ECON 301, Professor Hogendorn

Problem Set 3

1. *Thug.* Adam has $24 to spend on beer at the pub (and he'll spend whatever he has once he gets to the pub). His utility function is $u(b) = b^{1/3}$. The price of beer is $p_b = 3$, and one can buy fractional amounts of beer. There is a 50% chance that Adam will get mugged on the way to the pub and have his money stolen, in which case he consumes 0 beer. (There is no other utility loss from being mugged other than no beer.) (This problem adapted from Serrano and Feldman 2013.)

   (a) What is Adam's expected beer consumption? What is his expected utility?

   (b) Draw a graph of (a) including Adam's utility function.

   (c) The neighborhood thug is offering protection from mugging for $6 (which will come out of Adam's beer money). Will he pay for protection?

2. *CokePepsi.* The income elasticity demand for Coke is $\epsilon_m^c = 0.58$. For Pepsi, the income elasticity is $\epsilon_m^p = 1.38$ at the current equilibrium points

   (a) Which apply to Coke and Pepsi: normal, inferior, luxury, necessity? Why?

   (b) Suppose in equilibrium, a person buys 1 bottle of each drink. Draw the Engel Curves for Coke and Pepsi. Which Engel curve is steeper?

(c) Suppose we calculated a cross-price elasticity of Coke for Pepsi:

$$\epsilon_{cp} = \frac{\partial q_{coke}}{\partial p_{pepsi}} \frac{p_{pepsi}}{q_{coke}}$$

What sign do you expect? Why?

(d) Suppose the demand function for Coke is $q_{coke}(p_{coke}, p_{pepsi}, m)$. Write the total differential of this function.

3. *Levin.* There is a rule of thumb in the oil industry that each 10 cent increase in the price of gas adds $10 billion to oil industry revenues . This implies that

$$0.10\frac{dTR}{dp} = 10,000,000,000$$

(a) Show that you can obtain an elasticity estimate of $\epsilon = -0.23$ from this formula if you also know that the total quantity of gas consumed per year is 130 billion gallons.

(b) The average American spends $1750 per year on gas and consumes 700 gallons. Let us suppose that the average American has an income of $m = 50,000$. Suppose you want to calibrate a demand curve of the following form :

$$y(p) = Amp^{\epsilon}$$

What is the value for A?

(c) Perhaps we have chosen a bad demand function. Consider the following two demand functions:

$$\begin{aligned} y(p) &= A\sqrt{m}p^{\epsilon} \\ y(p) &= Am^2 p^{\epsilon} \end{aligned}$$

Draw the Engel curves that correspond to these functions. Which one is more reasonable for gas?