

0.1 Diagnostic Plots for Linear Models with R

Plot Diagnostics for an `lm` Object

Six plots (selectable by **which**) are currently available:

1. a plot of residuals against fitted values,
2. a Scale-Location plot of $\sqrt{|\text{residuals}|}$ against fitted values,
3. a Normal Q-Q plot,
4. a plot of Cook's distances versus row labels,
5. a plot of residuals against leverages,
6. a plot of Cook's distances against leverage/(1-leverage).

By default, the first three and 5 are provided.

- The **Scale-Location** plot, also called Spread-Location or S-L plot, takes the square root of the absolute residuals in order to diminish skewness ($\sqrt{|\text{E}|}$ is much less skewed than $|\text{E}|$ for Gaussian zero-mean E).
- The **Residual-Leverage** plot shows contours of equal Cook's distance, for values of `cook.levels` (by default 0.5 and 1) and omits cases with leverage one with a warning. If the leverages are constant (as is typically the case in a balanced aov situation) the plot uses factor level combinations instead of the leverages for the x-axis. (The factor levels are ordered by mean fitted value.)

```
par(mfrow=c(4,1))
plot(fittedmodel)
par(opar)
```

Chapter 1

Residuals for LME Models

1.1 Residual Analysis for LME Models

In classical linear models model diagnostics have been become a required part of any statistical analysis, and the methods are commonly available in statistical packages and standard textbooks on applied regression. However it has been noted by several papers that model diagnostics do not often accompany LME model analyses.

Cite:Zewotir lists several established methods of analyzing influence in LME models. These methods include

- Cook's distance for LME models,
- likelihood distance,
- the variance (information) ration,
- the Cook-Weisberg statistic,
- the Andrews-Prebigon statistic.

1.2 Computation and Notation

with \mathbf{V} unknown, a standard practice for estimating $\mathbf{X}\boldsymbol{\beta}$ is to estimate the variance components σ_j^2 , compute an estimate for \mathbf{V} and then compute the projector matrix \mathbf{A} , $\mathbf{X}\hat{\boldsymbol{\beta}} = \mathbf{A}\mathbf{Y}$.

Zewotir and Galpin (2005) remarks that \mathbf{D} is a block diagonal with the i -th block being $u\mathbf{I}$

Chapter 2

Application to Method Comparison Studies

Bibliography

Zewotir, T. and J. Galpin (2005). Influence diagnostics for linear mixed models. *Journal of Data Science* 3, 153–177.