

01 / LEARN THE METHOD

Present Bias Calculations

Beta-delta discounting worked practice

For introductory behavioral economics. All rewards are hypothetical utility points, with linear utility, certainty, and no transaction costs. This educational model is not investment advice.

Keep these distinctions clear

1. Use $V = u_0 + \beta \cdot \sum (\delta^t \cdot u_t)$ for $t \geq 1$. The present receives weight 1; every future payoff receives β once, plus its time-specific δ power.
2. For $0 < \beta < 1$, the model gives extra weight to the immediate present. $\beta = 1$ reduces it to exponential discounting.
3. When comparing two strictly future rewards, β is common to both. It does not create the same immediate-versus-future wedge until one reward becomes immediate.
4. A preference reversal needs the decision date to change. A single preference for a smaller reward now does not, on its own, establish present bias.

Worked example: $\beta = 0.6$ and $\delta = 0.9$

Option A gives 50 points now: $V(A) = 50$.

Option B gives 80 points in one period: $V(B) = 0.6 \cdot 0.9 \cdot 80 = 43.2$. Choose A.

Move both rewards one period into the future: $V(A) = 0.6 \cdot 0.9 \cdot 50 = 27$; $V(B) = 0.6 \cdot 0.9^2 \cdot 80 = 38.88$. Now choose B.

The reversal comes from the special weight on the present, not a change in reward size.

02 / TRY IT WITHOUT THE KEY

Practice set

Write the reasoning, not only the answer.

1. With $\beta = 0.6$ and $\delta = 0.9$, compare 40 points now with 80 in one period.
2. Under the same parameters, what one-period reward makes a person indifferent to 50 points now?
3. Set $\beta = 1$ and keep $\delta = 0.9$. Compare 50 now with 80 in one period.
4. With $\beta = 0.6$ and $\delta = 0.9$, compare 50 in one period with 80 in two periods.
5. A learner values 80 in two periods as $\beta^2 * \delta^2 * 80$. Correct the formula and compute the value.
6. Studying costs 7 points now and yields 10 next period. With $\beta = 0.6$ and $\delta = 1$, compute net value now.
7. One period earlier, both the 7-point study cost and the 10-point benefit are future. With $\beta = 0.6$ and $\delta = 1$, compute planned net value and compare with question 6.
8. Explain why choosing 50 now over 80 tomorrow, by itself, cannot distinguish present bias from ordinary impatience.

03 / CHECK AND CORRECT

Answers with reasoning

1. Now: 40. Later: $0.6 * 0.9 * 80 = 43.2$. Choose the later reward.
2. Solve $0.54 * X = 50$. $X = 92.59259...$, about 92.59 points. For a strict preference, the later reward must exceed the exact threshold.
3. The later value is $1 * 0.9 * 80 = 72$, which exceeds 50. Choose later.
4. Values are 27 and 38.88 respectively. Choose 80 in two periods.
5. Beta applies once to a future payoff: $0.6 * 0.9^2 * 80 = 38.88$, not 23.328.
6. Net value is $-7 + 0.6 * 10 = -1$. The current self prefers not to study in this model.
7. Planned value is $0.6 * (-7 + 10) = 1.8$. The earlier self plans to study, while the later self declines: a preference reversal.
8. A sufficiently small exponential delta also favors 50 now. Compare choices with both rewards delayed, and account for risk or other explanations, before attributing a pattern to present bias.

Reference reading

[MIT Economics, Behavioral Development Economics, time-preference discussion](#)

[MIT Economics, Quasi-hyperbolic discounting lecture slides](#)

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