

HW#5 Due February 25, 2021

Mankiw Page 107

3. Suppose the price elasticity of demand for heating oil is 0.2 in the short run and 0.7 in the long run.
- 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.)
 - 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

- 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.
- 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

$$\eta_D = 0.2$$

$$0.2 = \% \Delta Q_D / \% \Delta P$$

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

$$\% \Delta Q_D = \frac{0.2(0.4)}{2} = 0.04$$

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 in 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) $P_1 = \$8$ $Q_1 = 40$
 $P_2 = \$10$ $Q_2 = 32$

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

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

(ii) $Q_1 = 50$
 $Q_2 = 45$

$$\eta_D = \frac{-5}{2} \cdot \frac{15}{45} = -\frac{9}{18} \approx -0.47$$

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

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