

# Very robust regression

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## Abstract

The numerous methods of very robust regression resist up to 50% of outliers. This breakdown point, the maximum that can be achieved, is defined asymptotically as the outlying observations become infinitely far from the regression data. To distinguish between such very robust methods we study their behaviour as a function of the distance between the regression data and the outliers. We introduce a parameter  $\lambda$  that defines a parametric path in the space of models that enables us to study, in a systematic way, the properties of estimators as the groups of data move from being far apart to close together. We examine, as a function of  $\lambda$ , the variance and squared bias of several estimators and we also consider their power when used in the detection of outliers.

The results of our systematic approach are described in Riani et al. (2011). An algorithm using the forward search (Atkinson and Riani (2000)) has the best properties for both size and power of the outlier tests. The comparisons use new algorithms for Least Trimmed Squares estimators that have increased *computational* efficiency due to improved combinatorial sampling. The efficient sampling method forms part of the subject of the talk by Domenico Perrotta.

## Keywords

Distance of outliers, Forward search (FS), Least trimmed squares (LTS), MM estimate, Multiple outliers.

## References

- Riani, M., A.C. Atkinson, and D. Perrotta (2011). Calibrated very robust regression. Technical Report NI11033-DAE, Isaac Newton Institute, Cambridge, UK.
- Atkinson, A.C. and M. Riani (2000). *Robust Diagnostic Regression Analysis*. Springer-Verlag, New York.