CHAPTER 2: DEMAND, SUPPLY AND EQUILIBRIUM PRICES

OVERVIEW

This chapter introduces students to the important concepts of demand and supply. Demand is the relationship between price and the quantity demanded of a good by consumers in a given period of time, all other factors held constant. Supply is the relationship between price and the quantity supplied of a good by producers in a given period of time, all other factors held constant. The *Wall Street Journal* article on the copper industry demonstrates how both demand and supply factors influenced the price of copper as well as the surplus that was forecasted for 2007, despite the loss of production from a series of strikes in the preceding year. The chapter also covers detailed verbal, graphical and mathematical analyses of demand and supply.

OUTLINE OF TEXT MATERIAL

I. Introduction

A. Demand: Functional relationship between the price and quantity demanded of goods and services by consumers in a given period of time, all else equal.

B. Supply: Functional relationship between the price and quantity supplied of goods and services by producers in a given period of time, all else equal.

C. Managers need to understand demand and supply to develop competitive strategies and respond to the actions of competitors.

D. The chapter covers verbal, graphical and mathematical analyses of demand and supply.

II. Case for Analysis: Copper Surplus is Foreseen in 07

A. The *Wall Street Journal* article illustrates how demand and supply factors affected the copper industry in 2006 and 2007.

B. The prices of copper had remained high in 2006 due to the following reasons.

1. Numerous strikes limited production.

2. China's rapid economic growth, comparable to the U.S. industrial revolution of the 1800s, resulted in a strong demand.

3. Existing deposits of copper could not be extracted easily.

4. There was an increase in the incidence of copper theft in the United States.

C. Larger quantities of copper were predicted to be available for 2007 due to supply and demand factors outlined below.

1. An increase in supply was forecasted because of smooth production uninterrupted by strikes and technological advances that decreased production costs.

2. A decrease in demand was forecasted because of the slowing U.S. housing market and increased availability of substitutes (aluminum and plastic piping in home construction). These followed a lower demand from Southeast Asia in the aftermath of the financial crisis.

3. China's demand remains uncertain due to the lack of data.

D. The interaction of all supply and demand factors and their magnitudes affect the copper price.

III. Demand

A. Demand: Functional relationship between the price and quantity demanded of goods and services by consumers in a given period of time, all else equal.

B. Non-price factors influence demand, causing either an increase or a decrease in demand. These factors are the following.

1. Tastes and Preferences

(a) A favorable change in the taste for good X increases its demand.

Teaching Tip: The text has concrete examples of tastes and preferences. For instance, after September 11, 2001, airlines have used different marketing strategies to encourage more people to fly. In another example, to prevent a large drop in the demand for chicken stemming from fears of the avian flu, the phrase "pandemic flu" has replaced "bird flu."

2. Income

    (a) Normal Good: A product whose demand will increase with an increase in income.
    (b) Inferior Good: A product whose demand will decrease with an increase in income.

Teaching Tip: Make sure the students understand the difference between normal and inferior goods. Good examples of inferior goods are second-hand clothing and food such as Spam, ramen noodles, macaroni and cheese, and peanut butter and jelly. The example used in the text is a tooth extraction. Ask the students to come up with other examples of inferior goods as they have better and interesting examples.

3. Prices of Related Goods

    (a) Substitute Goods: Products that can be used in place of one another. An increase in the price of a substitute good, Y, causes an increase in the demand for good X.
    (b) Complementary Goods: Products that are used together. A decrease in the price of a complementary good, Y, causes an increase in the demand for good X.
    (c) Changes in the price of a necessity, such as gasoline, can have effects on the purchasing power. In 2008, people saw their real incomes decline as gasoline prices jumped to over $4 per gallon.

Teaching Tip: Make sure the students understand the difference between substitute goods and complementary goods. The examples used in the text are iPods and laptops that serve as substitutes for wristwatches, palladium as a cheap substitute for platinum and personal computers being complementary to printers and printer cartridges. Ask the students to come up with other examples of substitute goods and complementary goods.

4. Future Expectations

    (a) An expected increase in the future price of good X will increase its current demand.
    (b) This was demonstrated in the world grain prices in 2007.

5. Number of Consumers

    (a) An increase in the number of buyers of good X will increase its demand. This may be reflected in larger exports or a growing population.

C. Demand Function: Function represented by $Q_{XD} = f(P_X, T, I, P_Y, P_Z, EXC, NC, ...)$ where:

Q_{XD}= quantity demanded of X
P_X= price of X
T= variables representing an individual's tastes and preferences
I= income
P_Y, P_Z= prices of goods Y and Z, which are related in consumption to good X
EXC= consumer expectations about future prices
NC= number of consumers

1. Individual Demand Function: Function that shows the variables that affect an individual consumer's quantity demanded of a particular product.

2. Market Demand Function: Function that shows the variables that affect all consumers' quantity demanded of a particular product in the market.

D. Demand Curve: The graphical relationship between the price of a good (P) and the quantity demanded by consumers (Q), with all other factors influencing demand held constant.

[[Insert Figure 2.1 here]]

1. Demand Shifters: The variables in a demand function that are held constant when defining a given demand curve. If their values change, the demand curve would shift.

2. Price is on the vertical axis and quantity demanded is on the horizontal axis.

3. Demand curves are generally downward sloping.

4. Price and quantity demanded have a negative relationship.

E. Change in Quantity Demanded and Change in Demand

1. Change in Quantity Demanded: Movement along two points on a demand curve when consumers react to a change in the price of the product, all other factors held constant. This is illustrated in Figure 2.1.

[[Insert Figure 2.1 here]]

2. Change in Demand: Movement of the entire demand curve when consumers react to a change in factors other than the price of the product changing. This is illustrated in Figure 2.2.

[[Insert Figure 2.2 here]]

Teaching Tip: Make sure the students understand the distinction between a change in quantity demanded versus a change in demand. Although the difference in the wording seems trivial, these two concepts are quite different. The price of the product itself is the only determinant of a change in quantity demanded. All other factors are determinants of a change in demand.

F. The market demand curve can be derived by horizontal summation of the individual demand curves.

1. Horizontal Summation: For every price, add the quantity that each individual in a market demands.
2. A simple example is when there are two individuals in a market. This is illustrated in Figure 2.3.

[[Insert Figure 2.3 here]]

G. Linear Demand Function and Curves

1. Linear Demand Function: Mathematical relationship in which all terms are added or subtracted.

2. The graph of a linear demand curve is a straight line.

H. Math Example of a Demand Function

1. Equation 2.2: $Q_D=10-50P_C+0.3I+1.5TC+0.5E$
where:

Q_D= quantity demanded of copper (millions of pounds)
P_C= price of copper ($ per pound)
I= consumer income index
TC= telecom index showing uses or tastes for copper in the telecommunications industry
E=expectation index representing purchaser's expectations of a lower price over the following six months

2. The negative coefficient on P_C shows an inverse relationship between price and quantity demanded for copper.

3. The positive coefficient on I shows that copper is a normal good.

4. The positive coefficient on TC shows that improved technology leads to higher demand.

5. The negative coefficient on E shows that expectations of lower price leads to an increased demand for copper in the future but a decreased demand for copper for the current period.

6. Equation 2.3: $Q_D=60-50P_C$ is the alternative demand equation that is derived after substituting values for I, TC and E. It illustrates the meaning of the expression, "all else equal."

IV. Supply

A. Supply: Functional relationship between the price and quantity supplied of goods and services by producers in a given period of time, all else equal.

B. Non-price factors influence the cost of production, causing either an increase or a decrease in supply. These factors are the following.

1. State of Technology

(a) Better technology allows for a more efficient use of resources, increasing supply.

2. Input Prices

(a) Lower prices of inputs (labor, capital, land and raw materials) lead to a reduction in the production cost and an increase in supply.

3. Prices of Goods Related in Production

(a) Substitute Goods: The same inputs can be used to produce one good over another. An increase in the price of a substitute good, Y, causes an increase in the production of good X.
(b) Complementary Goods: Products that are produced together. A decrease in the price of a complementary good, Y, causes an increase in the production of good X.

Teaching Tip: Students sometimes get confused between prices of related goods that affect demand and the prices of goods related in production that affect supply. Make sure that they understand the distinctions that come from the demand or supply side of the market.

4. Future Expectations

(a) An expected decrease in the future price of good X will increase its current supply.

5. Number of Producers

   (a) An increase in the number of sellers of good X will increase its supply.
   (b) Changes in laws or regulations including trade barriers (quotas and tariffs) can also achieve the same result.

C. Supply Function: Function represented by Q_{XS}= f (P_X, TX, P_I, P_A, P_B, EXP, NP, ...) where:

Q_{XS}= quantity supplied of X
P_X= price of X
TX=state of technology
P_I= prices of inputs of production
P_A, P_B= prices of goods A and B, which are related in production of good X
EXP= producer expectations about future prices
NP= number of producers

D. Supply Curve: The graphical relationship between the price of a good (P) and the quantity supplied by producers (Q), with all other factors influencing supply held constant.

[[Insert Figure 2.4 here]]

1. Supply Shifters: The variables in a supply function that are held constant when defining a given supply curve. If their values change, the supply curve would shift.

2. Price is on the vertical axis and quantity supplied is on the horizontal axis.

3. Supply curves are generally upward sloping.

4. Price and quantity supplied have a positive relationship.

E. Change in Quantity Supplied and Change in Supply

1. Change in Quantity Supplied: Movement along two points on a supply curve when producers react to a change in the price of the product, all other factors held constant. This is illustrated in Figure 2.4.

[[Insert Figure 2.4 here]]

2. Change in Supply: Movement of the entire supply curve when producers react to a change in factors other than the price of the product changing. This is illustrated in Figure 2.5.

[[Insert Figure 2.5 here]]

F. Math Example of a Supply Function

1. Equation 2.5: $Q_S = -86+90P_C-1.5W+0.5T+0.4N$
   where:

   Q_S= quantity supplied of copper (millions of pounds)
   P_C= price of copper ($ per pound)
   W= an index of wage rates in the copper industry
   T= technology index
   N= number of active mines in the copper industry.

2. The positive coefficient on P_C shows a positive relationship between price and quantity supplied of copper.

3. The negative coefficient on W shows that as the input price increases, supply decreases due to costly production.

4. The positive coefficient on T shows that an increase in technology increases the supply of copper.

5. The positive coefficient on N shows that an increase in the number of active mines increases the supply of copper.

6. Equation 2.6: $Q_S = -66+90P_C$ is the alternative supply equation that is derived after substituting values for W, T and N. It illustrates the meaning of the expression, "all else equal."

V. Demand, Supply and Equilibrium

A. When the market is in equilibrium, there is an equilibrium price and quantity. This is illustrated in Figure 2.6.

[[Insert Figure 2.6 here]]

1. Equilibrium Price (P_E): The price that actually exists in the market (or toward which the market is moving) where the quantity demanded by consumers equals the quantity supplied by producers.

2. Equilibrium Quantity (Q_E): The quantity of a good, determined by the equilibrium price, where the amount of output that consumers demand is equal to the amount that producers want to supply.

B. Lower-than-equilibrium prices would result in a shortage of the good, as the quantity demanded exceeds the quantity supplied. This is illustrated in Figure 2.7.

[[Insert Figure 2.7 here]]

C. Higher-than-equilibrium prices would result in a surplus of the good, as the quantity supplied exceeds the quantity demanded. This is illustrated in Figure 2.8.

[[Insert Figure 2.8 here]]

D. Math Example of Equilibrium

1. Equation 2.3: $Q_D = 60-50P_C$

2. Equation 2.6: $Q_S = -66+90P_C$

3. In equilibrium, there is only one quantity where $Q_D=Q_S$. Equating the two equations lead to an equilibrium price of $0.90 and an equilibrium quantity of 15 million pounds.

E. Changes in Equilibrium Prices and Quantities

1. A change in demand results from a change in tastes and preferences, income, prices of related goods, expectations or the number of consumers. This alters the market equilibrium in the following ways.

[[Insert Figure 2.9 here]]

(a) An increase in demand (D_0 to D_1) raises the equilibrium price and raises the equilibrium quantity. This is illustrated in Figure 2.9.
(b) A decrease in demand (D_0 to D_2) lowers the equilibrium price and lowers the equilibrium quantity. This is illustrated in Figure 2.9.

2. A change in supply results from a change in technology, input prices, prices of goods related in production, expectations, or the number of suppliers. This alters the market equilibrium in the following ways.

[[Insert Figure 2.10 here]]

(a) An increase in supply (S_0 to S_1) lowers the equilibrium price and raises the equilibrium quantity. This is illustrated in Figure 2.10.
(b) A decrease in supply (S_0 to S_2) raises the equilibrium price and lowers the equilibrium quantity. This is illustrated in Figure 2.10.

3. The effects of changes in both sides of the market on the equilibrium price and quantity depend on the sizes of the shifts of the demand and supply curves.

4. An increase in demand and a decrease in supply raise the equilibrium price but the effect on the equilibrium quantity is indeterminate. This is illustrated in Figures 2.11 and 2.12.

[[Insert Figure 2.11 and 2.12 here]]

5. An increase in demand and an increase in supply raise the equilibrium quantity but the effect on the equilibrium price is indeterminate. This is illustrated in Figures 2.13 and 2.14.

[[Insert Figure 2.13 and 2.14 here]]

F. Math Example of an Equilibrium Change

1. Start with an initial equilibrium price of $0.90 and an initial equilibrium quantity of 15 million pounds.

2. Assume that a decrease in the demand for copper that resulted from the recession in Southeast Asia was not offset by an increase in the demand for copper from China.

3. A decline in the income index (I) decreased the demand for copper and an increase in the expectations index (E) increased the demand for copper.

4. An improvement in the technology (T) increased the supply of copper.

5. Substituting for new values of I, E and T, and equating the quantity supplied and quantity demanded, the new equilibrium price is $0.70 and the new equilibrium quantity is 45 million pounds. This is also illustrated graphically in Figure 2.15.

[[Insert Figure 2.15 here]]