R-Packages for Robust Asymptotic Statistics

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We present a family of R-packages designed for a conceptual adaptation of an asymptotic theory of robustness.

Package `RobAStBase` provides the basic `S4` classes and methods for optimally robust estimation in the sense of Rieder (1994). That is, we consider L_2 differentiable parametric models in the framework of infinitesimal (shrinking at a rate of $\sqrt{n}$) neighborhoods. The combination of `RobAStBase` with our `R` packages `distr`, `distrEx` and `RandVar` enables us to implement **one** algorithm which works for a whole class of various models, thus avoiding redundancy and simplifying maintenance of the algorithm.

Package `ROptEst` so far covers the computation of optimally robust influence curves for all(!) L_2 differentiable parametric families which are based on a univariate distribution. With the Kolmogorov and the Cramér von Mises minimum distance estimators which are implemented in our R package `distrMod` and which serve as starting estimators, we are able to provide optimally robust estimators by means of k-step constructions ($k \geq 1$).

Package `RobLox` includes functions for the determination of influence curves for several classes of robust estimators in case of normal location with unknown scale; cf. Kohl (2005). In particular, the function `roblox`, computes the optimally robust estimator for normal location and scale as described in Kohl (2005). In contrast to package `ROptEst`, in which we aim for generality, the function `roblox` is optimized for speed.

Package `ROptRegTS` contains the extension of the asymptotic theory of robustness to regression-type models like the linear model and certain time series models (e.g., ARMA and ARCH).

Finally, package `RobRex` provides functions for the determination of optimally robust influence curves in case of linear regression with unknown scale and standard normal errors where the regressor is random. Analogously to package `RobLox` the functions in package `RobRex` are optimized for speed.

References

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