Problem Set 11

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Question 0

0A: Yes, I followed the honor code on this problem set.

0B: 15hrs

Question 1: The dual-self model

In this question, we'll determine the amount L for a commitment contract that a person might make on StickK.com to exercise in one year. Assume that $\beta=0.7$ and the discount *rate* is 5% per year. (Remember the difference between discount *rate* and discount *factor*.) Assume that Exercise has a onetime health benefit b of $20 that accrues four (4) years after the exercise happens, and a personal utility cost c of $5. The game is like the StickK.com game from lecture, except that the one-time benefit accrues four years after exercise instead of one year after exercise.

A) We discussed three types of people in the lecture slides: standard (time-consistent) people, sophisticated present biased people, and naïve present biased people. Which of those three types might use StickK.com? Why?

- The standard time consistent people do not need the stickK program because their wants are already aligned with their actions. The naive ones need the program, but they do not realize they need the program because they do not know they are inclined to be not consistent. The sophisticated present bias people would be the ones who might use StickK.com because they realize that they are not time consistent and would accordingly and use Stickk.

B) If price p is such that the Present self Exercises if and only if the Long-run self chooses StickK, what is the maximum p such that the "Long-run self" chooses StickK instead of No StickK?

$$\beta = 0.7, \quad \delta = \frac{1}{1.05} = 0.95, \quad b = \$20, \quad c = \$5$$
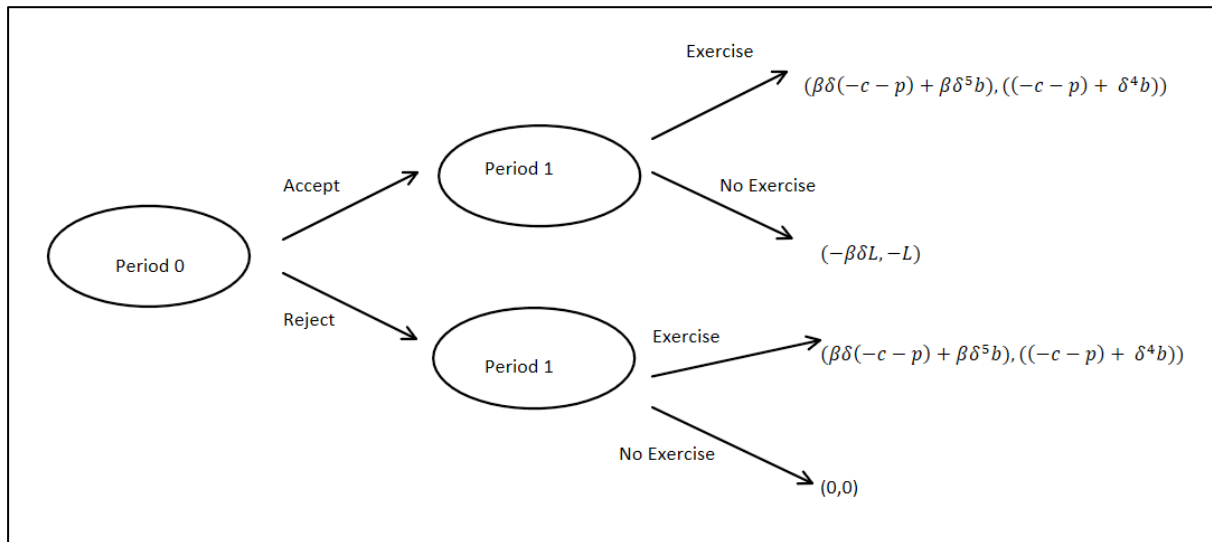
When Stickk is chosen, p is such that the consumer will exercise.
$(-c - p) + \beta\delta^4 b \geq -L$
$p \leq L + 6.403$
When No Stickk is chosen, p is such that the consumer will not exercise.
$0 \geq (-c - p) + \beta\delta^4 b$
$p \geq 6.403$
When Stickk is chosen, the consumer will exercise. When No Stickk is chosen, he will not exercise. Stickk will be chosen over No Stickk in such P.
$\beta\delta(-c - p) + \beta\delta^5 b \geq 0$
$p \leq 11.29$
$11.29 is the maximum p such that the "Long-run self" chooses StickK instead of No StickK

C) Assume that $p=10$. What is the minimum amount L that could induce the "Present self" to Exercise instead of sit on the Couch?
$p \leq L + 6.403$
$10 \leq L + 6.403$
$3.597 \leq L$
3.597 is the minimum amount L that could induce the "Present self" to exercise instead of sit on the couch.

Question 2: Pricing consumption goods with present biased consumers

Consider the DellaVigna and Malmendier (2004) health club pricing model considered in class. Imagine that $\delta=0.95$, $b=20$, $c=10$, $a=5$, and $K=2$. If consumers are present biased, their $\beta=0.7$.

A) What is/are the firm's profit-maximizing (L, p) if all consumers are time-consistent?

Time-consistent: $\beta = 1$
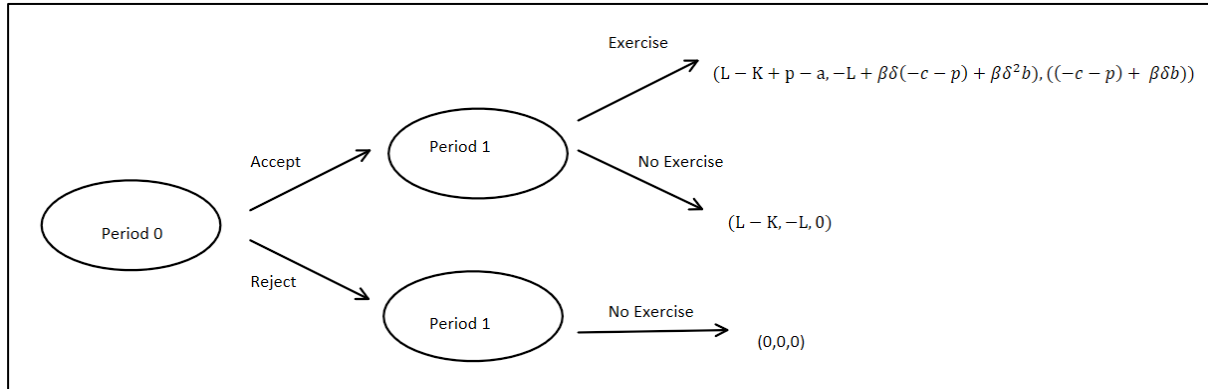
Case 1) Accept & Exercise Scenario:
Period 1 self goes to the gym if and only if
$((-c - p) + \beta\delta b) \geq 0$
$p \leq -c + \beta\delta b$
$p^* = 9$
Period 0 self accept the offer (assuming goes to the gym) if and only if
$-L + \beta\delta(-c - p) + \beta\delta^2 b \geq 0$
$L \leq \beta\delta(-c - p) + \beta\delta^2 b$
$L^* = 0$
Firm's profit
$\pi^* = (L - K)1_{Accept} + (p - a)1_{exercise}$
$\pi^* = (0 - 2) + (9 - 5)$
$\pi^* = 2$

Case 2) Accept & Doesn't exercise Scenario:
Period 1 self doesn't go to the gym if and only if
$0 > ((-c - p) + \beta\delta b)$
$p > -c + \beta\delta b$
$p^* = -c + \beta\delta b + \varepsilon$
$p^* = 9 + \varepsilon$
Period 0 self accept the offer (assuming he doesn't go to the gym) if and only if
$-L \geq 0$
$L \leq 0$
$L^* = 0$
Firm's Profit
$\pi^* = (L - K)1_{Accept} + (p - a)1_{exercise}$
$\pi^* = (0 - 2)$
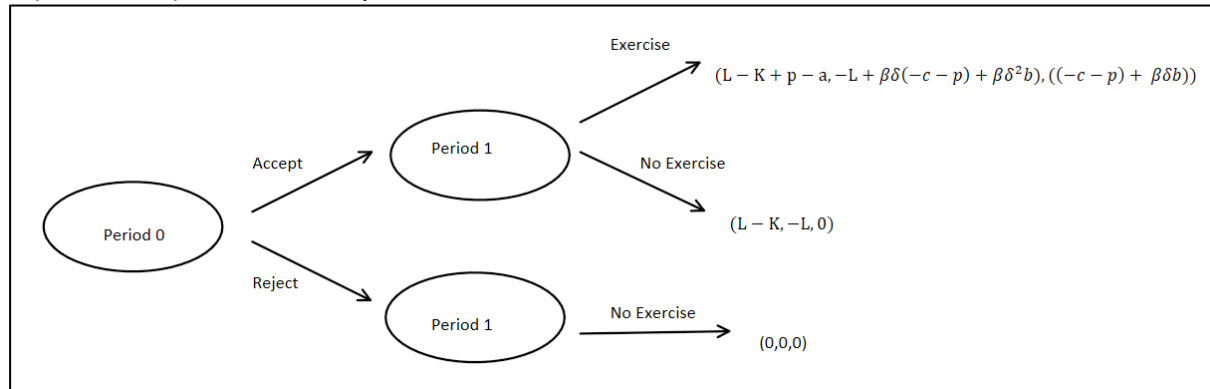$\pi^* = -2$

Case 3) Reject Scenario:
Firm's Profit
$\pi^* = 0$

For the time consistent consumer, Accept & Exercise Scenario gives the firm the highest profit, which is $\pi^* = 2$. Therefore, the firm's profit-maximizing L = 0 and p = 9.

B) What is/are the firm's profit-maximizing (L, p) if all consumers are sophisticated present biased?
sophisticated present biased: $\beta = 0.7$

Exercise
$(L - K + p - a, -L + \beta\delta(-c - p) + \beta\delta^2 b), ((-c - p) + \beta\delta b))$

Period 1

No Exercise
$(L - K, -L, 0)$

Accept

Period 0

Reject

Period 1

No Exercise
$(0,0,0)$

Case 1) Accept & Exercise Scenario:
Period 1 self goes to the gym if and only if
$((-c - p) + \beta\delta b) \geq 0$
$p \leq -c + \beta\delta b$
$p^* = 3.3$
Period 0 self accept the offer (assuming goes to the gym) if and only if
$-L + \beta\delta(-c - p) + \beta\delta^2 b \geq 0$
$L \leq \beta\delta(-c - p) + \beta\delta^2 b$
$L^* = 3.7905$
Firm's profit
$\pi^* = (L - K)1_{Accept} + (p - a)1_{exercise}$
$\pi^* = (3.7905 - 2) + (3.3 - 5)$
$\pi^* = 0.0905$

Case 2) Accept & Don't exercise Scenario:
Period 1 self doesn't go to the gym if and only if
$0 > ((-c - p) + \beta\delta b)$
$p > -c + \beta\delta b$
$p^* = -c + \beta\delta b + \varepsilon$
$p^* = 3.3 + \varepsilon$
Period 0 self accept the offer (assuming he doesn't go to the gym) if and only if
$-L \geq 0$
$L \leq 0$
$L^* = 0$
Firm's Profit
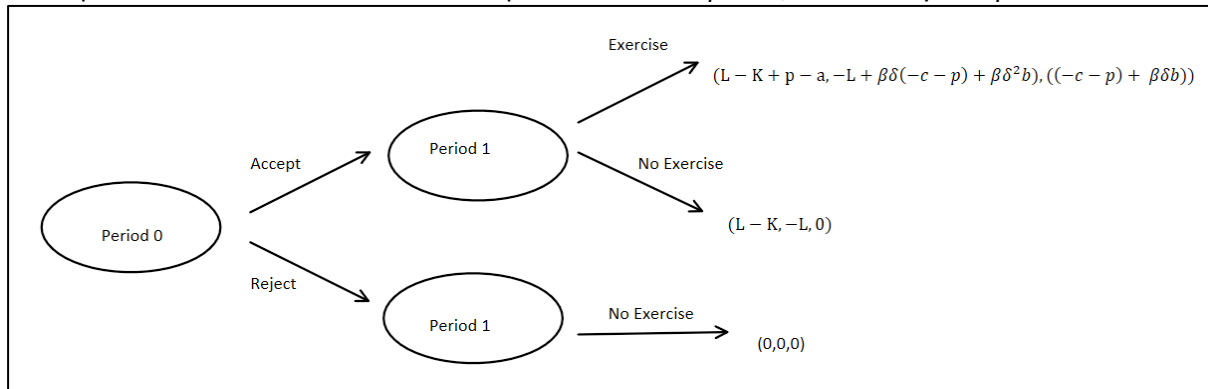$\pi^* = (L - K)1_{Accept} + (p - a)1_{exercise}$
$\pi^* = (0 - 2)$
$\pi^* = -2$

Case 3) Reject Scenario:
Firm's Profit

For the sophisticated present biased consumer, Accept & exercise Scenario gives the firm the highest profit, which is $\pi^* = 0.0905$. Therefore, the firm's profit-maximizing L = 3.7905 and p = 3.3.

C) What is/are the firm's profit-maximizing (*L, p*) if all consumers are naive present biased?
Naive present biased consumer thinks his period 1 self has $\beta = 1$, but actually has $\beta = 0.7$

Exercise
$(L - K + p - a, -L + \beta\delta(-c - p) + \beta\delta^2 b), ((-c - p) + \beta\delta b))$

Period 1

Accept

No Exercise
$(L - K, -L, 0)$

Period 0

Reject

Period 1

No Exercise
$(0,0,0)$

Case 1) Accept & Exercise Scenario:
Period 1 self goes to the gym if and only if
$((-c - p) + \beta\delta b) \geq 0$
$p \leq -c + \beta\delta b$
$p^* = 3.3$
Period 0 self accept the offer (assuming goes to the gym) if and only if
$-L + \beta\delta(-c - p) + \beta\delta^2 b \geq 0$
$L \leq \beta\delta(-c - p) + \beta\delta^2 b$
$L^* = 3.7905$
Firm's profit
$\pi^* = (L - K)1_{Accept} + (p - a)1_{exercise}$
$\pi^* = (3.7905 - 2) + (3.3 - 5)$
$\pi^* = 0.0905$

Case 2) Accept & Don't exercise Scenario:
<Naïve consumer thinks he will go to the gym in period 1 but he doesn't go>
Period 1 self doesn't go to the gym though he thinks he will if
$((-c - p) + \beta\delta b) \geq 0$
$p \leq -c + \beta\delta b$
From this price, if we add ε, then the naive consumer thinks he will go to the gym in period 1, but he does not.
$p \leq -c + \beta\delta b + \varepsilon$
$p^* = 3.3 + \varepsilon$
Period 0 self accepts the offer if and only if (assuming the consumer thinks he will go to the gym in period 1)
$-L + \beta\delta(-c - p) + \beta\delta^2 b \geq 0$
$L \leq \beta\delta(-c - p) + \beta\delta^2 b$
$L^* = 3.7905 - 0.665\varepsilon$
Firm's Profit
$\pi^* = (L - K)1_{Accept} + (p - a)1_{exercise}$

$\pi^* = 3.7905 - 0.665\varepsilon - 2$
$\pi^* = 1.7905 - 0.665\varepsilon$

<Naïve consumer doesn't think he will go to the gym in period 1 and he doesn't go>

Period 1 self doesn't go to the gym (assuming he thinks he won't be present biased in Period 1, but he is actually) if

$((-c - p) + \delta b) < 0$
$p > -c + \delta b$
$p^* = -c + \delta b + \varepsilon$
$p^* = 9 + \varepsilon$

Naïve consumer accepts the offer if and only if (assuming the consumer doesn't go to the gym)

$-L \geq 0$
$L \leq 0$
$L^* = 0$

Firm's Profit

$\pi^* = (L - K)1_{Accept} + (p - a)1_{exercise}$
$\pi^* = 0 - 2$
$\pi^* = -2$

Case 3) Reject Scenario:
Firm's Profit
$\pi^* = 0$

For the naive present biased consumer, Accept & Don't exercise Scenario (in which the naïve consumer thinks he will exercise) gives the firm the highest profit, which is $\pi^* = 1.7905 - 0.665\varepsilon$. Therefore, the firm's profit-maximizing L = $3.7905 - 0.665\varepsilon$ and p = $3.3 + \varepsilon$.

D) For which of the three consumer types is the social optimum attained in the SPNE?

- For the time-consistent consumer, the firm can have the highest profit of $2 under the Accept & Exercise scenario.
- For the sophisticated present biased consumer, the firm can have the highest profit of $0.0905 under the Accept & Exercise scenario.
- For the naïve present biased consumer, the firm can have the highest profit of $ $1.7905 - 0.665\varepsilon$ under the Accept & Don't exercise scenario in which the naïve consumer thinks he will exercise.
- **Therefore, in the SPNE, the social optimum is attained for the time-consistent consumer, because the firm gets the highest profit out of all scenarios, and also the consumer gets health benefit from working out.**

Question 3: Example of behavioral IO on the internet

Find an example of a business practice that exploits consumer biases. Potential biases to consider are present bias, overconfidence, confusion, and inattention to add-on costs. Potential types of practices are intentionally confusing contracts, intentionally hidden costs, and contracts that exploit overconfidence.

A) Include a screen shot or link to a web page describing the practice. Describe briefly the practice and what bias it's intended to exploit.
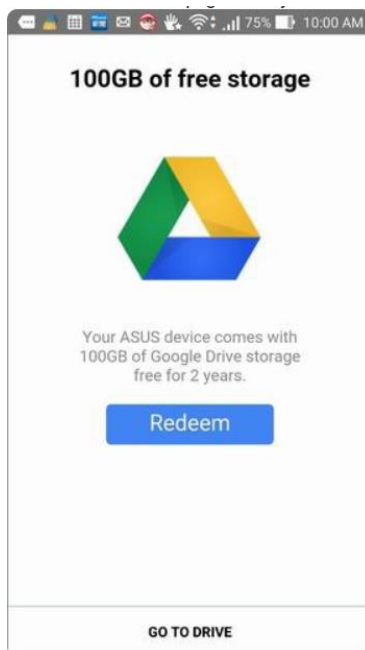
- When a consumer buys an ASUS device, google provides the consumer with 100GB of google drive storage for free for two years. But after two years, the consumer has to pay some amount to continue to use the drive.

B) Is "exploiting consumer mistakes" the only reason why firms might do this, or are there alternative explanations such as costs or price discrimination?

- In this case, there is no cost or price discrimination. It is purely exploiting consumer from their biasness.
- Entry cost for using it is zero once the customer buys the ASUS product. But after 2 years, the customer has to pay to continue to use it. But since this cost is coming 2 years later, the consumer values the money he has to pay 2 years later less than it actually is. So, the firm is exploiting the consumer by using the consumer's present biasedness.
- When the expiration for the free drive comes, assuming that the consumer has stored a lot of valuable works and pictures, if the benefit of continuing to use the drive minus the cost he has to pay is greater than the disutility of giving up all the files in the drive, then the consumer is likely to pay for the cost.

C) What harmful effects (either in terms of deadweight losses or transfers away from disadvantaged people) might this practice cause?
- Naïve present biased consumer cannot foresee its future self correctly. So, he may end up putting too much valuable works and pictures in the drive. So, after 2 years later, the benefit

of using the drive continuously minus the cost he has to pay is greater than the disutility of loosing all the work. If the naïve present biased consumer predicted its biasedness, then it would have not put too much valuable works in the drive. So, it is making the naïve present biased consumer to use the money that it would not have used. So, this is the transfer of surplus from the consumer to the firm.

D) Describe one or more ways in which a regulator such as the Federal Trade Commission or Consumer Financial Protection Bureau might intervene to reduce or eliminate the harmful effects.
- The regulation cannot perfectly protect the consumer, but it can lessen the harmful effects for the consumers by lowering the price that google charges on the consumer.
- Naïve present biased consumer would still not foresee his future self and still going to accept the free drive and put valuable works in there. But the price it has to pay is now lower than before.

E) Might such regulatory action have other potentially-harmful side effects?

- The cost of consumer using the google drive is nearly zero. Therefore, the price is always greater than the marginal cost. So, even though the government regulates the price to be lowered, the entry cost would not increase. It would be still zero.
- But the side effect would be that since the price is lower now, more consumer will put more valuable works and pictures in the google drive that the probability of the consumer purchasing the drive after two years becomes greater. This means more people's surplus is getting transferred to the firm with smaller shares.