

~~Free gold Micro (CS) GR-1, GR-2, GR-3~~

Michael Sini

QUESTIONS

1. Define *demand*. Define *supply*. In your answers, explain the difference between *demand* and *quantity demanded* and between *supply* and *quantity supplied*.
2. List the key nonprice factors that influence demand and supply.
3. In defining demand and supply, why do you think economists focus on price while holding constant other factors that might have an impact on the behavior of buyers and sellers?
4. Define comparative statics analysis. How does it compare with sensitivity analysis or what-if analysis used in finance, accounting, and statistics?
5. Define the *rationing function* of price. Why is it necessary for price to serve this function in the market economy?
6. Define the *guiding or allocating function* of price.
7. Discuss the differences between the short run and the long run from the perspective of producers and from the perspective of consumers.
8. Explain the difference between shortages and scarcity. In answering this question, you should consider the difference between the short run and the long run in economic analysis.
9. Why do you think it is important for managers to understand the mechanics of supply and demand both in the short run and in the long run? Give examples of companies whose business was either helped or hurt by changes in supply or demand in the markets in which they were competing.
10. "If Congress levies an additional tax on luxury items, the prices of these items will rise. However, this will cause demand to decrease, and as a result the prices will fall back down, perhaps even to their original levels." Do you agree with this statement? Explain.
11. Overheard at the water cooler in the corporate headquarters of a large manufacturing concern: "The competition is really threatening us with their new product line. I think we should consider offering discounts on our current line in order to stimulate demand." In this statement, is the term *demand* being used in a manner consistent with economic theory? Explain. Illustrate your answer using a line drawn to represent the demand for this firm's product line.
12. Briefly list and elaborate on the factors that will be affecting the demand for the following products in the next several years. Do you think these factors will cause the demand to increase or decrease?
 - a. Convenience foods (sold in food shops and supermarkets)
 - b. Products purchased on the Internet
 - c. Fax machines
 - d. Film and cameras
 - e. Videos rented from retail outlets
 - f. Pay-per-view television programming
 - g. Airline travel within the United States; airline travel within Europe
 - h. Gasoline
13. Briefly list and elaborate on the factors that will be affecting the supply of the following products in the next several years. Do you think these factors will cause the supply to increase or decrease?
 - a. Crude oil
 - b. Beef
 - c. Computer memory chips
 - d. Hotel rooms
 - e. Fast food outlets in emerging markets
 - f. Credit cards issued by financial institutions
 - g. Laptop computers
 - h. PC servers

PROBLEMS

1. The following function describes the demand condition for a company that makes caps featuring names of college and professional teams in a variety of sports.

$$Q = 2,000 - 100P$$

where Q is cap sales and P is price.

- a. How many caps could be sold at \$12 each?
 - b. What should the price be in order for the company to sell 1,000 caps?
 - c. At what price would cap sales equal zero?
2. Consider the following supply and demand curves for a certain product.

$$Q_S = 25,000 P$$

$$Q_D = 50,000 - 10,000 P$$

- a. Plot the demand and supply curves.
 - b. What are the equilibrium price and equilibrium quantity for the industry? Determine the answer both algebraically and graphically. (Round to the nearest cent.)
3. The following relations describe the supply and demand for posters.

$$Q_D = 65,000 - 10,000 P$$

$$Q_S = -35,000 + 15,000 P$$

where Q is the quantity and P is the price of a poster, in dollars.

- a. Complete the following table.

Price	Q_S	Q_D	Surplus or Shortage
\$6.00			
5.00			
4.00			
3.00			
2.00			
1.00			

- b. What is the equilibrium price?

4. The following relations describe monthly demand and supply for a computer support service catering to small businesses.

$$Q_D = 3,000 - 10 P$$

$$Q_S = -1,000 + 10 P$$

where Q is the number of businesses that need services and P is the monthly fee, in dollars.

- a. At what average monthly fee would demand equal zero?
- b. At what average monthly fee would supply equal zero?
- c. Plot the supply and demand curves.
- d. What is the equilibrium price/output level?
- e. Suppose demand increases and leads to a new demand curve:

$$Q_D = 3,500 - 10 P$$

What is the effect on supply? What are the new equilibrium P and Q ?

- f. Suppose new suppliers enter the market due to the increase in demand so the new supply curve is $Q = -500 + 10 P$. What are the new equilibrium price and equilibrium quantity?
 - g. Show these changes on the graph.
5. The ABC marketing consulting firm found that a particular brand of portable stereo has the following demand curve for a certain region:

$$Q = 10,000 - 200 P + 0.03 \text{Pop} + 0.6 I + 0.2 A$$

where Q is the quantity per month, P is price (\$), Pop is population, I is disposable income per household (\$), and A is advertising expenditure (\$).

- a. Determine the demand curve for the company in a market in which $P = 300$, $\text{Pop} = 1,000,000$, $I = 30,000$, and $A = 15,000$.
- b. Calculate the quantity demanded at prices of \$200, \$175, \$150, and \$125.

$A = \text{advertising}$
 $I = \text{disposable income} = \text{tax-income}$
 $\text{Pop} = \text{population}$

- c. Calculate the price necessary to sell 45,000 units.
6. Joy's Frozen Yogurt shops have enjoyed rapid growth in northeastern states in recent years. From the analysis of Joy's various outlets, it was found that the demand curve follows this pattern:

$$Q = 200 - 300P + 120I + 65T - 250A_c + 400A_j$$

where Q = Number of cups served per week

P = Average price paid for each cup

I = Per capita income in the given market (thousands)

T = Average outdoor temperature

A_c = Competition's monthly advertising expenditures (thousands)

A_j = Joy's own monthly advertising expenditures (thousands)

One of the outlets has the following conditions: $P = 1.50$, $I = 10$, $T = 60$, $A_c = 15$, $A_j = 10$.

- a. Estimate the number of cups served per week by this outlet. Also determine the outlet's demand curve.
- b. What would be the effect of a \$5,000 increase in the competitor's advertising expenditure? Illustrate the effect on the outlet's demand curve.
- c. What would Joy's advertising expenditure have to be to counteract this effect?
7. Illustrate the example of the world sugar market with supply and demand diagrams. Be sure to show how the relative shifts in supply and demand have led to the reduction in the world price of sugar.
8. Over the past decade, the demand for CDs has dramatically increased. What are some of the causes of this increase in demand? According to supply-and-demand theory, price should rise when demand increases. However, in recent years the average price of a CD has actually fallen. Explain this apparent contradiction between the theory and fact.
9. Suppose a firm has the following demand equation:

$$Q = 1,000 - 3,000P + 10A$$

where Q = quantity demanded

P = product price (in dollars)

A = advertising expenditure (in dollars)

Assume for the following questions that $P = \$3$ and $A = \$2,000$.

- a. Suppose the firm dropped the price to \$2.50. Would this be beneficial? Explain. Illustrate your answer with the use of a demand schedule and demand curve.
- b. Suppose the firm raised the price to \$4.00 while increasing its advertising expenditure by \$100. Would this be beneficial? Explain. Illustrate your answer with the use of a demand schedule and a demand curve. (Hint: First construct the schedule and the curve assuming $A = \$2,000$. Then construct the new schedule and curve assuming $A = \$2,100$.)
10. A travel company has hired a management consulting company to analyze demand in 26 regional markets for one of its major products: a guided tour to a particular country. The consultant uses data to estimate the following equation (the estimation technique is discussed in detail in chapter 5):

$$Q = 1,500 - 4P + 5A + 10I + 3PX$$

where Q = amount of the product demanded

P = price of the product in dollars

A = advertising expenditures in thousands of dollars

I = income in thousands of dollars

PX = price of some other travel products offered by a competing travel company

- a. Calculate the amount demanded for this product using the following data:

$$P = \$400$$

$$A = \$20,000$$

Supply and Demand

67

$$I = \$15,000$$
$$PX = \$500$$

- b. Suppose the competitor reduced the price of its travel product to \$400 to match the price of this firm's product. How much would this firm have to increase its advertising in order to counteract the drop in its competitor's price? Would it be worth it for them to do so? Explain.
- c. What other variables might be important in helping estimate the demand for this travel product?
11. Following are three sample equations. Plot them on a graph in which Q is on the vertical axis and P is on the horizontal axis. Then transform these equations so P is expressed in terms of Q and plot these transformed equations on a graph in which P is on the vertical axis and Q is on the horizontal axis.
- $Q = 250 - 10 P$
 - $Q = 1,300 - 140 P$
 - $Q = 45 - 0.5 P$
12. Use the following equation to derive a demand schedule and a demand curve. What types of products might exhibit this type of nonlinear demand curve? Explain.

$$Q = 100P^{-0.3}$$

- millions of dollars? Devise a product that saves people lots of time." LO2
4. Explain: LO2
 - a. Before economic growth, there were too few goods; after growth, there is too little time.
 - b. It is irrational for an individual to take the time to be completely rational in economic decision making.
 - c. Telling your spouse where you would like to go out to eat for your birthday makes sense in terms of utility maximization.
 5. In the last decade or so, there has been a dramatic expansion of small retail convenience stores (such as 7-Eleven, FamilyMart, and Circle K), although their prices are generally much higher than prices in large supermarkets. What explains the success of the convenience stores? LO2
 6. Many apartment-complex owners are installing water meters for each apartment and billing the occupants according to the amount of water they use. This is in contrast to the former procedure of having a central meter for the entire complex and dividing up the collective water expense as part of the rent. Where individual meters have been installed, water usage has declined 10 to 40 percent. Explain that drop, referring to price and marginal utility. LO3
 7. Using the utility-maximization rule as your point of reference, explain the income and substitution effects of an increase in the price of product B, with no change in the price of product A. LO4
 8. ADVANCED ANALYSIS A "mathematically fair bet" is one in which the amount won will on average equal the amount bet,
- for example, when a gambler bets, say, \$100 for a 10 percent chance to win \$1000 ($\$100 = .10 \times \1000). Assuming diminishing marginal utility of dollars, explain why this is not a fair bet in terms of utility. Why is it even a less fair bet when the "house" takes a cut of each dollar bet? So is gambling irrational? LO4
9. Suppose that Yoshi is loss averse. In the morning, Yoshi's stockbroker calls to tell him that he has gained \$1000 on his stock portfolio. In the evening, his accountant calls to tell him that he owes an extra \$1000 in taxes. At the end of the day, does Yoshi feel emotionally neutral since the dollar value of the gain in his stock portfolio exactly offsets the amount of extra taxes he has to pay? Explain. LO5
 10. You just accepted a campus job helping to raise money for your school's athletic program. You are told to draft a fund-raising letter. The bottom of the letter asks recipients to write down a donation amount. If you want to raise as much money as possible, would it be better if the text of that section mentioned that your school is #3 in the nation in sports or that you are better than 99% of other schools at sports? Explain. LO5
 11. LASTWORD What do you think of the ethics of using unconscious nudges to alter people's behavior? Before you answer, consider the following argument made by economists Richard Thaler and Cass Sunstein, who favor the use of nudges. They argue that in most situations, we couldn't avoid nudging—even if we wanted to, because whatever policy we choose will contain some set of unconscious nudges and incentives that will influence people. Thus, they say, we might as well choose the wisest set of nudges.

Problems



1. Mylie's total utility from singing the same song over and over is 60 utils after one repetition, 100 utils after two repetitions, 130 utils after three repetitions, 90 utils after four repetitions, 30 utils after five repetitions, and -50 utils after six repetitions. Write down her marginal utility for each repetition. Once Mylie's total utility begins to decrease, does each additional singing of the song hurt more than the previous one or less than the previous one? LO1
2. John likes Coca-Cola. After consuming one Coke, John has a total utility of 10 utils. After two Cokes, he has a total utility of 40 utils. After three Cokes, he has a total utility of 90 utils. Does John show diminishing marginal utility for Coke, or does he show increasing marginal utility for Coke? Suppose that John has \$3 in his pocket. If Cokes cost \$1 each and John is willing to spend one of his dollars on purchasing a first can of Coke, would he spend his second dollar on a Coke, too? What about the third dollar? If John's marginal utility for Coke keeps on increasing no matter how many Cokes he drinks, would it be fair to say that he is addicted to Coke? LO1
3. Suppose that Omar's marginal utility for cups of coffee is constant at 3.5 utils per cup no matter how many cups he drinks. On the other hand, his marginal utility per doughnut is 10 for the first doughnut he eats, 9 for the second he eats, 8 for the third he eats, and so on (that is, declining by 1 util per additional doughnut). In addition, suppose that coffee costs \$1 per cup, doughnuts cost \$1 each, and Omar has a budget that he can spend only on doughnuts, coffee, or both. How big would that budget have to be before he would spend a dollar buying a first cup of coffee? LO2
4. Columns 1 through 4 in the table at the top of the next page show the marginal utility, measured in utils, that Ricardo would get by purchasing various amounts of products A, B, C, and D. Column 5 shows the marginal utility Ricardo gets from saving. Assume that the prices of A, B, C, and D are, respectively, \$18, \$6, \$4, and \$24 and that Ricardo has an income of \$106. LO2

Column 1		Column 2		Column 3		Column 4		Column 5	
Units of A	MU	Units of B	MU	Units of C	MU	Units of D	MU	Number of Dollars Saved	MU
1	72	1	24	1	15	1	36	1	5
2	54	2	15	2	12	2	30	2	4
3	45	3	12	3	8	3	24	3	3
4	36	4	9	4	7	4	18	4	2
5	27	5	7	5	5	5	13	5	1
6	18	6	5	6	4	6	7	6	2
7	15	7	2	7	3	7	4	7	4
8	12	8	1	8	3	8	2	8	1

- a. What quantities of A, B, C, and D will Ricardo purchase in maximizing his utility?
 b. How many dollars will Ricardo choose to save?
 c. Check your answers by substituting them into the algebraic statement of the utility-maximizing rule.
 5. You are choosing between two goods, X and Y, and your marginal utility from each is as shown in the table below. If your income is \$9 and the prices of X and Y are \$2 and \$1, respectively, what quantities of each will you purchase to maximize utility? What total utility will you realize? Assume that other things remaining unchanged, the price of X falls to \$1. What quantities of X and Y will you now purchase? Using the two prices and quantities for X, derive a demand schedule (a table showing prices and quantities demanded) for X. LO3

Units of X	MU _x	Units of Y	MU _y
1	10	1	8
2	8	2	7
3	6	3	6
4	4	4	5
5	3	5	4
6	2	6	3

6. ADVANCED ANALYSIS Let $MU_A = z = 10 - x$ and $MU_B = z = 21 - 2y$, where z is marginal utility per dollar measured in utils, x is the amount spent on product A, and y is the amount spent on product B. Assume that the consumer has \$10 to spend on A and B—that is, $x + y = 10$. How is the \$10 best allocated between A and B? How much utility will the marginal dollar yield? LO3
 7. Suppose that with a budget of \$140, Deborah spends \$84 on sushi and \$56 on bagels when sushi costs \$2 per piece and bagels cost \$2 per bagel. But then, after the price of bagels falls to \$1 per bagel, she spends \$50 on sushi and \$50 on bagels. How many pieces of sushi and how many bagels did Deborah consume before the price change? At the new prices, how much money would it have cost Deborah to buy those same quantities (the ones that she consumed before the price change)? Given that it used to take Deborah's entire \$140 to buy those quantities, how big is the income effect caused by the reduction in the price of bagels? LO4

It can be seen from the graph that the solution values are
 $x = 2$ and $y = 3$

It may, however, be noted that an exact solution sometimes may not be made, only an approximate solution would be available in such situation.

Exercise 3

1. Find the solution of the following equations.

(i) $3x - 2 = x + 6$ (ii) $3x + 5 = 2(x + 7)$

(iii) $3 - 2x = 3(5 - 2x)$ (iv) $2y - 15 = 5y - (y + 5)$

(v) $\frac{x}{2} + \frac{3x}{4} + 3 = 2x - \frac{1}{8}$ (vi) $\frac{x-2}{2} = \frac{x}{5} + \frac{1}{2}$

(vii) $3x - 0.2 = 0.25 - 6x$ (viii) $\frac{1}{x} + \frac{2}{x} + \frac{3}{x} = 2$

(ix) $\frac{1}{x-1} = \frac{2}{x-2}$ (x) $\frac{x+1}{x-2} = \frac{x-3}{x-4}$

(xi) $x(x-3) + 4 = x^2 - 2(x+4)$

(xii) $(x-2)^2 = (x-3)^2$

2. Find the intercept on the y axis and slope of the following equations.

(i) $3x - 7y = 21$ (ii) $-5x + 3y = 10$

(iii) $2x + 5y = 12$ (iv) $4x - 2y + 16 = 0$

(v) $15 - 2x + 3y = 0$ (vi) $3x - 12 = 5y$

3. Re-write all the equations given in question 2, above in the standard form $y = a + bx$ and hence obtain their inverse functions.

4. Draw the graphs corresponding to each of the equations given in question 2, above.

5. Solve the following equations using substitution method.

(i) $2x + y = 1$ (ii) $x - y = 2$
 $3x - 2y = 12$ $x + y = 18$

(iii) $-2x + 3y = 13$ (iv) $5x + 2y = 34$
 $3x - 2y = -12$ $4x + 8y = 72$

6. Solve the equations given in question 5, above, using equal coefficient method.

7. Find graphical solution of the equations given in question 5, above.

8. Solve the following equations using a suitable method

(i) $x - y - z = a$ (ii) $x + y = 5$
 $-x - y + z = b$ $x + z = 6$

$-x + y - z = c$ $y + z = 7$

(iii) $2x + 3y + 4z = -4$ (iv) $3x - y - 6z = 0$
 $3x + 2y + z = -1$ $-x + 3y + 4z = 5$

$x + 4y + 2z = 0$ $x + y + 2z = 4$

9. For a two commodity market the equilibrium conditions are given by the equations

$$15P_1 - P_2 = 345$$

$$-2P_1 + 35P_2 = 1000$$

Where, P_1 and P_2 are the prices of tea and coffee in rupees per 500 grams respectively. Find the equilibrium price for each market using

- (i) substitution method
- (ii) equal coefficient method.

10. Prices in a three commodity market are related by the equations

$$8P_1 - 2P_2 - P_3 = 5$$

$$-P_1 + 8P_2 - 3P_3 = 21$$

$$-2P_1 - P_2 + 5P_3 = 7$$

Using some suitable method find the equilibrium values for P_1 , P_2 and P_3 .

11. Obtain the equilibrium level of income (y) and consumption (C) in the national income model using

- (i) Equal coefficient method
- (ii) Substitution method.

$$Y = C + 100$$

$$C = 50 + 0.6y$$

$$Y = \underline{Y} - T$$

12. Using a suitable method of solution, find the equilibrium level of income, consumption and tax revenue (T) in the extended model.

$$Y = C + 125$$

$$C = 55 + 0.8(Y - T)$$

$$T = 25 + 0.15y$$

13. Given the macro model,

$$Y = C + 420$$

$$C = 100 + 0.75(y - T)$$

$$T = 240 + 0.20y$$

determine the equilibrium levels of income, consumption and tax revenue.

14. The IS and LM equations for an economy are given as

$$0.25Y + 175R = 410$$

$$0.40Y - 250R = 550$$

Where y is income and R is the rate of interest. Using substitution and equal coefficient methods, find the equilibrium levels of income and interest rate.

15. The demand and supply function of a market with a single commodity in isolation are

$$Q = 10 - 2P \quad (\text{Demand})$$

$$Q = -5 + 3P \quad (\text{Supply})$$

Obtain the equilibrium price and quantity using equal coefficient, substitution and graphic method of solution.

Answers To Exercise 3

1. (i) 2 (ii) 9 (iii) 3 (iv) -5

(v) $\frac{25}{18}$ (vi) 5 (vii) 0.05 (viii) 3

(ix) 0 (x) 5 (xi) 12 (xii) $\frac{5}{2}$

2. (i) $a = -3$, $b = \frac{3}{7}$ (ii) $a = \frac{10}{3}$, $b = \frac{5}{3}$

(iii) $a = \frac{12}{5}$, $b = -\frac{2}{5}$ (iv) $a = 8$, $b = 2$

(v) $a = -5$, $b = \frac{2}{3}$ (vi) $a = -\frac{12}{5}$, $b = \frac{3}{5}$

3. Inverse Functions are

(i) $x = 7 + \frac{7}{3}y$ (ii) $x = -2 + \frac{3}{5}y$

CHAPTER 4

Determinants

4.0 Description of a Determinant

A determinant is an orderly arrangement of n^2 elements in n rows and n columns. A determinant having n^2 elements is called an nth order determinant. Thus a determinant having $2^2 = 4$ elements is a second order, that having $3^2 = 9$ elements is a third order and so forth. Determinants are enclosed within parallel lines and are denoted by capital alphabets like A, B etc. In the process of evaluation a determinant is reduced to a unique scalar. The scalar which we arrive at after evaluation is denoted by $|A|$, $|B|$ etc., and read as determinant A or determinant B etc. This may also be called as the value of determinant.

The value of determinant may be positive, negative or zero. If the value of the determinant is zero it is called singular otherwise it would be non-singular. Given below are examples of a 2nd, 3rd and 4th order determinant respectively in parametric form.

8. (i) $x = -2, y = 3$ (ii) $x = 10, y = 8$
- (iii) $x = -2, y = 3$ (iv) $x = 4, y = 7$

8. (i) $x = -\frac{b+c}{2}, y = -\frac{a+b}{2}, z = -\frac{a+c}{2}$
- (ii) $x = 2, y = 3, z = 4$
- (iii) $x = -2, y = 4, z = -3$
- (iv) $x = \frac{4}{3}, y = 1, z = \frac{5}{6}$

9. $\bar{P}_1 = \text{Rs.}25, \bar{P}_2 = \text{Rs.}30$
10. $\bar{P}_1 = 2, \bar{P}_2 = 4, \bar{P}_3 = 3$
11. $\bar{y} = 375, \bar{C} = 275$
12. $\bar{y} = 500, \bar{C} = 375, \bar{T} = 100$
13. $\bar{y} = 850, \bar{C} = 430, \bar{T} = 410$
14. $\bar{y} = 1500, \bar{R} = 0.20$
15. $\bar{P} = 3, \bar{Q} = 4$

a_{11}	a_{12}	a_{11}	a_{12}	a_{13}	a_{14}
a_{21}	a_{22}	a_{21}	a_{22}	a_{23}	a_{24}

a_{31}	a_{32}	a_{31}	a_{32}	a_{33}	a_{34}
a_{41}	a_{42}	a_{41}	a_{42}	a_{43}	a_{44}

The elements a_{11}, a_{12} etc., are the standard notations convenient to tell their exact location in the determinant. In general an element is denoted by a_{ij} , where the 1st subscript i indicates the row number and the 2nd subscript j indicates

- (iii) $x = 6 - \frac{5}{2}y$ (iv) $x = -4 + \frac{1}{2}y$
- (v) $x = \frac{15}{2} + \frac{3}{2}y$ (vi) $x = 4 + \frac{5}{3}y$

5,6 and 7.

- (i) $x = 2, y = 3$
- (ii) $x = 10, y = 8$
- (iii) $x = -2, y = 3$
- (iv) $x = 4, y = 7$

4. Solve the following system of equations using Cramer's rule.

$$(i) \begin{aligned} 2x + y &= 1 \\ 3x - 2y &= 12 \end{aligned}$$

$$(ii) \begin{aligned} x - y &= 2 \\ x + y &= 18 \end{aligned}$$

$$(iii) \begin{aligned} -2x + 3y &= 13 \\ 3x - 2y &= -12 \end{aligned}$$

$$(iv) \begin{aligned} 5x + 2y &= 34 \\ 4x + 8y &= 72 \end{aligned}$$

5. Solve the following using Cramer's rule

$$(i) \begin{aligned} -x + y + z &= a \\ x - y + z &= b \\ x + y - z &= c \end{aligned}$$

$$(ii) \begin{aligned} x + y &= 5 \\ x + z &= 6 \\ y + z &= 7 \end{aligned}$$

$$(iii) \begin{aligned} 2x + 3y + 4z &= -4 \\ 3x + 2y + z &= -1 \\ x + 4y + 2z &= 0 \end{aligned}$$

$$(iv) \begin{aligned} 3x + y - 6z &= 0 \\ -x + 3y + 4z &= 5 \\ x + y + 2z &= 4 \end{aligned}$$

6. For a two commodity market the equilibrium conditions are given by the equation.

$$\begin{aligned} 15P_1 - P_2 &= 345 \\ -2P_1 + 35P_2 &= 1000 \end{aligned}$$

Where P_1 and P_2 are the prices of tea and coffee in Rs per 500 grams respectively. Find the equilibrium price for each market using Cramer's rule.

7. Prices in a three commodity market are related by the equations.

$$\begin{aligned} 8P_1 - 2P_2 - P_3 &= 5 \\ -P_1 + 8P_2 - 3P_3 &= 21 \\ -2P_1 + P_2 + 5P_3 &= 7 \end{aligned}$$

Use determinants to find the equilibrium values for P_1 , P_2 and P_3

8. Obtain the equilibrium levels of income (Y) and consumption (C) in the national income model using determinants.

$$\begin{aligned} Y &= C + 100 \\ C &= 50 + 0.6Y \end{aligned}$$

9. Find the equilibrium level of income, consumption and tax revenue (T) in the extended model using Cramer's rule.

$$Y = C + 125$$

$$C = 55 + 0.8(Y - T)$$

$$T = 25 + 0.15Y$$

10. The prices in rupees per kilo of wheat and rice are P_1 and P_2 respectively. Their demand and supply functions are

$$Q_1 = 3 - 9P_1 + 5P_2 \quad \text{Demand for wheat}$$

$$Q_1 = 15 + 3P_1 - P_2 \quad \text{Supply for wheat}$$

$$Q_2 = 1 + 8P_1 - 2P_2 \quad \text{Demand for rice}$$

$$Q_2 = -3 - P_1 - 2P_2 \quad \text{Supply for rice}$$

Use Cramer's rule to find equilibrium prices and quantities for wheat and rice, (Hint: before applying Cramer's rule equate demand and supply for each good).

11. Given the macro model

$$Y = C + 420$$

$$C = 100 + 0.75(Y - T)$$

$$T = 240 + 0.20Y$$

Determine the equilibrium levels of income, consumption and tax revenue, use determinants.

12. The IS and LM equations for an economy are given as

$$0.25Y + 175R = 410$$

$$0.40Y - 250R = 550$$

Where, Y is income and R is the rate of interest. Use Cramer's rule to find the equilibrium levels of income and interest rate.

Answers to Exercise 4

1. (i) 14 (ii) 54 (iii) 16 (iv) -115

2. (i) -37 (ii) 20 (iii) 480 (iv) 41 (v) 36

3. (i) 58 (ii) -23

4. (i) $x = 2, y = -3$ (ii) $x = 10, y = 8$

(iii) $x = -2, y = 3$ (iv) $x = 4, y = 7$

5. (i) $x = \frac{b+c}{2}, y = \frac{a+c}{2}, z = \frac{a+b}{2}$

(ii) $x = 2, y = 3, z = 4$

(iii) $x = -2, y = 4, z = -3$

(iv) $x = \frac{4}{3}, y = 1, z = \frac{5}{6}$

6. $\bar{P}_1 = \text{Rs.} 25, \bar{P}_2 = \text{Rs.} 30$

7. $\bar{P}_1 = 2, \bar{P}_2 = 4, \bar{P}_3 = 3$

8. $\bar{Y} = 375, \bar{C} = 275$

9. $\bar{Y} = 500, \bar{C} = 375, \bar{T} = 100$

10. $\bar{P}_1 = \text{Rs } 4, \bar{P}_2 = \text{Rs } 10, \bar{Q}_1 = 17 \text{ Kg}, \bar{Q}_2 = 13 \text{ Kg}$

11. $\bar{Y} = 850, \bar{C} = 430, \bar{T} = 410$

12. $\bar{Y} = 1500, \bar{R} = 0.20$