Is the Evidence for Hyperbolic Discounting in Humans Just An Experimental Artefact?

by

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March 2005

Abstract. We question the behavioral premise underlying Ainslie's claims about hyperbolic discounting theory. The alleged evidence for humans can be easily explained as an artefact of experimental procedures that do not control for the credibility of payment over different time horizons. In appropriately controlled and financially motivated settings, human behavior is consistent with conventional exponential preferences.

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Ainslie's book, *Breakdown of Will*, is based on hyperbolic discounting theory. This theory predicts that the individual could behave in a dynamically inconsistent manner, by holding and acting on preferences at one point in time that contradict the preferences of the same individual at a later date. However, before worrying about ways that the individual could address possible dynamic inconsistencies, we need to be sure that the behavioral premise is valid.

A critical design feature in the empirical literature on hyperbolic discounting is the use of a time delay to the *early* payment option in order to control for any confounding effects from fixed premia due to transactions costs. The use of this front end delay (FED) means that one cannot differentiate between "quasi-hyperbolic preferences" and "exponential preferences," and we do not believe that any credible design can do so.

Ainslie [2001; p.47] concludes his discussion of the empirical evidence on hyperbolic discounting with the following passage:

> There is extensive evidence that both people and lower animals spontaneously value future vents in inverse proportion to their expected delays. The resulting hyperbolic discount curve is seen over all time ranges, from seconds to decades. Because a hyperbolic curve is more bowed than the exponential curve that most utility theories go by, it describes a preference pattern that these theories would call irrational: It predicts temporary preferences for the poorer but earlier of the two alternative goals during the time right before the poorer alternative becomes available.

This passage confounds three things. The first is whether the discount rate varies with the length of the time horizon over which it is being elicited, such as it does with continuously hyperbolic preferences. The second is whether the discount rate for a given horizon and elicited with a FED is different than the discount rate for the same horizon and elicited with no FED. For an experimenter, and for subjects evaluating the credibility of being paid, these are very different questions. The potential importance of this distinction seems to have been first noticed by Benzion,

Rapoport and Yagil [1989].[1] It was also highlighted by Roberts [1991; p.344], in the context of comments on Ainslie and Haendel [1983] and Winston and Woodbury [1991]. The third issue is whether non-exponential preferences imply dynamic inconsistency when one relaxes the restrictive assumption of temporally separable preferences (Machina [1989] and McClennan [1990]).

The FED design was introduced into discount rate experiments to address concerns about differential credibility. While it may not completely solve the potential credibility problem, it arguably mitigates it. The FED also serves to equalize any other unspecified differences subjects may perceive between the two payment options. For example, if subjects have a "passion for the present," they demand a premium in order to accept a delay of any length. In a choice between immediate payment and delayed payment, this premium is attached only to the delayed payment. Thus the subject is being asked to compare "good apples today" with "bad apples tomorrow," confounding the discount rate with the credibility of receiving the commodity. However, if both payments are delayed, the premium applies to both choices and thus becomes irrelevant to a choice between them. Harrison, Lau and Williams [2002] use a FED in a major field experiment in Denmark, and find that elicited discount rates are proximately invariant with respect to horizon.

There are, however, many field settings in which the relevant issue is what the discount rate is for "money today" versus "money in the future."[2] Even if the experimenter faces the inferential problem of having to then tease apart the effects of time horizon from credibility, transactions, or other subjective costs, it is entirely appropriate that experiments with no FED be considered. If

[1] Holcomb and Nelson [1992] re-examine the role of a FED with monetary payoffs, motivated by a concern that Benzion, Rapaport and Yagil [1989] only studied hypothetical choices. Their FED was only one day, so it is not obvious that the subjects viewed this as substantially different from there being no FED. They observed no apparent effect of the one-day FED on behavior.

[2] Such settings might include individual decisions of whether to consume now or save for future consumption, or to purchase a more expensive but energy efficient appliance. We believe that individual decisions involving more significant sums of money or public policy decisions are better characterized as having a FED.

there is a finding that discount rates are not constant when there is no FED, then it is a matter for interpretation as to whether this is a subjective differential cost effect or a time-inconsistency effect (or both).

Evidence for the behavioral importance of a 30-day FED was provided by Coller and Williams [1999]. In one of their experimental treatments they had no such delay, and the results from those experiments can be directly compared to their other experiments. After some minor modifications to their statistical analysis, their results provide evidence that the use of a FED decreases elicited rates by a large amount. The average effect of having no FED is to increase elicited rates by 28 percentage points, with a 95% confidence interval between 52 percentage points and 3 percentage points. Coller, Harrison and Rutström [2003] provide additional laboratory evidence on the role of the FED, and show that a 7-day FED is sufficient to overcome the effects of subjective transactions costs.

Finally, there have been no direct tests of the implication of dynamically inconsistency choice behavior using real rewards. Such longitudinal tests require that one allow for possible changes in the states of nature that the subject faces, since they may confound any in-sample comparisons of discount rate functions at different points in time. Harrison, Lau and Rutström [2005] report the results of a large-scale panel experiment undertaken in the field to examine this issue and find evidence strikingly consistent with dynamic consistency.

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