The Measurement of Price Elasticity

Elasticity (Greek letter eta: η) is defined as:

$$\eta = \frac{\textit{percentage change in quantity demanded}}{\textit{percentage change in price}}$$

$$\eta = \frac{\Delta Q^D / Q^D}{\Delta p / p}$$

Demand elasticity is negative, but economists emphasize the absolute value.

Elasticity measures the change in *p* and Q relative to some "base" values of p and Q.

The Use of Average Price and Quantity (Midpoint recipe)

Demand elasticity between point "0" and point "1" on some demand curve is:

$$\eta = \frac{(Q_1 - Q_0)/\bar{Q}}{(p_1 - p_0)/\bar{p}}$$

where $\bar{p}$ and $\bar{Q}$ are the average price and average quantity, respectively. Thus $p = (p_1+p_0)/2$ and $Q = (Q_1+Q_0)/2$. After a little simplifying, we get:

$$\eta = \frac{(Q_1 - Q_0)/(Q_1 + Q_0)}{(p_1 - p_0)/(p_1 + p_0)}$$

Table 4.1 Price Reductions and Corresponding Increases in Quantity Demanded for Three Products

Commodity	Reduction in Price	Increase in Quantity Demanded (per month)
Cheese	$2 per pound	7,500 pounds
T-shirts	$2 per shirt	25,000 shirts
CD players	$2 per CD player	500 CD players

Table 4.2 Price and Quantity Information Underlying Data of Table 4.1

Product	Unit	Original Price ($)	New Price ($)	Average Price ($)	Original Quantity	New Quantity	Average Quantity
Cheese	pound	5.00	3.00	4.00	116,250	123,750	120,000
T-shirts	shirt	17.00	15.00	16.00	187,500	212,500	200,000
CD players	player	81.00	79.00	80.00	9,750	10,250	10,000

Table 4.3 Calculation of Demand Elasticities

Product	(1) Percentage Decrease in Price	(2) Percentage Increase in Quantity	(3) Elasticity of Demand (2) ÷ (1)
Cheese	50.0	6.25	0.125
T-shirts	12.5	12.5	1.0
CD players	2.5	5.0	2.0

A Numerical Example of Price Elasticity

Product	Original Price	New Price	Average Price	Original Quantity	New Quantity	Average Quantity
Corona Beer (6-pack)	$9.00	$8.00	$8.50	2000	3000	2500

$$\eta = \frac{(3000 - 2000)/(3000 + 2000)/2}{(8 - 9)/(8 + 9)/2}$$

$$\eta = \frac{(1000)/(2500)}{(1)/(8.5)}$$

$$\eta = \frac{0.4}{0.1176} = 3.40$$