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Based on linear regression forecasting of a number of factors and optimization joint use

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Abstract

This paper gives the simplex method of algebraic transformation principle, then simplifies the operational process through the establishment of the simplex method table. Second, assume the same physical indicators have many factors and that any two factors have a linear relationship. By linear regression analysis, multivariate linear equation between factors meet. In the known objective function on the basis of linear programming by simplex method, Obtain optimal target. Thus overall project to provide theoretical guidance for decision-making system.

Keywords: *Optimization, simplex method, Simplex tableau, regression analysis, Joint use.*

Introduction

In the real life, the same physical indicators tend to have a number of factors affecting the value of his size., but there are always a certain number of relationships between each of these factors. The relationship which exists in number and function may not be set up between two factors parallelly,it may or may not cross one crossing established correspondence between a plurality of., or a network-like mutual restraint each other., while in turn a function of the specific exhibits linear., non-linear relationships even more complicated than. Therefore, how to identify the specific function relationship between many of factors and obtain how to determine the specific value of various factors to make the physical indicators of concern can achieve the most big or small value for the production, distribution., planning is of great significance. This article will discuss a relatively simple case - a function relationship sets up between the two factors parallelly.And assuming the function relationship has linear nature to complete regression forecast and the joint use of optimal solving.

(A)the algebraic form of the simplex method and simplex method table.

First, through the introduction of slack variables and surplus variables and other methods of linear programming as a standard form such as:

$$\max Z = \sum_{j=1}^{n} c_j x_j$$

$$s.t.\sum_{j=1}^{n} a_{ij} x_j + x_{si} = b_i (i = 1,2,......, m)$$

$$x_j \geq 0 (j = 1,2,......, n)$$

Then through the coefficient matrix discern nonacid variables and the basic variables, we can find most of the linear programming after the completion of the standard, there is "positive" identity matrix and "negative" unit matrix

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}_{n\times n} \quad \begin{pmatrix} -1 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & -1 \end{pmatrix}_{n\times n}$$

So naturally you can select the unit matrix corresponding to the basic variables. And then come to the initial basic feasible solution. Next make equivalent deformation for equations

$$Z - \sum_{j=1}^{n} c_j x_j = 0$$

$$\sum_{j=1}^{n} a_{1j} x_j + x_{s1} = b_1$$

$$\cdots\cdots\cdots\cdots\cdots\cdots$$

$$\sum_{j=1}^{n} a_{mj} x_j + x_{sm} = b_m$$

Then determine the optimum number by testing σ_j .If the variable value is increased, target still increases. Then initial basic feasible solution is not optimal. We need to enter an iterative process. By the speed of increasing for the target, select nonacid variables into the base. Complete the base operation. There are two scenarios for σ_j <0,in order to make the target increase faster. General principles selected:

$$\max_j \left(|\sigma_j| > 0 \right) = |\sigma_k|$$

In the feasible region to maximize the value of the basic variables, while keeping the other nonbasic variables equal 0.Observing which variables' minimum ratio to be reduced to zero firstly,

as a out variable.Basis in variables and out variable, completing the equivalent deformation of the original linear equations and obtaining basic feasible solution. To see the check number whether satisfies the optimal

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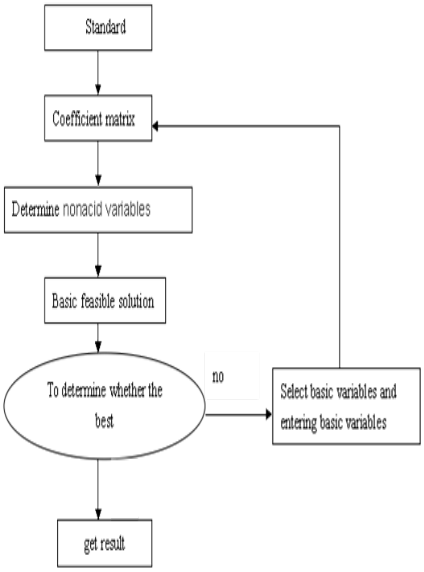
state. By objective function, if the check number is not satisfied, then again the next.



Among them, the table structure described as follows:

A	B	C	D						
C_j			c_1	c_2	c_3	c_4	c_5	c_6	……
c_i'	X_B	b	x_1	x_2	x_3	x_4	x_5	x_6	……
0	x_{i_1}		a_{ij}						
0	x_{i_2}	b_2							
Z_j			0	0	0	0	0	0	……
$c_j - Z_j$			c_1	c_2	c_3	c_4	c_5	c_6	……

Among them, the table structure described as follows:

- column A is the C_j basic variables value of the i-th row
- Column B is the name of basic variables in basic feasible solution
- Column C is the i-th constraint right value
- below the D bar ,the order of each row element : x_j variables corresponding to each objective function coefficients c_j decision variables x_j , and x_j corresponding matrix coefficients a_{ij}
- Z is called opportunity cost
- $c_j - Z_j$ is called check number

Just noted that the conversion of the base variable base variable, then the other iterations tableau can be established.

In fact, the tableau is the simplex method of algebraic expression in the form of tabular form.

(B) linear regression forecast and ptimization decision problem solving system

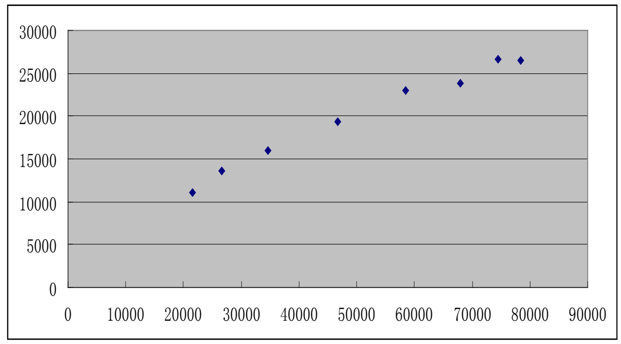
Suppose the following known physical indicators and a known relationship

$$Z = \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + \alpha_4 x_4 + \alpha_5 x_5 + \alpha_6 x_6$$

Among them,

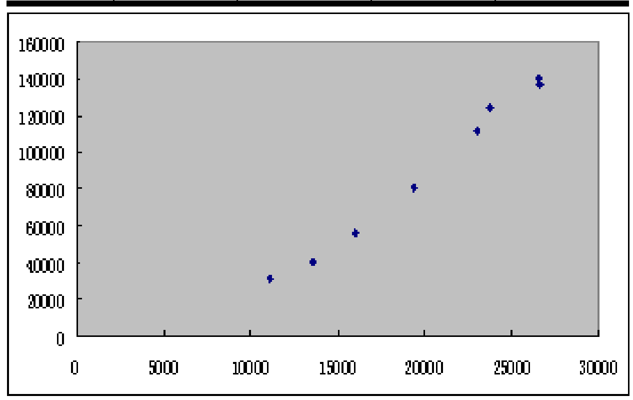
【 $x_1 - x_2$ 】

x_1	21617.8	26638.1	34634.4	46759.4
x_2	30221	39088	54315	79237



【 $x_3 - x_4$ 】

x_3	11127.4	13573.46	16047.4	19402.84
x_4	31332	40003	56333	81078



【 $x_5 - x_6$ 】

x_5	22227.8	26768.1	36544.4	46819.4
x_6	13187.4	14323.9	17147.8	19473.4

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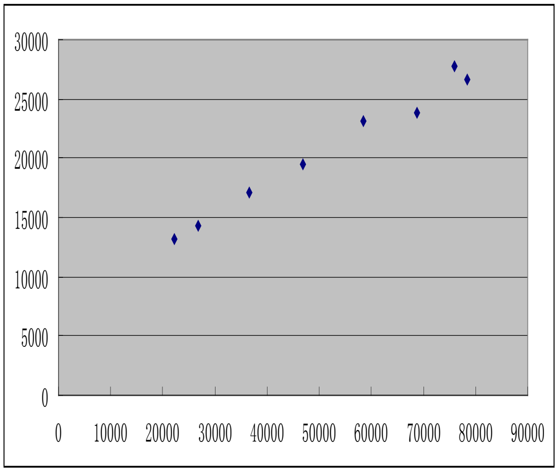

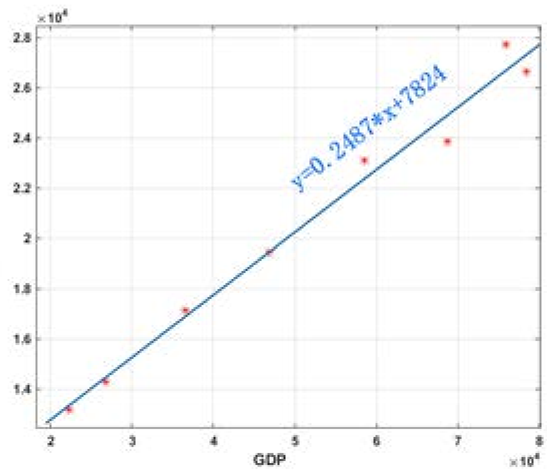

Some indicators meet the relationship factors basically determined by regression analysis，：

$$x_2 = 0.268x_1 + 6324$$

$$x_4 = 7.341x_3 - 56890$$

$$x_6 = 0.2487x_5 + 7824$$

Thus, by regression analysis, a critical constraint equations to determine the out, and then be completed by the simplex method for solving optimization constraints met by multiple linear regression determined between.

(C) Promotion

The relationship between factors of indicators often in real life is complicated, even between two or more factors to establish functional relationships are often not linear, as long as the corresponding regression analysis to determine the critical constraint equation in known target function can be completed on the basis of decision-making problem-solving system.

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