HIROSHIMA MATH. J.
23 (1993), 365–416

Admissibility of some tests, multiple decision procedures and classification procedures in multivariate analysis

Nobuo NISHIDA

(Received January 18, 1992)

1. Introduction

In this paper we study the admissibility of some tests, multiple decision procedures and classification procedures. In general, two methods are mainly used in multivariate analysis to show the admissibility of various procedures. One is to use Bayes procedures. The other is to use the structure of the exponential family. The former method has been used in Kiefer and Schwartz [16], Nishida [19], [20], [21], [22], [24]. The latter method has been seen in Ghosh [13], Birnbaum [9], Stein [33], Schwartz [29], Anderson and Takemura [5], etc. In this paper we use the former method. All the problems are studied for 0–1 loss function.

In Section 3, we consider testing problems related to a given structure of means (For testing a given structure of means, see, e.g., Rao [27], Mardia et al. [18], Siotani et al. [31]). Nishida [24] obtained a class of admissible tests for the combined problem of a given structure of means and $\Sigma = \Sigma_0$. In this section two testing problems are considered. One is to test the combined hypothesis of a given structure of means and the sphericity covariance structure. The other is to test a given structure of means under the sphericity covariance structure. The admissibility of the likelihood ratio test (LRT) is shown for each problem.

Testing problems for covariance matrices are studied in Section 4. As for testing independence of sets of variates, Kiefer and Schwartz [16] derived a class of admissible tests. They also treated the problem of testing equality of covariance matrices for k samples case. One sample case (that is, the problem that $\Sigma = \Sigma_0$) was studied by Nishida [19]. Each work obtained a class of admissible tests which contains the LRT. In this section we consider one sided tests for one and two samples cases. Linear structure for the inverse matrix of a covariance matrix is also considered. A class of admissible tests is obtained for each problem.

In Section 5, the admissibility of multiple decision procedures for covariance matrices is studied. Multiple decision problems or ranking