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Rank plots in the affine invariant case

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Abstract: The bivariate ranks and quantiles based on the bivariate affine equivariant median are considered. Correspondences between two different plots for bivariate data, the direct diagram and the Oja rank plot, are described. Several illustrative examples are given.

Key words: Affine invariance, affine equivariance, bivariate quantile, bivariate rank, multivariate median.

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1 Introduction

Rank methods occupy a central role among standard univariate statistical methods, and form the backbone of conventional nonparametrics. Consequently, it has been recently of some interest to explore concepts of rank for multivariate data, and in particular, for bivariate data. There are various alternatives, including ideas based on depth (Liu, 1990,1992; Liu and Singh, 1993). But another analytic definition of bivariate rank which leads to appealing bivariate analogues of univariate rank statistical methods is reached through the gradients of a convex objective function used to define a bivariate median; see Brown and Hettmansperger (1987a,b), Hettmansperger, Nyblom and Oja (1992), Hettmansperger, Möttönen and Oja (1997a,b) and Möttönen and Oja (1995). To show how this idea works, the notion of