Price Elasticities of Demand

If the demand function for a certain good 1 is given by $D_1 = 10{p_1}^{-0.5}{p_2}^{-1.5}$ where p_1 refers to the price of good 1 and p_2 to the price of the other good. Determine the partial elasticities of demand for good 1 with respect to p_1 and p_2 when $p_1 = 100$; $p_2 = 20$.

Solution

First, I calculate the derivatives:

$$\frac{\partial D_1}{\partial p_1} = 10(-0.5){p_1}^{-1.5}{p_2}^{-1.5}$$

$$\frac{\partial D_1}{\partial p_2} = 10(-1.5){p_1}^{-0.5}{p_2}^{-2.5}$$

Evaluating at the point:

$$\frac{\partial D_1}{\partial p_1} = -0.000055902$$

$$\frac{\partial D_1}{\partial p_2} = -0.000838525$$

Calculate the demand at the point:

$$D_1 = 0.011180340$$

Calculate the elasticities:

$$\text{Direct price elasticity of demand:} |-0.000055902 \frac{100}{0.011180340}| = 0.5$$

$$\text{Cross-price elasticity of demand:} |-0.000838525 \frac{20}{0.011180340}| = 1.5$$

Therefore, when the price of good 1 increases by 1%, the demand for that good changes by 0.5%. Meanwhile, if the price of good 2 increases by 1%, the demand for good 1 changes by 1.5%.