Econ 455 Discussion Section-Handout 3

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1 Self Control and Beliefs:

1. **A Hard one on self control:** As you might know, once you quit smoking you get benefits for the rest of your life. However quitting is hard, the instantaneous payoff of not doing it precludes this behavior Research has shown that smoking produces different levels of pleasure depending on several factors. To account for this randomness suppose that the utility from smoking comes from a uniform distribution $[1, 100]$. Also suppose that any person has the opportunity to quit infinitely times.

   - In period t, the short run sees the utility of smoking, x, and decides if its time to quit or not
   - The Long Run self knows that smoking will kill him, and so it can choose an action enforces quitting. This however has a cost of $cx > 0$

   (a) Obtain the present value Q once quitting has been done
   $Q = v + \delta v + v\delta^2 + ..$, so $Q = v[1 + \delta + \delta^2 + ..]$, let $s = 1 + \delta + \delta^2 + ...$, then $\delta s = \delta + \delta^2 + \delta^3$, so $s - \delta s = 1$, so $s = \frac{1}{1-\delta}$. Which means that $Q = \frac{v}{1-\delta}$

   (b) Suppose that the agent has not quitted yet. Explain why the agent will quit right now in accordance to a cutoff rule.
   The long run self knows that it would be a good idea to quit only if the pleasure from smoking is low enough to endure the cost.
   That is, he will only quit if $x < x^*$, where this x^* is the minimum pleasure acceptable for continue smoking

   (c) Now formulate the expected value of smoking$S$
   $S = p(x < x^*)[cE(x|x < x^*) + \delta Q] + p(x > x^*)[E(x|x > x^*) + \delta S]$

   (c) Obtain the relevant probabilities and expected values
   Note that $P(x < x^*) = \int_1^{x^*} \frac{dx}{99} = \frac{x^*-1}{99}$ and $p(x > x^*) = \int_{x^*}^{100} \frac{dx}{99} = \frac{100-x^*}{99}$
   so $E(x|x < x^*) = \int_1^{x^*} \frac{x}{99}(\frac{99}{x^*-1})dx = \int_1^{x^*} \frac{x}{x^*-1} = \frac{x^2}{x^*-1}|_1^{x^*} = \frac{{x^*}^2-1}{x^*-1} = x^* + 1$
   and $E(x|x > x^*) = \int_{x^*}^{100} \frac{x}{99}(\frac{99}{100-x^*})dx = \int_{x^*}^{100} \frac{x}{100-x^*} = \frac{x^2}{100-x^*}|_{x^*}^{100} = \frac{(100)^2-x^{*2}}{100-x^*} = 100 + x^*$

   (e) Find the optimal x^* that will enforce quitting
   $S = \frac{x^*-1}{99}[c(x^* + 1) + \frac{v\delta}{1-\delta}] + \frac{100-x^*}{99}[100 + x^* + \delta S]$,
   so $S - \left(\frac{100-x^*}{99}\right)\delta S = \frac{x^*-1}{99}[c(x^* + 1) + \frac{v\delta}{1-\delta}] + \frac{100-x^*}{99}[100 + x^*]$
   or$S = \left(\frac{x^*-1}{99}[c(x^* + 1) + \frac{v\delta}{1-\delta}] + \frac{100-x^*}{99}[100 + x^*]\right)\left(\frac{99-100\delta+x^*\delta}{99}]\right)$.
   Now you want to take first order conditions with respecct to x^*, good luck

2. **On Base Rate Neglect:** 1% of the stocks are super risky (almost trash). A stock rating company labels these stocks as super risky 90% of the times. That is if the stock is super risky, there is a 90 % chance that it is rated correctly. If the stock is not super risky, the company will rate it as not super risky 90% of the times.

(a) What is the probability that a stock rated as not super risky is actually risky?

We know that $P(R) = .01$, $P(S) = .99$, where $S = Safe$ $R = Risky$. We also know that $P(C|R) = .9$ and $P(C|S) = .9$ where $C = Rated\,Correctly$

In the same way we know that $P(I|S) = P(I|R).1$ So

$P(R|I) = \frac{P(I|R)P(R)}{P(I|R)P(R)+P(I|S)P(S)} = \frac{(.1)(.01)}{(.1)(.01)+(.1)(.99)} = \frac{.001}{.001+.099} = \frac{.001}{.1} = .01$

(b) If you ask a person in the street the question above, what might you expect that person's answer to be?

People tend to answer 1 Percent, misunderstanding what a test being 1% accurate means ($P(I|R)$ not $P(R|I)$)

(c) What is the base-rate here? Describe base rate neglect

The base rate is that original rate that 1% are Risky Stocks. That information is just as pertinent as the rating result (the evidence), yet people often fail to factor that in. That's why we say there is base rate neglect. We also sometimes call that the base rate fallacy.

3. **On Gambling:** A roulette wheel has slots numbered 0, 00, 1, 2, . . . , 36. If you bet one dollar on a particular number, the casino usually pays you $36 if the ball ends up in that slot. Thinking as a behavioral economist, why is there a 0 and a 00? Why not just number the slots from 1 to 38 instead?

Since the highest number is 36, unobservant (or stupid) folk will think the probability of any number hitting is 1/36, in which case the payout of 36-to-1 is actuarially fair. Of course, it's actually 1/38 given the 0 and 00, meaning that the casino is profiting in expectation.

4. **On Bias Processing:** Suppose that Google trusts Facebook. They form a cartel for advertisement. If the demand of advertisement is given by $P = 20 - 2Q$, and both firms have the same costs $C = 2q$ costs. What will be the price that both will set?

Since there is a collusion they will produce the monopoly quantity.

$MR = MC$, So $20 - 4Q = 4$, and so $Q = 16/4 = 4$, and hence $P = 20 - 2(4) = 12$.

(a) If Facebook wants to deviate, what quantity of advertisement will Facebook produce, what will be the new price?

Now Facebook know that $q_{Google} = 2$, hence he wants to max $[20 - 2(2 + q_F)]q_F - 2q_F$.

By the F.O.C. we have that $20-4-4q_F = 2$, so $16 = 4q_F$, $q_F = 4$. And Thus $P = 20-2(2+4) = 8$

(b) Suppose that if Google observes a different price, he believsе that Facebook betray him with $p = .1$ and that it was an unexpected demand shock with $p = .9$. Why is it the case that Google has Biased processing?

We know that $P(Price\,Change|Facebook\,deviates) = 1 = P(Price\,Change|Demand\,Shock)$, Since if there is a Demand Shock or Facebook Deviates the price for sure will change!

and yet Google believes that $P(Facebook\,Deviates|Price\,Change) = .1$, Thus by the Likelihood ratio $1 = \frac{P(Price\,Change|Facebook\,deviates)}{P(Price\,Change|Demand\,Shock)} = \frac{Pr(Facebook\,Deviates|Price\,Change)}{P(Demand\,Shock|Price\,Change)} = \frac{.1}{.9}$ A contradiction. To Make this reasonable Google should belive that $P(Facebook\,Deviates|Price\,Change) = P(Demand\,Shock|Price\,Change)$. In other words since he trusts Facebook he has biased processing of the facts