

# 6 | ELASTICITY OF DEMAND

Purpose: To provide practice in computing and understanding price elasticity of demand.

Computer file: **elas98.xls**

Instructions and background information:

Elasticity of demand is the economist's way of talking about how responsive consumers are to price changes. For some goods, like salt, even a big increase in price will not cause consumers to cut back very much on consumption. For other goods, like vanilla ice cream cones, even a modest price increase will cause consumers to cut back a lot on consumption. [Think for a minute about why this is so. For example, there are few substitutes for salt, but many substitutes for vanilla ice cream cones. Moreover, most people don't spend very much of their income on salt, so they won't feel the pinch so much when its price rises.]

*Price elasticity of demand* is the percentage change in quantity demanded divided by the percentage change in a good's price. Take any pair of prices and quantities on a demand curve. Call these points  $(p_0, Q_0)$  and  $(p_1, Q_1)$ . The formula for price elasticity of demand is

The first term in brackets is the percentage change in quantity,  $Q$ . The second term in

$$[(Q_1 - Q_0 / Q_{base}) \cdot 100] / [(p_1 - p_0 / p_{base}) \cdot 100]$$

brackets is the percentage change in price,  $p$ .  $Q_{base}$  and  $p_{base}$  are the base values of quantity and price for which the percentage change is to be computed. Most economists set  $Q_{base}$  equal to the average quantity, rather than either of the two points. The same convention holds for  $p_{base}$ . While arbitrary, this convention at least assures that the percentage changes you get will be the same no matter whether price and quantity are increasing or decreasing. . When  $Q_{base}$  and  $p_{base}$  are the average values, then elasticity is being computed using the "midpoint method".

Notice that if you apply the formula above exactly then the number you get for elasticity will be negative. This is because demand curves are negatively sloped -- an increase in price always causes a decrease in quantity. Often, economists will change the formula a bit by putting a minus sign in front of it so the number for elasticity will be positive. While sometimes confusing to non-economists, this convention is widely used and you should be aware of it. In the problems you will do here, the computer has been programmed to allow both positive and negative values of elasticity to be correct.

There is a neat way of classifying values of elasticity. When the numerical value of elasticity is less than one, demand is said to be "inelastic". When the numerical value of elasticity is greater than one, demand is "elastic". So "elastic" demand means that people are

relatively responsive to price changes (remember the vanilla ice cream cone). “Inelastic” demand means that people are relatively unresponsive to price changes (remember salt).

An important relationship exists between the elasticity of demand for a good and the amount of money consumers want to spend on it at different prices. Spending is price times quantity,  $p$  times  $Q$ . In general, a decrease in price leads to an increase in quantity, so if price falls spending may either increase or decrease, depending on how much quantity increases. If demand is elastic, then a drop in price will increase spending, because the percent increase in quantity is larger than the percent decrease in price. On the other hand, if demand is inelastic a drop in price will decrease spending because the percent increase in quantity is smaller than the percent decrease in price.

In the graph of a demand curve, spending is a rectangular area ( $p$  times  $Q$ ), and it is often easy to see whether demand is elastic or inelastic just by inspecting the spending rectangles at different prices.

Here are some things to watch for and learn as you do the problems:

- 1) Notice that elasticity is a pure number. It has no units of measurement attached to it. This makes it easy to compare elasticity between different goods.
- 2) The linear demand curve here has constant slope (by definition). Notice that the elasticity is not constant as you choose different price/quantity pairs. Demand is more elastic at higher prices than lower prices. Elasticity is not slope.
- 3) Despite the rather mechanical nature of these problems remember that it's more important to understand the idea of elasticity than it is to compute it. One path to understanding is to remove some of the mystery of the concept by being able to compute it.

Here are some hints to help you get the answers quicker:

- 1) Use a hand calculator to do the computations. Or use the calculator that is built in to the computer you are using.
- 2) Carry two decimal places (at least) for the values you compute for elasticity.

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**MATH MAVEN'S CORNER:** The demand function for spaghetti is linear in all variables in this problem set. The parameters of the function are chosen randomly when a person begins using the computer file.

## ELASTICITY OF DEMAND

### Questions

Set all variables to their baseline values.

- 1) What's the percent change in the price of spaghetti between prices of \$18 and \$20? [Hint: Use the midpoint method.]

Set all variables to their baseline values.

- 2) What's the percent change in the QUANTITY of spaghetti when the price changes from \$18 to \$20?

Set all variables at their baseline values.

- 3) What's the elasticity of demand for spaghetti between the prices of \$18 and \$20?
- 4) Set all variables to their baseline values. Based on your answer to the last question, is the demand for spaghetti elastic or inelastic between prices of \$18 and \$20?
- 5) Set all variables to their baseline values. What's the percent change in the price of spaghetti between prices of \$10 and \$12?
- 6) What's the percent change in the QUANTITY of spaghetti when the price changes from \$10 to \$12?
- 7) What's the elasticity of demand for spaghetti between the prices of \$10 and \$12?
- 8) Set all variables to their baseline values. Based on your answer to the last question, is the demand for spaghetti elastic or inelastic between prices of \$10 and \$12?
- 9) Set all variables to their baseline values. Is the demand for spaghetti elastic or inelastic between prices of \$8 and \$10?
- 10) Set all variables to their baseline values. How much money do consumers want to spend on spaghetti when the price is \$25?
- 11) Set all variables to their baseline values. The price drops to \$23. How much money do consumers want to spend on spaghetti now?
- 12) When the price falls from \$25 to \$23 (as in the last two questions), does spending on spaghetti increase or decrease?
- 13) What's the elasticity of demand between these prices?

- 14) Is demand elastic or inelastic?
- 15) Set all variables to their baseline values. How much money do consumers want to spend on spaghetti when the price is \$7?
- 16) Set all variables to their baseline values. The price drops to \$5. How much money do consumers want to spend on spaghetti now?
- 17) When the price falls from \$7 to \$5 (as in the last two questions), does spending on spaghetti increase or decrease?
- 18) What's the elasticity of demand between these prices?
- 19) Is demand elastic or inelastic?