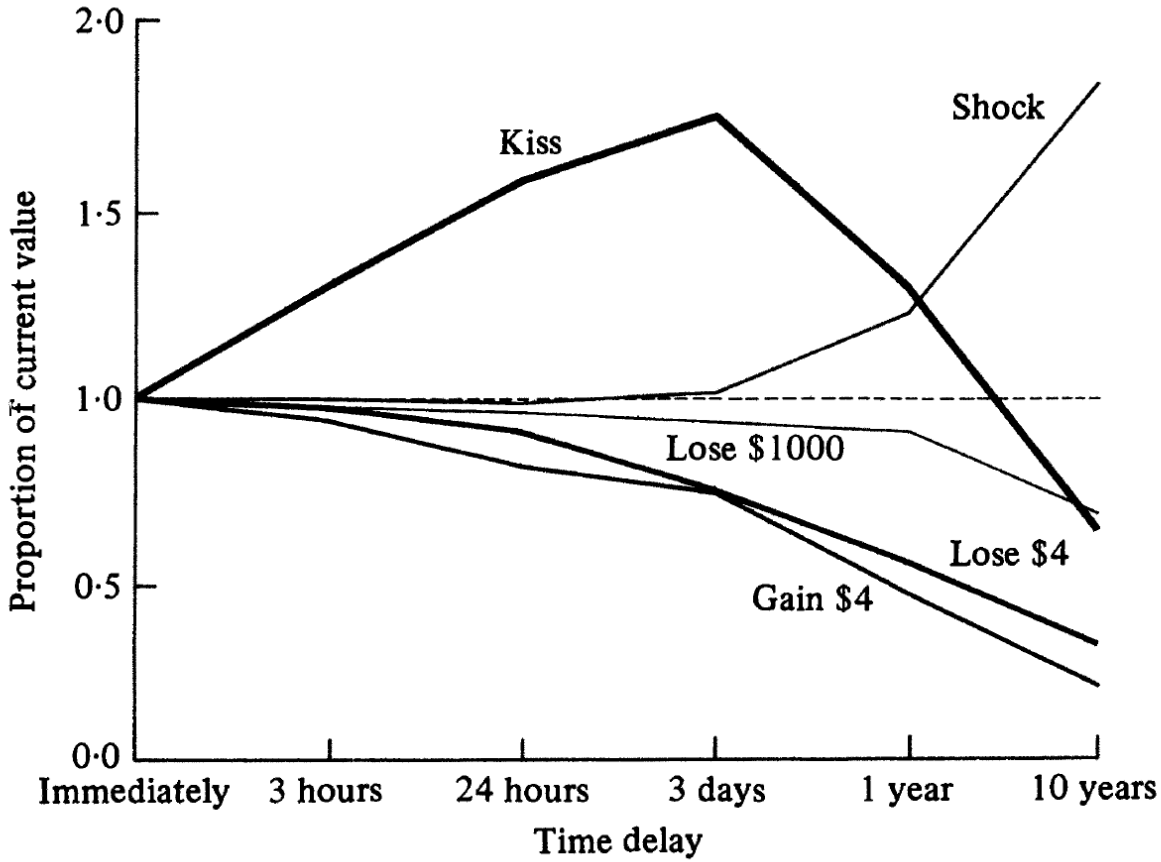
Motivating Experiment: Results



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 $(c_1, c_2, ...)$ 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"

Recall:

$$u\left(c_t, c_{t+1}\right) \;=\; v\left(c_t\right) \;+\; \phi * v\left(c_{t+1}\right)$$

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Period-1 intertemporal utility of "kiss":

- Kiss in period 1: $v(\text{kiss})$
- Kiss in period 2: $\phi * v(\text{kiss}) + \delta * v(\text{kiss})$
- Kiss in period 3: $0 + \delta * \phi * v(\text{kiss}) + \delta^2 * v(\text{kiss})$

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).

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- 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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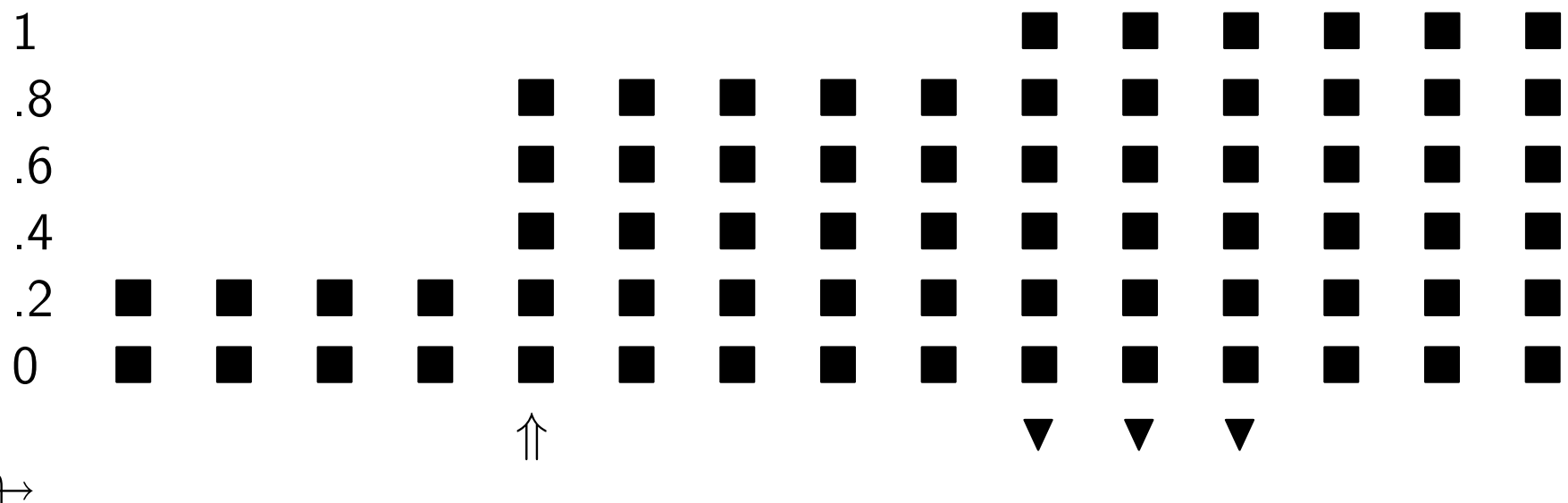

More Examples of Anticipatory Utility

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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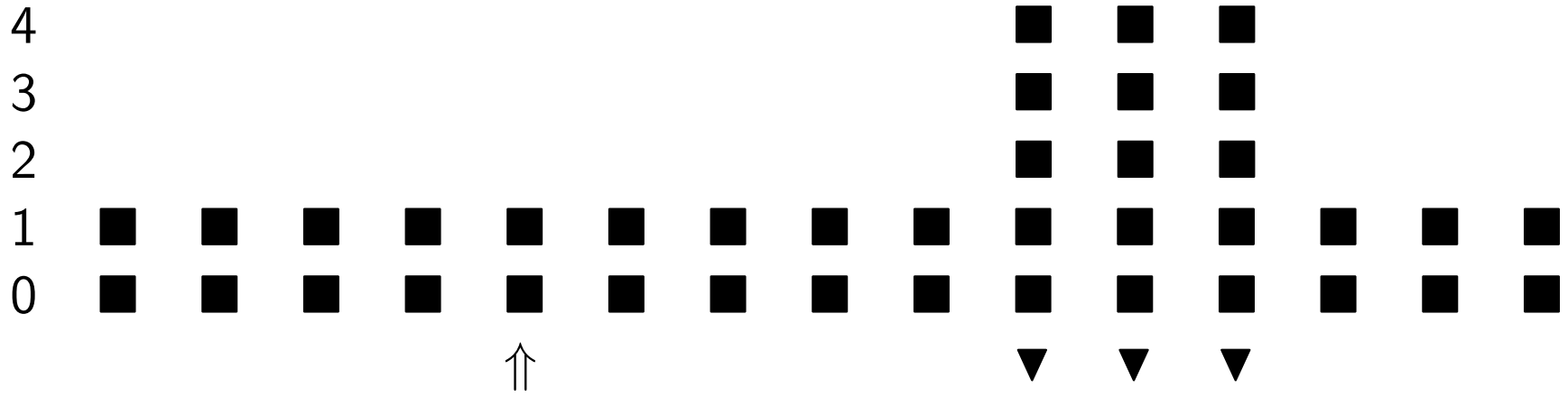
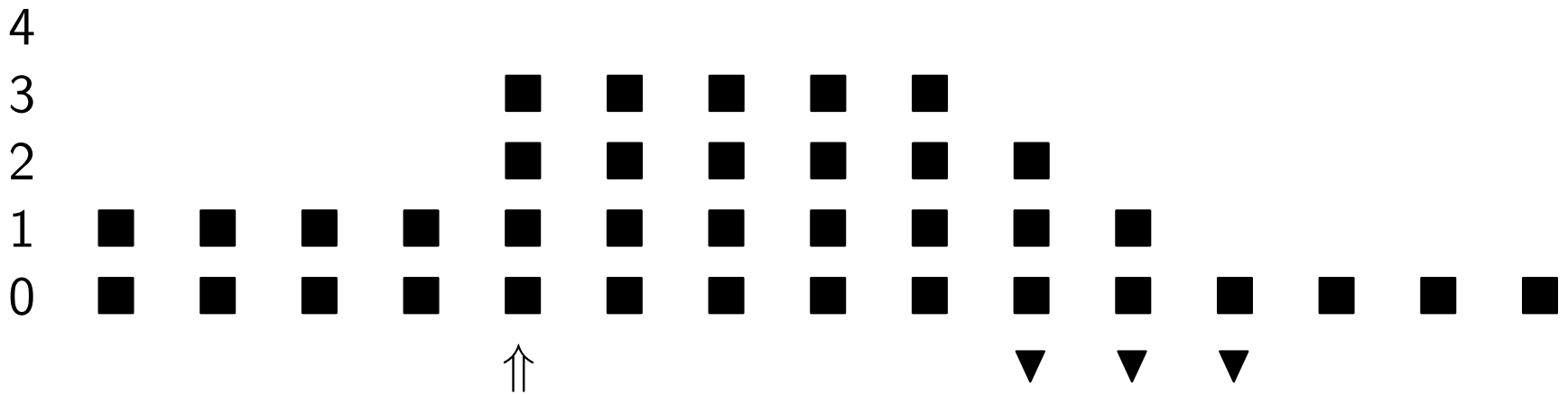


Belief-Based Utility

Or could be:



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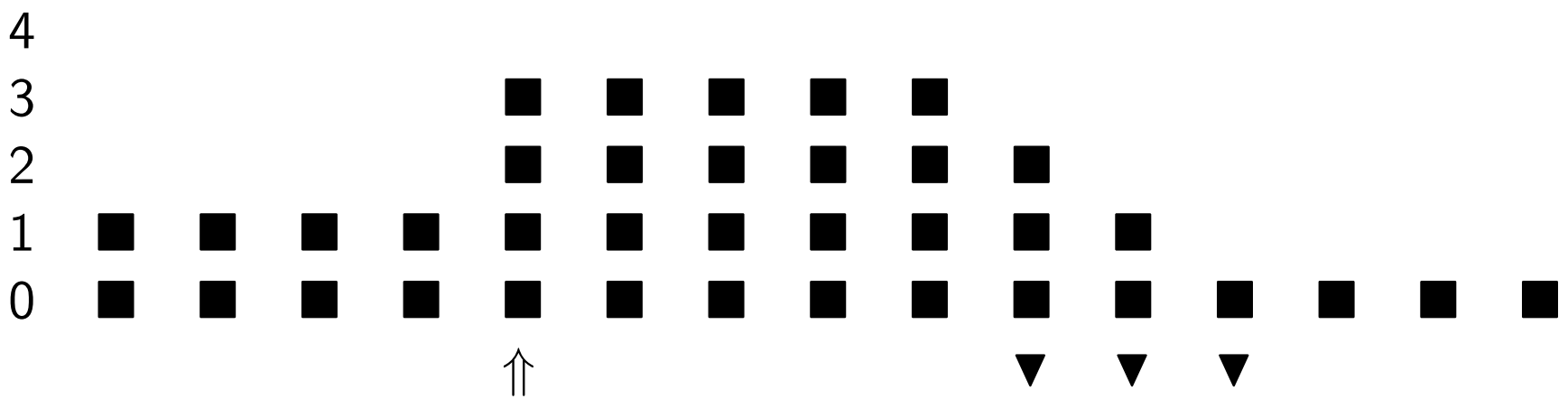

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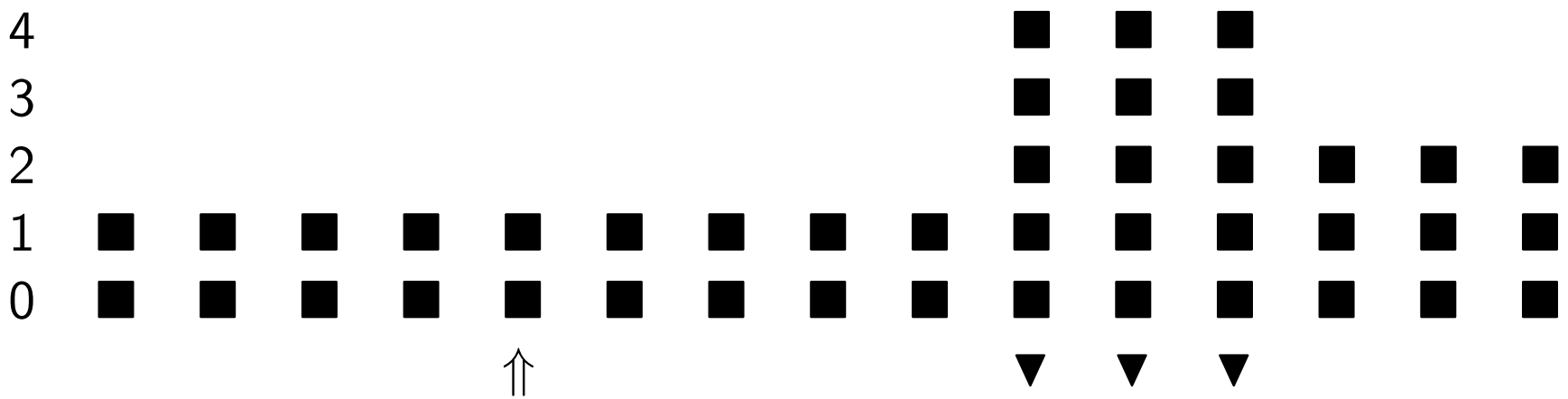

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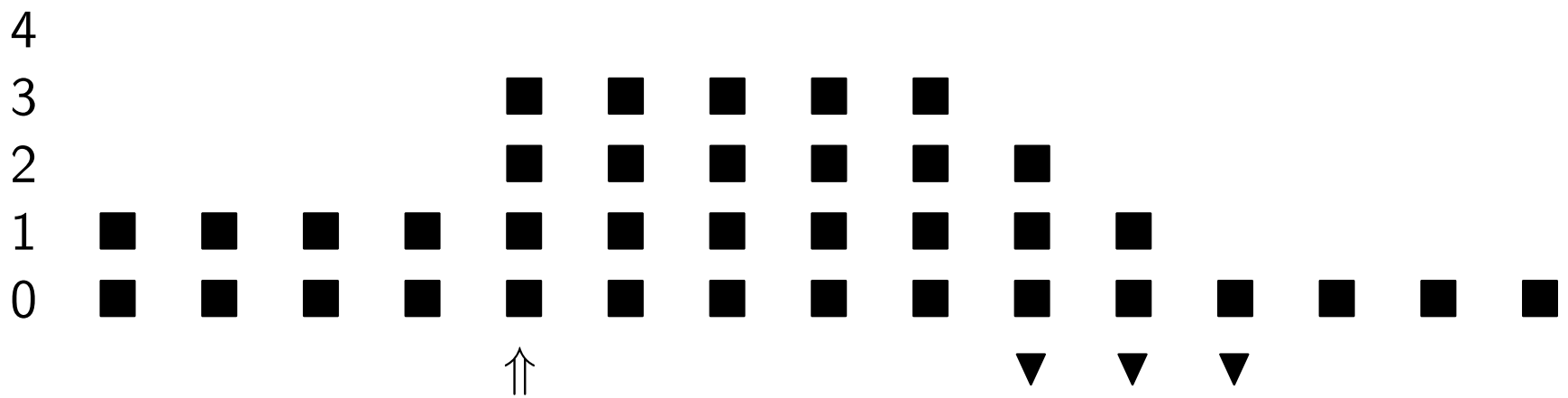

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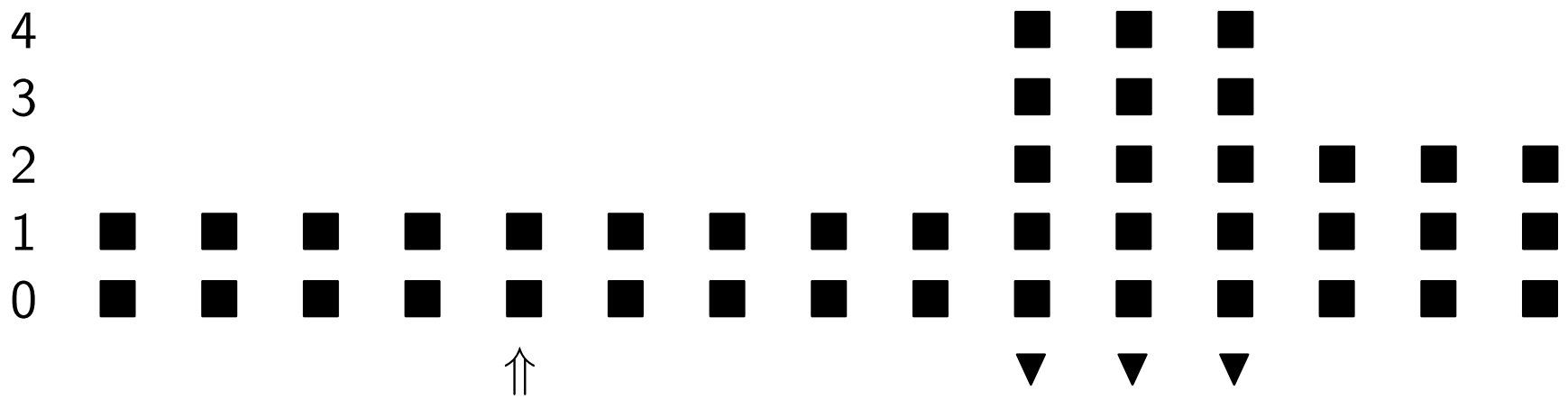

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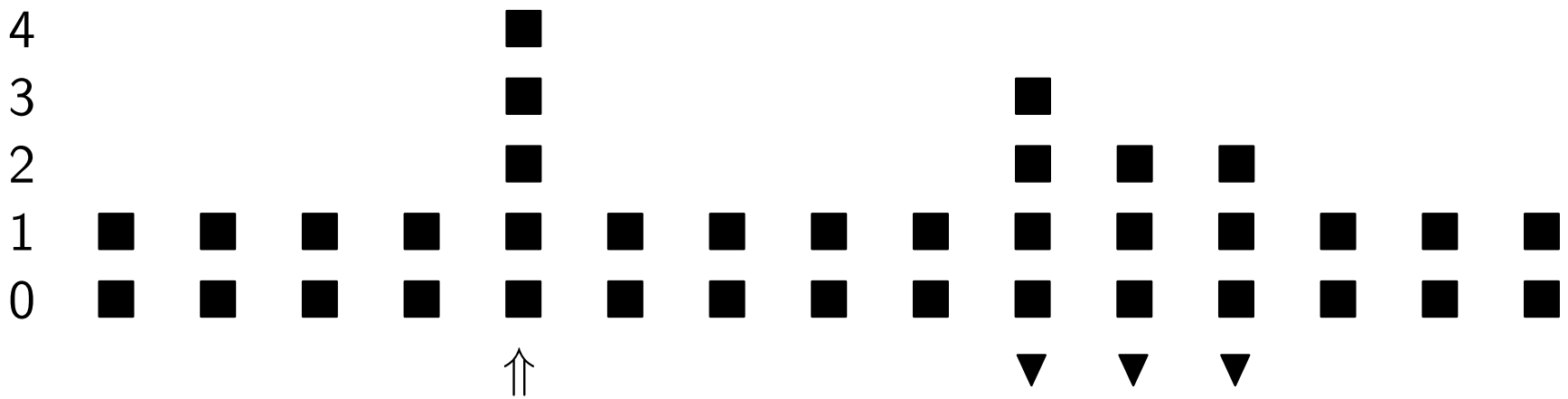

Belief-Based Utility

So what?

- Why care about the timing or reason for enjoying a vacation?
- Often: We don't. All captured by u(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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$\Rightarrow$ She **would not** buy the package, then **would not** go on the vacation.

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- 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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$\Rightarrow$ She **would not** buy the package, then **would not** go on the vacation.

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.
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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.

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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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  - We'll ignore.

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Belief-Based Utility

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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2nd attempt to model:

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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:

- $u_1 = m(c_1) + \phi[m(\widetilde{c}_2^1) + m(\widetilde{c}_3^1)]$
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- $u_3 = m(c_3)$

where $\widetilde{c}_\tau^t$ are Yugi's period-t beliefs about period-τ consumption.

- **What will Yugi do?**

Belief-Based Utility

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:
  - $c_1^{**} = \frac{1}{3+3\phi}Y, \qquad c_2^{**} = \frac{1+\phi}{3+3\phi}Y, \qquad c_3^{**} = \frac{1+2\phi}{3+3\phi}Y$
- How do these depend on ϕ?
  - Respectively decreasing, independent of, and increasing in ϕ.
  - Intuition?

- If $\phi = 1$, then:
  - $c_1^{**} = \frac{3}{18}Y, , \qquad c_2^{**} = \frac{6}{18}Y, \qquad c_3^{**} = \frac{9}{18}Y$

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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.
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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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- 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?
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$\Rightarrow$ Need a model of what are the limits to distortions.

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