Elasticity

Market prices will change whenever shifts in supply or demand occur.

Example 2.3

Table 2.2 gives a hypothetical market demand and supply schedule for wheat; it shows whether a surplus or shortage occurs at each price and indicates the pressure on price toward equilibrium. Thus, the equilibrium price is $2 because the quantity demanded, 4,500 bushels of wheat per month, equals the quantity supplied.

Table 2.2

Price ($ per bu)	Quantity Demanded in the Market (1000 bu per month)	Quantity Supplied in the Market (1000 bu per month)	Surplus (+) or Shortage (−)	Pressure on Price
$4	2.0	7.0	+5	downward
3	3.0	6.0	+3	downward
2	4.5	4.5	0	equilibrium
1	6.5	2.5	−4	upward

The elasticity of demand (E_D) measures the percentage change in the quantity demanded of a commodity as a result of a given percentage in its price. The formula is

$$E_D = \frac{\text{percentage change in the quantity demanded}}{\text{percentage change in price}}$$

E_D can be calculated in terms of the new quantity and price, or with the original quantity and price. However, different results would then be obtained. To avoid this problem, economists generally measure E_D in terms of the average quantity and the average price, as follows:

$$E_D = \frac{\text{change in quantity demanded}}{(\text{sum of quantities demanded})/2} \div \frac{\text{change in price}}{(\text{sum of prices})/2}$$

E_D is a pure number. Thus, it is a better measurement tool than the slope, which is expressed in terms of the units of measurement. E_D is always

expressed as a positive number, even though price and quantity demanded move in opposite directions. The demand curve is said to be elastic if $E_D > 1$, unitary elastic if $E_D = 1$, and inelastic if $E_D < 1$.

★ Don't Forget!

Different formulas are used to compute elasticity and slope. A simple glance at a graph is not enough to determine whether a curve has a high or low elasticity.

Example 2.4

The elasticity between the quantities demanded at \$4 and \$3 of Table 2.2 is calculated below using the average quantities and prices.

$$E_D = \frac{1}{(2+3)/2} \div \frac{1}{(4+3)/2} = \frac{1}{2.5} \div \frac{1}{3.5} = \frac{3.5}{2.5} = 1.4$$

Thus, we say that this demand curve is elastic (on the average) between these two points. The elasticity of demand is greater (1) the greater the number of good substitutes available, (2) the greater the proportion of income spent on the commodity, and (3) the longer the time period considered.

When the price of a commodity falls, the total revenue of producers (price times quantity) increases if $E_D > 1$, remains unchanged if $E_D = 1$, and decreases if $E_D < 1$. This occurs because when $E_D > 1$, the percentage increase in quantity exceeds the percentage *decline* in price and so total revenue (TR) increases. When $E_D = 1$, the percentage increase in quantity equals the percentage decline in price and so TR remains unchanged. Finally, when $E_D < 1$, the percentage increase in quantity is less than the percentage decline in price, and so TR falls.

The *elasticity of supply* (E_S) measures the percentage change in the quantity supplied of a commodity as a result of a given percentage change in its price. We again use the average quantity and price as follows:

$$E_S = \frac{\text{change in quantity supplied}}{(\text{sum of quantities supplied})/2} \div \frac{\text{change in price}}{(\text{sum of prices})/2}$$

E_S is a pure number and is positive because price and quantity move in the same direction. Supply is said to be elastic if $E_S > 1$, unitary elastic if $E_S = 1$, and inelastic if $E_S < 1$.

Example 2.5

The (average) elasticity between the quantities supplied at \$1 and \$2 of the supply schedule of Table 2.2 is

$$E_S = \frac{2}{(2.5 + 4.5)/2} \div \frac{1}{(1+2)/2} = \frac{1}{3.5} \div \frac{1}{1.5} \cong 0.43.$$

True or False Questions

1. There is a decrease in the demand for a commodity when the price of a substitute commodity increases.
2. When the supply curve is positively sloped, an increase in demand will result in a larger quantity supplied.
3. A surplus exists when the market price is above the equilibrium price.
4. Government subsidization of firms producing Good A results in an increase in the demand for Good A.
5. Demand is inelastic if the percentage increase in quantity exceeds the percentage decrease in price.
6. A decline in price leaves total revenue unchanged when $E_D = 1$.

Answers: 1. False; 2. True; 3. True; 4. False; 5. False; 6. True

Solved Problems

Solved Problem 2.1 Explain what happens to the demand curve for air transportation between New York City and Washington, D.C., as a result of the following events:

a. The income of households in metropolitan New York and Washington, D.C., increases 20%.

b. The cost of a train ticket between New York City and Washington, D.C., is reduced 50%.

c. The price of an airline ticket decreases 20%.

Solution:

a. Individuals will travel more since they have more disposable income. The demand for air transportation between NYC and Washington increases; the demand curve shifts up and to the right.

b. The cost of an alternative mode of transportation between NYC and Washington has decreased; thus, more individuals will travel by train between NYC and Washington. The demand for air transportation decreases; the demand curve shifts down and to the left.

c. There is no shift, but there is a movement down the existing demand curve; the lower price for an airline ticket results in an increase in the number of people traveling (quantity demanded) by air between NYC and Washington.

Solved Problem 2.2 Suppose the market supply and demand curves for Good A are initially S and D, respectively, in Figure 2-3; equilibrium price is $3 and equilibrium quantity is 280 units.
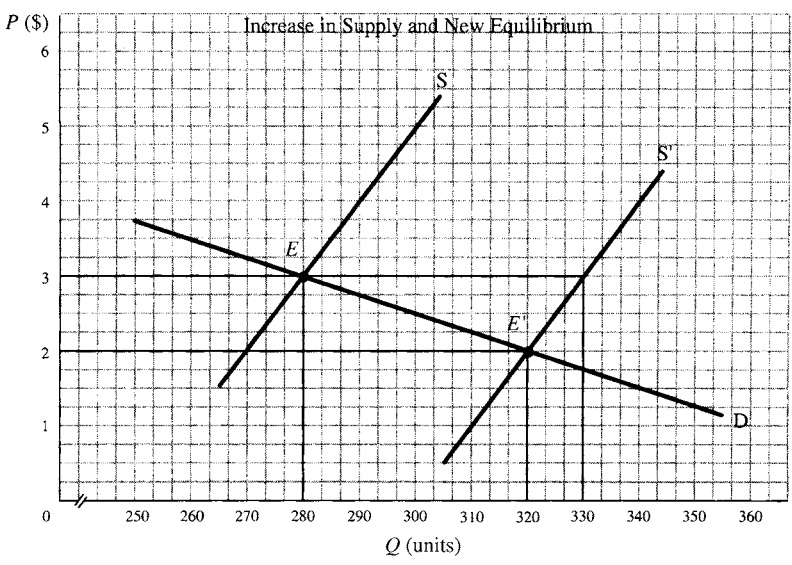

Figure 2-3

a. Suppose improved technology in the production of Good A shifts the market supply curve from S to S′, *ceteris paribus*. After the initial supply shift, what is the relationship between quantity demanded and quantity supplied at the initial $3 equilibrium price?

b. What is the new equilibrium price and quantity after the technological advance has increased the supply of Good A?

Solution:

a. Quantity demanded for market schedule D is 280 units when the price is $3, while market supply is 330 units. There is a surplus of Good A at the initial $3 equilibrium price which puts downward pressure on the price of Good A.

b. Equilibrium price falls from $3 to $2 as a result of the increase in market supply; equilibrium quantity increases from 280 to 320 units.

Solved Problem 2.3 Why has the federal government placed price floors on some agricultural goods?

Solution: A price floor is a government-mandated price that exists above the market's equilibrium price; price floors result in a surplus of production. While market demand for most agricultural commodities is relatively stable over time, market supply is very much influenced by the weather. A drought, for example, decreases supply and pushes up prices while a bumper crop can severely depress agricultural prices. The profitability of farming becomes uncertain, as does the price of food products and the income needed to feed a household. Thus, the reasons for agricultural price supports (price floors) are: (1) to stabilize farmer incomes and encourage farmers to continue farming whether there are bumper crops or droughts; (2) to provide a steadier flow of agricultural products at relatively stable prices; and (3) to stabilize the amount of income that households need to spend on food.

Solved Problem 2.4
a. Is the demand for table salt elastic or inelastic? Why?
b. Is the demand for stereos elastic or inelastic? Why?

Solution:
a. The demand for salt is inelastic because there are no good substitutes for salt and households spend a very small portion of their total in-

come on this commodity. Even if the price of salt were to rise substantially, households would reduce their purchases of salt little.

b. The demand for stereos is elastic because stereos are expensive and, as a luxury rather than a necessity, their purchase can be postponed or avoided when their price rises. One could also use the radio as a partial substitute for a stereo.

Solved Problem 2.5

a. Should the price of a subway ride or bus ride be increased or decreased if total revenue needs to be increased?

b. What about the price of a taxi ride?

Solution:

a. To the extent that there are no inexpensive good substitutes for public transportation in metropolitan areas, the demand for subway and bus rides is inelastic. Their prices should, therefore, be increased to increase total revenue. However, this can be self-defeating. Sharply increasing the price of public transportation will encourage people to use their cars and increase congestion and pollution.

b. For taxi rides, the case is likely to be different. Taxi rides are relatively expensive; an increase in their price may encourage people to rely much more on their cars and public transportation. To the extent that this makes the demand for taxi rides elastic, total revenue will fall when the price of taxi rides is increased.