ELASTICITY

Price elasticity of demand (referred to as "elasticity", "elasticity of demand", or "price elasticity") measures the responsiveness of quantity demanded to a change in the price of a good. More specifically it measures the percentage change in quantity demanded resulting from a one percent change in the price of a good.

There are three degrees of elasticity:
1. **Elastic demand** -- a one percent change in price will result in a change in quantity demanded that is greater than one percent. Quantity demanded is very responsive to a change in price. Graphically, if the demand for a product is elastic, the demand curve will be relatively flat. The flatter the demand curve is, the more elastic demand is and vice versa. In the extreme case that demand will immediately change to zero if there is any change in price, demand is known as perfectly elastic. This will be relevant to future discussions regarding one firm's output in a perfectly competitive market.

2. **Inelastic demand** -- a one percent change in price will result in a change in quantity demanded that is less than one percent. Quantity demanded is not very responsive to a change in price. Graphically, if the demand for a product is inelastic, the demand curve will be relatively steep. The steeper the demand curve is, the more inelastic demand is and vice versa. In the extreme case that the same quantity of a product will be demanded at any price, the demand curve is vertical and demand is known as perfectly inelastic. This is nor realistic in the long run, but in the **VERY** short run it might be realistic in reference to a product that is necessary to sustain life.

3. **Unit elastic demand** -- a one percent change in price will result in a one percent change in quantity demanded. Quantity demanded is evenly responsive to a change in price.

If the demand curve is a straight line ("linear" for you mathematicians) it will have sections that have the attributes of all three elasticities. The inelastic portion tends to be at the bottom, the unit elastic portion in the middle, and the elastic portion at the top of the demand curve.

There are three methods of determining elasticity, two of them provide a numerical result (known as the coefficient of elasticity of demand, or "elasticity of demand"), and the third merely indicates if demand is elastic, inelastic, or unit elastic. The two methods that provide the numerical result will have negative values because of the law of demand, however, we ignore the negative sign by considering the absolute value of the result. The three methods are as follows:

1. **Point elasticity** -- Percentage change in quantity divided by percentage change in price. This formula is good only in general terms, because if you are given two quantities and two prices, the result depends on which price or quantity you use to calculate the percentage change. (Example, consider the numbers 1 & 2. If you use 1 as the reference point, the percentage change from 1 to 2 is 100%, if you use 2 as the reference point, the percentage change from 2 to 1 is -50%.) Use this formula only when you are given the percentage change in quantity demanded the percentage change in price.

2. **Average Arc Elasticity (a.k.a. "The Mid-Point Formula")** -- This formula ignores the "starting point" and is more accurate. **This formula is simply [(Change in quantity divided by average quantity) divided by (Change in price divided by average price)].** Once again ignore the negative sign by using the absolute value. (For example at a price of $6 quantity demanded is 10, at a price of $4 quantity demanded is 20. In this instance (using absolute values) the change in quantity is 10 and the average quantity is 15 and 10/15 is .667, the change in price is 2 and the average price is 5 and 2/5 is.4. .667/.4 equals 1.6675 (you need only round to two digits, however if you prefer you can use up to four, whichever is easiest for you). In this case the elasticity of demand is 1.6675. This implies that a one percent change in price will change quantity demanded by 1.6675 percent.

FOR BOTH OF THE ABOVE METHODS, THE FOLLOWING APPLY TO YOUR RESULTS

   a.   **If the result is less than 1, demand is inelastic.**
   b.   **If the result is equal to 1, demand is unit elastic.**
   c.   **If the result is greater than 1, demand is elastic.**

3. **Total revenue test.** Total revenue is equal to price times quantity (P*Q). This is only useful if you want to known in general if demand is elastic, inelastic or unit elastic. The determination is made as follows:
   a.   When price increases and total revenue also increases, or when price decreases and total revenue decreases, demand is inelastic.
   b.   When price increases and total revenue decreases, or when price decreases and total revenue increases, demand is elastic.
   c.   When price increases and total revenue is unchanged, or when price decreases and total revenue is unchanged, demand is unit elastic.

What determines how elastic (or inelastic) the demand for a good is?

1.   **The number of available substitutes for a good.** If there are no good substitutes for a good, the demand for the good is likely to be inelastic. Also, it is likely that the demand for specific brands of the same product will be more elastic than the demand for the product itself. For example, the demand for Pepsi will be more elastic than the overall demand for cola.

2.   **Necessity or luxury.** If a good is a luxury, the demand for that good will be more elastic than the demand for a necessity. The demand for insulin is inelastic (as is the demand for food and housing) while the demand for restaurant meals or luxury cars will be elastic.

3.   **Period of time.** As you have more time to find substitutes for a good, the demand for that good will become more elastic. In the immediate period, the demand for many goods will be inelastic, but as time goes on and substitutes are developed, demand becomes more elastic. (The demand for gasoline is like this, in the short term, it is difficult to reduce gasoline consumption, but in the long run, you can carpool, walk, use public transportation, or other means to travel, thus making the demand for gasoline more elastic in the long run).

4.   **Ratio of product price to overall budget.** If a good takes up a relatively small portion of your budget, the demand for it will tend to be more inelastic, if the good takes up a relatively larger portion of your

budget, the demand for that good will tend to be elastic. For example, if you earn $100,000 per year and purchase five 59 cent containers of salt per year, if the price of salt doubles, you would not expect quantity demanded to change very much if any at all. However, if you earn $100,000 per year, and the price of vacations doubles from $2,000 to $4,000, your quantity demanded might change from two to one.

There are also two other important measures of elasticity of demand: Income elasticity and cross elasticity.

1.   **Income elasticity** -- measures the responsiveness of quantity demanded to a change in an individual's income. **To calculate this use this formula [(change in quantity /average quantity) divided by (change in income/average income)]. HERE YOU WANT TO KNOW IF THE RESULT IS POSITIVE OR NEGATIVE.**   If the result is positive the good is a normal good, if the result is negative, the good is an inferior good. (Example, when income is $200 per week quantity demanded is 4, when income is $300 per week, quantity demanded is 6.   The change in quantity is 2, and the average quantity is 5, 2/5 is .4. The change in income is $100, and average income is $250, 100/250 is .4. Therefore income elasticity is 1. This number is positive and the good is a normal good. For normal goods, the greater the income elasticity, the more of a luxury a good is.

2.   **Cross elasticity** -- measures the responsiveness of quantity demanded of one good to a change in the price of another good. This will indicate whether or not the goods are substitutes or complements. **Use this formula [(Change in quantity of good A/Average quantity of good A) divided by (Change in price of good B/Average price of good B)]. HERE YOU WANT TO KNOW IF THE RESULT IS POSITIVE OR NEGATIVE.** If the result is negative, the goods are complements, if the result is positive, the goods are substitutes. If the result is relatively close to zero, they are not related. Example: When the price of good B is $8 the quantity demanded of good A is 20. When the price of good B is $12 the quantity demanded of good A is 32. The change in the quantity demanded of good A is 12, and the average quantity demanded is 16, 12/16 equals .75. The change in the price of good B is $4, the average price is $10. 4/10 equals .4. .75/.4 equals 1.875. This number is positive therefore the goods are substitutes.

The other important elasticity concern is elasticity of supply. In simple terms, in the immediate or "market" period, supply is perfectly inelastic. Regardless of how much price changes, you can not bring any more or less of a good to market. In the short run, supply is more elastic, you can make slight changes in production to react to changes in price. In the very long run, supply is very elastic, many changes can be made to respond to price changes and profitability.