Price Elasticity of Demand Example Questions

Review:

First, a quick review of Price Elasticity of Demand from lecture on 02/19/09.

The definition, of Price Elasticity of Demand (PED) is:

Price Elasticity of Demand = <u>Percentage Change in Quantity Demanded</u> $= \dfrac{\% \Delta Q_D}{\% \Delta P}$
Percentage Change in Price

In order to calculate the PED we need two points on the demand curve, (Q_{D_1}, P_1) and (Q_{D_2}, P_2).

We use the midpoint formula, so:

$$PED = \dfrac{\dfrac{Q_{D_2} - Q_{D_1}}{\left(\dfrac{Q_{D_2} + Q_{D_1}}{2}\right)}}{\dfrac{P_2 - P_1}{\left(\dfrac{P_2 + P_1}{2}\right)}}$$

Once we have calculated the PED between two points on the demand curve, we can say if demand between those points is "elastic," "inelastic" or "unit elastic":

- *Demand is "elastic" at a certain point if PED < -1*
- *Demand is "inelastic" at a certain point if 0 > PED > -1*
- *Demand is "unit elastic" at a certain point if PED = -1*

There are a number of factors that can determine if a demand curve will be more elastic, or more inelastic (we will talk more about these factors on Tuesday, 02/24/09):

Four Factors Affecting PED:

1. *Availability of close substitutes*
2. *Necessities vs. luxuries*
3. *Definition of Market*
4. *Amount of time*

When calculating different elasticities it is very important to keep in mind, what information you need to calculate a certain elasticity and what information you have available. Also, sometimes there is information that is not relevant to certain elasticities. Be sure you are aware of what information is necessary and what information is not. The following examples emphasize this point. The answers to these example problems are at the end of this handout.

Example 1: You are given market data that says when the price of pizza is $4, the quantity demanded of pizza is 60 slices and the quantity demanded of cheese bread is 100 pieces. When the price of pizza is $2, the quantity demanded of pizza is 80 slices and the quantity demanded of cheese bread is 70 pieces.

- Can the Price-Elasticity of Demand be calculated for either good?
- If so, calculate the PED.

Example 2: Consider the markets for widgets and cogs. You study survey data and observe that if widgets cost $5, then 100 widgets are demanded. You also observe that if widgets cost $3, then 150 cogs are demanded and if widgets cost $4 then 100 cogs are demanded. If cogs cost $2, then 125 cogs are demanded.

- Can the Price-Elasticity of Demand be calculated for either good?
- If so, calculate the PED.

Example 3: Consider the market for widgets and cogs (again). You study survey data and observe that if widgets cost $5, then 100 widgets are demanded and 60 cogs are demanded. You also observe that if widgets cost $3, then 200 widgets are demanded and 100 cogs are demanded. If cogs cost $2, then 125 cogs are demanded.

- Can the Price-Elasticity of Demand be calculated for either good?
- If so, calculate the PED.

Answers to Example Questions

Example 1: You are given market data that says when the price of pizza is $4, the quantity demanded of pizza is 60 slices and the quantity demanded of cheese bread is 100 pieces. When the price of pizza is $2, the quantity demanded of pizza is 80 slices and the quantity demanded of cheese bread is 70 pieces.

- Can the Price-Elasticity of Demand be calculated for either good?

In order to calculate PED we need two (quantity, price) pairs for one good (two points along a certain good's demand curve). We are given this information for pizza. We are never given this information for cheese bread.

- If so, calculate the PED.

We need to use the formula, PED $= \dfrac{\dfrac{Q_{D_2} - Q_{D_1}}{\left(\dfrac{Q_{D_2} + Q_{D_1}}{2}\right)}}{\dfrac{P_2 - P_1}{\left(\dfrac{P_2 + P_1}{2}\right)}}$.

We have two (quantity, price) pairs for pizza. Specifically, $(Q_{D_1}, P_1) = (60, \$4)$ and $(Q_{D_2}, P_2) = (80, \$2)$. Then, plugging these numbers into the above formula, we obtain:

$$\frac{\dfrac{80-60}{\dfrac{80+60}{2}}}{\dfrac{2-4}{\dfrac{2+4}{2}}} = \frac{\dfrac{20}{70}}{\dfrac{-2}{3}} = \frac{2}{7} * \frac{-3}{2} = \frac{-3}{7}$$

Given this data, the PED is $\dfrac{-3}{7}$.

NOTE, that this tells us that given these two points, this demand curve for pizza is **inelastic.** We know this because the PED is between 0 and -1.

Example 2: Consider the market for widgets. You study survey data and observe that if widgets cost $5, then 100 widgets are demanded. You also observe that if widgets cost $3, then 150 cogs are demanded and if widgets cost $4 then 100 cogs are demanded. If cogs cost $2, then 125 cogs are demanded.

- Can the Price-Elasticity of Demand be calculated for either good?

In order to calculate PED we need two (quantity, price) pairs for one good (two points along a certain good's demand curve). We are not given this information for either widgets or cogs. We cannot calculate PED for either good in this case.

Example 3: Consider the market for widgets and cogs (again). You study survey data and observe that if widgets cost $5, then 100 widgets are demanded and 60 cogs are demanded. You also observe that if widgets cost $3, then 200 widgets are demanded and 100 cogs are demanded. If cogs cost $2, then 125 cogs are demanded.

- Can the Price-Elasticity of Demand be calculated for either good?

In order to calculate PED we need two (quantity, price) pairs for one good (two points along a certain good's demand curve). We are given this information for widgets. We are never given this information for cogs.

- If so, calculate the PED.

We need to use the formula, $\text{PED} = \dfrac{\dfrac{Q_{D_2} - Q_{D_1}}{\left(\dfrac{Q_{D_2} + Q_{D_1}}{2}\right)}}{\dfrac{P_2 - P_1}{\left(\dfrac{P_2 + P_1}{2}\right)}}$.

We have two (quantity, price) pairs for widgets. Specifically, $(Q_{D_1}, P_1) = (100, \$5)$ and $(Q_{D_2}, P_2) = (200, \$3)$. Then, plugging these numbers into the above formula, we obtain:

$$\frac{\dfrac{200-100}{200+100}}{\dfrac{2}{\dfrac{3-5}{3+5}}} = \dfrac{\dfrac{100}{150}}{\dfrac{-2}{4}} = \dfrac{100}{150} * \dfrac{-4}{2} = \dfrac{2}{3} * \dfrac{-4}{2} = \dfrac{-4}{3}$$

Given this data, the PED is $\dfrac{-4}{3}$.

NOTE, that this tells us that given these two points, this demand curve for pizza is **elastic.** We know this because the PED is less than -1.