

What is matrix?

Ans:- In mathematics, a matrix is a rectangular array or table of numbers, symbols, or expressions, arranged in rows and columns. For example, the dimension of the matrix below is 2×3 , because there are two rows and three columns.

$$A = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 6 & 7 \end{bmatrix}_{2 \times 3}$$

Matrix algebra can enable us to do many things. In the first place, it provides a compact way of writing an equation system, even an extremely large one. Second, it leads to a way of testing the existence of a solution by evaluation of a determinant. Third, it gives a method of finding that solution. Matrix algebra is applicable only to linear-equation systems.

The two-commodity market model can be written — as a system of two linear equations as

$$c_1 P_1 + c_2 P_2 = -c_0$$

$$\gamma_1 P_1 + \gamma_2 P_2 = -\gamma_0$$

In general, a system of m linear equations equations in n variables (x_1, x_2, \dots, x_n) can also be arranged into such a format:

$$\begin{aligned} a_{11}x_1 + a_{12}x_2 + \dots + a_{1n}x_n &= d_1 \\ a_{21}x_1 + a_{22}x_2 + \dots + a_{2n}x_n &= d_2 \\ &\vdots \\ &\vdots \\ &\vdots \\ a_{m1}x_1 + a_{m2}x_2 + \dots + a_{mn}x_n &= d_m \end{aligned}$$

There are essentially three types of ingredients in the equation system, the first is the set of coefficients a_{ij} , the second is the set of variables x_1, x_2, \dots, x_n and the last is the set of constant terms d_1, d_2, \dots, d_m . If we arrange the three set as three rectangular arrays and label them, respectively as A , x and d , then we have:

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix} \quad x = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix} \quad d = \begin{bmatrix} d_1 \\ d_2 \\ \vdots \\ d_m \end{bmatrix}$$

As a simple example, given the linear-equation system

$$6x_1 + 3x_2 + x_3 = 22$$

$$x_1 + 4x_2 - 2x_3 = 12$$

$$4x_1 - x_2 + 5x_3 = 10$$

We can write

$$A = \begin{bmatrix} 6 & 3 & 1 \\ 1 & 4 & -2 \\ 4 & -1 & 5 \end{bmatrix}_{3 \times 3} \quad x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}_{3 \times 1} \quad d = \begin{bmatrix} 22 \\ 12 \\ 10 \end{bmatrix}_{3 \times 1}$$