

Week 10 Problem Solution

- a) A firm estimates that it could sell 60 units of a given product at a price of \$40 per unit, and 30 units at a price of \$60 per unit. Assume that the demand curve is linear.

- i) Write down the maximum willingness to buy and MRP.
- ii) Calculate the elasticity when the price is \$40.
- iii) Determine the optimal price if the variable cost is \$10.
- iv) What is the total contribution at the optimal price?

$$\begin{aligned} \text{i) } \text{MRP} &= P_1 - [(P_2 - P_1)/(Q_2 - Q_1)] * Q_1 \\ &= \$40 - [(\$60 - \$40) / (30 - 60)] * 60 = \$80 \end{aligned}$$

$$\begin{aligned} \text{MWB} &= Q_1 - [(Q_2 - Q_1) / (P_2 - P_1)] * P_1 \\ &= 60 - ((-30) / 20) * \$40 = 120 \text{ units.} \end{aligned}$$

$$\text{ii) Elasticity} = [(Q_2 - Q_1)/Q_1] / [(P_2 - P_1)/P_1] = (30/60) / (-20/40) = -1$$

$$\text{iii) Optimal price} = (\text{MRP} + \text{variable cost}) / 2 = (80 + 10) / 2 = \$45.$$

$$\text{iv) Contribution} = (\text{MWB} / \text{MRP}) * (P - \text{VC})^2 = (120/80) * (45 - 10)^2 = \$1837.5$$

- b) The current price of a product is \$3 and the demand is 60,000 units. Elasticity at the current price is -2.5. Find the demand if price is increased to \$3.18 under each of the scenarios given below.

- i) There is a linear relationship between price and demand.
- ii) There is a constant elasticity of -2.5.

$$\text{Current price} = \$3 \qquad \text{demand} = 60,000 \text{ units}$$

$$\text{Elasticity} = [(Q_2 - Q_1)/Q_1] / [(P_2 - P_1)/P_1]$$

$$-2.5 = [(Q_2 - 60000)/60,000] / (3.18 - 3)/3$$

$$(-2.5 * 0.06) * 60000 = Q_2 - 60000$$

$$Q_2 = 60000 - 9000 = 51000 \text{ units.}$$

Alternative method: For every 1% increase in price, quantity sold decreases by 2.5%.

\$3.18 represents 6% increase in price. Hence quantity sold would decrease by $2.5 \times 6 = 15\%$.

New quantity is therefore $85\% \times 60,000 = 51,000$ units.

- c) With constant elasticity demand, price change from P_1 to P_2 will change the quantity demanded from Q_1 to $Q_2 = (P_2/P_1)^{E_{\text{las}}} \times Q_1$

$$\text{Therefore } Q_2 = (3.18/3)^{(-2.5)} \times 60,000 = 51,866 \text{ units.}$$

c) Coles can sell 1000 kg of bananas per day at a price of \$3 per kilo. If it reduces the price to \$2 a kilo, it can sell 1500 kg of bananas assuming its competitors do not react. However, Woolworth's reaction elasticity to Cole's price change is 0.9 and sales at Cole's increases by 10% for every 20% increase in price at Woolworths.

- i) Calculate the own price elasticity at Coles at the current price
- ii) Calculate the residual elasticity if Woolworths is the only competitor to Coles
- iii) Calculate the net sales at Coles if it reduces its price to \$2 a kilo
- iv) Discuss whether it is profitable for Coles to reduce the price if the cost price of bananas is \$1 per kilo.

$$\text{Own price elasticity} = [(1500-1000)/1000]/[(2-3)/3] = -1.5$$

$$\text{Competitor's reaction elasticity} = 0.9$$

$$\text{Cross price elasticity} = 10\% / 20\% = 0.5$$

$$\text{Residual price elasticity} = -1.5 + 0.9 \times 0.5 = -1.05$$

$$\% \text{ change in quantity} = \% \text{ change in price} \times \text{reaction elasticity} = -33.33\% \times -1.05 = 35\%$$

$$\text{New quantity} = 1.35 \times 1000 = 1350.$$

$$\text{Profits at } \$3 = 1000 \times (\$3 - \$1) = \$2000.$$

$$\text{Profits at } \$2 = 1350 \times (\$2 - \$1) = \$1350.$$

The overall profit for Coles is less when the price is \$2. Hence it is not profitable for Coles to reduce its price.