Example of procrastination

4 Periods where the value of doing work in each period $\boldsymbol{\tau}$ is fixed as $\boldsymbol{v_\tau = 13}$.

Cost in each period of doing work is the value of the alternate activity: watching a movie $\boldsymbol{c_\tau}$=(3, 5, 8, 13).

Assuming immediate costs, but future benefits, the utility of completing the activity at time $\boldsymbol{\tau}$ during period $\boldsymbol{t}$ is

$$\boldsymbol{U^t(\tau)} = \begin{cases} \boldsymbol{\beta v_\tau - c_\tau}, & \boldsymbol{\tau = t} \\ \boldsymbol{\beta v_\tau - \beta c_\tau}, & \boldsymbol{\tau > t} \end{cases}$$

β here refers to their level of time-inconsistency: $\beta < 1$ are hyperbolic discounters.

NAIFS

Naifs have $\boldsymbol{\beta = 0.5}$, but do not take into account that they will change their choice when the period actually comes.

	Day 1	Day 2	Day 3	Day 4
Do report on Day 1	$\boldsymbol{0.5\overline{v} - 3 = 3.5}$	-	-	-
Do report on Day 2	$\boldsymbol{0.5(\overline{v} - 5) = 4}$	$\boldsymbol{0.5\overline{v} - 5 = 1.5}$	-	-
Do report on Day 3	$\boldsymbol{0.5(\overline{v} - 8) = 2.5}$	$\boldsymbol{0.5(\overline{v} - 8) = 2.5}$	$\boldsymbol{0.5\overline{v} - 8 = -1.5}$	-
Do report on Day 4	$\boldsymbol{0.5(\overline{v} - 13) = 0}$	$\boldsymbol{0.5(\overline{v} - 13) = 0}$	$\boldsymbol{0.5(\overline{v} - 13) = 0}$	Has to do report

On day 1, they plan to do work on day 2. On day 2, they plan to do work on day 3 and so on.

Strategies in each period are thus (N,N,N,Y)

SOPHISTICATES

Sophisticates have $\boldsymbol{\beta = 0.5}$, but do take into account the choices that they will make in future given that they know their type.

It can be solved by backward induction.

If he reaches period 4 without doing the report, he has to do it then, so the strategy for that period is Y. So we have (- , - , - , Y)

If he reaches period 3 without doing the report, his payoff from doing it then is $\boldsymbol{0.5\overline{(v - 8)} = -1.5}$. If he does not do the report, he predicts that he will do it in period 4: we thus compare it to $\boldsymbol{U^3(4)}$

which is $\mathbf{0.5(\overline{v} - 13) = 0}$ which gives a higher payoff. Thus, he chooses N in period 3. So we have (-, -, N, Y).

If he reaches period 2 without doing the report, his payoff from doing it then is $\mathbf{0.5\overline{v} - 5 = 1.5}$. If he does not do the report, he predicts that he will do it in period 4: we thus compare it to $\mathbf{U^2(4)}$ which is $\mathbf{0}$ which gives a lower payoff. Thus, he chooses Y in period 3. So we have

(- , Y, N, Y).

In period 1, his payoff from doing it then is $\mathbf{0.5\overline{v} - 3 = 3.5}$. If he does not do the report, he predicts that he will do it in period 2: we thus compare it to $\mathbf{U^1(2)}$ which is $\mathbf{0.5(\overline{v} - 5)}$ which gives a higher payoff. Thus, he chooses N in period 1.

So, we have (N, Y, N, Y), which is the full perception perfect strategy.

Unlike the naïve agent, he completes the report at an earlier date (period 2).

Background stuff

1. *Immediate Costs.*—If a person completes the activity in period τ, then her intertemporal utility in period $t \leq \tau$ is

$$U^t(\tau) \equiv \begin{cases} \beta v_\tau - c_\tau & \text{if } \tau = t \\ \beta v_\tau - \beta c_\tau & \text{if } \tau > t. \end{cases}$$

Definition 2: A *perception-perfect strategy for TCs* is a strategy $\mathbf{s}^{tc} \equiv (s_1^{tc}, s_2^{tc}, \ldots, s_T^{tc})$ that satisfies for all $t < T$ $s_t^{tc} = Y$ if and only if $U^t(t) \geq U^t(\tau)$ for all $\tau > t$.

Definition 3: A *perception-perfect strategy for naifs* is a strategy $\mathbf{s}^n \equiv (s_1^n, s_2^n, \ldots, s_T^n)$ that satisfies for all $t < T$ $s_t^n = Y$ if and only if $U^t(t) \geq U^t(\tau)$ for all $\tau > t$.

Definition 4: A *perception-perfect strategy for sophisticates* is a strategy $\mathbf{s}^s \equiv (s_1^s, s_2^s, \ldots, s_T^s)$ that satisfies for all $t < T$ $s_t^s = Y$ if and only if $U^t(t) \geq U^t(\tau')$ where $\tau' \equiv \min_{\tau > t} \{\tau | s_\tau^s = Y\}$.