HW#5 Due February 25, 2021

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3. Suppose the price elasticity of demand for heating oil is 0.2 in the short run and 0.7 in the long run.
   a. If the price of heating oil rises from $\$1.80$ (P_1) to $\$2.20$ (P_2) per gallon, what happens to the quantity of heating oil demanded in the short run? In the long run? (Use the midpoint method in your calculations.)
   b. Why might this elasticity depend on the time horizon?

a) $\eta_D = \dfrac{\%\,\Delta Q_D}{\%\,\Delta P}$

In short run, $0.2 = \dfrac{\%\,\Delta Q_D}{\dfrac{(1.80 - 2.20)}{\dfrac{(2.20 + 1.80)}{2}}}$

$\%\,\Delta Q_D = 0.2 \times -\dfrac{0.4}{2}$

$\%\,\Delta Q_D = -0.04$

∴ demand will decrease by 4 %

In Long run, $0.7 = \dfrac{\%\,\Delta Q}{\dfrac{-0.4}{\dfrac{4}{2}}}$

$\%\,\Delta Q = 0.7 \times -\dfrac{0.4}{2}$

$\%\,\Delta Q = -0.14$

∴ demand will decrease by 14 %

b) The elasticity depends on time horizon as the longer the time, the greater the elasticity. Consumers have more time to find substitute products such as natural gas and eletric furnaces. Thus, if the price of heating oil increase, the demand will decrease.

7. Suppose that your demand schedule for pizza is as follows:

Price	Quantity Demanded (income = $20,000)	Quantity Demanded (income = $24,000)
$8	P_1 40 pizzas Q_1	50 pizzas
10	P_2 32 Q_2	45
12	24 Q_1	30 Q_2
14	16	20
16	8	12

a. Use the midpoint method to calculate your price elasticity of demand as the price of pizza increases from $8 to $10 if (i) your income is $20,000 and (ii) your income is $24,000.

b. Calculate your income elasticity of demand as your income increases from $20,000 to $24,000 if (i) the price is $12 and (ii) the price is $16. I_1 I_2

a) $n_D = \dfrac{\%\,\Delta Q_D}{\%\,\Delta P}$

(i) Income $ 20,000

$$n_D = \frac{(Q_2 - Q_1)/(Q_2 + Q_1)}{(P_2 - P_1)/(P_2 + P_1)} = \frac{(32-40)/(32+40)}{(10-8)/(10+8)} = \frac{-8/72}{2/18} = -\frac{8}{72}\times\frac{18}{2} = -1$$

(ii) Income $ 24,000

$$n_D = \frac{(45-50)/(45+50)}{(10-8)/(10+8)} = \frac{-5/95}{2/18} = \frac{-5}{95}\times\frac{19}{2} = -\frac{9}{19} = -0.47$$

b) $n_I = \dfrac{\%\,\Delta Q_D}{\%\,\Delta I}$

(i) Price $ 12

$$\%\,\Delta Q_D = \frac{Q_2 - Q_1}{Q_1} = \frac{30-24}{24} = 0.25 = 25\%$$

$$\%\,\Delta I = \frac{I_2 - I_1}{I_1} = \frac{24{,}000 - 20{,}000}{20{,}000} = 0.2 = 20\%$$

$$n_I = \frac{25\%}{20\%} = 1.25$$

(ii) Price $ 16

$$\%\,\Delta Q_D = \frac{12-8}{8} = 0.5 = 50\%$$

$$\%\,\Delta I = 20\%$$

$$n_I = \frac{50\%}{20\%} = 2.5$$