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APPLICATION OF THE SYSTEM OF LINEAR EQUATIONS TO ECONOMIC PROBLEMS

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Abstract
Nowadays, an economist with a high level of education must have mathematical knowledge. Because many issues of economics are directly related to the linear algebra course of mathematics. In this regard, the section on the system of linear equations is especially important. In this article, a mathematical model of economic problems resulting in a number of linear equations has been developed.

Keywords: system of linear equations, method of solving system of linear equations, method Kramer, determinants.

Introduction

Mathematics in our lives place and importance is incomparable . Get married each one field indispensable to the part as it turns out as if Economy , finance , chemistry , physics , technology and another one row fields mathematician concepts modelling with directly is engaged . Economy science society his life improve and his progressive reach factors learning and to marry app who does in our lives important importance occupation as an accomplished science show will be This is the field different quantitative characteristics own into takes and mathematician modelling with is engaged . Linear algebra of economics many issues easily solution to be done directly help gives Now one how much economic in process surface to come possible has been masala mathematician madeleine linear equations system using let 's make

Transport issues mathematician in making linear equations from the system is used .

of *m* objects $a_1, a_2, \dots a_n$one in quantity different there is a product . To n consumers of this product $b_1, b_2, \dots b_n$ amount delivered to give necessary c_{ij}(i = 1,2 ,...m; j=1,2,...n)- one unity the load each one from i-object to j- consumer delivered to give price known . Shipping so the plan make up demand is done in this all in objects products full distribution need Loads transport minimum cost for to do demand will be done.

a_i b_j	b_1	b_2	…	b_n
a_1	c_{11}	c_{12}	…	c_{1n}
a_2	c_{21}	c_{22}	…	c_{2n}
…	…	…	…	…
a_m	c_{m1}	c_{m2}		c_{mn}

The issue of transport unknowns $x_{ij}(i = 1,2,\ldots m; j = 1,2,\ldots n)$let's define and make a model. In all m objects loads full distribution below equations system with we express ;

$$\begin{cases} x_{11} + x_{12} + \cdots + x_{1n} = a_1 \\ x_{21} + x_{22} + \cdots + x_{2n} = a_2 \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ x_{m1} + x_{m2} + \cdots + x_{mn} = a_m \end{cases}$$

All of consumers requirements to satisfy the following system with we define :

$$\begin{cases} x_{11} + x_{12} + \cdots + x_{1m} = b_1 \\ x_{21} + x_{22} + \cdots + x_{2m} = b_2 \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ x_{n1} + x_{n2} + \cdots + x_{nm} = b_n \end{cases}$$

them of the issue of combined transport common in appearance mathematician madeleine harvest we do :

$$\sum_{j=1}^{n} x_{ij} = a_i \ (i = \overline{1, m})$$

$$\sum_{i=1}^{m} x_{ij} = b_j \ (j = \overline{1, n})$$

$$x_{ij} \geq 0 \ (i = \overline{1, m, \quad j = n})$$

Load transport for to go common the minimum amount of expenses as below we define :

$$Y = \sum_{i=1}^{m} \sum_{j=1}^{n} c_{ij} \, x_{ij}$$

Now the following issue seeing we go out In this b_j(*j=1,2,3,4)* to businesses a_i (*i =1,2,3)* from the warehouse product reserves and each one of the enterprise to the product has been requirements in the table expressed .

In the table from the data using the given transport problem mathematician madeleine let's make :

a_i b_j	250	300	200	200
200	9	8	3	1
350	7	10	6	4
400	2	3	8	12

Solution : Pours equations system through usa_i in the warehouse total products the amount we express

$$\begin{cases} 9x_{11} + 8x_{12} + 3x_{13} + x_{14} = 200 \\ 7x_{21} + 10x_{22} + 6x_{13} + 4x_{24} = 350 \\ 2x_{31} + 3x_{32} + 8x_{33} + 12x_{34} = 400 \end{cases}$$

Har one to the enterprise given products while the following equations system through is represented by :

$$\begin{cases} 2x_{11} + 7x_{12} + 9x_{13} = 200 \\ 3x_{21} + 10x_{22} + 8x_{13} = 300 \\ 8x_{31} + 6x_{32} + 3x_{33} = 200 \\ 12x_{41} + 4x_{42} + x_{43} = 200 \end{cases}$$

All the load transport for gone all costs min. quantity to the following equal to will be : $Y = 9x_{11} + 8x_{12} + 3x_{13} + x_{14} + 7x_{21} + 10x_{22} + 6x_{13} + 4x_{24} + 2x_{31} + 3x_{32} + 8x_{33} + 12x_{34}$ to equal to will be

of the problem mathematician model as follows is represented by :

$$\begin{cases} 9x_{11} + 8x_{12} + 3x_{13} + x_{14} = 200 \\ 7x_{21} + 10x_{22} + 6x_{13} + 4x_{24} = 350 \\ 2x_{31} + 3x_{32} + 8x_{33} + 12x_{34} = 400 \\ 2x_{11} + 7x_{12} + 9x_{13} = 200 \\ 3x_{21} + 10x_{22} + 8x_{13} = 300 \\ 8x_{31} + 6x_{32} + 3x_{33} = 200 \\ 12x_{41} + 4x_{42} + x_{43} = 200 \end{cases}$$

3 types of firms kind of the product work releases Of this for him A_1, A_2, A_3 from raw materials uses Below given in the table raw material spending given .

Raw material type	One to the product expendable raw material quantity			One daily expendable raw material quantity
	1 product	2 product horse	3 products	
A_1	7	4	5	10150
A_2	5	3	2	5750
A_3	2	6	4	7900

From us demand done thing , firm har one from the product per day from how many work releases

Of this for we from the table used without of the matter mathematician madeleine we build Of course it is equations to the system will come and it is as follows will be :

$$.\begin{cases} 7x_1 + 4x_2 + 5x_3 = 10150 \\ 5\ \ x_1 + 3x_2 + 2x_3 = 5750 \\ 2x_1 + 6x_2 + 4x_3 = 7900 \end{cases}$$

the resulting system using optional methods of solving the system of linear equations (Gauss method, solving by matrix equation, solving by multiplying Kramer's formulas). We solve the system using Cramer's formulas.

$$\Delta = \begin{vmatrix} 7 & 4 & 5 \\ 5 & 3 & 2 \\ 2 & 6 & 4 \end{vmatrix} = 56, \qquad \Delta(1) = \begin{vmatrix} 10150 & 4 & 5 \\ 5750 & 3 & 2 \\ 7900 & 6 & 4 \end{vmatrix} = 25200,$$

$$\Delta(2) = \begin{vmatrix} 7 & 10150 & 5 \\ 5 & 5750 & 2 \\ 2 & 7900 & 4 \end{vmatrix} = 28000 \Delta(3) = \begin{vmatrix} 7 & 4 & 10150 \\ 5 & 3 & 5750 \\ 2 & 6 & 7900 \end{vmatrix} = 56000$$

$$x_1 = \frac{\Delta(1)}{\Delta} = \frac{25200}{56} = 450 \quad x_2 = \frac{\Delta(2)}{\Delta} = \frac{28000}{56} = 500$$

$$x_3 = \frac{\Delta(3)}{\Delta} = \frac{56000}{56} = 1000$$

So , the firm is one 450 from the 1st maslutot, 500 from the 2nd maslutot, 1000 from the 3rd maslutot per day will issue it is

The enterprise consists of 2 departments consists of This year common profit 100 mln . soum organize does Next year the first department profit by 75% , the second department and increase by 45% was planned . Then the next 1.57 times the firm's income per year increase planned . Find the annual income of each department this year and last year. x_1, x_2 with departments yearly income let's define . Given to information suitable equations system let's make :

$$\begin{cases} x_1 + x_2 = 100 \\ 1{,}75x_1 + 1{,}45x_2 = 157 \end{cases}$$

Equations system solve and $x_1 = 40,\ x_2 = 60$get the result.

So , the first of the department this of the year profit is 40 mln . second of the department and 60 mln. it is Next year the first department $1{,}75 * 40 = 70$million second of the department $1{,}45 * 60 = 87$million profit organize to do planned .

In conclusion, it can be said that it is convenient to simplify complex economic issues through deep analysis. Finding optimal economic solutions for the rational use of limited resources, and for this, developing a mathematical model of economic processes is the main factor in the development of society. Of this for linear equations system method the most good is the solution.

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