SIMULTANEOUS ESTIMATION OF EIGENVALUES

Dipak K. Dey

Department of Statistics, University of Connecticut, Storrs, CT 06268, U.S.A.

Abstract. The problem of simultaneous estimation of eigenvalues of covariance matrix is considered for one and two sample problems under a sum of squared error loss. New classes of estimators are obtained which dominate the best multiple of the sample eigenvalues in terms of risk. These estimators shrink or expand the sample eigenvalues towards their geometric mean. Similar results are obtained for the estimation of eigenvalues of the precision matrix and the residual matrix when the original covariance matrix is partitioned into two groups. As a consequence, a new estimator of trace of the covariance matrix is obtained.

The results are extended to two sample problem where two Wishart distributions are independently observed, say, $S_i \sim W_p(\Sigma_i, k_i)$, $i=1, 2$, and eigenvalues of $\Sigma_1 \Sigma_2^{-1}$ are estimated simultaneously. Finally, some numerical calculations are done to obtain the amount of risk improvement.