

# High Breakdown Rank Regression

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## Abstract

A weighted rank estimate is proposed which has 50% breakdown and is asymptotically normal at rate  $\sqrt{n}$ . Based on this theory, inferential procedures, including asymptotic confidence and tests, and diagnostic procedures, such as Studentized residuals, are developed. The influence function of the estimate is derived and it is shown to be continuous and bounded everywhere in  $(\mathbf{x}, Y)$  space. Examples show that robustness against outlying high-leverage clusters may approach that of the LMS, while retaining more stability against inliers. The estimator uses weights that correct for both factor and response spaces. A Monte Carlo study shows that the estimate is more efficient than GR, a similar estimate where the weights only correct for factor space. When weights are constant, the estimate reduces to the regular Wilcoxon rank estimate.

**KEY WORDS:** Rank regression; Weights; GR-estimate; LMS; 50% breakdown; Inlier stability.

## 1 Introduction

Rank-based estimates of the regression coefficients of a linear model were proposed by Jureckova (1971) and Jaeckel (1972). These estimates based on the Wilcoxon scores generalize the Wilcoxon-Mann-Whitney tests and estimates for simple location problems. In

# Chapter 4 High Breakdown Regression Procedures

**Christian G. Meyer**



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