# Center of Jaroslav Hájek for Theoretical and Applied Statistics

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## $R$-Estimation in Nonlinear Regression

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*Abstract*

The nonlinear regression model is considered:

$$y_i = g(x_i; \beta_0) + \varepsilon_i, \; i = 1, \ldots, n,$$

where $\beta_0 \in \mathbf{\Theta} \subset \mathbb{R}^p$, $\varepsilon_1, \ldots, \varepsilon_n$ are i.i.d. with distribution function $F$, density $f$ which is positive a.e., $E\varepsilon = 0$ and has finite Fisher's information. The regression function is required to be "nice" and smooth.

Introduce a dispersion measure of Jackel's type:

$$D(\beta) = \sum_{i=1}^{n} (y_i - g(x_i, \beta)) a_n(R_i(\beta)).$$

Note, in difference to the linear regression model, the dispersion measure is not longer convex. The rank estimator is defined as a solution of the minimization problem:

$$\widetilde{\beta_R} = \arg\min_{\beta \in \mathbf{\Theta}} D(\beta).$$

The local approximation of the dispersion measure by a quadratic criterion works also for nonlinear regression. The related result of Koul (1996) can be generalized to unbounded score functions. In the talk results on consistency and asymptotic normality of the rank estimator are presented.

### References

[1] Hira L. Koul (1996). Asymptotics of some estimators and sequential residual empiricals in nonlinear time series. *The Annals of Statistics*, Vol. 24, No 1, 380-404.