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Seminar

Singularities in skew-symmetric models: characterization results and asymptotic implications

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Abstract

In recent years, the skew-normal models introduced by Azzalini (1985)---and their multivariate generalizations from Azzalini and Dalla Valle (1996)---have enjoyed an amazing success, although an important literature has reported that they exhibit, in the vicinity of symmetry, singular Fisher information matrices and stationary points in the profile log-likelihood function for skewness, with the usual unpleasant consequences for inference. It has been shown (DiCiccio and Monti 2004, 2009) that these singularities, in some specific parametric extensions of skew-normal models (such as the classes of skew-exponential or skew-t distributions), appear at skew-normal distributions only. Yet, an important question remains open: in broader semiparametric models of skewed distributions (such as the general skew-symmetric and skew-elliptical ones), which symmetric kernels lead to such singularities? The present paper provides an answer to this question. In very general (possibly multivariate) skew-symmetric models, we characterize, for each possible value of the rank of Fisher information matrices, the class of symmetric kernels achieving the corresponding rank. Our results show that, for strictly multivariate skew-symmetric models, not only Gaussian kernels yield singular Fisher information matrices. In contrast, we prove that systematic stationary points in the profile log-likelihood functions are obtained for (multi)normal kernels only. Finally, we also discuss the implications of such singularities on inference.

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