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*Improved Saddlepoint Density Approximations through Polynomial Adjustments*

Improved density approximations are obtained by means of moment-based polynomial adjustments applied to the widely used saddlepoint approximation, the initial distributional support being determined from the Lugannani-Rice formula. Approximate percentiles, as evaluated from the original saddlepoint formula and its adjusted counterpart, are compared both numerically and graphically to their exact values in several illustrative examples. The bivariate case is addressed by applying a polynomial adjustment to the product of the approximated marginal densities of the standardized variables. Furthermore, extensions to the context of density estimation are formulated and applied to several univariate and bivariate data sets. Interestingly, the proposed methodology for approximating bivariate distributions gives rise to copula density functions that prove much more flexible than the conventional functional type.