Planning To Self-Control

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Motivation

Self-control problem:

- longer-term interest (u) in conflict with (short-term) choice inclination (v)
- *example:* run (r) vs. movie (m) after work

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Plans:

- help steer own choices
- effective mechanism of SC (Mischel and Patterson, 1976; Gollwitzer, 1999; Gollwitzer and Sheeran, 2006; Lynch et al., 2010; Ludwig et al., 2018)

Planning To Self-Control (PTSC)

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- plan $\emptyset \neq P \subseteq A$ induces $x_P := \operatorname*{argmax}_P v$ at cost $\kappa(P, A)$
- DM plans optimally:

$$U(A) = \max_{P \subseteq A} u(x_P) - \kappa(P, A) \qquad (\star)$$

and

$$c(A) = x_{P^*}, \text{ where } P^* \text{ solves } (\star).$$

Contributions & Literature

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- application to intertemporal choice:
  1. Magnitude Effect: (cf. Thaler, 1981; Green et al., 1997; Noor, 2011; Andersen et al., 2013; Meyer, 2015; Sun and Potters, 2022)

$$(30\$, now) \succ (50\$, week) \text{ but } (300\$, now) \prec (500\$, week)$$

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  2. Poverty Trap: wealthy DMs use self-control to save, poor DMs over-consume (cf. Balboni et al., 2022)

Axioms

Setting: $|X| < \infty$, $\mathcal{A} = 2^X \backslash \emptyset$
Primitives: $(\succsim, c(\cdot))$ with transitive

$$x \gtrless y :\iff x \succ \{x, y\} \succsim y \text{ and } x \gg y :\iff x \sim \{x, y\} \succ y$$

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$$c(A \cup B) \in A \implies A \succsim A \cup B \qquad \text{(PfC)}$$

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Better Choice

$$x \gg c(A) \implies x \cup A \succ A \tag{BC}$$

Representation

1. $(\succsim, c(\cdot))$ is PTSC iff its satisfies Axioms PfC, CP and BC.

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1. $(\succsim, c(\cdot))$ is PTSC iff its satisfies Axioms PfC, CP and BC.
2. PTSC is equivalent to a generic SC-cost representation where

$$U(A) = \max_{x \in A} u(x) - C(x, A) \qquad (\star\star)$$

and

$$c(A) \text{ solves } (\star\star).$$

Fixed Cost & increasing SC

Consider $U(A) = \max_{x \in A} u(x) - C(x, A)$

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- with fixed cost, only no or full SC can be optimal

Let $W(A) = \max_{x \in A} u(x)$ and $V(A) = u(\text{argmax}_A \, v)$, then

- $U(A) = \max\{W(A) - k, V(A)\}$ i.e. SC is optimal iff

$$\underbrace{W(A) - V(A)}_{\textit{utility-stakes}} > k$$

- SC optimal only if stakes are sufficiently large

1. Magnitude Effect

- Let $u(m, \tau) = \delta^\tau \cdot m$ be such that $\delta^\tau l - s > 0$ and let v be such that the immediate payoff would be chosen. Then

$$(\lambda s, 0) \prec (\lambda l, \tau) \iff \lambda \left(\delta^\tau l - s\right) > k$$

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- more generally, if $u(m,\tau) = D(\tau) \cdot m$ and an immediate payoff would be chosen under v, then the DM chooses among dated payoffs according to (cf. Benhabib et al., 2010)

$$D(\tau, m) \cdot m \ where \ D(\tau, m) = \begin{cases} D(\tau) - \frac{k}{m} & \tau > 0 \\ 1 & \tau = 0 \end{cases}$$

2. A Simple Consumption-Savings Problem

Let $w > 0$ be initial wealth and

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Let $w > 0$ be initial wealth and

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where W, V solve the Bellman equations

$$W(w) = \max_{c \in [0,w]} \left[(1-\delta)c^{\sigma} + \delta U(R(w-c))^{\sigma}\right]^{\frac{1}{\sigma}}$$

and

$$V(w) = \left[(1-\delta)c_{NSC}^{\sigma} + \delta U(R(w-c_{NSC}))^{\sigma}\right]^{\frac{1}{\sigma}}$$

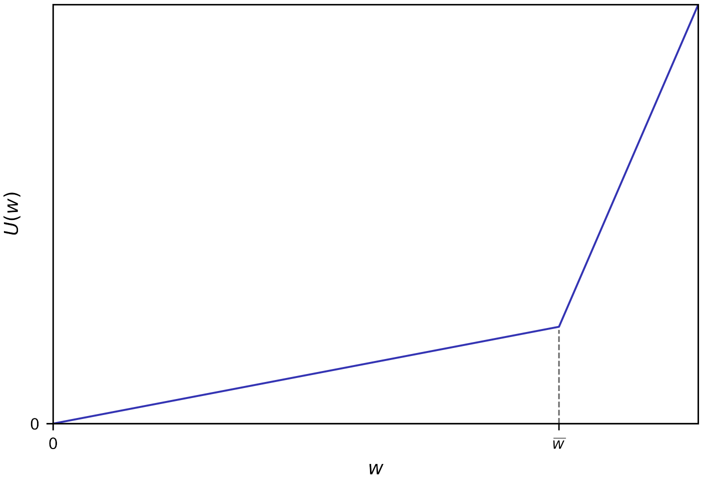
such that c_{NSC} solves the NSC problem with *present bias* $\beta < 1$:

$$\max_{c \in [0,w]} \left[(1-\delta)c^{\sigma} + \beta\delta U(R(w-c))^{\sigma}\right]^{\frac{1}{\sigma}}.$$

Constant EIS: $\gamma = 1/(1-\sigma)$

2. Value Function U

for $\beta = 0.1$, $\delta = 0.9$, $\gamma = 0.8$, $k = 0.1$ and $R = 1.03$



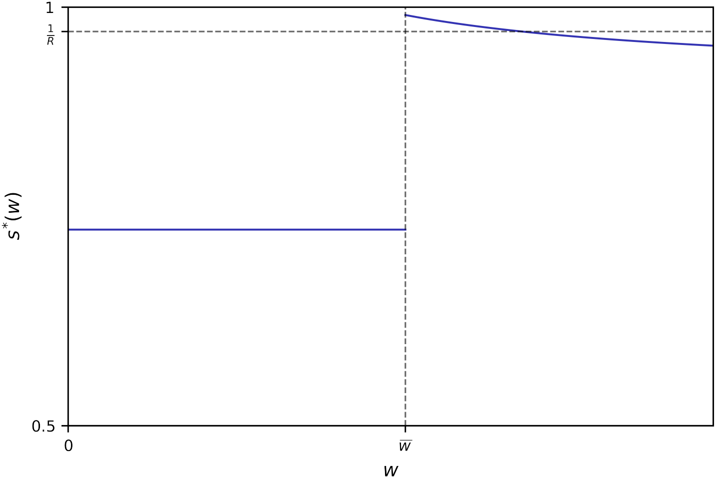
2. Optimal Savings

Costly SC creates excess savings:

$$w - c^*(w) = \begin{cases} (1-\mu_{NSC}) \cdot w & \text{if } w < \bar{w} \\ \underbrace{(1-\mu_{SC}) \cdot w}_{\text{benchmark savings}} + \underbrace{\mu_{SC} \frac{a}{b_{SC} R}}_{\text{excess savings}} & \text{if } w \geq \bar{w} \end{cases}$$

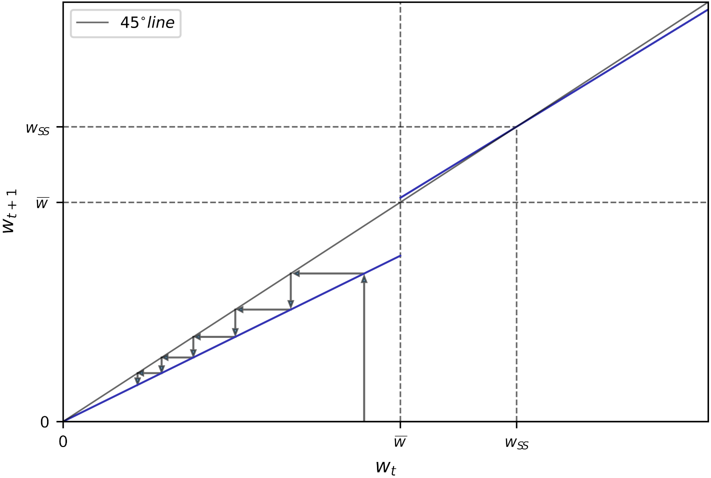
2. Savings Rate

for $\beta = 0.1$, $\delta = 0.9$, $\gamma = 0.8$, $k = 0.1$ and $R = 1.03$



2. Poverty Trap

Wealth dynamics for $\beta = 0.1$, $\delta = 0.9$, $\gamma = 0.8$, $k = 0.1$ and $R = 1.03$



Conclusion

- characterized PTSC in terms of three simple Axioms
- consistent with increasing self-control (for example, produced by fixed cost)
- may explain Magnitude Effect and (individual-level) poverty traps

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◂ Literature