Demand, Supply and Elasticity
CHAPTER 2 OUTLINE

2.1 Demand and Supply
   Definitions, Determinants and Disturbances

2.2 The Market Mechanism

2.3 Changes in Market Equilibrium

2.4 Elasticities of Supply and Demand

2.5 Short-Run versus Long-Run Elasticities

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The Basics of Demand and Supply

Demand and supply analysis is a fundamental and powerful tool that can be applied to a wide variety of interesting and important problems. To name a few:

- Understanding and predicting how changing world economic conditions affect market price and production
- Evaluating the impact of government price controls, minimum wages, price supports, and production incentives
- Determining how taxes, subsidies, tariffs, and import quotas affect consumers and producers
The Demand Curve

- **demand curve**  Relationship between the quantity of a good that consumers are willing to buy and the price of the good.

We can write this relationship between quantity demanded and price as an equation:

\[ Q_D = Q_D(P) \]
The Demand Curve

Figure 2.2

The demand curve, labeled $D$, shows how the quantity of a good demanded by consumers depends on its price. The demand curve is downward sloping; holding other things equal, consumers will want to purchase more of a good as its price goes down.

The quantity demanded may also depend on other variables, such as income, the weather, and the prices of other goods. For most products, the quantity demanded increases when income rises.

A higher income level shifts the demand curve to the right (from $D$ to $D'$).
2.1 DEMAND AND SUPPLY

The Demand Curve

Shifting the Demand Curve

If the market price were held constant at $P_1$, we would expect to see an increase in the quantity demanded—say from $Q_1$ to $Q_2$, as a result of consumers’ higher incomes. Because this increase would occur no matter what the market price, the result would be a shift to the right of the entire demand curve.

Shifting the Demand Curve

- **substitutes** Two goods for which an increase in the price of one leads to an increase in the quantity demanded of the other.
- **complements** Two goods for which an increase in the price of one leads to a decrease in the quantity demanded of the other.
The Supply Curve

- **supply curve** Relationship between the quantity of a good that producers are willing to sell and the price of the good.

Figure 2.1

The supply curve, labeled $S$ in the figure, shows how the quantity of a good offered for sale changes as the price of the good changes. The supply curve is upward sloping: The higher the price, the more firms are able and willing to produce and sell.

If production costs fall, firms can produce the same quantity at a lower price or a larger quantity at the same price. The supply curve then shifts to the right (from $S$ to $S'$).
The supply curve is thus a relationship between the quantity supplied and the price. We can write this relationship as an equation:

$$Q_s = Q_s(P)$$

Other Variables That Affect Supply

The quantity that producers are willing to sell depends not only on the price they receive but also on their production costs, including wages, interest charges, and the costs of raw materials.

When production costs decrease, output increases no matter what the market price happens to be. The entire supply curve thus shifts to the right.

Economists often use the phrase change in supply to refer to shifts in the supply curve, while reserving the phrase change in the quantity supplied to apply to movements along the supply curve.
2.2 THE MARKET MECHANISM

Supply and Demand

The market clears at price $P_0$ and quantity $Q_0$.

At the higher price $P_1$, a surplus develops, so price falls.

At the lower price $P_2$, there is a shortage, so price is bid up.

Figure 2.3
Equilibrium

- **equilibrium (or market clearing) price**  
  Price that equates the quantity supplied to the quantity demanded.

- **market mechanism**  
  Tendency in a free market for price to change until the market clears.

- **surplus**  
  Situation in which the quantity supplied exceeds the quantity demanded.

- **shortage**  
  Situation in which the quantity demanded exceeds the quantity supplied.
When Can We Use the Supply-Demand Model?

We are assuming that at any given price, a given quantity will be produced and sold.

This assumption makes sense only if a market is at least roughly *competitive*.

By this we mean that both sellers and buyers should have little *market power*—i.e., little ability *individually* to affect the market price.

Suppose instead that supply were controlled by a single producer—a monopolist.

If the demand curve shifts in a particular way, it may be in the monopolist’s interest to keep the quantity fixed but change the price, or to keep the price fixed and change the quantity.
New Equilibrium Following Shift in Supply

When the supply curve shifts to the right, the market clears at a lower price $P_3$ and a larger quantity $Q_3$. 

Figure 2.4
New Equilibrium Following Shift in Demand

When the demand curve shifts to the right, the market clears at a higher price $P_3$ and a larger quantity $Q_3$.
Supply and demand curves shift over time as market conditions change. In this example, rightward shifts of the supply and demand curves lead to a slightly higher price and a much larger quantity. In general, changes in price and quantity depend on the amount by which each curve shifts and the shape of each curve.
2.3 CHANGES IN MARKET EQUILIBRIUM

**Example 2.4**

The Effects of 9/11 on the Supply and Demand for New York City Office Space

Following 9/11 the supply curve shifted to the left, but the demand curve also shifted to the left, so that the average rental price fell.
2.4 ELASTICITIES OF SUPPLY AND DEMAND

- **elasticity**  Percentage change in one variable resulting from a 1-percent increase in another.

**Price Elasticity of Demand**

- **price elasticity of demand**  Percentage change in quantity demanded of a good resulting from a 1-percent increase in its price.

\[ E_p = \frac{\% \Delta Q}{\% \Delta P} \]

\[ E_p = \frac{\Delta Q / Q}{\Delta P / P} = \frac{P}{Q} \frac{\Delta Q}{\Delta P} \quad (2.1) \]
2.4 ELASTICITIES OF SUPPLY AND DEMAND

Linear Demand Curve

- **linear demand curve** Demand curve that is a straight line.

\[ Q = a - bP \]

Figure 2.11

**Linear Demand Curve**

The price elasticity of demand depends not only on the slope of the demand curve but also on the price and quantity.

The elasticity, therefore, varies along the curve as price and quantity change. Slope is constant for this linear demand curve.

Near the top, because price is high and quantity is small, the elasticity is large in magnitude.

The elasticity becomes smaller as we move down the curve.
2.4 ELASTICITIES OF SUPPLY AND DEMAND

Linear Demand Curve

Figure 2.12
(a) Infinitely Elastic Demand

(a) For a horizontal demand curve, $\Delta Q/\Delta P$ is infinite. Because a tiny change in price leads to an enormous change in demand, the elasticity of demand is infinite.

- **infinitely elastic demand** Principle that consumers will buy as much of a good as they can get at a single price, but for any higher price the quantity demanded drops to zero, while for any lower price the quantity demanded increases without limit.
2.4 ELASTICITIES OF SUPPLY AND DEMAND

Linear Demand Curve

**Figure 2.12**

(b) Completely Inelastic Demand

(b) For a vertical demand curve, $\Delta Q/\Delta P$ is zero. Because the quantity demanded is the same no matter what the price, the elasticity of demand is zero.

- **completely inelastic demand** Principle that consumers will buy a fixed quantity of a good regardless of its price.
Other Demand Elasticities

- **income elasticity of demand**  
  Percentage change in the quantity demanded resulting from a 1-percent increase in income.

  \[ E_I = \frac{\Delta Q/Q}{\Delta I/I} = \frac{I \Delta Q}{Q \Delta I} \]  
  \hspace{1cm} (2.2)

- **cross-price elasticity of demand**  
  Percentage change in the quantity demanded of one good resulting from a 1-percent increase in the price of another.

  \[ E_{Q_b P_m} = \frac{\Delta Q_b/Q_b}{\Delta P_m/P_m} = \frac{P_m}{Q_b} \frac{\Delta Q_b}{\Delta P_m} \]  
  \hspace{1cm} (2.3)

Elasticities of Supply

- **price elasticity of supply**  
  Percentage change in quantity supplied resulting from a 1-percent increase in price.
ELASTICITIES OF SUPPLY AND DEMAND

2.4

The Market for Wheat

During recent decades, changes in the wheat market had major implications for both American farmers and U.S. agricultural policy.

To understand what happened, let’s examine the behavior of supply and demand beginning in 1981.

Supply: \( Q_S = 1800 + 240P \)

Demand: \( Q_D = 3550 - 266P \)

By setting the quantity supplied equal to the quantity demanded, we can determine the market-clearing price of wheat for 1981:

\[ Q_S = Q_D \]

\[ 1800 + 240P = 3550 - 266P \]

\[ 506P = 1750 \]

\[ P = $3.46 \text{ per bushel} \]
Substituting into the supply curve equation, we get

\[ Q = 1800 + (240)(3.46) = 2630 \text{ million bushels} \]

We use the demand curve to find the price elasticity of demand:

\[
E_D^P = \frac{P}{Q} \frac{\Delta Q_D}{\Delta P} = \frac{3.46}{2630} (-266) = -0.35
\]

Thus demand is inelastic.

We can likewise calculate the price elasticity of supply:

\[
E_S^P = \frac{P}{Q} \frac{\Delta Q_S}{\Delta P} = \frac{3.46}{2630} (240) = 0.32
\]

Because these supply and demand curves are linear, the price elasticities will vary as we move along the curves.
In the short run, an increase in price has only a small effect on the quantity of gasoline demanded. Motorists may drive less, but they will not change the kinds of cars they are driving overnight.

In the longer run, however, because they will shift to smaller and more fuel-efficient cars, the effect of the price increase will be larger. Demand, therefore, is more elastic in the long run than in the short run.
The opposite is true for automobile demand. If price increases, consumers initially defer buying new cars; thus annual quantity demanded falls sharply. In the longer run, however, old cars wear out and must be replaced; thus annual quantity demanded picks up. Demand, therefore, is less elastic in the long run than in the short run.
Income elasticities also differ from the short run to the long run.

For most goods and services—foods, beverages, fuel, entertainment, etc.—the income elasticity of demand is larger in the long run than in the short run.

For a durable good, the opposite is true. The short-run income elasticity of demand will be much larger than the long-run elasticity.
Given data for the equilibrium price and quantity $P^*$ and $Q^*$, as well as estimates of the elasticities of demand and supply $E_D$ and $E_S$, we can calculate the parameters $c$ and $d$ for the supply curve and $a$ and $b$ for the demand curve. (In the case drawn here, $c < 0$.) The curves can then be used to analyze the behavior of the market quantitatively.
2.6 UNDERSTANDING AND PREDICTING THE EFFECTS OF CHANGING MARKET CONDITIONS

\[ \text{Demand: } Q = a - bP \quad (2.5a) \]
\[ \text{Supply: } Q = c + dP \quad (2.5b) \]

- **Step 1:**

\[ E = \frac{P}{Q} \left( \frac{\Delta Q}{\Delta P} \right) \]

\[ \text{Demand: } E_D = -b \left( \frac{P^*}{Q^*} \right) \quad (2.6a) \]
\[ \text{Supply: } E_S = d \left( \frac{P^*}{Q^*} \right) \quad (2.6b) \]

- **Step 2:**

\[ a = Q^* + bP^* \]
\[ c = Q^* - dP^* \quad (2.7) \]