

Demand and Supply: The Price of Coffee

Coffee Surges on Poor Colombian Harvests

FT.com

July 30, 2010

Coffee prices hit a 12-year high on Friday on the back of low supplies of premium Arabica coffee from Colombia after a string of poor crops in the Latin American country.

The strong fundamental picture has also encouraged hedge funds to reverse their previous bearish views on coffee prices.

In New York, ICE September Arabica coffee jumped 3.2 percent to 178.75 cents per pound, the highest since February 1998. It traded later at 177.25 cents, up 6.8 percent on the week.

The London-based International Coffee Organization on Friday warned that the “current tight demand and supply situation” was “likely to persist in the near to medium term.”

Coffee industry executives believe prices could rise toward 200 cents per pound in New York before the arrival of the new Brazilian crop later this year.

“Until October it is going to be tight on high quality coffee,” said a senior executive at one of Europe’s largest coffee roasters. He said: “The industry has been surprised by the scarcity of high quality beans.”

Colombia coffee production, key for supplies of premium beans, last year plunged to a 33-year low of 7.8m bags, each of 60kg, down nearly a third from 11.1m bags in 2008, tightening supplies worldwide. ...

Excerpted from “Coffee Surges on Poor Colombian Harvests” by Javier Blas. *Financial Times*, July 30, 2010. Reprinted with permission.

ESSENCE OF THE STORY

- The price of premium Arabica coffee increased by 3.2 percent to almost 180 cents per pound in July 2010, the highest price since February 1998.
- A sequence of poor crops in Columbia cut the production of premium Arabica coffee to a 33-year low of 7.8 million 60 kilogram bags, down from 11.1 million bags in 2008.
- The International Coffee Organization said that the “current tight demand and supply situation” was “likely to persist in the near to medium term.”
- Coffee industry executives say prices might approach 200 cents per pound before the arrival of the new Brazilian crop later this year.
- Hedge funds previously expected the price of coffee to fall but now expect it to rise further.

ECONOMIC ANALYSIS

- This news article reports two sources of changes in supply and demand that changed the price of coffee.
- The first source of change is the sequence of poor harvests in Columbia. These events decreased the world supply of Arabica coffee. (Arabica is the type that Starbucks uses.)
- Before the reported events, the world production of Arabica was 120 million bags per year and its price was 174 cents per pound.
- The decrease in the Columbian harvest decreased world production to about 116 million bags, which is about 3 percent of world production.
- Figure 1 shows the situation before the poor Columbia harvests and the effects of those poor harvests. The demand curve is D and initially, the supply curve was S^0 . The market equilibrium is at 120 million bags per year and a price of 174 cents per pound.
- The poor Columbian harvests decreased supply and the supply curve shifted leftward to S^1 . The price increased to 180 cents per pound and the quantity decreased to 116 million bags.
- The second source of change influenced both supply and demand. It is a change in the expected future price of coffee.
- The hedge funds referred to in the news article are speculators that try to profit from buying at a low price and selling at a high price.
- With the supply of coffee expected to remain low, the price was expected to rise further—a rise in the expected future price of coffee.
- When the expected future price of coffee rises, some people want to buy more coffee (so they can sell it later)—an increase in the demand today. And some people offer less coffee for sale (so they can sell it later for a higher price)—a decrease in the supply today.
- Figure 2 shows the effects of these changes in the demand and supply today.
- Demand increased and the demand curve shifted from D^0 to D^1 . Supply decreased and the supply curve shifted from S^1 to S^2 .
- Because demand increases and supply decreases, the price rises. In this example, it rises to 200 cents per pound.

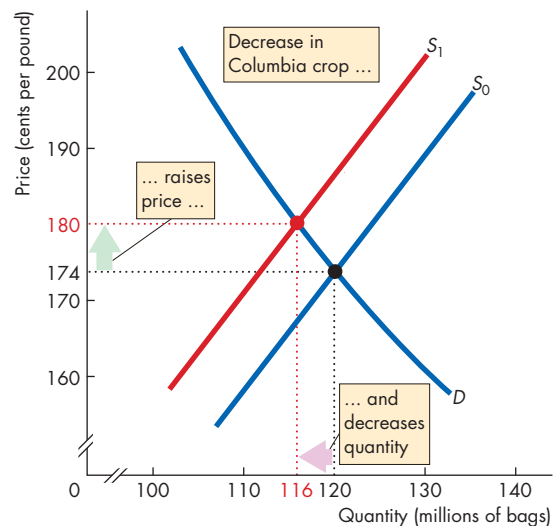


Figure 1 The effects of the Columbian crop

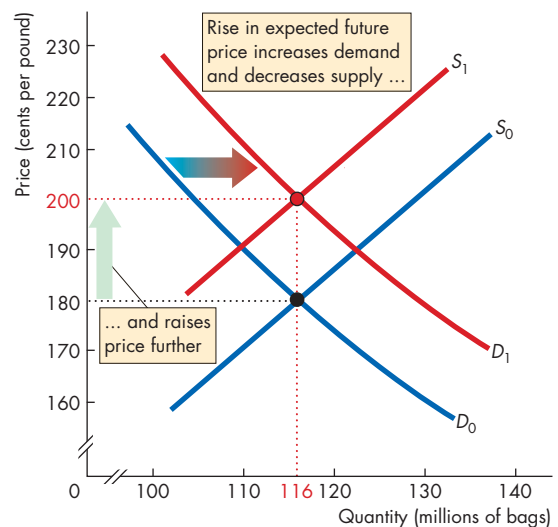


Figure 2 The effects of the expected future price

- Also, because demand increases and supply decreases, the change in the equilibrium quantity can go in either direction.
- In this example, the increase in demand equals the decrease in supply, so the equilibrium quantity remains constant at 116 million bags per year.

MATHEMATICAL NOTE

Demand, Supply, and Equilibrium

Demand Curve

The law of demand says that as the price of a good or service falls, the quantity demanded of that good or service increases. We can illustrate the law of demand by drawing a graph of the demand curve or writing down an equation. When the demand curve is a straight line, the following equation describes it:

$$P = a - bQ_D,$$

where P is the price and Q_D is the quantity demanded. The a and b are positive constants.

The demand equation tells us three things:

1. The price at which no one is willing to buy the good (Q_D is zero). That is, if the price is a , then the quantity demanded is zero. You can see the price a in Fig. 1. It is the price at which the demand curve hits the y -axis—what we call the demand curve's “ y -intercept.”
2. As the price falls, the quantity demanded increases. If Q_D is a positive number, then the price P must be less than a . As Q_D gets larger, the price P becomes smaller. That is, as the quantity increases, the maximum price that buyers are willing to pay for the last unit of the good falls.
3. The constant b tells us how fast the maximum price that someone is willing to pay for the good falls as the quantity increases. That is, the constant b tells us about the steepness of the demand curve. The equation tells us that the slope of the demand curve is $-b$.

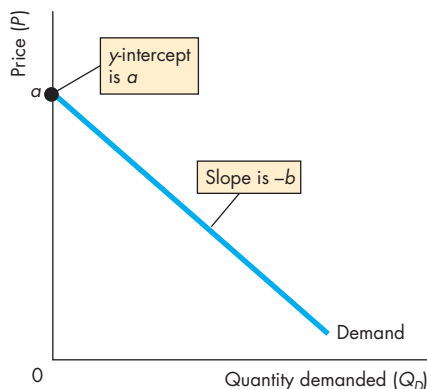


Figure 1 Demand curve

Supply Curve

The law of supply says that as the price of a good or service rises, the quantity supplied of that good or service increases. We can illustrate the law of supply by drawing a graph of the supply curve or writing down an equation. When the supply curve is a straight line, the following equation describes it:

$$P = c + dQ_S,$$

where P is the price and Q_S is the quantity supplied. The c and d are positive constants.

The supply equation tells us three things:

1. The price at which sellers are not willing to supply the good (Q_S is zero). That is, if the price is c , then no one is willing to sell the good. You can see the price c in Fig. 2. It is the price at which the supply curve hits the y -axis—what we call the supply curve's “ y -intercept.”
2. As the price rises, the quantity supplied increases. If Q_S is a positive number, then the price P must be greater than c . As Q_S increases, the price P becomes larger. That is, as the quantity increases, the minimum price that sellers are willing to accept for the last unit rises.
3. The constant d tells us how fast the minimum price at which someone is willing to sell the good rises as the quantity increases. That is, the constant d tells us about the steepness of the supply curve. The equation tells us that the slope of the supply curve is d .

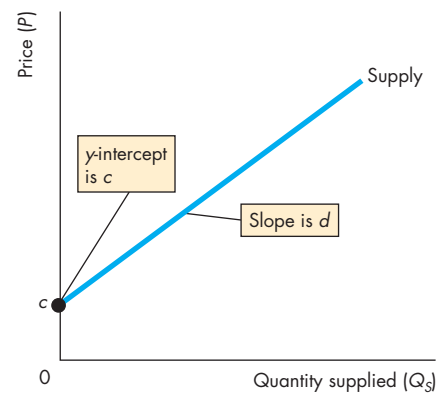


Figure 2 Supply curve

Market Equilibrium

Demand and supply determine market equilibrium. Figure 3 shows the equilibrium price (P^*) and equilibrium quantity (Q^*) at the intersection of the demand curve and the supply curve.

We can use the equations to find the equilibrium price and equilibrium quantity. The price of a good adjusts until the quantity demanded Q_D equals the quantity supplied Q_S . So at the equilibrium price (P^*) and equilibrium quantity (Q^*),

$$Q_D = Q_S = Q^*.$$

To find the equilibrium price and equilibrium quantity, substitute Q^* for Q_D in the demand equation and Q^* for Q_S in the supply equation. Then the price is the equilibrium price (P^*), which gives

$$\begin{aligned} P^* &= a - bQ^* \\ P^* &= c + dQ^*. \end{aligned}$$

Notice that

$$a - bQ^* = c + dQ^*.$$

Now solve for Q^* :

$$\begin{aligned} a - c &= bQ^* + dQ^* \\ a - c &= (b + d)Q^* \\ Q^* &= \frac{a - c}{b + d}. \end{aligned}$$

To find the equilibrium price, (P^*), substitute for Q^* in either the demand equation or the supply equation.

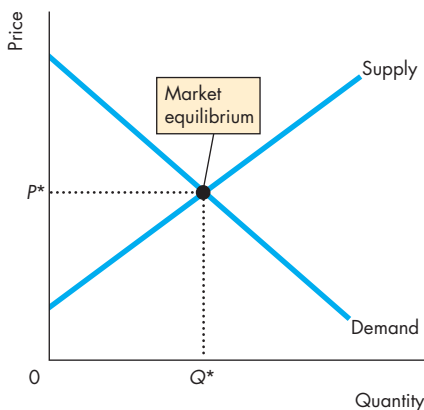


Figure 3 Market equilibrium

Using the demand equation, we have

$$\begin{aligned} P^* &= a - b \left(\frac{a - c}{b + d} \right) \\ P^* &= \frac{a(b + d) - b(a - c)}{b + d} \\ P^* &= \frac{ad + bc}{b + d}. \end{aligned}$$

Alternatively, using the supply equation, we have

$$\begin{aligned} P^* &= c + d \left(\frac{a - c}{b + d} \right) \\ P^* &= \frac{c(b + d) + d(a - c)}{b + d} \\ P^* &= \frac{ad + bc}{b + d}. \end{aligned}$$

An Example

The demand for ice-cream cones is

$$P = 800 - 2Q_D.$$

The supply of ice-cream cones is

$$P = 200 + 1Q_S.$$

The price of a cone is expressed in cents, and the quantities are expressed in cones per day.

To find the equilibrium price (P^*) and equilibrium quantity (Q^*), substitute Q^* for Q_D and Q_S and P^* for P . That is,

$$\begin{aligned} P^* &= 800 - 2Q^* \\ P^* &= 200 + 1Q^*. \end{aligned}$$

Now solve for Q^* :

$$\begin{aligned} 800 - 2Q^* &= 200 + 1Q^* \\ 600 &= 3Q^* \\ Q^* &= 200. \end{aligned}$$

And

$$\begin{aligned} P^* &= 800 - 2(200) \\ &= 400. \end{aligned}$$

The equilibrium price is \$4 a cone, and the equilibrium quantity is 200 cones per day.

SUMMARY

Key Points

Markets and Prices (p. 56)

- A competitive market is one that has so many buyers and sellers that no single buyer or seller can influence the price.
- Opportunity cost is a relative price.
- Demand and supply determine relative prices.

Working Problem 1 will give you a better understanding of markets and prices.

Demand (pp. 57–61)

- Demand is the relationship between the quantity demanded of a good and its price when all other influences on buying plans remain the same.
- The higher the price of a good, other things remaining the same, the smaller is the quantity demanded—the law of demand.
- Demand depends on the prices of related goods (substitutes and complements), expected future prices, income, expected future income and credit, the population, and preferences.

Working Problems 2 to 5 will give you a better understanding of demand.

Supply (pp. 62–65)

- Supply is the relationship between the quantity supplied of a good and its price when all other influences on selling plans remain the same.
- The higher the price of a good, other things remaining the same, the greater is the quantity supplied—the law of supply.

- Supply depends on the prices of factors of production used to produce a good, the prices of related goods produced, expected future prices, the number of suppliers, technology, and the state of nature.

Working Problems 6 to 9 will give you a better understanding of supply.

Market Equilibrium (pp. 66–67)

- At the equilibrium price, the quantity demanded equals the quantity supplied.
- At any price above the equilibrium price, there is a surplus and the price falls.
- At any price below the equilibrium price, there is a shortage and the price rises.

Working Problems 10 and 11 will give you a better understanding of market equilibrium

Predicting Changes in Price and Quantity (pp. 68–73)

- An increase in demand brings a rise in the price and an increase in the quantity supplied. A decrease in demand brings a fall in the price and a decrease in the quantity supplied.
- An increase in supply brings a fall in the price and an increase in the quantity demanded. A decrease in supply brings a rise in the price and a decrease in the quantity demanded.
- An increase in demand and an increase in supply bring an increased quantity but an uncertain price change. An increase in demand and a decrease in supply bring a higher price but an uncertain change in quantity.

Working Problems 12 and 13 will give you a better understanding of predicting changes in price and quantity.

Key Terms

Change in demand, 58

Change in supply, 63

Change in the quantity demanded, 61

Change in the quantity supplied, 64

Competitive market, 56

Complement, 59

Demand, 57

Demand curve, 58

Equilibrium price, 66

Equilibrium quantity, 66

Inferior good, 60

Law of demand, 57

Law of supply, 62

Money price, 56

Normal good, 60

Quantity demanded, 57

Quantity supplied, 62

Relative price, 56

Substitute, 59

Supply, 62

Supply curve, 62



STUDY PLAN PROBLEMS AND APPLICATIONS

 You can work Problems 1 to 17 in MyEconLab Chapter 3 Study Plan and get instant feedback.

Markets and Prices (Study Plan 3.1)

- William Gregg owned a mill in South Carolina. In December 1862, he placed a notice in the *Edgehill Advertiser* announcing his willingness to exchange cloth for food and other items. Here is an extract:
 - 1 yard of cloth for 1 pound of bacon
 - 2 yards of cloth for 1 pound of butter
 - 4 yards of cloth for 1 pound of wool
 - 8 yards of cloth for 1 bushel of salt
 - What is the relative price of butter in terms of wool?
 - If the money price of bacon was 20¢ a pound, what do you predict was the money price of butter?
 - If the money price of bacon was 20¢ a pound and the money price of salt was \$2.00 a bushel, do you think anyone would accept Mr. Gregg's offer of cloth for salt?

Demand (Study Plan 3.2)

- The price of food increased during the past year.
 - Explain why the law of demand applies to food just as it does to all other goods and services.
 - Explain how the substitution effect influences food purchases and provide some examples of substitutions that people might make when the price of food rises and other things remain the same.
 - Explain how the income effect influences food purchases and provide some examples of the income effect that might occur when the price of food rises and other things remain the same.
- Place the following goods and services into pairs of likely substitutes and pairs of likely complements. (You may use an item in more than one pair.) The goods and services are
 - coal, oil, natural gas, wheat, corn, rye, pasta, pizza, sausage, skateboard, roller blades, video game, laptop, iPod, cell phone, text message, email, phone call, voice mail
- During 2010, the average income in China increased by 10 percent. Compared to 2009,

how do you expect the following would change:

- The demand for beef? Explain your answer.
 - The demand for rice? Explain your answer.
- In January 2010, the price of gasoline was \$2.70 a gallon. By spring 2010, the price had increased to \$3.00 a gallon. Assume that there were no changes in average income, population, or any other influence on buying plans. Explain how the rise in the price of gasoline would affect
 - The demand for gasoline.
 - The quantity of gasoline demanded.

Supply (Study Plan 3.3)

- In 2008, the price of corn increased by 35 percent and some cotton farmers in Texas stopped growing cotton and started to grow corn.
 - Does this fact illustrate the law of demand or the law of supply? Explain your answer.
 - Why would a cotton farmer grow corn?

Use the following information to work Problems 7 to 9.

Dairies make low-fat milk from full-cream milk. In the process of making low-fat milk, the dairies produce cream, which is made into ice cream. In the market for low-fat milk, the following events occur one at a time:

- The wage rate of dairy workers rises.
 - The price of cream rises.
 - The price of low-fat milk rises.
 - With the period of low rainfall extending, dairies raise their expected price of low-fat milk next year.
 - With advice from health-care experts, dairy farmers decide to switch from producing full-cream milk to growing vegetables.
 - A new technology lowers the cost of producing ice cream.
- Explain the effect of each event on the supply of low-fat milk.
 - Use a graph to illustrate the effect of each event.
 - Does any event (or events) illustrate the law of supply?

Market Equilibrium (Study Plan 3.4)

10. “As more people buy computers, the demand for Internet service increases and the price of Internet service decreases. The fall in the price of Internet service decreases the supply of Internet service.” Explain what is wrong with this statement.
11. The demand and supply schedules for gum are

Price (cents per pack)	Quantity demanded (millions of packs a week)	Quantity supplied
20	180	60
40	140	100
60	100	140
80	60	180
100	20	220

- Draw a graph of the market for gum and mark in the equilibrium price and quantity.
- Suppose that the price of gum is 70¢ a pack. Describe the situation in the gum market and explain how the price adjusts.
- Suppose that the price of gum is 30¢ a pack. Describe the situation in the gum market and explain how the price adjusts.

Predicting Changes in Price and Quantity

(Study Plan 3.5)

12. The following events occur one at a time:
- The price of crude oil rises.
 - The price of a car rises.
 - All speed limits on highways are abolished.
 - Robots cut car production costs.
- Which of these events will increase or decrease (state which occurs)
- The demand for gasoline?
 - The supply of gasoline?
 - The quantity of gasoline demanded?
 - The quantity of gasoline supplied?
13. In Problem 11, a fire destroys some factories that produce gum and the quantity of gum supplied decreases by 40 million packs a week at each price.
- Explain what happens in the market for gum and draw a graph to illustrate the changes.
 - If at the time the fire occurs there is an increase in the teenage population, which increases the quantity of gum demanded by 40 million packs a week at each price, what are the new equilibrium price and quantity of gum? Illustrate these changes on your graph.

Economics in the News (Study Plan 3.N)

14. **American to Cut Flights, Charge for Luggage**
American Airlines announced yesterday that it will begin charging passengers \$15 for their first piece of checked luggage, in addition to raising other fees and cutting domestic flights as it grapples with record-high fuel prices.

Source: *Boston Herald*, May 22, 2008

- According to the news clip, what is the influence on the supply of American Airlines flights?
 - Explain how supply changes.
15. **Of Gambling, Grannies, and Good Sense**
Nevada has plenty of jobs for the over 50s and its elderly population is growing faster than that in other states.

Source: *The Economist*, July 26, 2006

Explain how grannies have influenced:

- The demand in some Las Vegas markets.
 - The supply in other Las Vegas markets.
16. **Frigid Florida Winter is Bad News for Tomato Lovers**

An unusually cold January in Florida destroyed entire fields of tomatoes and forced many farmers to delay their harvest. Florida's growers are shipping only a quarter of their usual 5 million pounds a week. The price has risen from \$6.50 for a 25-pound box a year ago to \$30 now.

Source: *USA Today*, March 3, 2010

- Make a graph to illustrate the market for tomatoes in January 2009 and January 2010.
- On the graph, show how the events in the news clip influence the market for tomatoes.
- Why is the news “bad for tomato lovers”?

17. **Pump Prices on Pace to Top 2009 High by Weekend**

The cost of filling up the car is rising as the crude oil price soars and pump prices may exceed the peak price of 2009.

Source: *USA Today*, January 7, 2010

- Does demand for gasoline or the supply of gasoline or both change when the price of oil soars?
- Use a demand-supply graph to illustrate what happens to the equilibrium price of gasoline and the equilibrium quantity of gasoline bought when the price of oil soars.

ADDITIONAL PROBLEMS AND APPLICATIONS

 You can work these problems in MyEconLab if assigned by your instructor.

Markets and Prices

18. What features of the world market for crude oil make it a competitive market?
19. The money price of a textbook is \$90 and the money price of the Wii game *Super Mario Galaxy* is \$45.
 - a. What is the opportunity cost of a textbook in terms of the Wii game?
 - b. What is the relative price of the Wii game in terms of textbooks?

Demand

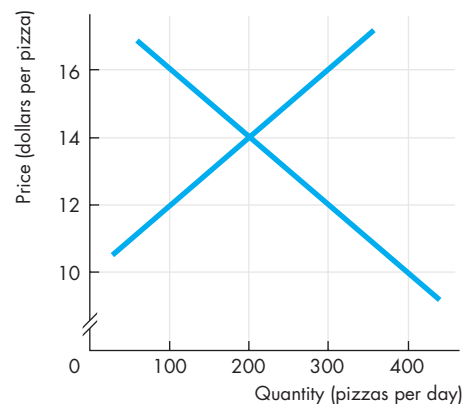
20. The price of gasoline has increased during the past year.
 - a. Explain why the law of demand applies to gasoline just as it does to all other goods and services.
 - b. Explain how the substitution effect influences gasoline purchases and provide some examples of substitutions that people might make when the price of gasoline rises and other things remain the same.
 - c. Explain how the income effect influences gasoline purchases and provide some examples of the income effects that might occur when the price of gasoline rises and other things remain the same.
21. Think about the demand for the three game consoles: Xbox, PS3, and Wii. Explain the effect of the following events on the demand for Xbox games and the quantity of Xbox games demanded, other things remaining the same.
 - a. The price of an Xbox falls.
 - b. The prices of a PS3 and a Wii fall.
 - c. The number of people writing and producing Xbox games increases.
 - d. Consumers' incomes increase.
 - e. Programmers who write code for Xbox games become more costly to hire.
 - f. The expected future price of an Xbox game falls.
 - g. A new game console that is a close substitute for Xbox comes onto the market.

Supply

22. Classify the following pairs of goods and services as substitutes in production, complements in production, or neither.
 - a. Bottled water and health club memberships
 - b. French fries and baked potatoes
 - c. Leather purses and leather shoes
 - d. Hybrids and SUVs
 - e. Diet coke and regular coke
23. As the prices of homes fell across the United States in 2008, the number of homes offered for sale decreased.
 - a. Does this fact illustrate the law of demand or the law of supply? Explain your answer.
 - b. Why would home owners decide not to sell?
24. **G.M. Cuts Production for Quarter**
General Motors cut its fourth-quarter production schedule by 10 percent because Ford Motor, Chrysler, and Toyota sales declined in August.
Source: *The New York Times*, September 5, 2007
Explain whether this news clip illustrates a change in the supply of cars or a change in the quantity supplied of cars.

Market Equilibrium

Use the following figure to work Problems 25 and 26.



25. a. Label the curves. Which curve shows the willingness to pay for a pizza?
b. If the price of a pizza is \$16, is there a shortage or a surplus and does the price rise or fall?

- c. Sellers want to receive the highest possible price, so why would they be willing to accept less than \$16 a pizza?
26. a. If the price of a pizza is \$12, is there a shortage or a surplus and does the price rise or fall?
b. Buyers want to pay the lowest possible price, so why would they be willing to pay more than \$12 for a pizza?
27. The demand and supply schedules for potato chips are

Price (cents per bag)	Quantity demanded (millions of bags per week)	Quantity supplied
50	160	130
60	150	140
70	140	150
80	130	160
90	120	170
100	110	180

- a. Draw a graph of the potato chip market and mark in the equilibrium price and quantity.
b. If the price is 60¢ a bag, is there a shortage or a surplus, and how does the price adjust?

Predicting Changes in Price and Quantity

28. In Problem 27, a new dip increases the quantity of potato chips that people want to buy by 30 million bags per week at each price.
a. How does the demand and/or supply of chips change?
b. How does the price and quantity of chips change?
29. In Problem 27, if a virus destroys potato crops and the quantity of potato chips produced decreases by 40 million bags a week at each price, how does the supply of chips change?
30. If the virus in Problem 29 hits just as the new dip in Problem 28 comes onto the market, how does the price and quantity of chips change?

Economics in the News

31. After you have studied *Reading Between the Lines* on pp. 74–75 answer the following questions.
a. What happened to the price of coffee in 2010?
b. What substitutions do you expect might have been made to decrease the quantity of coffee demanded?
c. What influenced the demand for coffee in 2010 and what influenced the quantity of coffee demanded?
d. What influenced the supply of coffee during

2010 and how did the supply of coffee change?

- e. How did the combination of the factors you have noted in parts (c) and (d) influence the price and quantity of coffee?
f. Was the change in quantity of coffee a change in the quantity demanded or a change in the quantity supplied?
32. **Strawberry Prices Drop as Late Harvest Hits Market**

Shoppers bought strawberries in March for \$1.25 a pound rather than the \$3.49 a pound they paid last year. With the price so low, some growers plowed over their strawberry plants to make way for spring melons; others froze their harvests and sold them to juice and jam makers.

Source: *USA Today*, April 5, 2010

- a. Explain how the market for strawberries would have changed if growers had not plowed in their plants but offered locals “you pick for free.”
b. Describe the changes in demand and supply in the market for strawberry jam.

33. “Popcorn Movie” Experience Gets Pricier

Cinemas are raising the price of popcorn. Demand for field corn, which is used for animal feed, corn syrup, and ethanol, has increased and its price has exploded. That’s caused some farmers to shift from growing popcorn to easier-to-grow field corn.

Source: *USA Today*, May 24, 2008

Explain and illustrate graphically the events described in the news clip in the market for

- a. Popcorn
b. Movie tickets

Use the following news clip to work Problems 34 and 35.

Sony’s Blu-Ray Wins High-Definition War

Toshiba Corp. yesterday withdrew from the race to be the next-generation home movie format, leaving Sony Corp.’s Blu-ray technology the winner. The move could finally jump-start a high-definition home DVD market.

Source: *The Washington Times*, February 20, 2008

34. a. How would you expect the price of a used Toshiba player on eBay to change? Will the price change result from a change in demand, supply, or both, and in which directions?
b. How would you expect the price of a Blu-ray player to change?
35. Explain how the market for Blu-ray format movies will change.