Discount rates, procrastination and getting it over with
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This essay is motivated by a perceived discrepancy in conventional treatments of procrastination. Individuals have been observed treating negative future outcomes in seemingly inconsistent ways. Procrastination is well documented as is individuals' awareness of the time-inconsistency of preferences that results in sub-optimal procrastination.[1] Ariely and Wertenbroch (2002) found that, in an effort to avoid procrastinating, people set their own deadlines sub-optimally, that is too early. This is the case of individuals knowing that they will procrastinate the negative outcome, doing the assignment and the disutility that results, and committing themselves to a deadline to prevent that procrastination. I will call this AW behaviour. Lowenstein (1987) and Caplin and Leahy (1997) provide experimental evidence of individuals seeking to expedite the utility loss or requiring increasing compensation to delay the negative outcome, in both cases a non-lethal electric shock, for a longer period. Thaler (1981) also provides evidence of a preference to expedite a loss. This 'get it over with' behaviour will be termed CL behaviour.

The primary question is why two negative, non-monetary outcomes (shocks and homework) are treated differently by individuals.

This paper is a brief look at how such behaviour might arise using a simple discreet time approach. The set up is as follows. A student has a simple pay-off stream $U = (\theta,\theta,\theta,\theta,...)$ where θ>1. She arrives at class on the first day of term and is given an assignment with a deadline four weeks out. Doing the assignment will take one week and the final mark will be independent of when the assignment is done. Let's say the teacher is stern and failure to submit an assignment will result in death so students are compelled to have it completed by the deadline The week that she does the assignment will result in a payoff of 1. At the time the assignment is given (say Monday morning of the first week) she has a choice between 4 pay-off streams

(1) $U_1 = (1,\theta,\theta,\theta); U_2 = (\theta,1,\theta,\theta); U_3 = (\theta,\theta,1,\theta); U_4 = (\theta,\theta,\theta,1)$

Assume that the future is discounted, so δ<1. I look first at the failure of the conventional discounted utility (DU) approach. Under the assumptions of DU theory, an individual will be indifferent to when she completes her assignment for a discount rate of $\delta^*=1$ (See A1). Given the assumption that δ<1, she will procrastinate until the last period and then only do it to avoid death. Conventional discounted utility can explain procrastination but fails to capture the 'get it over with' mentality or even why people wish to avoid procrastination as the welfare, in this case, is the same regardless of when the assignment is done.

If we take into account anticipatory anxiety, as done in Caplin and Leahy (1997), we capture both the CL behaviour and explain the welfare effect that leads individuals to employ commitment technology to avoid procrastinating. Let γ be the payoff in

[1] This paper looks at the procrastination, delay, of undesirable outcomes. There is evidence (Lowenstein and Prelec, 1993) of individuals procrastinating a desirable outcome in order to capture some positive anticipatory utility.

periods preceding completion of the assignment where $1<\gamma<\theta$ capturing the anxiety the student feels about needing to get the assessment done. She now faces the payoff streams

(2) $U_1^a = (1,\theta,\theta,\theta); U_2^a = (\gamma,1,\theta,\theta); U_3^a = (\gamma,\gamma,1,\theta); U_4^a = (\gamma,\gamma,\gamma,1)$

The discount rate that leaves the student indifferent in this case can be shown to be

(3) $$\frac{1-\gamma}{1-\theta} = \delta_a^*$$

where the ***a*** subscript indicates it is the anticipatory result (See A2). For any $\delta<\delta_a^*$, the student will procrastinate. However, we know that $\delta_a^*<\delta^*=1$ so procrastination is not a forgone conclusion as before. Adding 1 to both sides and rearranging yields

(4)
$$\frac{1-\gamma}{1-\theta} - \frac{1-\theta}{1-\theta} = \delta_a^* - 1$$
$$\frac{1}{1-\theta}(\theta-\gamma)+1 = \delta_a^*$$

Define $\beta=\theta-\gamma$

(5) $$-\frac{1}{1+\theta}\beta + 1 = \delta_a^*$$

note that

(5) $$-1<-\frac{1}{1+\theta}\beta<0$$

and

(6) $$\frac{\partial \delta_a^*}{\partial \beta} = -\frac{1}{1+\theta}$$

So, as $(\theta-\gamma)=\beta\to\infty, \delta_a^*\to 0$ and CL behaviour completely dominates at the limit. Let θ be fixed and the different values of β reflect different levels of dread manifested in the reduction of utility from θ to $\gamma>1$. Note that if we were to increase the fixed level of θ, the marginal effect of changes in β diminish. The discount rate is a ratio of the two payoffs, as they go to infinity, a marginal change in the difference will have a decreasing effect on that ratio.

The contrasting behaviour of procrastinating some bad outcomes, while bringing other bad outcomes forward in time can be explained using anticipatory (dis)utilities. However, this simple result implies different discount rates for different types of

consumption (the shock vis-à-vis the assessment) and is a major departure from DU theory.

There is a lot of evidence that the discount rate does vary across different types of consumption based on whether that consumption is a loss or a gain, how far into the future it is, the size of the loss or gain and the duration of the loss or gain. There is also evidence of a distinction between monetary and non-monetary outcomes. Such characteristics might be included in a parameterization of a discount factor. What follows is an attempt to capture the observed behaviour with respect to the duration of the welfare loss; the time the student needs to complete the assignment.

If the student needs two weeks to complete the assignment it can be shown that the threshold discount rate will be

$$(7)\ \sqrt{\frac{1-\gamma}{1-\theta}} = \delta_T^*$$

and more generally, if we extend the number of periods until the deadline, the discount rate is given by

$$(8)\ \left(\frac{1-\gamma}{1-\theta}\right)^{1/T} = \delta_T^*$$

where T is the duration of the negative outcome (See A3). So, as the duration of the negative outcome increases the threshold discount rate at which individuals will or will not procrastinate, increases. If we assume θ is bounded, then it can be seen that a permanent negative outcome, say the amputation of a leg, will be procrastinated as long as possible. That is, given a bounded θ, as $T\to\infty$, $\delta_T^*\to 1$, procrastination dominates.

Equation (8) can be re-expressed as

$$(9)\ \left(-\frac{1}{1+\theta}\beta + 1\right)^{1/T} = \delta_T^*$$

which gives the discount rate as a function of $\boldsymbol{T}$, $\boldsymbol{\beta}$ and $\boldsymbol{\theta}$. This simple parameterization captures two observed behaviours that conventional DU theory fails to adequately explain and help explain why some negative outcomes are procrastinated and others are brought forward: 1) more fleeting negative outcomes are expedited and 2) those outcomes generating more dread are brought forward. Both results can help explain why a shock might be brought forward while doing an assignment might be procrastinated.

<u>Conclusion</u>

This paper is motivated by the observed difference in discounting various types of negative outcomes. It has been shown that in a simple, discreet time context, discount rates can be parameterized using anticipatory utilities so as to be more consistent with observed behaviour with respect to the scheduling of negative outcomes. The development of the theoretical model should seek to follow the work done in, as done in Caplin and Leahy (1997) and Lowenstien (1987), moving to more fully parameterize the discount rate. Empirically, the next step might be to categorize different types of consumption according at to some set of criteria (duration of disutility, some measure of dread) and estimate the various parameters.

Bibilography

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