

Short run

$$0.2 = \frac{\text{percentage changed in quantity of Demand}}{(2.20 - 1.80) / (2.20 + 1.80) / 2}$$

$$0.2 = \frac{\text{percentage changed in quantity of Demand}}{\frac{0.4}{4/2}}$$

$$\text{percentage change in quantity of Demand} = 0.2 \times 0.2$$

$$\text{percentage change in quantity of Demand} = 0.04 \rightarrow \text{inelastic}$$

Long Run

$$0.7 = \frac{\text{percentage changed in quantity of Demand}}{(2.20 - 1.80) / (2.20 + 1.80) / 2}$$

$$0.7 = \frac{\text{percentage changed in quantity of Demand}}{\frac{0.4}{4/2}}$$

$$\text{percentage change in quantity of Demand} = 0.7 \times 0.2$$

$$\text{percentage change in quantity of Demand} = 0.14 \rightarrow \text{inelastic}$$

\therefore In short run percentage change in quantity of Demand equal 0.04. In long run percentage change in quantity Demand equal 0.14. There for long run percentage change in quantity of Demand is 0.06 bigger than short run percentage change in quantity of Demand.

⑥ why might this elasticity depend on time horizon

because in longrun the consumer of heating oil can consumer less of heating oil and find substitute good instead. On the other hand, in short run consumer can't find something to replace the use of heating oil easily. so, in short run the demand of heating oil is more inelastic than in the long run.

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.

① i) income is 20,000

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

$$\begin{aligned} \text{Price elasticity of demand for pizza} &= \frac{(32 - 40)}{(32 + 40)/2} \\ &= \frac{(10 - 8)}{(10 + 8)/2} \\ &= \frac{-8/36}{2/9} = -1 \end{aligned}$$

When income is \$20,000 price elasticity of demand as the price increase from \$8 to \$10 equal 1. percentage change in price / percentage change in quantity Demand curve is unit elasticity.

(ii) income is \$24,000

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

$$\text{Price elasticity of demand for pizza} = \frac{\frac{(45 - 50)}{(45 + 50)/2}}{\frac{(10 - 8)}{(10 + 8)/2}}$$
$$= \frac{-5 / 47.5}{2 / 9}$$

$$\approx -0.47$$

inelastic

∴ when income is \$24,000

price elasticity of demand as the price increase from \$8 to \$10 equal 0.47

quantity of pizza move proportionately less than the price.

(b) income elasticity of demand

i) the price is \$12

income elasticity of demand = $\frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}$

$$= \frac{(Q_2 - Q_1) \times 100}{Q_1}$$

$$= \frac{(Y_2 - Y_1) \times 100}{Y_1}$$

$$= \frac{(30 - 24) / 24}{(24,000 - 20,000) / 20,000}$$

$$\begin{aligned} \text{income elasticity of Demand} &= \frac{6/24}{4000/20,000} \\ &= \frac{0.25}{0.2} \\ &= 1.25 \times \end{aligned}$$

∴ At price \$16

Quantity of Demand more than quantity of income
 $|1.25| > 1$ (Elastic)

ii) the price is \$16

$$\begin{aligned} \text{income elasticity of Demand} &= \frac{(Q_2 - Q_1) / Q_1}{(Y_2 - Y_1) / Y_2} \\ &= \frac{(12 - 8) / 8}{24000 - 20000 / 20,000} \\ &= \frac{0.5}{0.2} \\ &= 2.5 \times \end{aligned}$$

∴ At price \$16

Quantity of Demand more than quantity of income
 $|2.5| > 1$ (Elastic)