TIME PREFERENCE: INTRODUCTION

EE416

SEM 1/2020

THE MARSHMALLOW EXPERIMENT

HTTPS://YOUTU.BE/QX_OY9614HQ

Temptation and Self-Control

- Standard economic theory says that if Marshmallows/any other consumptions of goods and services/any kind of activities made us eventually unhappy or have long-term net benefit lower than other choices, we wouldn’t have eaten/done/pursue them in the first place.

Temptation and Self-Control

- Standard economic agent has no self-control problem, they always do what is best in the long run.
- Standard economic agent is far-sighted.
- Standard economic agent is, when we are making choices across different time periods, time consistent.
  - e.g. initially he picks A over B, and later he will pick A over B!

Temptation and Self-Control

- Homo economicus has self-control problem, they might NOT do what is best in the long run.
- They sometimes are short-sighted.
- The problem for homo economicus is that when we are making choices across different time periods, our preferences can be **time**_inconsistent_.
  - e.g. initially we pick_A over B_, but later we pick_B over A_

Temptation and Self-Control

- Richard Thaler describes this as a battle between each person two selves:

the far-sighted "Planner"
and the myopic "Doer"

Some Implications of shortsightedness

British Petroleum decided not to replace blowdown drums at their Texas Refinery for 100’s of thoudsands of dollars and lost 100’s of millions paying off workers’ families for deaths.

VW dismissed the future risk of faking emissions tests on diesels.

Homebuyers before the housing crisis ignored future balloon payments.

Intertemporal Choice: Overview

The standard model:

Exponential discounting model

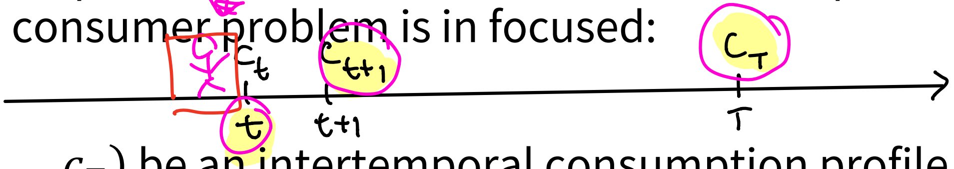
Behavioral models:

Present-biased model

(β-δ preferences)

The Exponential Discounting Model

- In intertemporal choices, the discount factor component of our general consumer problem is in focused:



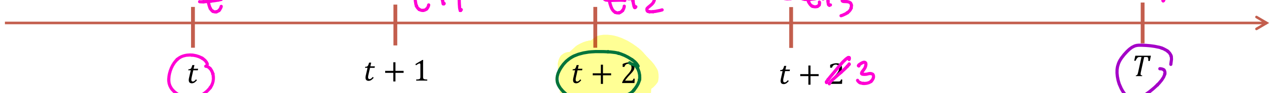
- Let $(c_t, \dots, c_T)$ be an intertemporal consumption profile

- Under the "usual assumption", preferences over $(c_t, \dots, c_T)$ can be represented by an intertemporal utility function $\mathrm{U}^{\mathrm{t}} = \mathrm{U}(c_t, \dots, c_T)$.

- Ramsey(EJ 1928) and Samuelson(RES 1937) proposed the following functional form:

The Exponential Discounting Model

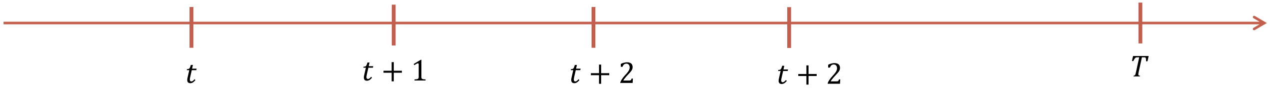
$$U^t = \underline{\qquad\qquad} + \underline{\qquad\qquad} + \underline{\qquad\qquad} + \underline{\qquad\qquad} + \cdots + \underline{\qquad\qquad}$$



- Time-separable intertemporal utility.
- $u_\tau \equiv u(c_\tau)$ is period-τ instantaneous utility.
- $(c_t, \dots, c_T)$ are choice variables.
- We usually assume $u'' < 0$, which motivates consumption smoothing.

The Exponential Discounting Model

$$U^t = u(c_t) + \delta u(c_{t+1}) + \delta^2 u(c_{t+2}) + \delta^3 u(c_{t+3}) + \cdots + \delta^{T-t} u(c_T)$$



- Standard model assumes that individuals discount the future using a discount factor.
- **δ is a_______________.** ρ is a________________.
- We usually assume ______________________which implies impatience.
    - The incentive to consume____________________

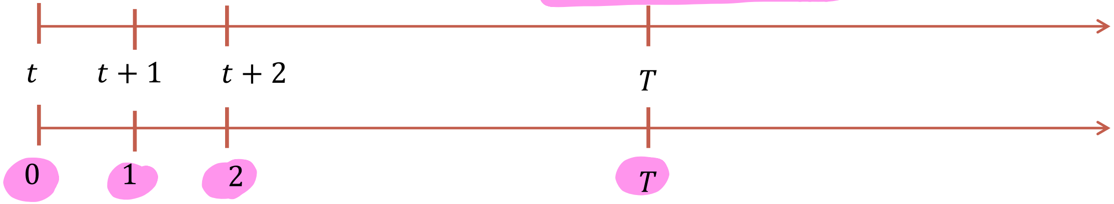
The Exponential Discounting Model

utility at time t

$$U(c_t, \dots, c_T) = \sum_{\tau=t}^{T} \delta^{\tau-t} U(c_\tau)$$

$$U(c_t, \dots, c_T) = \sum_{\tau=t}^{T} \left(\frac{1}{1+\rho}\right)^{\tau-t} U(c_\tau)$$

If t = 0, $U(c_0, \dots, c_T) = \sum_{\tau=0}^{T} \delta^{\tau} U(c_\tau)$



The Exponential Discounting Model

- Suppose δ is the discount factor between any two time periods, and $0 < \delta < 1$, and consider some consumption quantity x:

- From today standpoint, i.e. you are **at time 0:**
  - If consume x today ($t = 0$), get utility $u(x)$.
  - If consume x tomorrow ($t = 1$), get utility __δ__$u(x)$.
  - If consume x in two days ($t = 2$), get utility __δ^2__$u(x)$.
  - If consume x in three days ($t = 3$), get utility __δ^3__$u(x)$….
  - If consume x in T days ($t = T$), get utility __δ^T__$u(x)$.

The Exponential Discounting Model

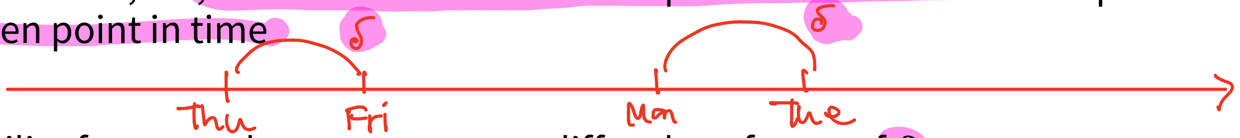
- From today standpoint, i.e. you are at time 0:
  - If I consume x each day for T days, my total utility is:
  - $U = u(x) + \delta u(x) + \delta^2 u(x) + \cdots + \delta^T u(x)$

- Because $\delta < 1$, the exponential discounting model captures the idea that individuals prefer consumption now to later.

The Exponential Discounting Model: (rational benchmark)

Time consistency

- The exponential discounting model assumes that time preferences are time consistent, i.e., individuals have the same preferences about future plans at any given point in time



❖ Utility from x today vs. tomorrow: differs by a factor of δ

❖ Utility from x tomorrow vs. day after: differs by a factor of δ

- The discount factor between any two periods is independent of WHEN the utility is evaluated.

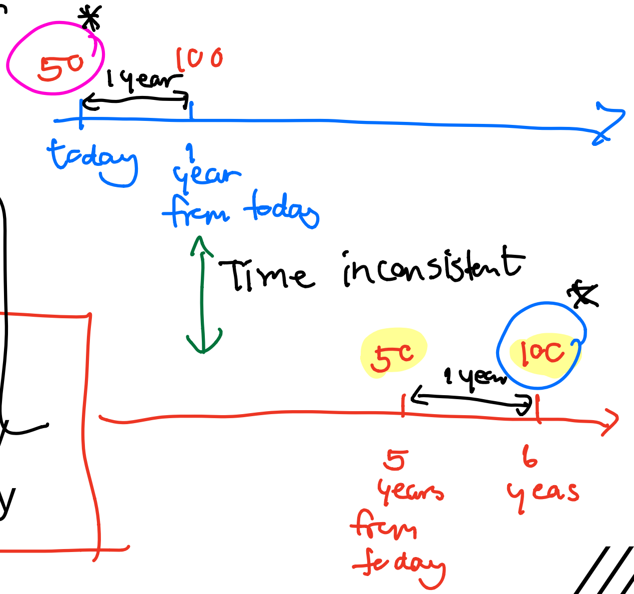
Exponential Discounting in the Lab

- But does this model fit people's actual behavior?

- Problem #1:
- A: I give you $50 today
- B: I give you $100 a year from today

- Problem #2:
- C : I give you $50 five years from today
- D : I give you $100 six years from today

Cannot be explained exponential discounting



Present Bias

- But an exponential discounting model says that we should always have **the same preferences** when:

- (i) *the ______________choices are the same* ($50 vs. $100); and
- (ii) *the ____________choices is the same* (each choice 1 year apart)

- For many, however, preferences are not time-consistent when one of the time periods being considered is **today**.

Present Bias

- A quasi-hyperbolic discounting (or present bias, or $\beta\delta$) model includes an **extra parameter ________** to account for this difference.

- With present bias, consuming x each day for T days yields total utility:

$$U = u(x) + \_\_\_\delta u(x) + \_\_\_\_\delta^2 u(x) + \cdots + \_\_\_\delta^T u(x)$$

$$U^t = u(c_t) + \beta\delta u(c_{t+1}) + \beta\delta^2 u(c_{t+2}) + \beta\delta^3 u(c_{t+3}) + \cdots + \beta\delta^{T-t} u(c_T)$$

Present-Biased preferences (β, δ preferences)

$$U^t = u(c_t) + \beta\delta u(c_{t+1}) + \beta\delta^2 u(c_{t+2}) + \beta\delta^3 u(c_{t+3}) + \cdots + \beta\delta^{T-t} u(c_T)$$

$$\mathrm{U}(c_t, \ldots, c_T) = u(c_t) + \_\_\_\_ \sum_{\tau=t+1}^{T} \delta^{\tau-t} u(c_\tau)$$

$\beta < 1$ reflects that I am ______ impatient in the short-run (i.e. between______ ______________________________).

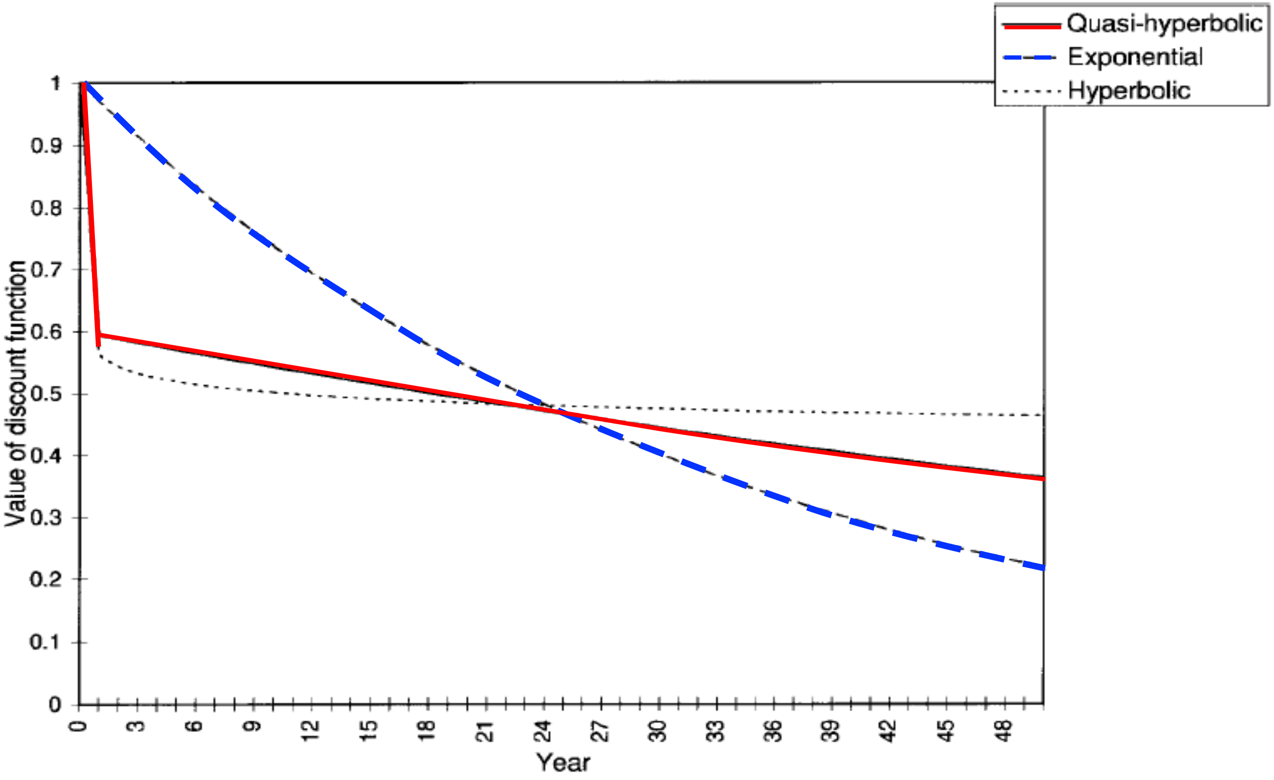


FIGURE I
Discount Functions

Laibson(1997, QJE)

Present-Biased preferences (β, δ preferences)

- An individual has two selves:
  - The “planner” who is farsighted, looks at future plan, and exhibit self-control in the future. (System-2 self)
  - The “doer” who is myopic and want immediate gratification again on **next “today”.** (System-1 self)
  - Planner is trying to promote long-term welfare, while must cope with the feelings and strong will of the Doer who is exposed to temptation.

Present-Biased preferences (β, δ preferences)

- Suppose you are deciding whether or not to do some activity:
  - Do activity: get payoff π_{now} immediately & get π_{later} next period
  - Do nothing: get payoffs equal to 0

- Question: Will I choose to do the activity, or not?
  - Consider two cases when:
    - "now" is later.
    - "now" is now.

Present-Biased preferences (β, δ preferences)

- If I'm making a choice about future plans (i.e. "now" is later), then I will choose to do the activity if:

$$U(activity) > U(nothing)$$

$$\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_$$

$$\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_$$

- If I'm making a choice about current plans (i.e. "now" is now), then I will choose to do the activity if:

$$U(activity) > U(nothing)$$

$$\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_$$

$$\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_$$

Present-Biased preferences (β, δ preferences)

- When do the two "selves" prefer to do the activity?

➢ "Planner" does activity if $\pi_{now} >$ ________

➢ "Doer" does activity if $\pi_{now} >$ ____________

Present-Biased preferences (β, δ preferences)

- Doer does activity more than Planner wants if:
  - Doer's threshold is lower than Planner's threshold.
  - $-\delta\pi_{later} > -\beta\delta\pi_{later}$
  - $\delta\pi_{later} < \beta\delta\pi_{later}$
  - ______________
- Doer does activity less than Planner wants if:
  - Doer's threshold is higher than Planner's threshold.
  - $-\delta\pi_{later} < -\beta\delta\pi_{later}$
  - $\delta\pi_{later} > \beta\delta\pi_{later}$
  - _______________

Activity Types: Investment vs. Indulgence

- Suppose the activity is an investment $\pi_{now} < 0, \pi_{later} > 0$:
  - Example: exercise, studying
  - Since $\pi_{later} > 0$, Doer does activity less than Planner prefers.

- Suppose the activity is an indulgence $\pi_{now} > 0, \pi_{later} < 0$:
  - Example: smoking, junk food
  - Since $\pi_{later} < 0$, Doer does activity more than Planner prefers.

- **Three Important Differences between exponential discounting and β, δ preferences**

(1.) Nature of impatience

(2.) Time consistency vs. Time inconsistency

(3.) Is there a strict preference for commitment?

Nature of impatience:

Exponential discounting implies constant discounting:

- **How you feel about a specific delay ______________of how far into the future that delay occurs.**
- If you prefer 15 utils in 26 weeks over 10 utils in 25 weeks, then you also prefer 15 utils next week over 10 utils now.

Nature of impatience:

β, δ preferences implies that you are more impatient about **now vs.future** trade-offs than you are about **future vs. further-future** trade-offs

- How you feel about a specific delay is __________of how far into the future that delay occurs.
- You prefer 15 utils in 26 weeks over 10 utils in 25 weeks, but you might prefer 10 utils now over 15 utils next week.

Time consistency vs. Time inconsistency:

Exponential discounting implies time consistency.

- If you currently prefer 15 utils on Dec 11 over 10 utils on Dec 4,
- then on Dec 4 you will still prefer 15 utils on Dec 11 over 10 utils on Dec 4 (now).

Time consistency vs. Time inconsistency:

β, δ preferences can generate time inconsistency.

- Even if you currently prefer 15 utils on Dec 11 over 10 utils on Dec 4,
- When Dec 4 arrives you might instead prefer 10 utils on Dec 4 (now) over 15 utils on Dec 11.

Is there a strict preference for commitment?

- Imagine that on Dec 4 you will choose between 10 utils on Dec 4 vs. 15 utils on Dec 11.
- Imagine further that you have the option to eliminate this future choice by committing yourself now to getting 13 utils on Dec 11.

Is there a strict preference for commitment?

Exponential discounting implies no strict preference for commitment.

- In this example, you would definitely____________.

Is there a strict preference for commitment?

β, δ preferences can generate a strict preference for commitment.

- If you predict that on Dec 4 you would choose 10 utils on Dec 4 over 15 utils on Dec 11, and if you currently prefer 15 utils on Dec 11 to 10 utils on Dec 4,
- then you might commit now to eliminate the future choice on Dec 4.