

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.)

★ Information from the question: 1.) ϵ^d short run = 0.2
long run = 0.7
→ as time pass, there might be other product to substitute so customer have more choices

2.) Price of heating oil (per gallon) Old : 1.80
New : 2.20

★ Find Q_D in short run and long run

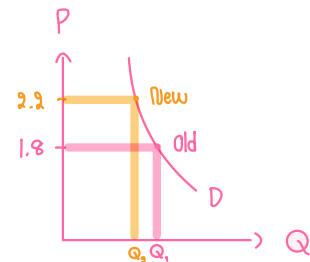
★ In short run: $\eta_D = 0.2 \Rightarrow$ inelasticit
 $\Rightarrow$ when price increase by 1% so Q_D will decrease a little bit

$$\Rightarrow \eta_D = \frac{\% \Delta Q_D}{\% \Delta P} = \frac{\% \Delta Q_D}{\frac{P_2 - P_1}{2}}$$

$$0.2 = \frac{\% \Delta Q_D}{\frac{2.2 - 1.8}{2}}$$

$$0.04 = \% \Delta Q_D$$

$\therefore$ In short run, as the price is increasing by 1%, quantity demand will decrease by 4% due to the law of demand



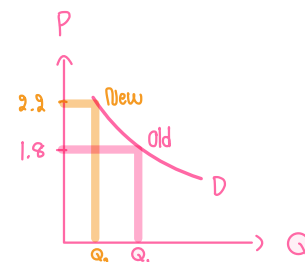
★ In long run:

$$\eta_D = \frac{\% \Delta Q_D}{\% \Delta P} = \frac{\% \Delta Q_D}{\frac{P_2 - P_1}{2}}$$

$$0.7 = \frac{\% \Delta Q_D}{\frac{2.2 - 1.8}{2}}$$

$$0.14 = \% \Delta Q_D$$

$\therefore$ In short run, as the price is increasing by 1%, quantity demand will decrease by 1.4% due to the law of demand



b. Why might this elasticity depend on the time horizon?

Because when the price of heating oil increase, in short run there might be limited choices for customer to use other product (limited substitute product), but in long run as heating oil is expensive, people will find substitute product that have a cheaper price or even better quality. [Elasticity depend on what can be substitute]

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.

$$\text{Midpoint Formula} = \frac{Q_2 - Q_1}{P_2 - P_1} \times \frac{P_2 + P_1 / 2}{Q_2 + Q_1 / 2}$$

$$\begin{aligned} \text{i.) } \eta_D &= \frac{32 - 40}{10 - 8} \times \frac{\frac{10 + 8}{2}}{\frac{32 + 40}{2}} \\ &= \frac{-8}{2} \times \frac{9}{36} \\ &= -4 \times \frac{1}{4} \\ &= -1 \end{aligned}$$

$$\begin{aligned} \text{ii.) } \eta_D &= \frac{45 - 50}{10 - 8} \times \frac{\frac{10 + 8}{2}}{\frac{45 + 50}{2}} \\ &= \frac{-5}{2} \times \frac{9}{47.5} \\ &= -0.4739 \end{aligned}$$

- 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.

$$\eta_I = \frac{\% \Delta Q_D}{\% \Delta I}$$

$$\begin{aligned} \text{i.) } \eta_I &= \frac{\frac{30 - 24}{24}}{\frac{24,000 - 20,000}{20,000}} \\ &= \frac{5}{4} \\ &= 1.25 \end{aligned}$$

$$\begin{aligned} \text{ii.) } \eta_I &= \frac{\frac{12 - 8}{8}}{\frac{24,000 - 20,000}{20,000}} \\ &= \frac{5}{2} \\ &= 2.5 \end{aligned}$$