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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 to $2.20 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?

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

Price	Quantity Demanded (income = $20,000)	Quantity Demanded (income = $24,000)
$8	40 pizzas	50 pizzas
10	32	45
12	24	30
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.

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a) $P_1 = \$1.80$

$P_2 = \$2.20$

Note from the midpoint formula

$$\% \Delta Q_D = \frac{(Q_2 - Q_1)}{(Q_2 + Q_1)/2}$$

$$= \Delta Q_D / \bar{Q}$$

$$\% \Delta P = \Delta P / \bar{P}$$

Short run

$\eta_D = 0.2$

$$0.2 = \frac{\% \Delta Q_D}{\Delta P / \bar{P}}$$

$$\frac{0.2(\Delta P)}{\bar{P}} = \% \Delta Q_D$$

$$\% \Delta Q_D = \frac{0.2(0.4)}{2}$$

$$= 0.04$$

Long run

$\eta_D = 0.7$

$$\frac{0.7(\Delta P)}{\bar{P}} = \% \Delta Q_D$$

$$\% \Delta Q_D = \frac{0.7(0.4)}{2}$$

$$= 0.14$$

∴ As the price of heating oil rises, the Q_D decreases in short-run 4% and long-run 14%.

b) Elasticity depend on the time horizon because consumer will soon find substitute products that could be even better than the heating oil as they have more time.

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a) (i) $P_1 = \$8$ $Q_1 = 40$

$P_2 = \$10$ $Q_2 = 32$

$$\eta_D = \frac{1}{\text{slope}} \cdot \frac{\bar{P}}{\bar{Q}}$$

$$= \frac{(Q_2 - Q_1)}{(P_2 - P_1)} \cdot \frac{(P_2 + P_1)/2}{(Q_2 + Q_1)/2}$$

(ii) $Q_1 = 50$

$Q_2 = 45$

$$\eta_D = \frac{-5}{2} \cdot \frac{18}{95} = \frac{-9}{19} \approx -0.47$$

b) (i)

I	Q_D
20,000	24
24,000	30

$$\eta_I = \frac{\% \Delta Q_D}{\% \Delta I} = \frac{1/4}{1/5} = \frac{5}{4} = 1.25$$

(ii)

I	Q_D
20,000	8
24,000	12

$$\eta_I = \frac{1/2}{1/5} = \frac{5}{2} = 2.5$$

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