Estimating the ratio of two scale parameters: a simple approach

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Abstract We describe a simple approach for estimating the ratio $\rho = \sigma_2/\sigma_1$ of the scale parameters of two populations from a decision theoretic point of view. We show that if the loss function satisfies a certain condition, then the estimation of ρ reduces to separately estimating σ_2 and $1/\sigma_1$. This implies that the standard estimator of ρ can be improved by just employing an improved estimator of σ_2 or $1/\sigma_1$. Moreover, in the case where the loss function is convex in some function of its argument, we prove that such improved estimators of ρ are further dominated by corresponding ones that use all the available data. Using this result, we construct new classes of double-adjustment improved estimators for several well-known convex as well as non-convex loss functions. In particular, Strawderman-type estimators of ρ in general models are given whereas Shinozaki-type estimators of the ratio of two normal variances are briefly treated.