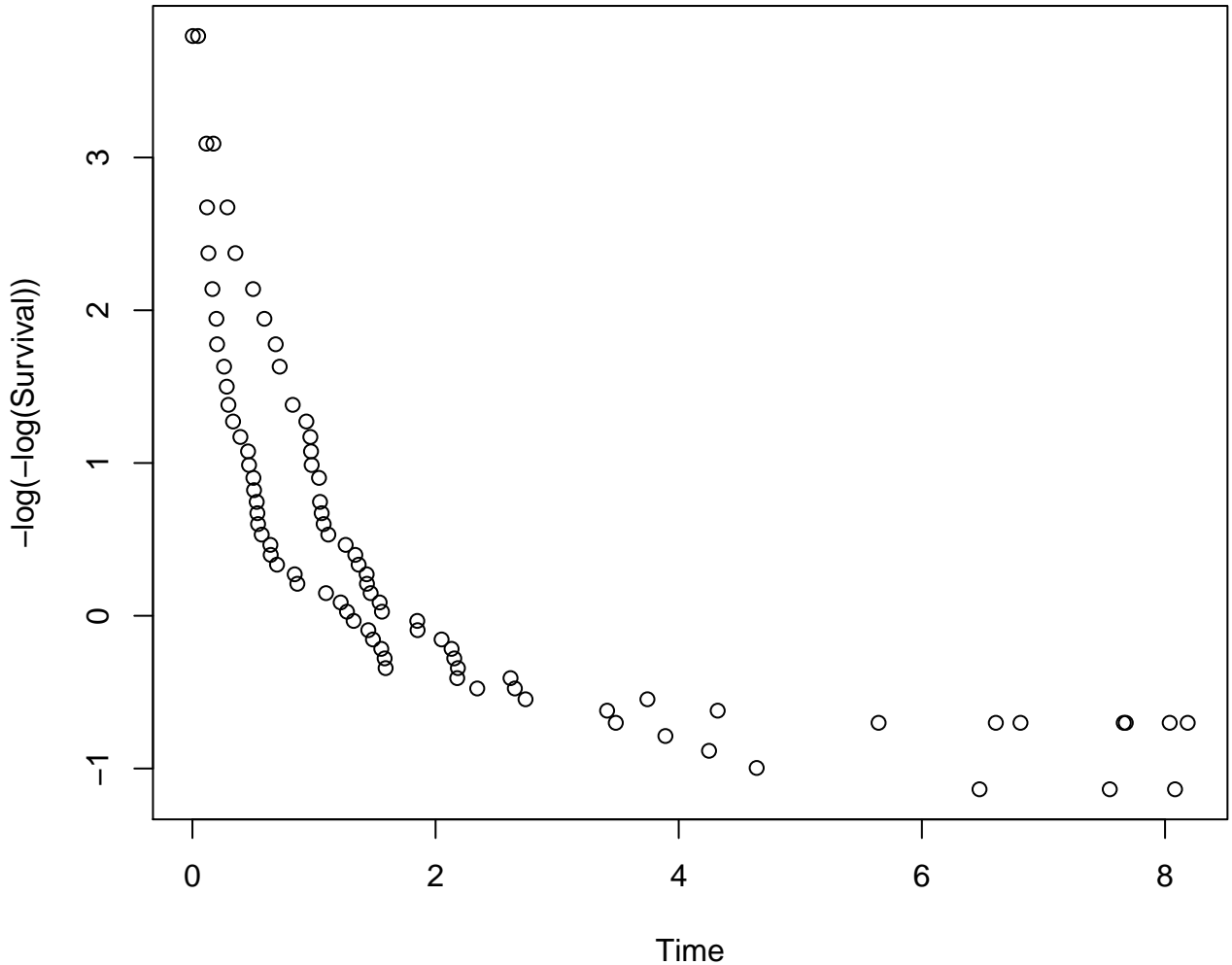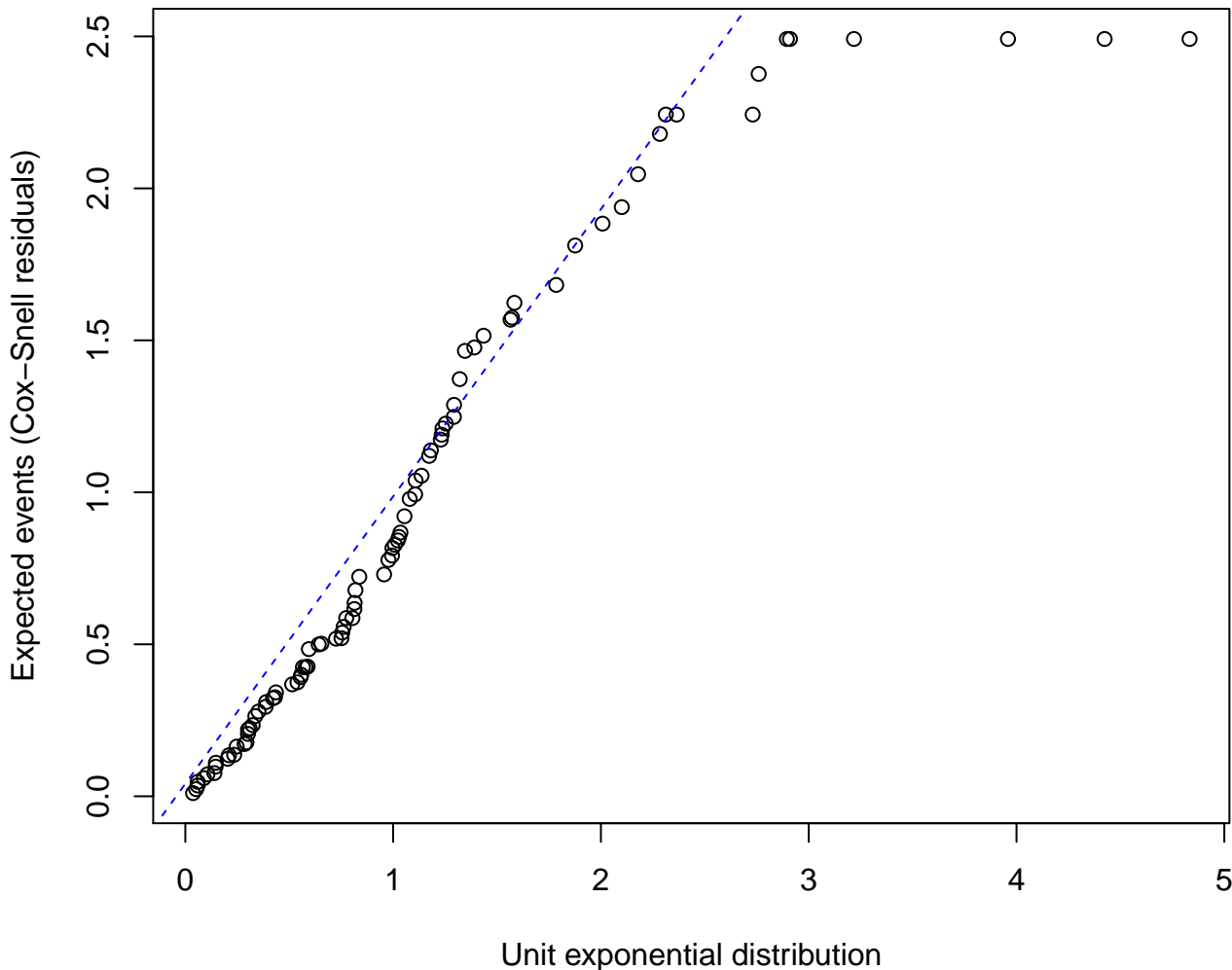Time vs. −log−log survival.
Kaplan−Meier curves should be parallel if
proportional−hazards assumption is correct

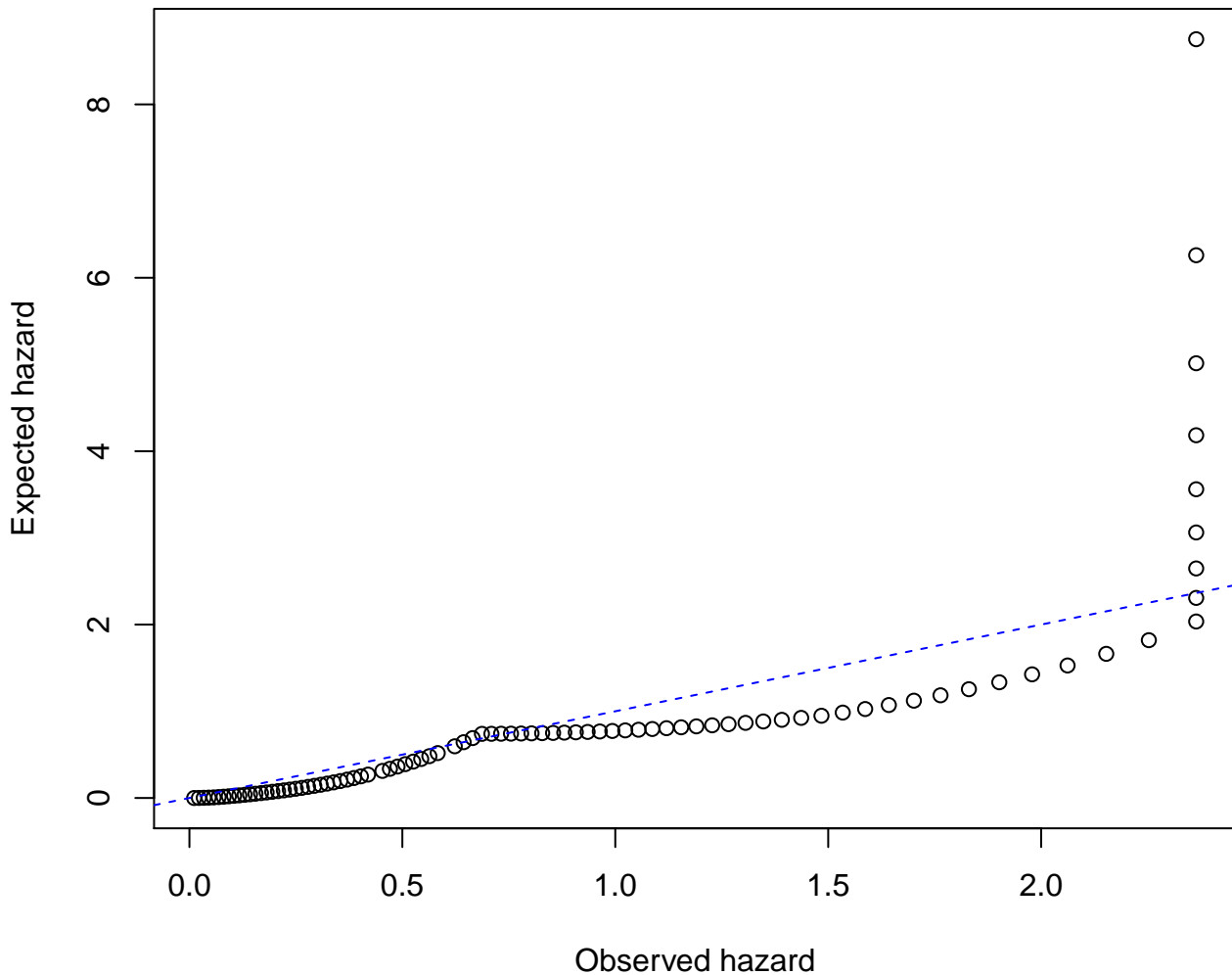**Complete model:**
Surv(time/365, event) ~ treatment

Quantile−quantile plot.
Unit exponential distribution vs. expected events (Cox−Snell residuals).
Should follow line through origin at 45 degrees (blue) if well fit.

Complete model:
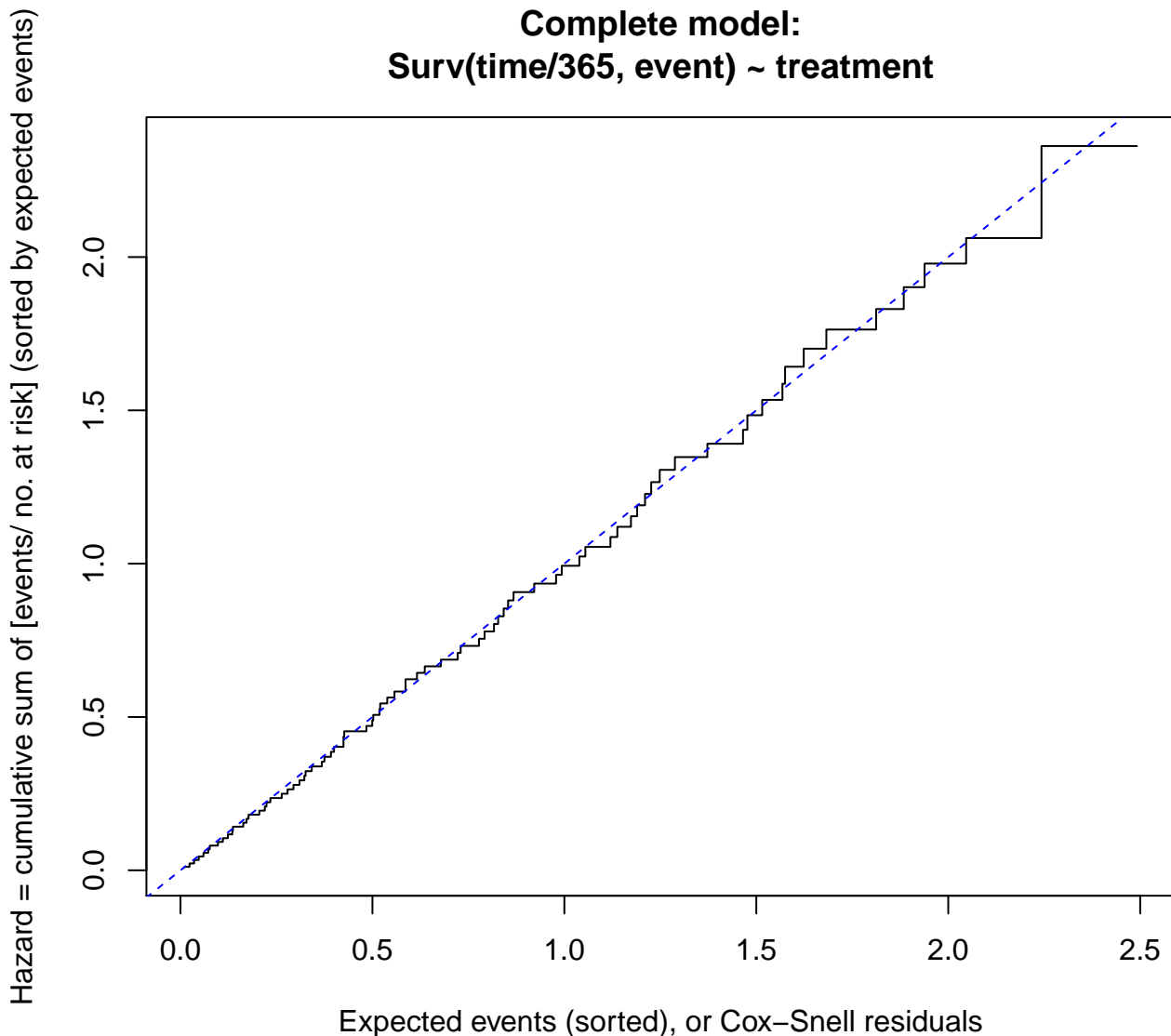**Surv(time/365, event) ~ treatment**

Observed vs. expected hazard.
Should follow line through origin at 45 degrees (blue) if well fit.

Complete model:
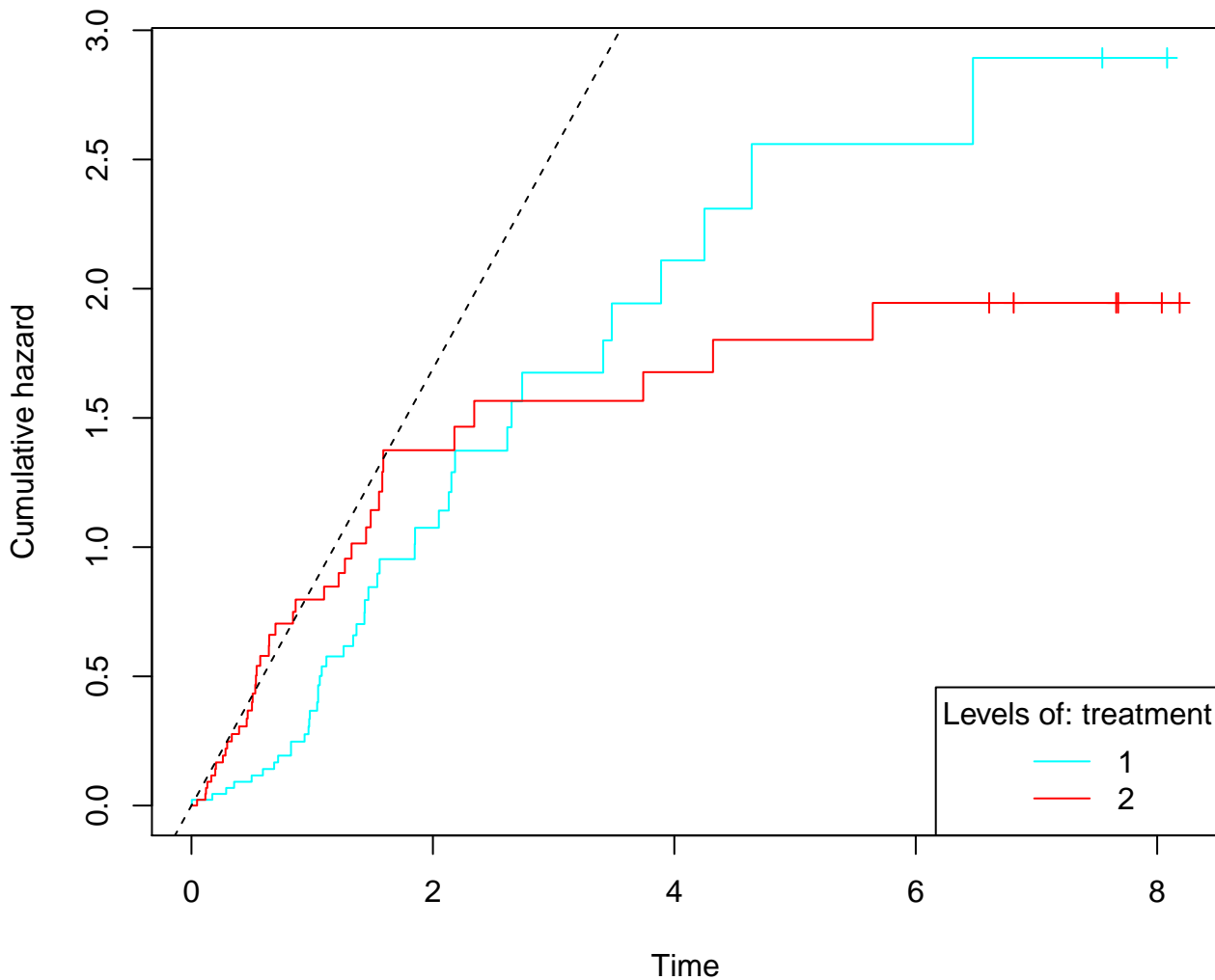**Surv(time/365, event) ~ treatment**

Expected events vs. hazard based on sorted expected events
or Cox−Snell residuals vs. cumulative hazard of these residuals.
Should follow line through origin at 45 degrees (blue) if well fit.

Complete model:
Surv(time/365, event) ~ treatment

Hazard = cumulative sum of [events/ no. at risk] (sorted by expected events)

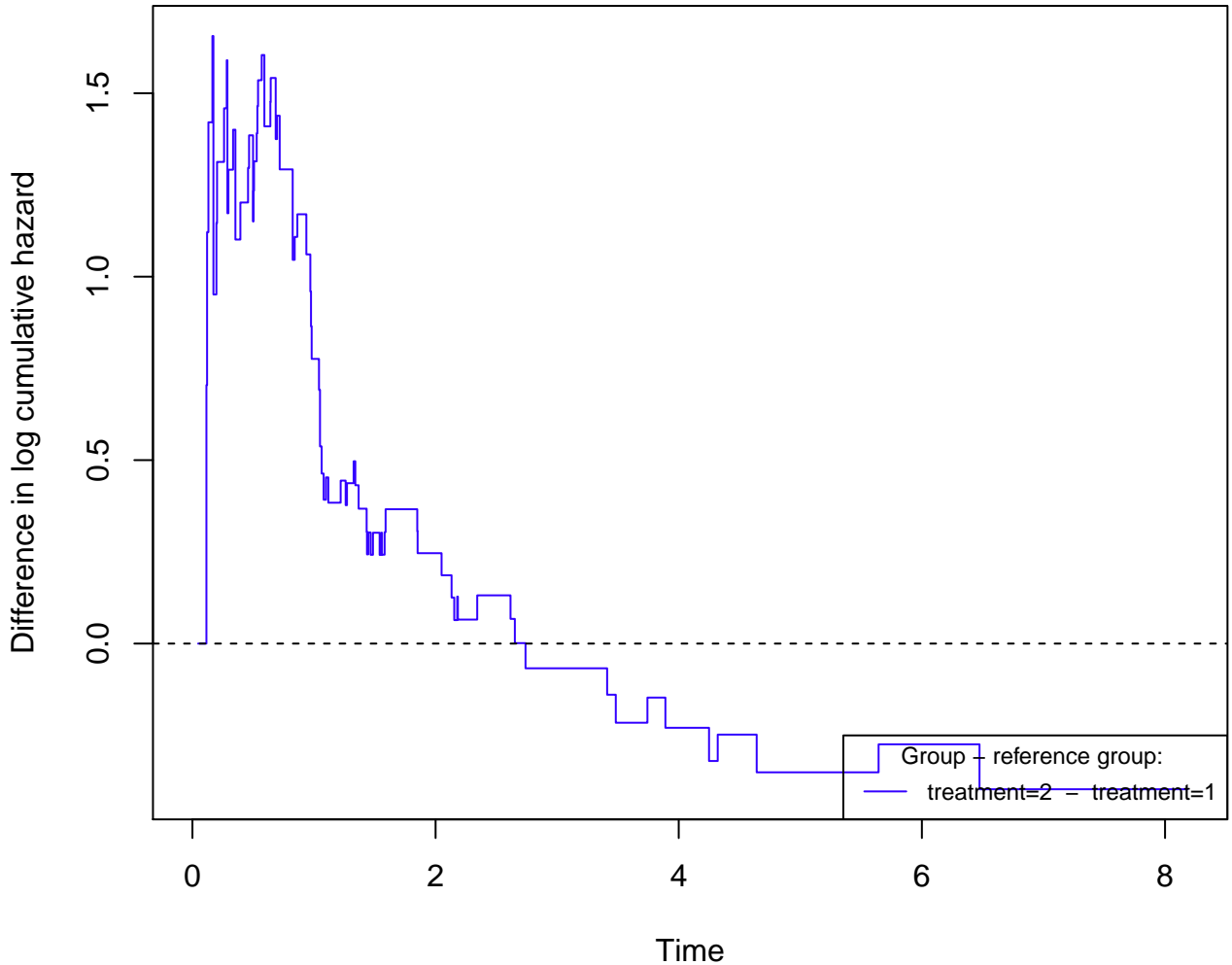Expected events (sorted), or Cox−Snell residuals

Time vs. hazard, per predictor.
If hazards proportional then curves should be constant multiples of a baseline.
Reference (black) line is 45 degrees.
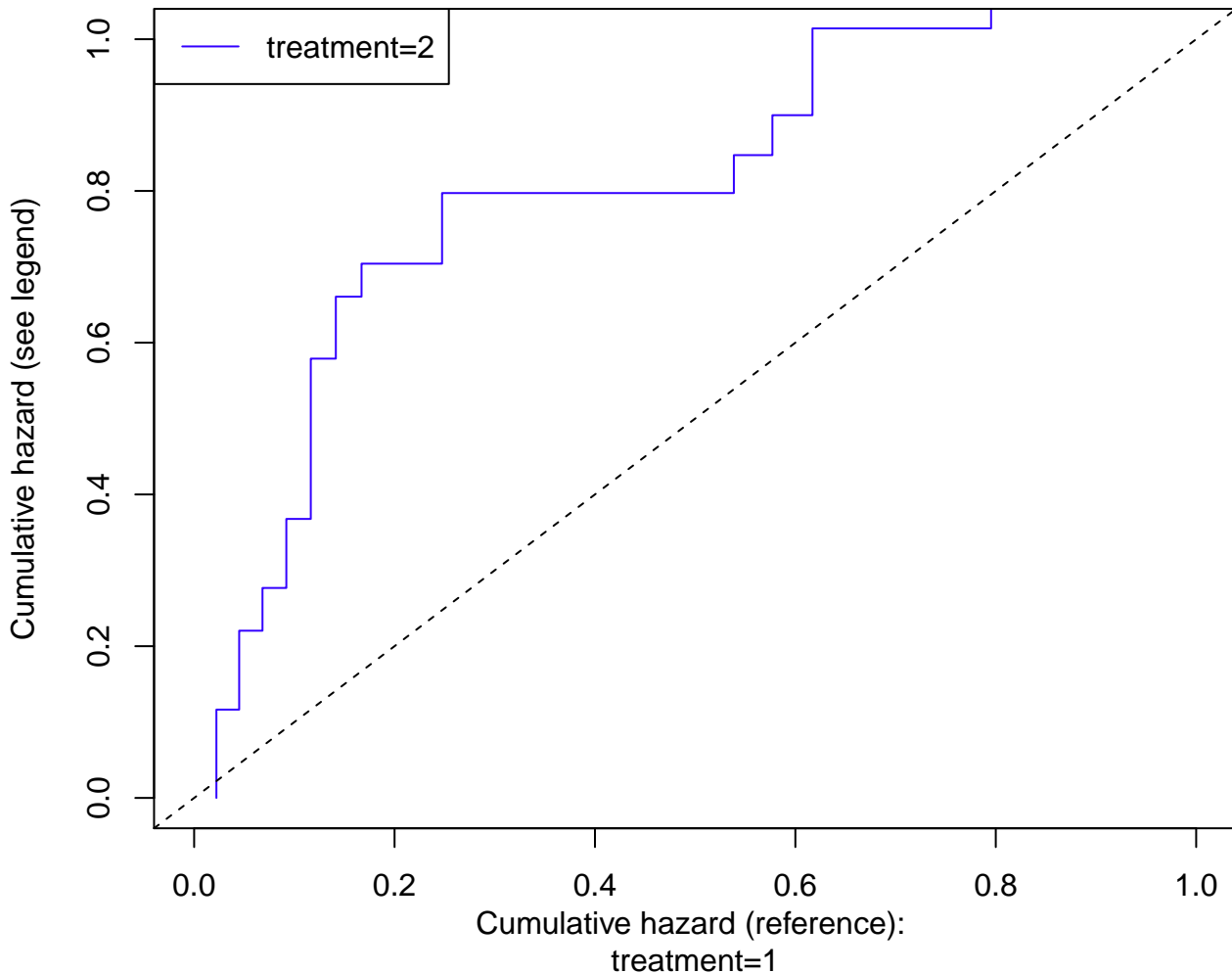
Predictor: treatment

Time vs. difference in log hazards, per predictor.
Should be constant over time.
If >0 (black line) shows survival advantage for reference group.

Reference: treatment = 1

Difference in log cumulative hazard

Time

Group – reference group:
—— treatment=2 — treatment=1

Cumulative hazard vs. reference group. Should be linear plot through origin.
If convex (towards top left) shows ratio of hazards is increasing over time.
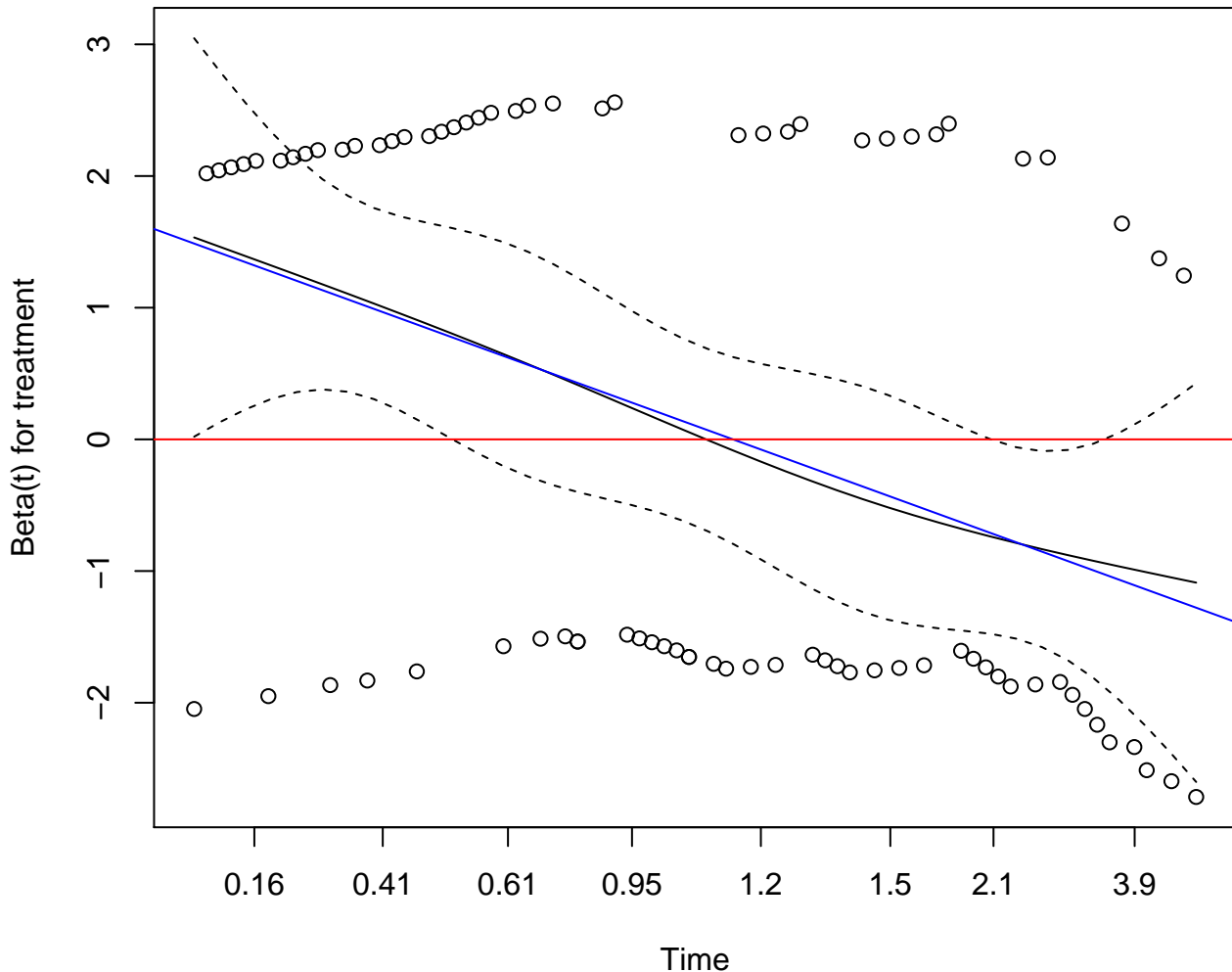Reference line (black) is at 45 degrees.

Predictor: treatment

treatment=2

Cumulative hazard (see legend)

Cumulative hazard (reference):
treatment=1

Time vs. scaled Schoenfeld residuals, with smoothed spline (black).
If <0 (red line), indicates a protective effect.
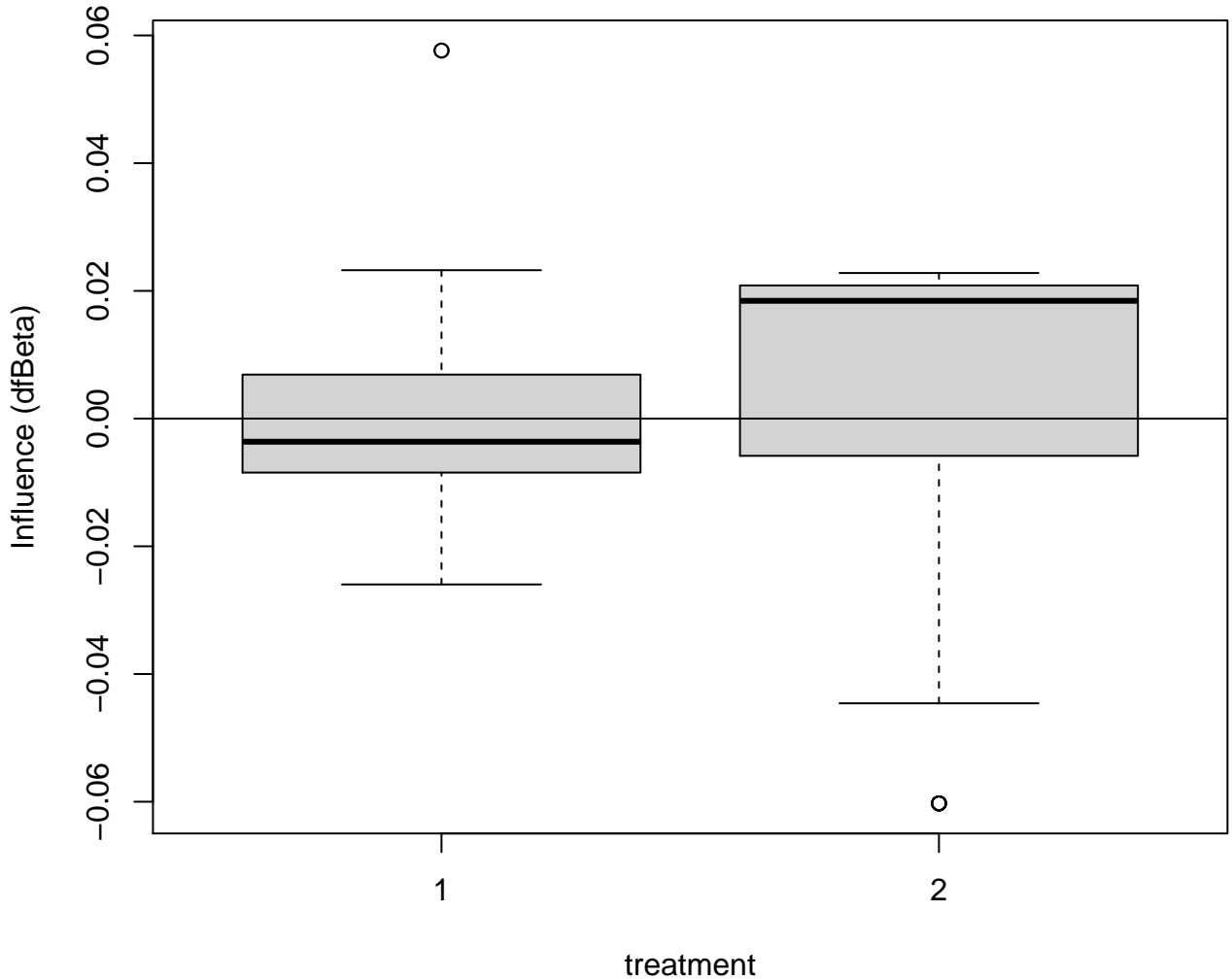Regression line (blue) should be horizontal if model well fit.
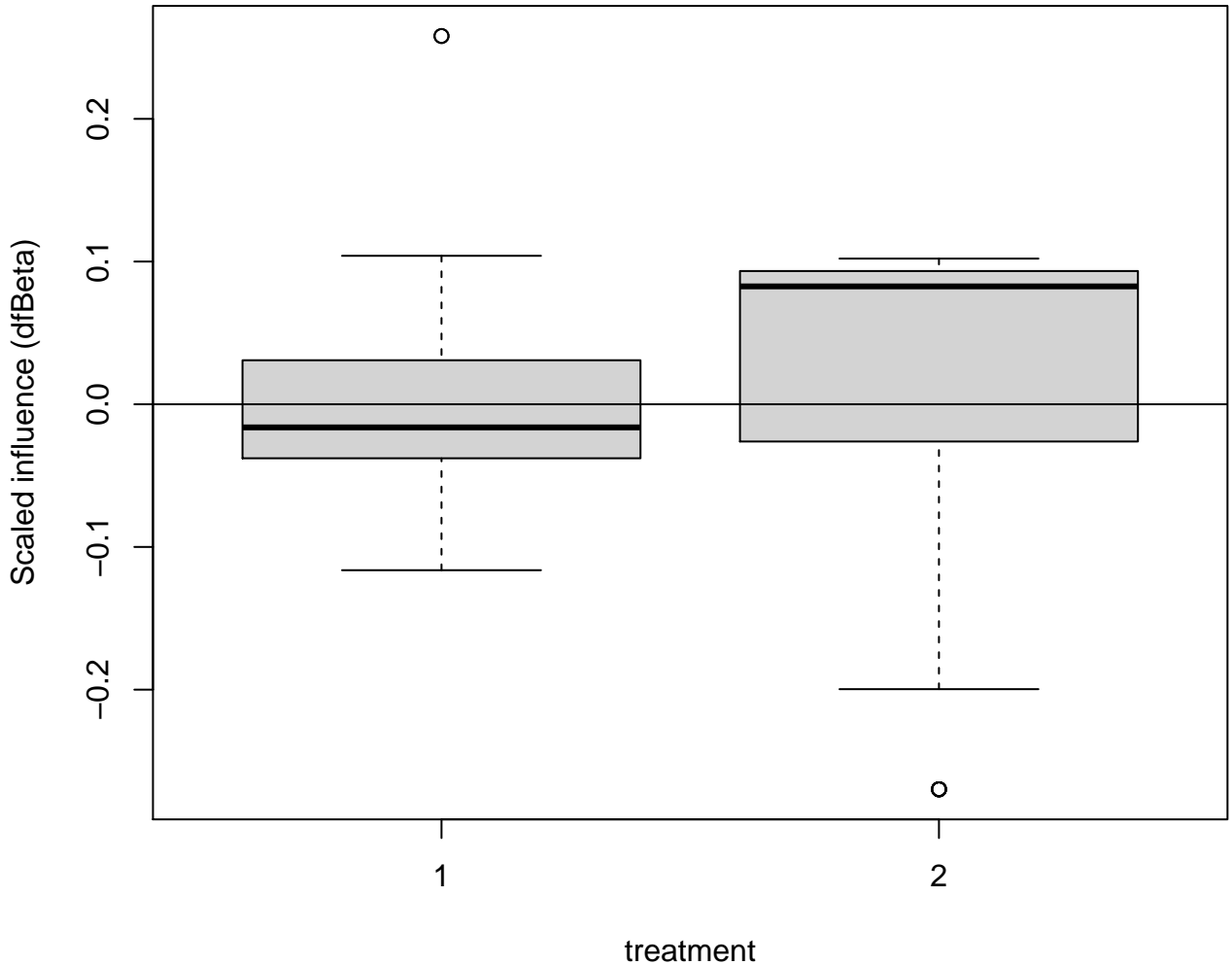
Predictor: treatment
Time transform: km

Coefficient vs. jacknife influence.
Change in coefficient if this observation dropped.
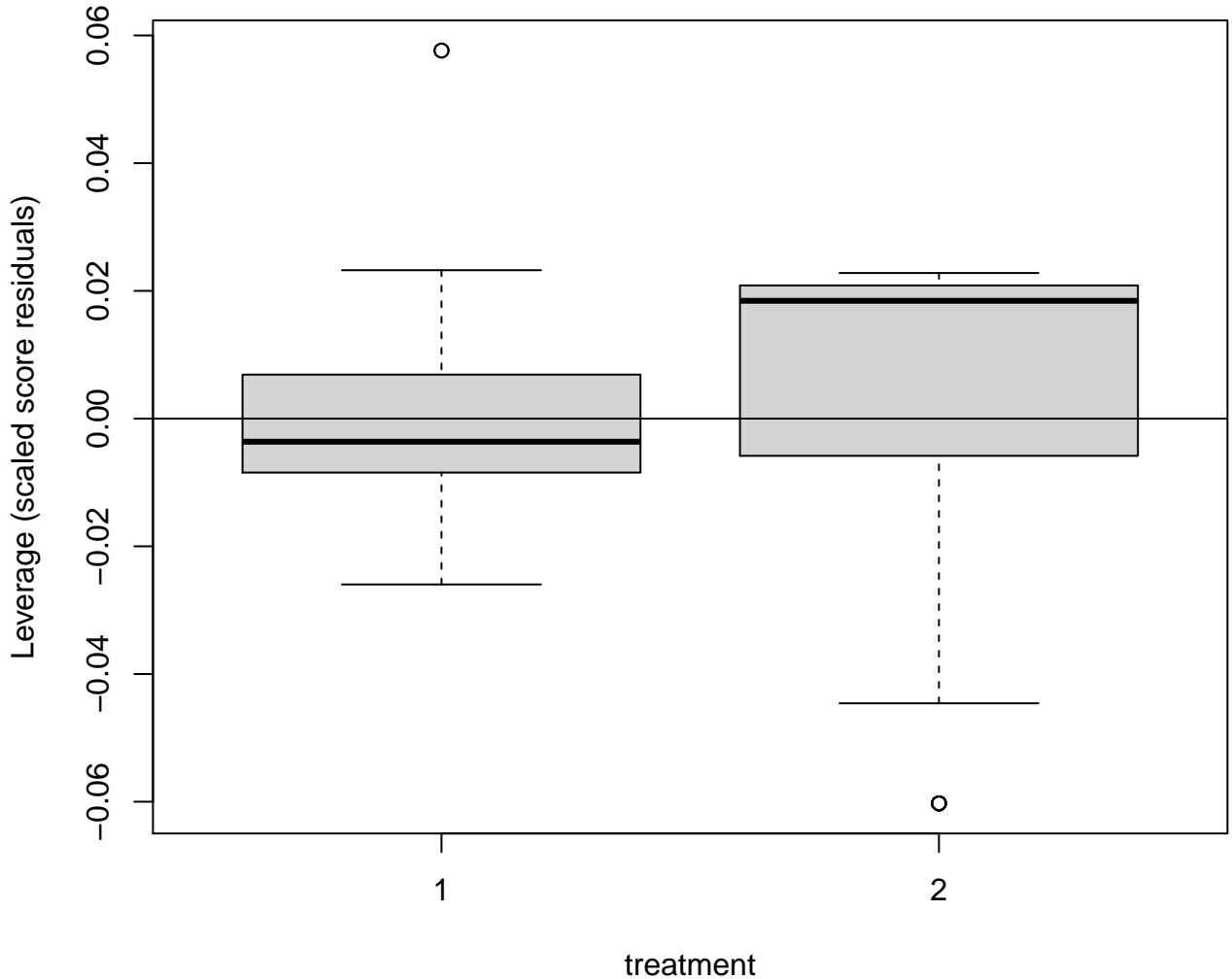Outliers may need to be re−examined

Coefficient: treatment

Coefficient vs. jacknife influence scaled by standard error of coefficients.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined

Coefficient: treatment

Coefficient vs. scaled score residuals.
Assesses leverage: influence of observation on a single coefficient.
Outliers may need to be re−examined

Coefficient: treatment

Martingale residuals vs. likelihood displacement residuals.
Assesses influence of observation on coefficient.
Outliers may need to be re−examined.

Coefficient: treatment