Estimation of Parameters in Random Blocks Model with Minmad Method

Assoc.Prof.Dr. Ayºen APAYDIN
Ankara University, Faculty of Science
Dept. of Statistics Ankara, TÜRKIYE
e-mail: apaydin@science.ankara.edu.tr

Res. Assist. Kamile ª ANLI
Ankara University, Faculty of Science
Dept. of Statistics Ankara, TÜRKIYE
e-mail: sanli@science.ankara.edu.tr

Instr. Özlem M. AYDIN
Baskent University, Faculty of Health Sciences,
Department of Healthcare Management, 06530
Ankara TÜRKÝYE
e-mail: ozlem@baskent.edu.tr

1. Introduction

Parameter estimation is quite important in statistics. Statisticians are engaged in various studies on this problem. Use of optimization methods in the solution of this estimation problem have become common especially after the 1970's. The present study has the objective of estimating parameters in a random blocks model equation capitalizing on the significance of optimization methods in statistics.
The study suggests the goal programming (GP) model for the estimation of parameters in the random blocks model equation.

2. Random Block Design

In cases where experimental units are not fully homogenous, the design must be developed by dividing these units up into more homogenous sub-units. This will eliminate the heterogeneity of experimental units to a certain extent. These relatively more homogenous sub-units are called "blocks." Elimination of excess variance in experimental units through the sum of squares amongst blocks will allow for a smaller error variance. Since data in the design of a random blocks experiment are designed with respect to two criteria as "block" and "trial", the process is also called "double classification." [3].

3. Minimum Mean Absolute Deviation (MINMAD) Method

In this section, there will be definitions of the MINMAD method for linear and goal programming in the context of the regression problem modeled as MINMAD and a model will be suggested for estimating parameters in linear regression.

3.1. Linear Programming for the Regression Problem Modeled as MINMAD

The multiple linear regression model is:

$$Y_i = \sum_{j=1}^{p} X_{ij} b_j + e_i \qquad i = 1,\ldots,n$$

Here, n is the number of observations, p is the number of variables and finally b_j is the regression coefficient.
The linear programming problem is formulated as

$$Minimum \sum_{i=1}^{n} |d_i| \qquad (1)$$
$$Xb + d = Y$$

d, β is unrestricted in sign.

In the expression (1), the unsigned variable d is made signed by using the positive variables $d_{1i}, d_{2i} \geq 0$ and the model (1) is defined as follows as a linear programming problem:

P1. *Minimum* $\sum d_{1i} + \sum d_{2i}$

$$Xb + d_1 - d_2 = Y$$

$$d_1, d_2 \geq 0$$

β is unrestricted in sign [1,2, 4]

4. Models for An Random Block Design

This section suggests models for estimating parameters in random block design.

Model 1. *Minimum* $e^{'} d_1^{-} + e^{'} \ d_2^{+}$

$$X\theta + Id_1^{-} - Id_2^{+} = Y$$

$$\sum_{i=1}^{a} \tau_i = 0 \quad , \quad \sum_{j=1}^{b} \beta_j = 0$$

$$d_1^{-} \geq 0 \quad , \quad d_2^{+} \geq 0$$

θ is unrestricted in sign, $\theta = (m, \tau_1, ..., \tau_a ; \beta_1, ..., \beta_b)$,

In Model 1 above, parameters are given the weight W in which case the model turns into the following:

Model 2. *Minimum* $e^{'} d_1^{-} + e^{'} \ d_2^{+}$

$$Xq + Id_1^{-} - Id_2^{+} = Y$$

$$Wq \leq d$$

$$\sum_{i=1}^{a} \tau_i = 0 \ , \ \sum_{j=1}^{b} \beta_j = 0$$

$$d_1^{-} \geq 0 \quad , \quad d_2^{+} \geq 0 \quad , \quad d = 1$$

θ is unrestricted in sign

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Résumé

Dans ce travaille, on proposera, le model de programme de but pour supposer les paramétres au équation d'aléatoire bloque model.