Economics of Behavioral Finance

Lecture 6

Investors' Time Preferences

Investors only care about delays in payoff in terms of interest gained or lost.

Is this realistic?

Time Preference Modeling

Standard economics assumes that a decision maker discounts future by a constant fraction each time period—δ, which is called the discount factor

Overall utility = utility in t=1 + δ * utility in t=2

+ δ^2 * utility in t=3 + …

Estimates of δ

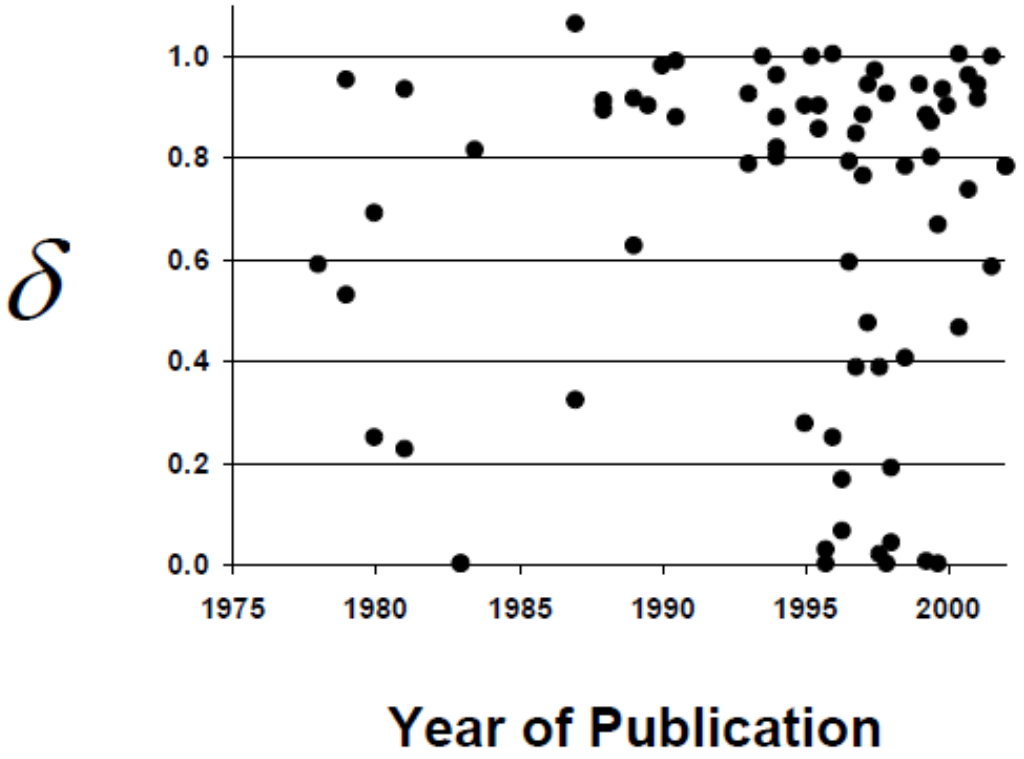


Figure 3.2: Estimated Annual δ's from Economics Research

Question

- Suppose I am going to give you $100 at this moment

- Suppose I can instead give you money after two weeks. How much money would it takes for you to not take this $100 now?

Discounting

- We got an median of ____ in class
- That works out as δ = ____ using two weeks as the time period
- If the standard model is true, the median student in our class should be indifferent between $100 now and ___^{26} * $100 = _____ in one year

Real World Example—Payday Loan

- Short term—usually 2 weeks or less
- Intended to be paid back at payday, thus the name
- Very high effective interest rate
  - e.g. 10% interest for a two-week loan
  - Effectively $(1.1^{26} - 1) =$ **1001%**
  - Could go up to 7000% in reality

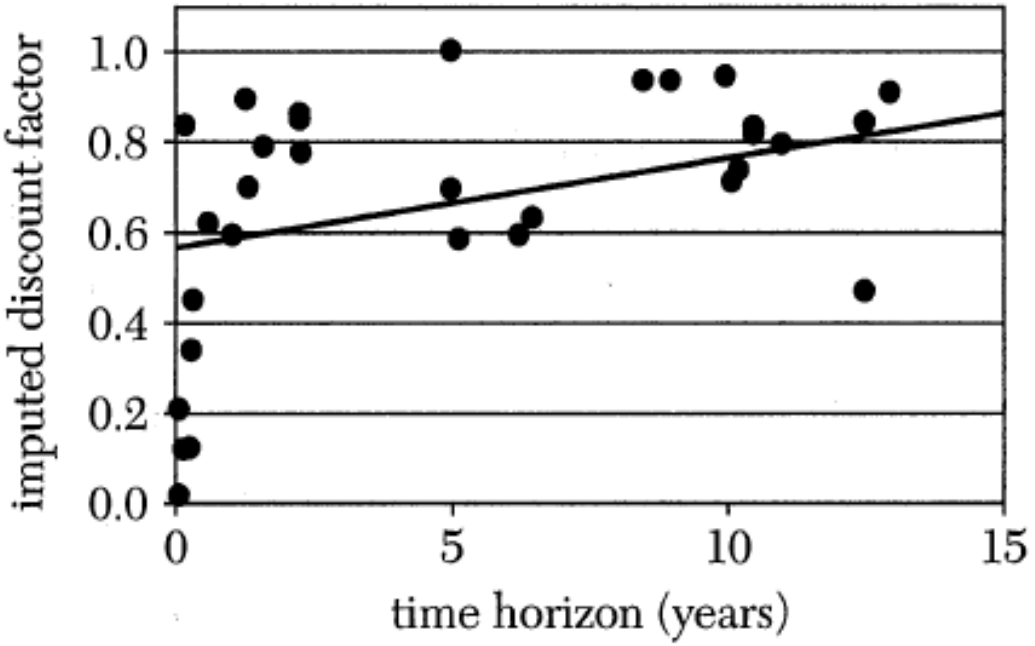
Discounting

- There has to be something wrong here
- What could be the reason?
  - Transaction cost of getting the future payment
  - (but in our in-class “experiment”, you are coming to class anyway in two weeks)
  - Miscalculation (but repeatedly?)
  - Competition for limited resources (the cookies at home will be gone by next week, so I would rather eat them now than later)

Impatience

- Maybe people are just impatient
  - There is something special about having something now
  - This behavior is called **present-biased**
- Another thought experiment
  - $100 in ten years, and $120 in ten years and two weeks
  - Which one would you choose?

Implied Discount Rate from Experiment



Discounting

- Discount factor seems to have a hyperbolic shape
  - Hard to model

- An approximation: β-δ discounting

- Overall utility = utility now + β (δ * utility in t=2
  + δ^2 * utility in t=3 + …)

β-δ discounting

- If $\beta = 1$, we get back the standard model in economics

- If $\beta < 1$, the decision maker values the current period more than the difference between two future periods

Time-Inconsistency

- If $\beta < 1$, the decision maker is time-inconsistent, because her preferences for the next period changes when the next period actually comes

- The standard economic model, on the other hand, is time-consistent. Preferences are stable over time

An Example

- Suppose a student has a midterm in 3 days
- She can either spread out the studying over 2 days or cram everything in 1 day.
- Cramming is more costly (because of lower efficiency for example),
  - Cost per day if spread out studying over 2 days = 1
  - Cost per day if cram everything in 1 day = 2.4
- Assume $\beta = 0.7$, $\delta = 0.9$ and utility each period = 10 – cost of studying

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Sophistication

- If the decision maker is aware of her time-inconsistency, she is **sophisticated**. If she does not, she is **naive**

- Back to the studying example. Will the student be willing to commit herself to start working on the 1st day?

- A Sophisticate will take steps to **commit** herself to a plan if possible

An Application: Scheme $6000

- Scheme $6000
  - A one-time stimulus measure announced in the 2011-2012 Budget
  - $6,000 cash transfer for every permanent resident of Hong Kong
  - A choice of receiving an additional $200 by delaying the application for ~6 months.

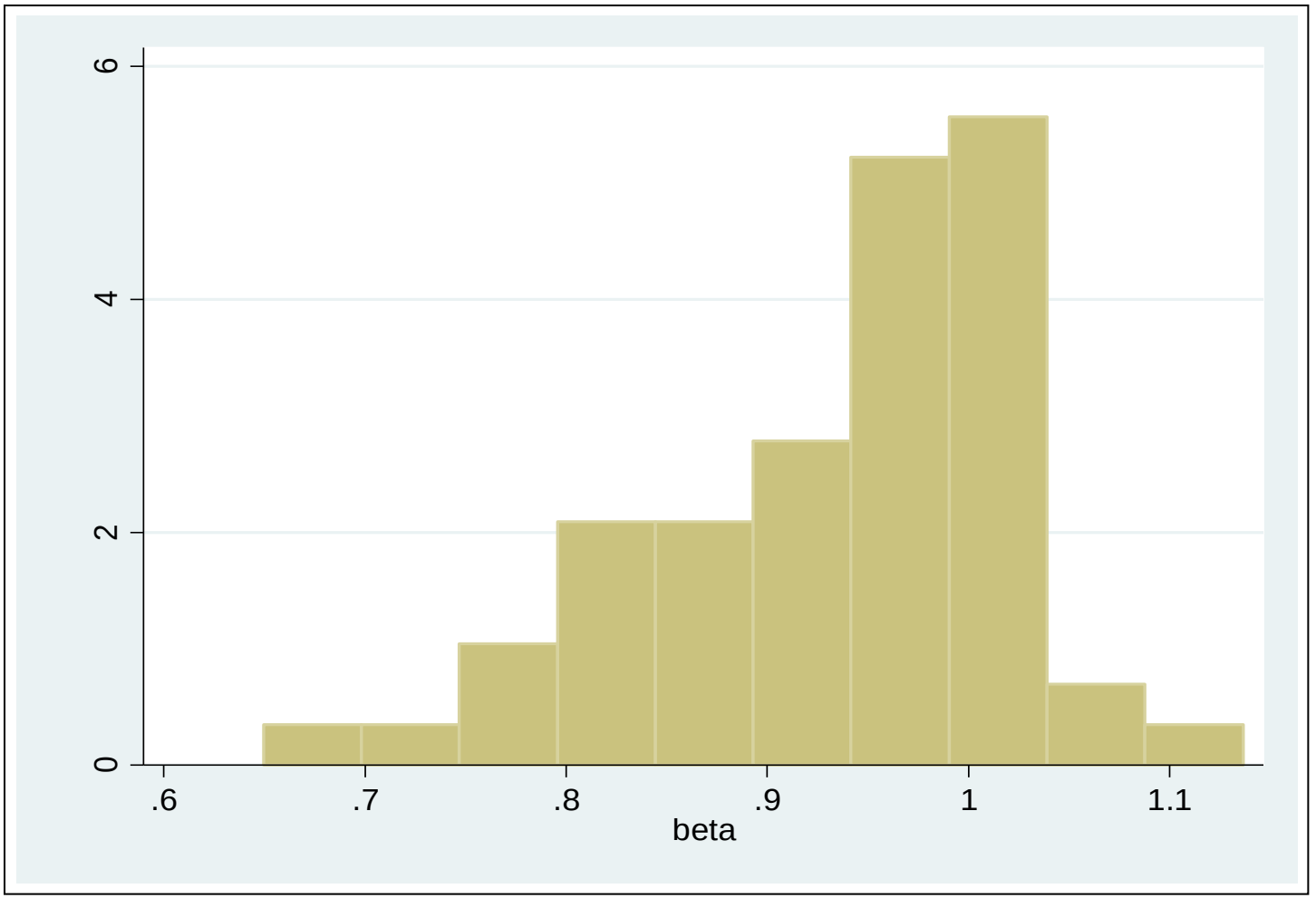
Research Methodology

- Data collection
  - By questionnaire, non-incentivized
  - Sample Sizes: 59

- Questions
  - Q1: How much bonus is needed for delaying the receive of $6000 for **6 months**?
  - Q2: How much bonus is needed for delaying the receive of $6000 for **12 months**?
  - Q3 How much bonus is needed for delaying the receive of $6000 for **24 months**?

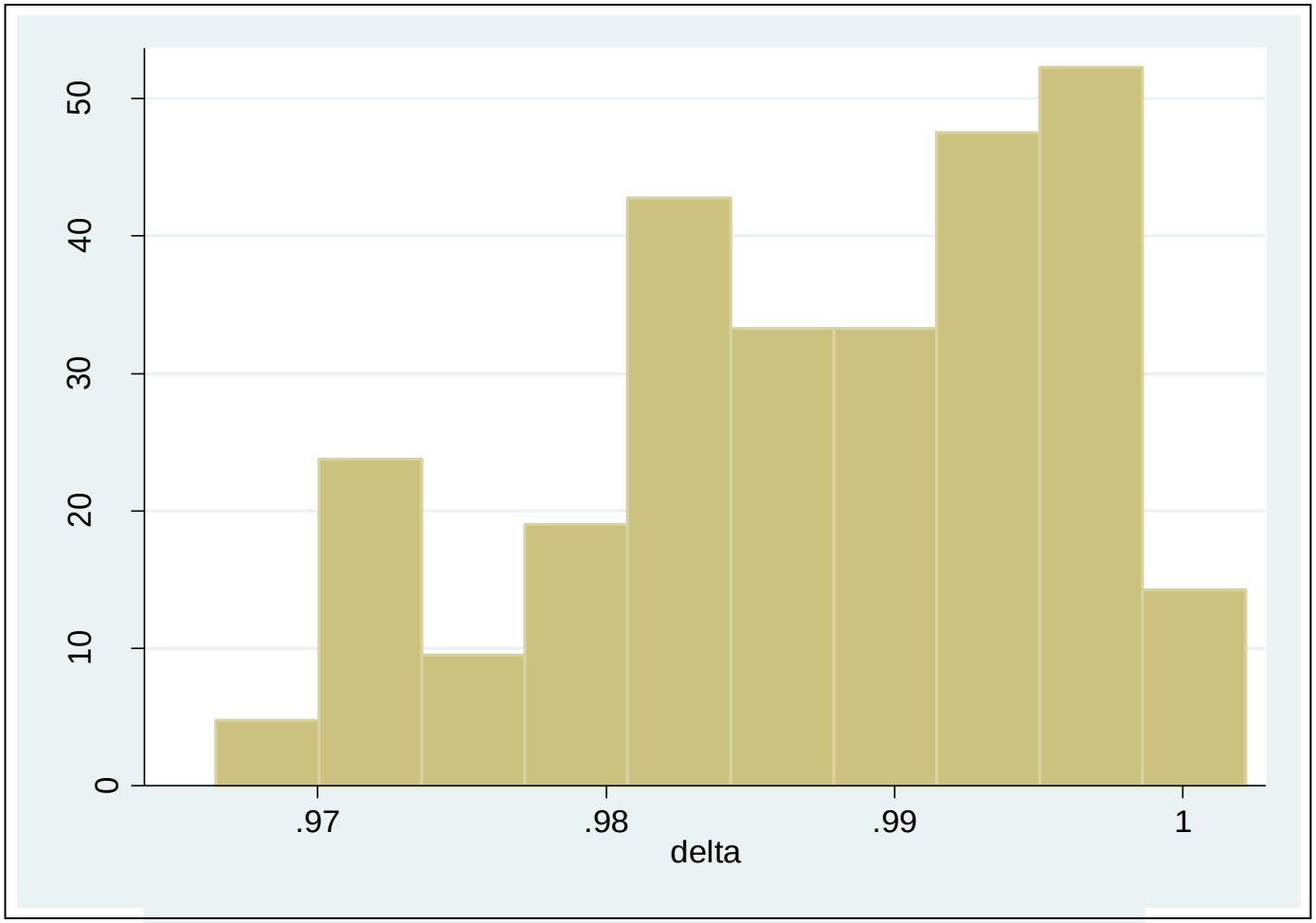
Source: Lam, Sin Kin. "Choice of receiving reward on time or delaying---the crucial factor." *CUHK STOT paper*.

Beta



Variable	Obs	Mean	Std. Dev.	Min	Max
beta	59	.933388	.0943753	.6495584	1.136408

Delta



Variable	Obs	Mean	Std. Dev.	Min	Max
delta	59	.9877592	.0084378	.9664801	1.002159

Comparing delta with the $200 postponing reward

- **Delta**: time-consistent discounting
  - $\delta_{year} = (\delta_{month})^{12}$

Variable	Obs	Mean	Std. Dev.	Min	Max
delta_yr	59	.8666335	.0865908	.6642244	1.026219

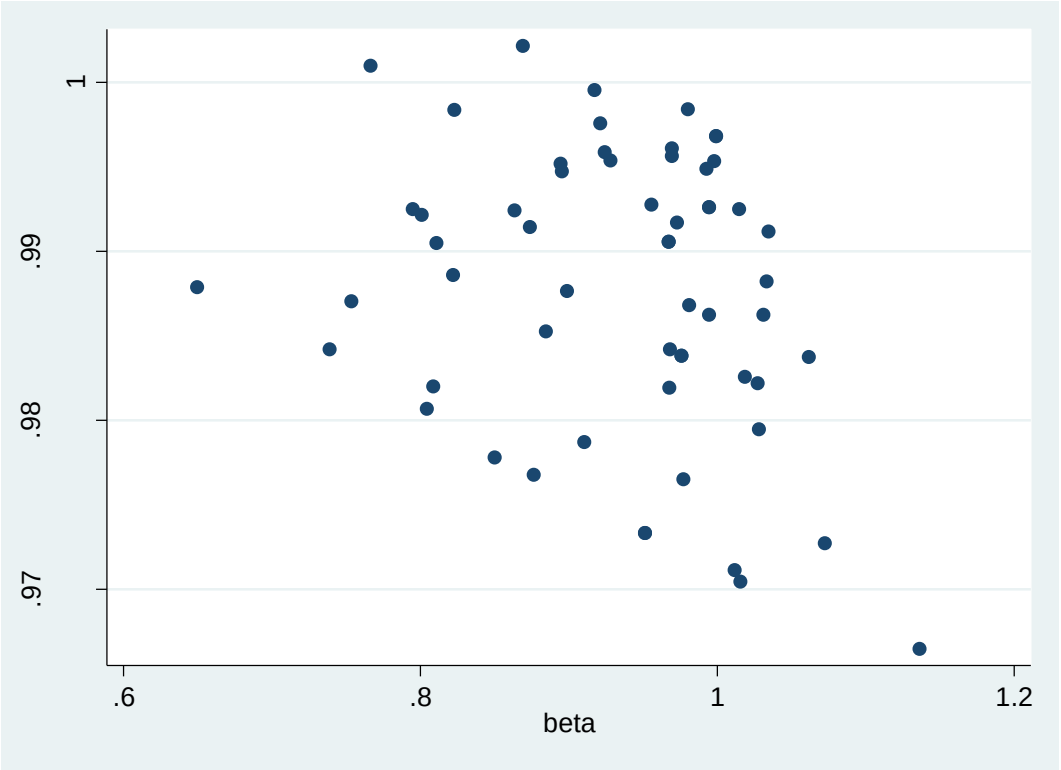
Variable	Obs	Mean	Std. Dev.	Min	Max
delta_halfyr	59	.9297597	.0470964	.8149997	1.013025

- $\delta = \frac{1}{1+r}$
  - Estimated **annual** discount rate = 1-1/ Delta_yr = 1-1/0.8666335 = **15%**
  - Estimated **6-month** discount rate = 1-1/0.9297597 =**7.55%**

- Reward return: $200/$6000= **3.33%**
  - The return of the reward is lower the estimated average discount rate

Relationship between Beta and Delta

- Beta and Delta are negatively correlated
  - Coef: -2.81
- It is statistically significant at the 5.4% (P>t : 0.054)



Does commitment really help?

- Employees at Philips Electronics
- Test group subjects can choose to increase their savings by 1-3% automatically each year. Increase will stop once savings rate reach 10%
- Among those who choose to join the program, savings went up by ~1.5%

TABLE 4
AVERAGE SAVING RATES (%) FOR PHILIPS ELECTRONICS

DATE	EMPLOYEES WHO WERE ALREADY SAVING IN DECEMBER 2001: Joined SMarT	EMPLOYEES WHO WERE ALREADY SAVING IN DECEMBER 2001: Did Not Join SMarT	EMPLOYEES WHO WERE NOT SAVING IN DECEMBER 2001: Joined SMarT	EMPLOYEES WHO WERE NOT SAVING IN DECEMBER 2001: Did Not Join SMarT	ALL EMPLOYEES
	A. Control Group				
Observations		7,405		7,053	14,458
Pre-SMarT (December 2001)		5.65		.00	2.90
Post-SMarT (March 2002)		5.76		.70	3.29
	B. Test Group (Divisions A and O Combined)				
Observations	180	339	36	260	815
Pre-SMarT (December 2001)	5.26	5.38	.00	.00	3.40
Post-SMarT (March 2002)	6.83	5.72	5.03	1.55	4.61
	C. Division A				
Observations	66	190	10	163	449
Pre-SMarT (December 2001)	5.47	5.48	.00	.00	3.12
Post-SMarT (March 2002)	7.32	5.97	6.80	1.54	4.38
	D. Division O				
Observations	114	149	26	77	366
Pre-SMarT (December 2001)	5.14	5.25	.00	.00	3.74
Post-SMarT (March 2002)	6.55	5.41	4.35	1.58	4.89

NOTE.—The "test" group consists of individuals at Divisions A and O.

Source: Thaler, Richard H. and Shlomo Benartzi. 2004. "Save more Tomorrow: using Behavioral Economics to Increase Employee Saving." *Journal of Political Economy*.

Do People Want Commitment?

- 99 students in a class were required to write three papers.
  - 51 were allowed to pick the deadlines for their own papers. 1% late penalty for each day.
  - 48 students were given evenly-spaced deadlines
- Self-imposed deadlines were significantly earlier than the last day of class
- The group with evenly-spaced deadlines have higher grades, suggesting that students in the first group were not setting deadlines optimally

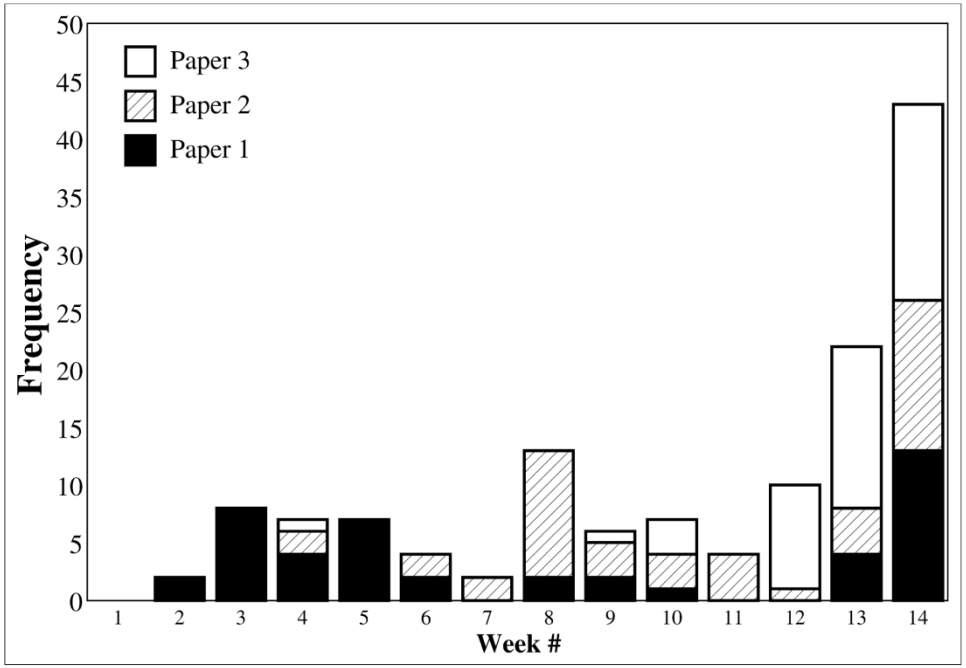


Fig. 1. Frequency distribution of the declared deadlines in Study 1 as a function of the week of class (Week 1 is the first week, and Week 14 the last week), plotted separately for the three papers.

Source: Ariely, Dan and Klaus Wertenbroch. "Procrastination, Deadlines, and Performance: Self-Control by Precommitment." *Psychological Science*.

Optimality of Commitment

- 60 students were paid to proofread an artificially-generated article
  - 1/3 have evenly-spaced deadlines
  - 1/3 have self-imposed deadlines
  - 1/3 have a single deadline, set to the end of the experiment
  - $1 late penalty for each day

- The evenly-spaced-deadline group has the highest performance, while the end-deadline group has the lowest. This suggests people do not set commitment optimally by themselves

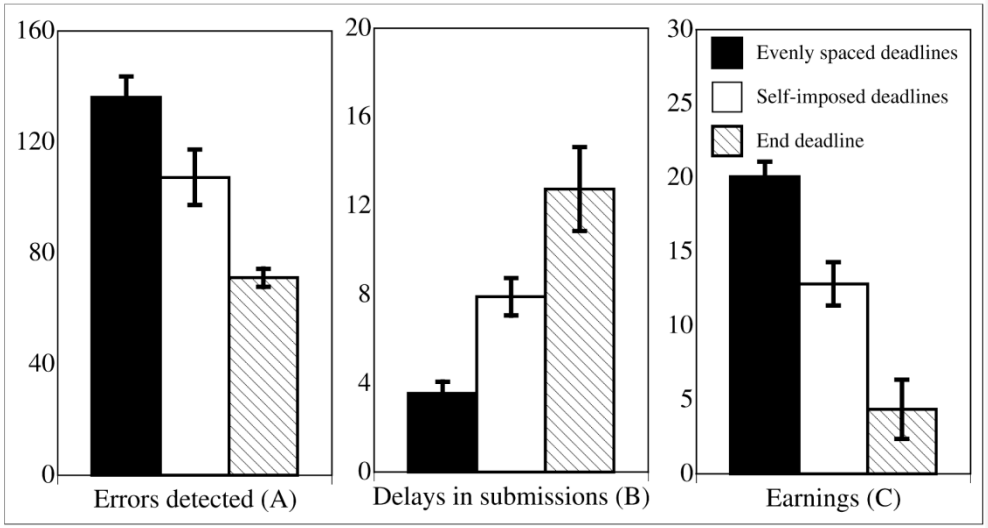


Fig. 2. Mean errors detected (a), delays in submissions (b), and earnings (c) in Study 2, compared across the three conditions (error bars are based on standard errors). Delays are measured in days, earnings in dollars.

Source: Ariely, Dan and Klaus Wertenbroch. 2002. "Procrastination, Deadlines, and Performance: Self-Control by Precommitment." *Psychological Science*.

Future Bias

- When you ask people whether they are willing to wait a day for equally amount of money, sometimes they say yes

- This violates exponential discounting, since discounting should mean that people always prefer getting the money earlier
  - Note that this violation is in opposite direction of present-biasedness

- In this case, people are having a **future bias**, in the sense that they are more patience than what the exponential discounting predicts
  - Takeuchi (2011) estimated in an experiment that people are future biased for an average of 22.4 days

Source: Takeuchi, Kan. "Non-parametric test of time consistency: Present bias and future bias." *Games and Economic Behavior*.

Alternative Theories

- Suppose your friend tells you earlier that she does not want to eat ice-cream, but now when she is in front of some ice-cream, she eats it
- One explanation is she is **present-biased**: eating ice-cream is unhealthy, but this mostly affect the future, while the enjoyment of eating ice-cream is immediate
- It is also possible that she is tempted by the presence of the ice-cream and knowingly choose to eat the ice-cream. This is modeled as **temptation utility**
- Finally, maybe she is not even thinking rationally. The presence of ice-cream causes her to enter a “hot” state, in which she acts by instinct. This is called **Cue Theory** or **Two-Self Model**