elasticity of supply is zero, and perfectly elastic when the elasticity of supply is infinite.

h. For small shifts in the demand curve, the less elastic the supply curve at the equilibrium price, the larger the price change and the smaller the change in the amount bought and sold. For small shifts in the supply curve, the less elastic the demand curve at the initial equilibrium price, the larger the price change and the smaller the change in the amount bought and sold.

i. Economists also study elasticities of a product's demand or supply with respect to other factors, such as income (for demand), the prices of other products (for demand and supply), and input prices (for supply).

ADDITIONAL EXERCISES

Exercise 2.1: Consider again the demand function for corn in formula (1). Graph the corresponding demand curve when potatoes and butter cost $0.75 and $4 per pound, respectively, and average income is $40,000 per year. At what price does the amount demanded equal 15 billion bushels per year? Show your answer using algebra.

Exercise 2.2: Consider again the supply function for corn in formula (2). Graph the corresponding supply curve when diesel fuel costs $2.75 per gallon and the price of soybeans is $10 per bushel. At what price does the amount supplied equal 21 billion bushels per year? Show your answer using algebra.

Exercise 2.3: What is the equilibrium price for the demand and supply conditions described in exercises 2.1 and 2.2? How much corn is bought and sold? What if the price of diesel fuel increases to $4.50 per gallon? Show the equilibrium price before and after the change in a graph.

Exercise 2.4: Consider again the demand and supply functions in worked-out problem 2.2 (page 33). Suppose the government needs to buy 3.5 billion bushels of corn for a third-world famine relief program. What effect will the purchase have on the equilibrium price of corn? How will it change the amount of corn that consumers and firms buy?

Exercise 2.5: After terrorists destroyed the World Trade Center and surrounding office buildings on September 11, 2001, some businesspeople worried about the risks of remaining in Manhattan. What effect would you expect their concern to have in the short run (before any of the destroyed office buildings are rebuilt) on the price of office space in Manhattan? What factors does your answer depend on? What about the effect over the long run? Suppose the area around the former World Trade Center is made into a park, so that the destroyed office buildings are never rebuilt. Economically, who would gain and who would lose from such a plan?

Exercise 2.6: If the U.S. government were to ban imports of Canadian beef for reasons unrelated to health concerns, what would be the effect on the price of beef in the United States? How would the typical American's diet change? What about the typical Canadian's? What if the ban suggested to consumers that there might be health risks associated with beef?

Exercise 2.7: Suppose that the U.S. demand for maple syr in thousands of gallons per year, is $Q^d = 6000 - 30P$. Wh the elasticity of demand at a price of $75 per gallon?

Exercise 2.8: Consider again exercise 2.7. At what price is expenditure on maple syrup by U.S. consumers highest?

Exercise 2.9: Suppose the demand function for jelly beans in Cincinnati is linear. Two years ago, the price of jelly bea was $1 per pound, and consumers purchased 100,000 poun of jelly beans. Last year the price was $2, and consumers purchased 50,000 pounds of jelly beans. No other factors th might affect the demand for jelly beans changed. What was elasticity of demand at last year's price of $2? At what price would the total expenditure on jelly beans have been larges

Exercise 2.10: Consider again the demand and supply functions in in-text exercise 2.2 (page 33). At the equilibriu price, what are the elasticities of demand and supply?

Exercise 2.11: Last September, the price of gasoline in Chattanooga was $2 a gallon, and consumers bought 1 mill gallons. Suppose the elasticity of demand in September at a price of $2 was -0.5, and that the demand function for gasoline that month was linear. What was that demand function? At what price does consumers' total expenditure o gasoline reach its largest level?

Exercise 2.12: Suppose the annual demand function for th Honda Accord is $Q^d = 430 - 10P_A + 10P_C - 10P_G$, where P_A and P_C are the prices of the Accord and the Toyota Camry respectively (in thousands), and P_G is the price of gasoline p gallon). What is the elasticity of demand of the Accord wit respect to the price of a Camry when both cars sell for $20,0 and fuel costs $3 per gallon? What is the elasticity with resp to the price of gasoline?

Exercise 2.13: The demand for a product is $Q^d = A - BP$, where P is its price and A and B are positive numbers. Suppo that when the price is $1 the amount demanded is 60 and the elasticity of demand is -1. What are the values of A and B?

APPENDIX

ESTIMATING DEMAND AND SUPPLY CURVES

To answer many questions in economics and business, we need to measure the relationships between the amount demanded and/or supplied and various factors, including the product's price. We've already seen that we need to know the demand and supply functions to predict market prices. Later in this book, we'll see that this same knowledge is useful for such diverse purposes as evaluating the effects of a tax and determining a firm's profit-maximizing price. The process of learning about demand and/or supply is known as demand and/or supply function estimation. For the sake of simplicity, and because the issues are very similar, we'll focus here primarily on the estimation of demand functions.

How can we determine the demand function for a product? There are various approaches to this problem. One is to ask buyers about their willingness to buy the product at different prices. Marketing specialists have developed survey methods for this purpose. But while surveys can provide useful information, they suffer from some shortcomings. Consumers may have difficulty providing accurate responses about what they would do in hypothetical situations. And since their well-being doesn't depend on their answers, they may not give these questions much thought.

Given these problems, economists usually take a different approach: they try to learn about demand by studying consumers' *actual behavior.*

The "Ideal Experiment"

Suppose we're interested in estimating the weekly demand function for hot dogs in Evanston, Illinois. To start, we'll assume for simplicity that this demand depends only on the price of a hot dog. Suppose the demand function is linear, so that it takes the form $Q^d = A - BP$. We don't know the values of A (the intercept term) and B (which determines how much the amount demanded changes when the price changes).

How can we learn these values? First let's think about an ideal experiment, in which we present consumers with different prices in different weeks and observe their demand. Figure 2.19 shows the amounts demanded at two different prices, $P = \$1$ and $P = \$2$, as black dots. We can find the demand curve, labeled D, by drawing a line through these dots, as in the figure. The value A is the quantity at which this line hits the horizontal axis (corresponding to the amount demanded when hot dogs are free). The demand curve hits the vertical axis at a height equal to A/B. So the value of B equals the horizontal intercept of the demand curve divided by the vertical intercept. [This is also equal to $-$(1/demand curve slope)].

If the demand function isn't linear, we would usually need to observe the demand at more than two prices to trace out the demand curve. And if observable factors other than the price affect demand, such as the season (summer versus nonsummer), we would need to perform a similar experiment in each season.