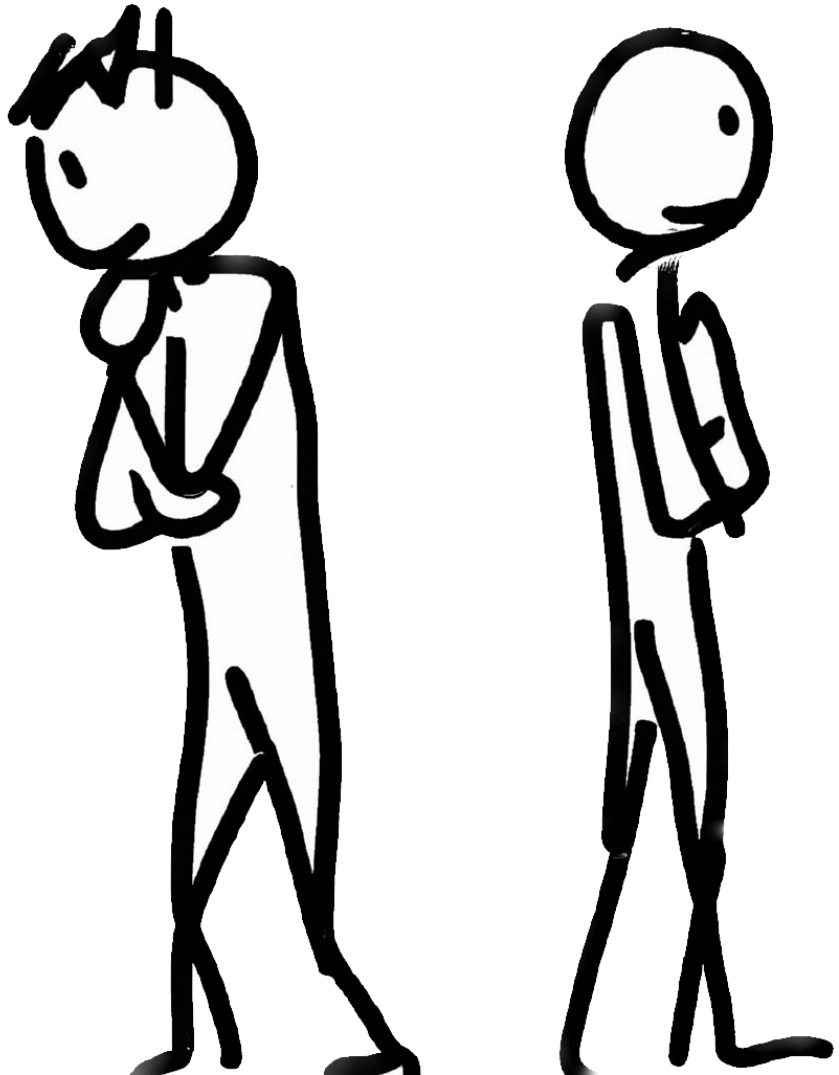
Sophisticated present bias examples

Notes on Behavioural Economics

Jason Collins



Naïve and sophisticated present-biased agent

$\beta = 0.95$

$\delta = 0.95$

$u(x_n) = x_n$

$100 next week or $110 in two weeks?

The naïve agent

At $t = 0$, \$100 next week or \$110 in two weeks?

The naïve agent

At $t = 0$, \$100 next week or \$110 in two weeks?

$$
\begin{aligned}
U_0(1, \$100) &= \beta\delta u(x_1) \\
&= \beta\delta u(\$100) \\
&= 0.95 \times 0.95 \times 100 \\
&= 90.25
\end{aligned}
$$

The naïve agent

At $t = 0$, \$100 next week or \$110 in two weeks?

$$
\begin{aligned}
U_0(2, \$110) &= \beta\delta^2 u(x_2) \\
&= \beta\delta^2 u(\$110) \\
&= 0.95 \times 0.95^2 \times 110 \\
&= 94.31
\end{aligned}
$$

The naïve agent

At $t = 0$, \$100 next week or \$110 in two weeks?

$$U_0(1, \$100) = 90.25 < 94.31 = U_0(2, \$110)$$

The naïve agent

At $t = 1$, \$100 today or \$110 next week?

$$U_1(1, \$100) = u(x_1)$$
$$= u(\$100)$$
$$= 100$$

The naïve agent

At $t = 1$, \$100 today or \$110 next week?

$$
\begin{aligned}
U_1(2, \$110) &= \beta\delta u(x_2) \\
&= \beta\delta u(\$110) \\
&= 0.95 \times 0.95 \times 110 \\
&= 99.275
\end{aligned}
$$

The naïve agent

At $t = 1$, \$100 today or \$110 next week?

$$U_1(1, \$100) = 100 > 99.275 = U_1(2, \$110)$$

The sophisticated agent

At $t = 1$, \$100 today or \$110 next week?

The sophisticated agent

At $t = 1$, \$100 today or \$110 next week?

$$U_1(1, \$100) = u(x_1)$$
$$= u(\$100)$$
$$= 100$$

The sophisticated agent

At $t = 1$, \$100 today or \$110 next week?

$$
\begin{aligned}
U_1(2, \$110) &= \beta\delta u(x_2) \\
&= \beta\delta u(\$110) \\
&= 0.95 \times 0.95 \times 110 \\
&= 99.275
\end{aligned}
$$

The sophisticated agent

At $t = 1$, \$100 today or \$110 next week?

$$U_1(1, \$100) = 100 > 99.275 = U_1(2, \$110)$$

The sophisticated agent

At $t = 0$, \$100 next week?

	Naive agent	**Sophisticated agent**
$t = 0$	\$110 at $t = 2$	\$100 at $t = 1$
$t = 1$	\$100 at $t = 1$	\$100 at $t = 1$

Naïve and sophisticated present-biased agent

$\beta = 0.5$

$\delta = 1$

OK movie: 6

Good movie: 10

Great movie: 16

The naïve agent

$$U_0(0, \mathrm{OK}) = u(\mathrm{OK})$$

$$= 6$$

The naïve agent

$$U_0(1, \text{good}) = \beta\delta u(\text{good})$$

$$= 0.5 \times 1 \times 10$$

$$= 5$$

The naïve agent

$$U_0(2, \text{great}) = \beta\delta^2 u(\text{great})$$

$$= 0.5 \times 1^2 \times 16$$

$$= 8$$

The naïve agent

$$U_0(2, \text{great}) > U_0(0, \text{OK}) > U_0(1, \text{good})$$

The naïve agent

$$U_1(1, \text{good}) = u(\text{good})$$

$$= 10$$

The naïve agent

$$U_1(2, \text{great}) = \beta\delta u(\text{great})$$

$$= 0.5 \times 1 \times 16$$

$$= 8$$

The naïve agent

$$U_1(1, \text{good}) = 10 > 8 = U_1(2, \text{great})$$

The sophisticated agent

The sophisticated agent

$$U_1(1, \text{good}) = u(\text{good})$$

$$= 10$$

The sophisticated agent

$$U_1(2, \text{great}) = \beta\delta u(\text{great})$$

$$= 0.5 \times 1 \times 16$$

$$= 8$$

The sophisticated agent

$$U_1(1, \text{good}) = 10 > 8 = U_1(2, \text{great})$$

The sophisticated agent

$$U_0(0, \mathrm{OK}) = u(\mathrm{OK})$$

$$= 6$$

The sophisticated agent

$$U_0(1, \text{good}) = \beta\delta u(\text{good})$$

$$= 0.5 \times 1 \times 10$$

$$= 5$$

The sophisticated agent

$$U_0(0, \mathrm{OK}) = 6 > 5 = U_0(1, \mathrm{good})$$

(0, -$10)

(1, -$15)

(2, -$25)

The naïve agent

$\beta = 0.5$

$\delta = 1$

$u(x_n) = x_n$

The naïve agent

$$U_0(0, -\$10) = u(-\$10)$$

$$= -10$$

The naïve agent

$$U_0(1, -\$15) = \beta\delta u(-\$15)$$

$$= 0.5 \times 1 \times (-15)$$

$$= -7.5$$

The naïve agent

$$U_0(2, -\$25) = \beta\delta^2 u(-\$25)$$

$$= 0.5 \times 1^2 \times (-25)$$

$$= -12.5$$

The naïve agent

$$U_0(1, -\$15) > U_0(0, -\$10) > U_0(2, -\$25)$$

The naïve agent

$$U_1(1, -\$15) = u(-\$15)$$

$$= -15$$

The naïve agent

$$U_1(2, -\$25) = \beta\delta u(-\$25)$$

$$= 0.5 \times 1 \times (-25)$$

$$= -12.5$$

The naïve agent

$$U_1(2, -\$25) = -12.5 > 15 = U_1(1, -\$15)$$

(0, -$10)

(1, -$15)

(2, -$25)

The sophisticated agent

$\beta = 0.5$

$\delta = 1$

$u(x_n) = x_n$

The sophisticated agent

$$U_1(1, -\$15) = u(-\$15)$$

$$= -15$$

The sophisticated agent

$$U_1(2, -\$25) = \beta\delta u(-\$25)$$

$$= 0.5 \times 1 \times (-25)$$

$$= -12.5$$

The sophisticated agent

$$U_1(2, -\$25) = -12.5 > 15 = U_1(1, -\$15)$$

The sophisticated agent

$$U_0(0, -\$10) = u(-\$10)$$

$$= -10$$

The sophisticated agent

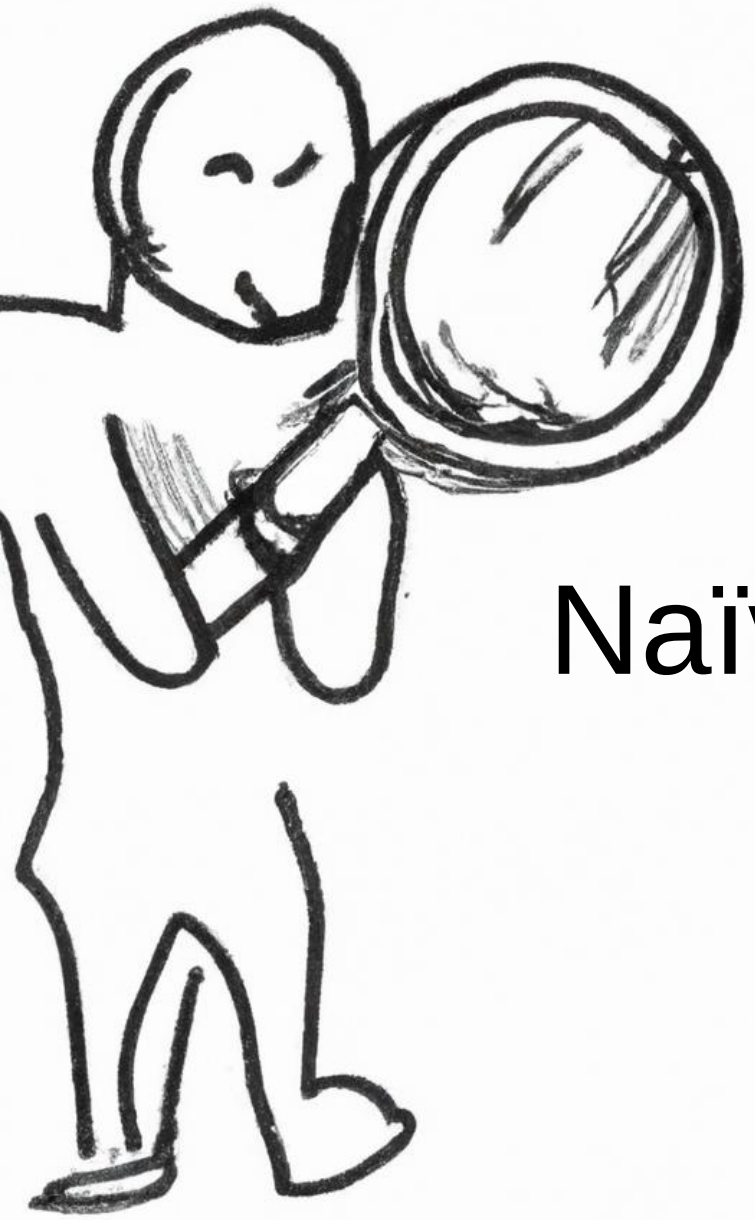
$$U_0(2, -\$25) = \beta\delta^2 u(-\$25)$$

$$= 0.5 \times 1^2 \times (-25)$$

$$= -12.5$$

The sophisticated agent

$$U_0(0, -\$10) = -10 > 12.5 = U_0(2, -\$25)$$



Naïve

Sophisticated