Answer on Question #50982, Economics, Finance

Acme tobacco is currently selling 5000 pounds of pipe tobacco per year. Due to competitive pressures, the average price of a pipe declines from $15 to $12. As a result, the demand for Acme pipe tobacco increases to 6000 pounds per year.

a) What is the cross elasticity of demand for pipes and pipe tobacco?

b) Assuming that the cross elasticity does not change, at what price of pipes would the demand for pipe tobacco be 3,000 pounds per year? Use $15 as the initial price of a pipe.

Solution:

a) Cross elasticity of demand (XED) measures the percentage change in quantity demand for a good after the change in price of another.

$$E_{xy} = \frac{Q_{x_2} - Q_{x_1}}{P_{y_2} - P_{y_1}} \cdot \frac{P_{y_2} + P_{y_1}}{Q_{x_2} + Q_{x_1}}$$

We have the following given data $Q_{x_2} = 6000$ pounds, $Q_{x_1} = 5000$ pounds, $P_{y_2} = \$12$, $P_{y_1} = \$15$. We substitute the given values into the formula.

$$E_{xy} = \frac{(6000 - 5000)}{(\$12 - \$15)} \cdot \frac{(\$12 + \$15)}{(6000 + 5000)} = -0.818$$

b) In given problem we have the following given data $E_{xy} = -0.818$, $P_{y_1} = \$15$, $Q_{x_2} = 3000$ pounds, $Q_{x_1} = 5000$ pounds.

We apply the same formula for determination cross elasticity of demand to find what price of pipes would be if the demand for pipe tobacco be 3,000 pounds per year.

$$\frac{(3000 - 5000)}{(P_{y_2} - \$15)} \cdot \frac{(P_{y_2} + \$15)}{(3000 + 5000)} = -0.818$$

Simplify the obtained equation.

$$\frac{-2000}{(P_{y_2} - \$15)} \cdot \frac{(P_{y_2} + \$15)}{8000} = -0.818$$

$$\frac{(-0.25) \cdot (P_{y_2} + \$15)}{(P_{y_2} - \$15)} = -0.818$$

We need to find the value of price P_{y_2}. Multiply both sides of the equation by $\left(P_{y_2} - \$15\right)$.

$$(-0.25) \cdot (P_{y_2} + \$15) = -0.818 \cdot (P_{y_2} - \$15)$$

Simplify the equation by opening the parenthesis.

$$-0.25P_{y_2} - 3.75 = -0.818P_{y_2} + 12.27$$

Then we add $0.818P_{y_2}$ and 3.75 to both sides of the equation.

$$-0.25P_{y_2} + 0.818P_{y_2} = 12.27 + 3.75$$

$$0.568P_{y_2} = 16.02$$

Finally we divide both sides of the equation by 0.568 to get the value of price.

$$P_{y_2} = \$28.204$$

The demand for pipe tobacco be 3,000 pounds per year if the value of price will be equal to $28.204.