

**Rao, C. Radhakrishna**

**Estimation of variance and covariance components - MINQUE theory.** (English)

Zbl 0223.62086

J. Multivariate Anal. 1, 257-275 (1971).

The paper consists of two parts. The first part deals with solutions to some optimization problems. The general problem is one of minimising trace  $AVA'U$  with respect to elements of matrix  $A$ , where  $V$  and  $U$  are positive definite matrices, subject restrictions of the type  $AX = 0$  or  $X'AX = 0$  and trace  $AV_i = p_i$ ,  $i = 1, \dots, k$ , or  $U_1'AU_1 + \dots + U_k'AU_k = M$  where  $V_i, U_i, M, p_i$  are given. Two situations are considered, when  $A$  is a general  $m \times n$  matrix and when  $A$  is restricted to the class of symmetric  $n \times n$  matrices.

The results are applied in the proposed theory of estimation of variance components called MINQUE (minimum norm quadratic unbiased estimation). We consider the linear model  $Y = X\beta + \varepsilon$  where  $E(\varepsilon) = 0$  and  $D(\varepsilon) = \sigma_1^2 V_1 + \dots + \sigma_k^2 V_k$ , where  $V_i$  are known and  $\sigma_i^2$  are to be estimated. The quadratic statistic  $Y'AY$  is said to be MINQUE of the parametric function  $p_1\sigma_1^2 + \dots + p_k\sigma_k^2$  if  $A$  such that  $AX = 0$  or  $X'AX = 0$  and trace  $AV_i = p_i$ ,  $i = 1, \dots, k$ , and subject to these conditions  $AVAv$  is a minimum. Two choices of  $V$  are suggested:  $V = V_1 + \dots + V_k$  and  $V = \alpha_1 V_1 + \dots + \alpha_k V_k$  where  $\alpha_1, \dots, \alpha_k$  are apriori values of  $\sigma_1^2, \dots, \sigma_k^2$ . The paper also considers the estimation of the covariance matrix  $\Sigma$  when  $D(\varepsilon) = U_1'\Sigma U_1 + \dots + U_k'\Sigma U_k$  in the linear model.

Reviewer: C.Radhakrishna Rao

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**MSC:**

62J10 Analysis of variance and covariance (ANOVA)

Cited in **12** Reviews  
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**References:**

- [1] Focke, J.; Dewess, G., Über die schätzmethode MINQUE von C. R., (1971), Rao und ihre Verallgemeinerung, in press · Zbl 0289.62024
- [2] Hartley, H.O.; Rao, J.N.K., Maximum likelihood estimation for the mixed analysis of variance model, Biometrika, 54, 99-108, (1967) · Zbl 0178.22001
- [3] Mitra, S.K., Another look at Rao's MINQUE of variance and covariance components, () · Zbl 0263.62042
- [4] Rao, C.Radhakrishna, ()
- [5] Rao, C.Radhakrishna, Calculus of generalized inverse of matrices, part 1: general theory, Sankhyā ser. A, 29, 317-342, (1967) · Zbl 0178.03103
- [6] Rao, C.Radhakrishna, Estimation of variance and covariance components in linear models, (), (in press, \textit{J.A.S.A.}) · Zbl 0231.62082
- [7] Rao, C.Radhakrishna, Estimation of heteroscedastic variances in linear models, J.a.s.a., 65, 161-172, (1970)
- [8] Rao, C.R.; Mitra, S.K., (), in press
- [9] Searle, S.R., Topics in variance component estimation, Biometrics, 27, 1-76, (1971)

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