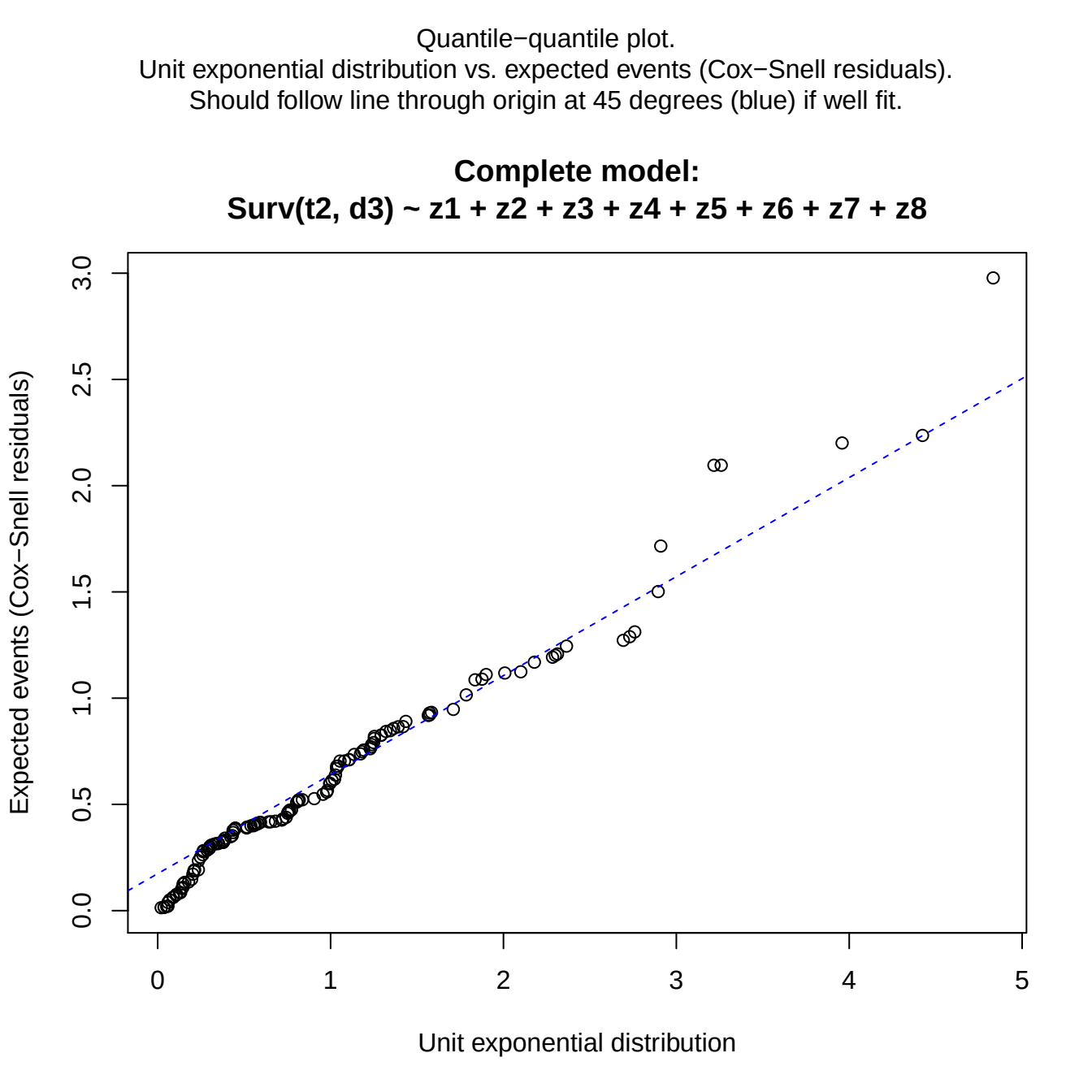
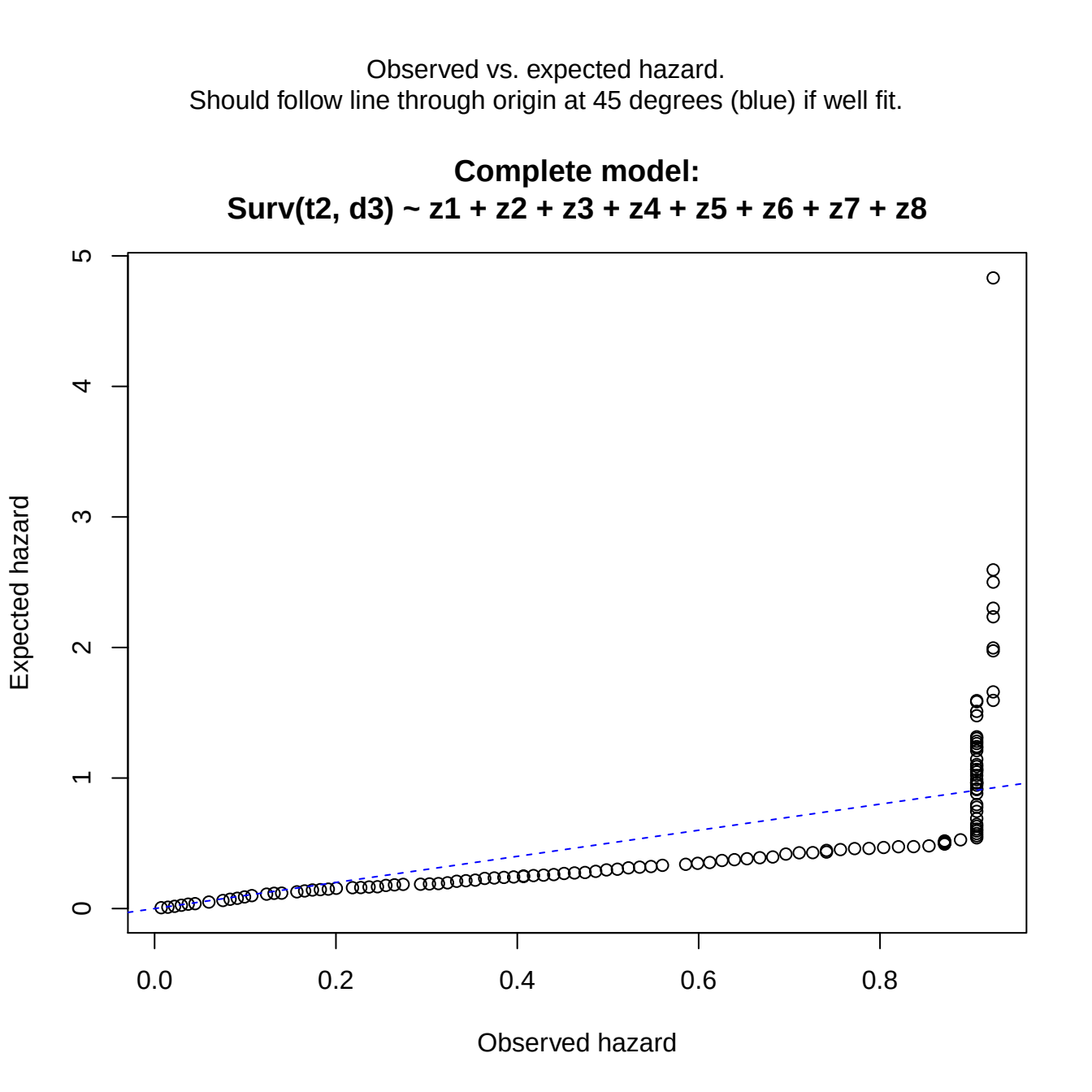
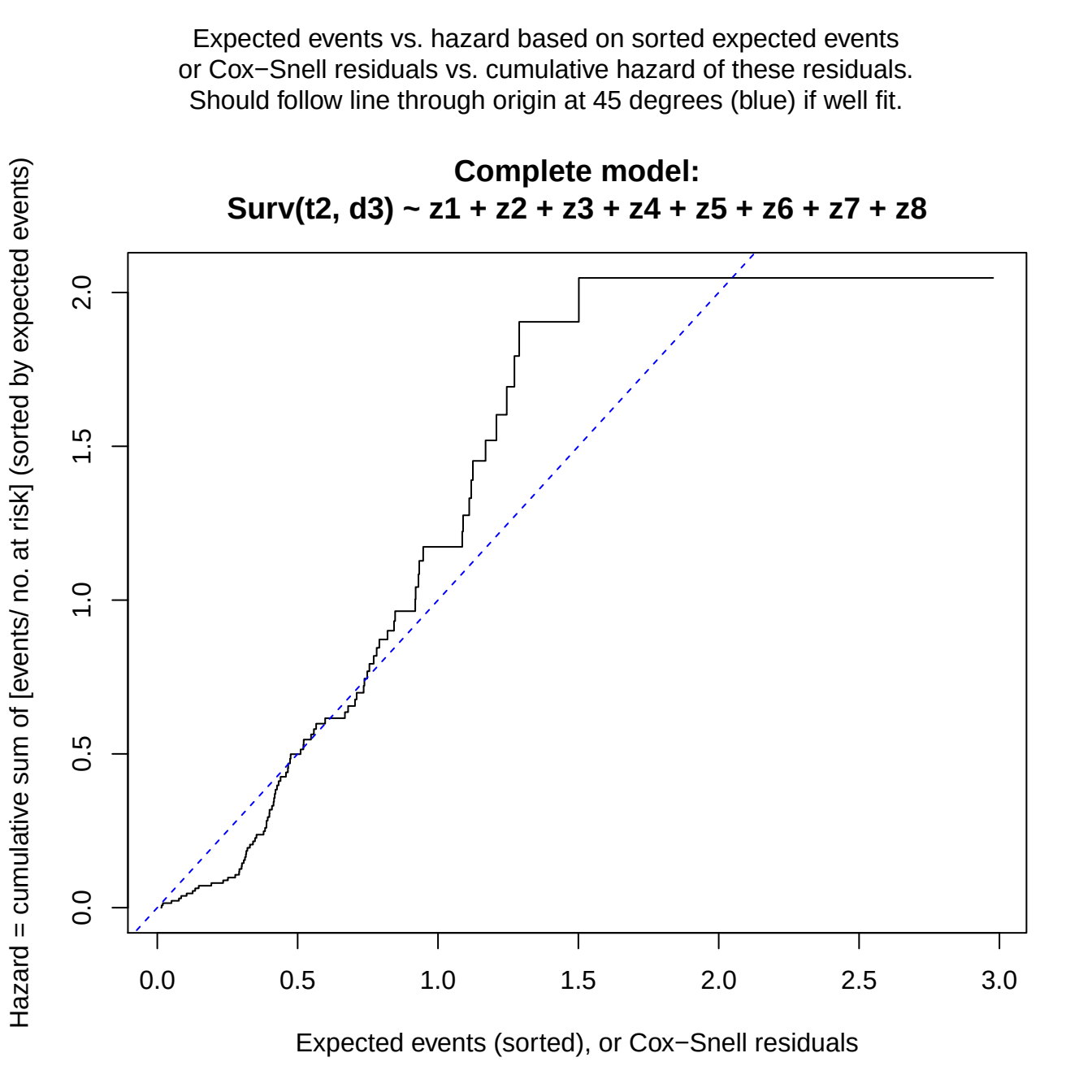
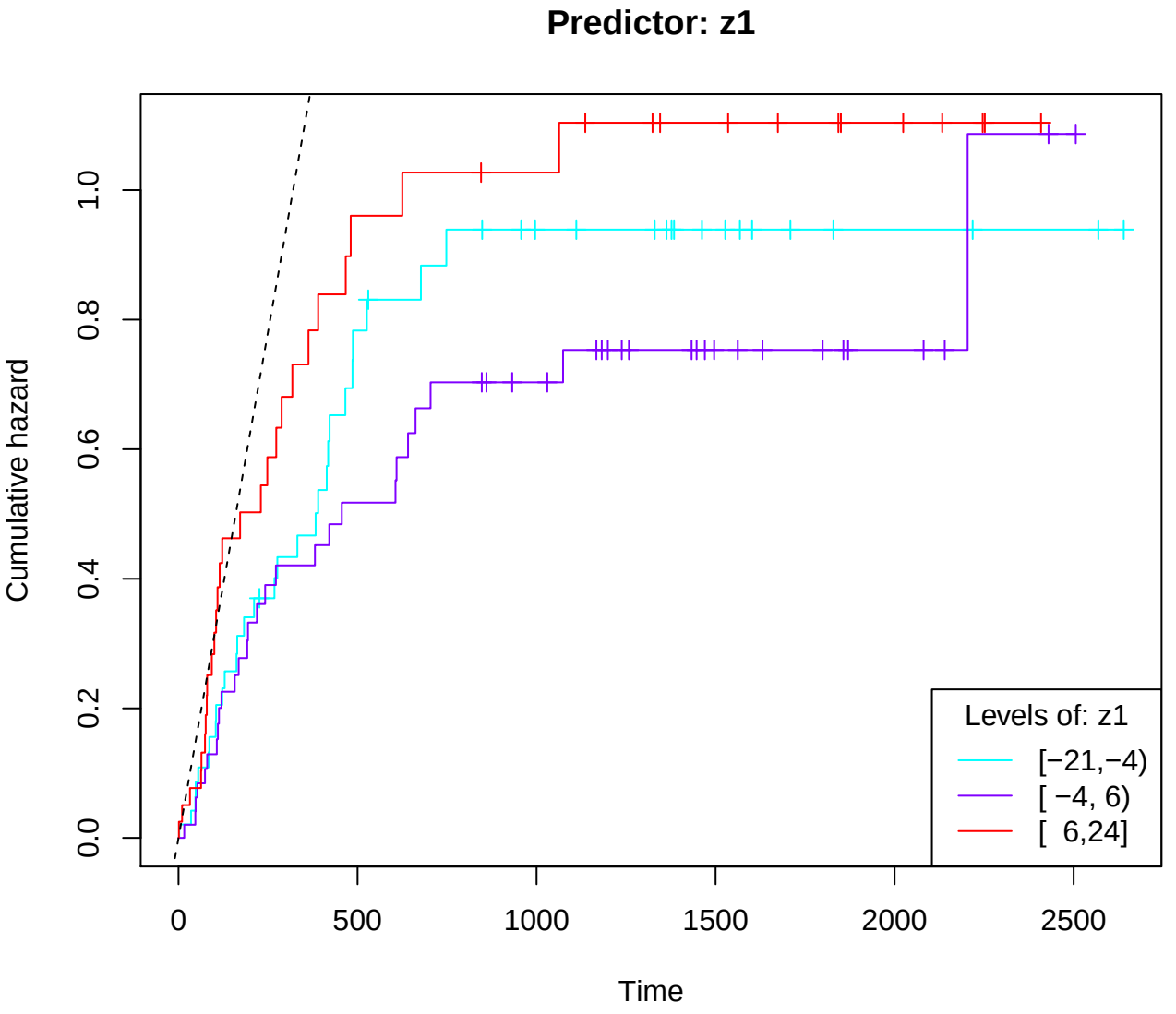

Quantile−quantile plot.
Unit exponential distribution vs. expected events (Cox−Snell residuals).
Should follow line through origin at 45 degrees (blue) if well fit.
Complete model:
Surv(t2, d3) ~ z1 + z2 + z3 + z4 + z5 + z6 + z7 + z8
Expected events (Cox−Snell residuals)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0
1
2
3
4
5
Unit exponential distribution

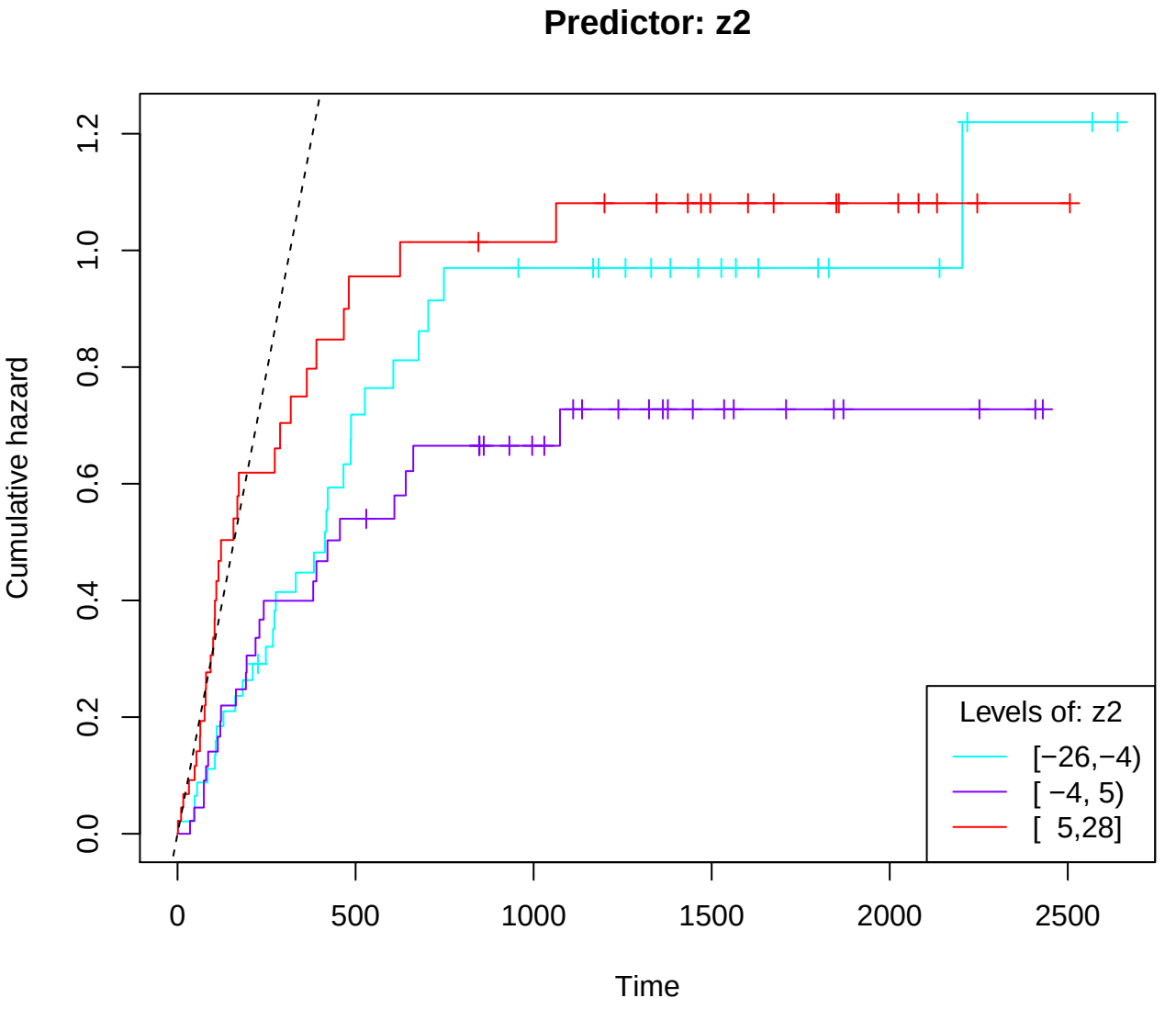

Observed vs. expected hazard.
Should follow line through origin at 45 degrees (blue) if well fit.
Complete model:
Surv(t2, d3) ~ z1 + z2 + z3 + z4 + z5 + z6 + z7 + z8
Expected hazard
0
1
2
3
4
5
0.0
0.2
0.4
0.6
0.8
Observed hazard


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(t2, d3) ~ z1 + z2 + z3 + z4 + z5 + z6 + z7 + z8
Hazard = cumulative sum of [events/ no. at risk] (sorted by expected events)
0.0
0.5
1.0
1.5
2.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Expected events (sorted), or Cox−Snell residuals

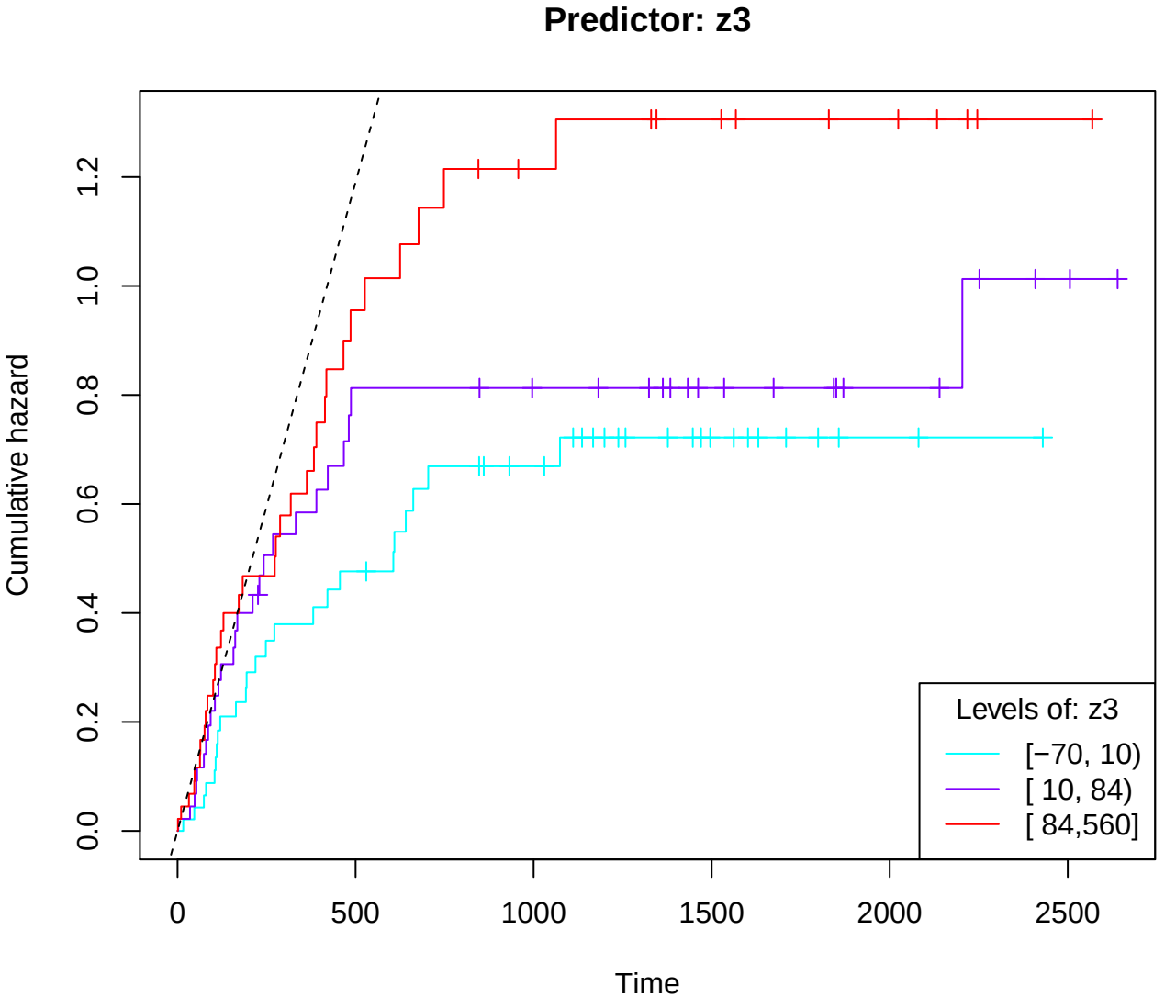
Time vs. hazard, per predictor.
If hazards proportional then curves should be constant multiples of a baseline.
Reference (black) line is 45 degrees.



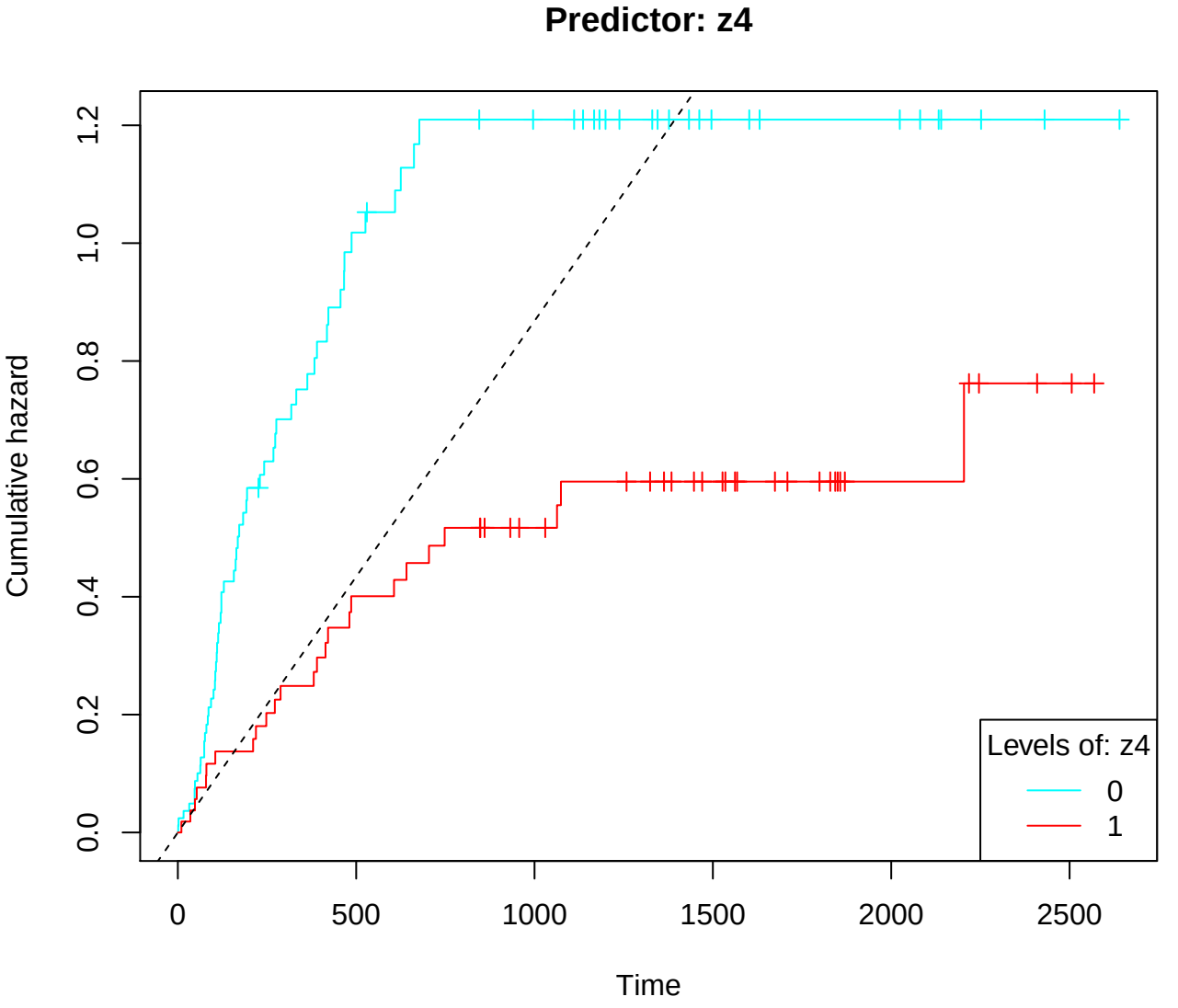
Time vs. hazard, per predictor.
If hazards proportional then curves should be constant multiples of a baseline.
Reference (black) line is 45 degrees.

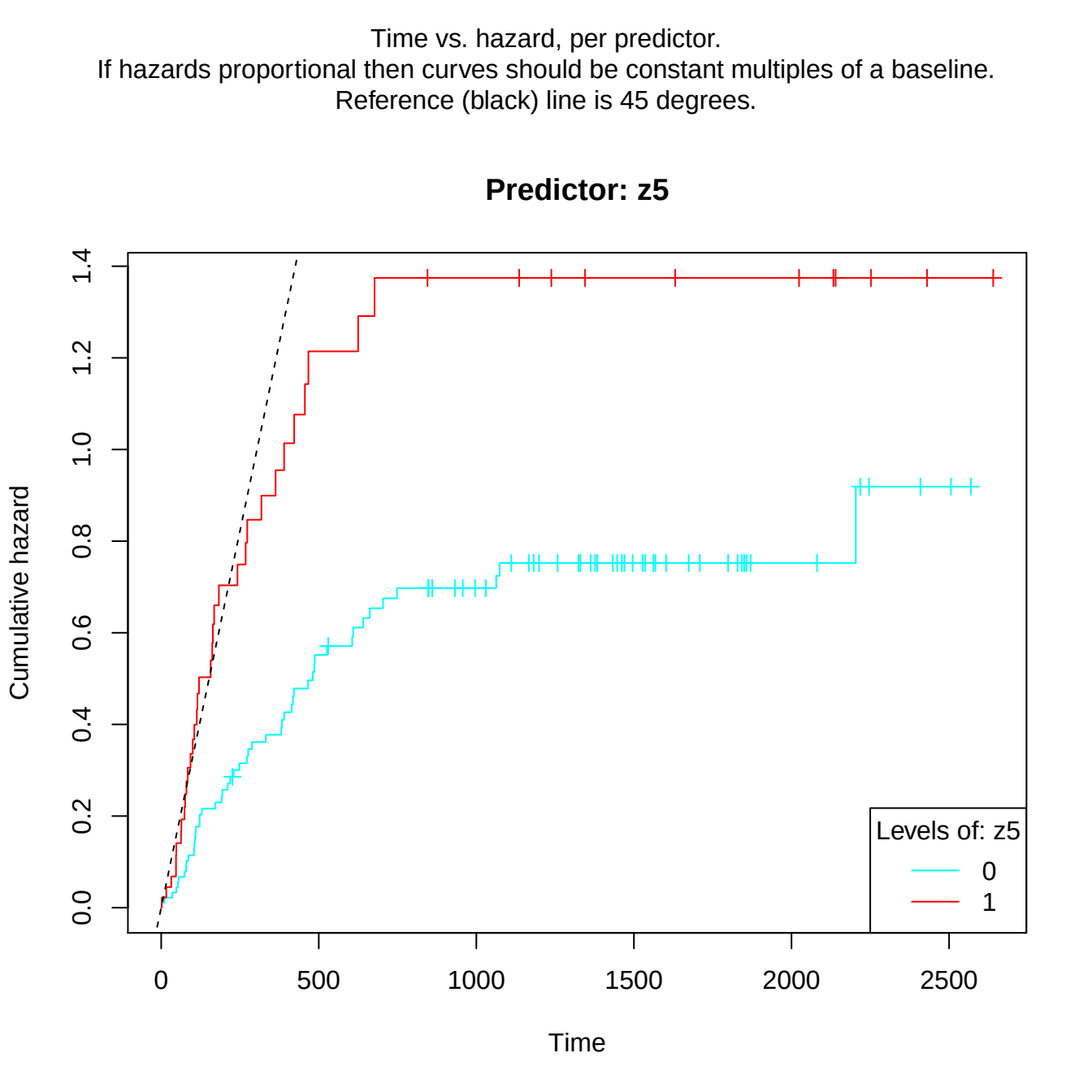


Time vs. hazard, per predictor.
If hazards proportional then curves should be constant multiples of a baseline.
Reference (black) line is 45 degrees.

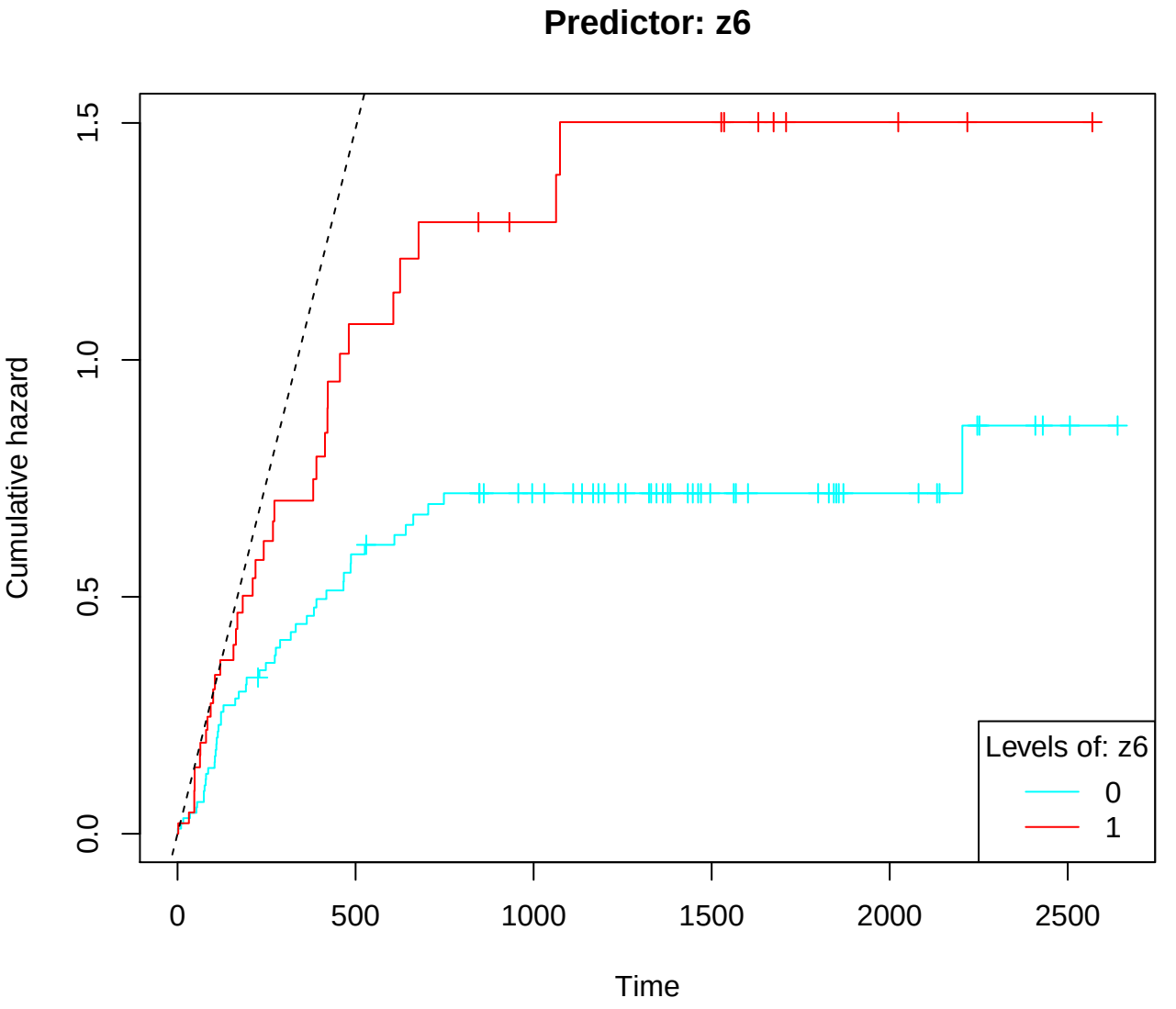


Time vs. hazard, per predictor.
If hazards proportional then curves should be constant multiples of a baseline.
Reference (black) line is 45 degrees.

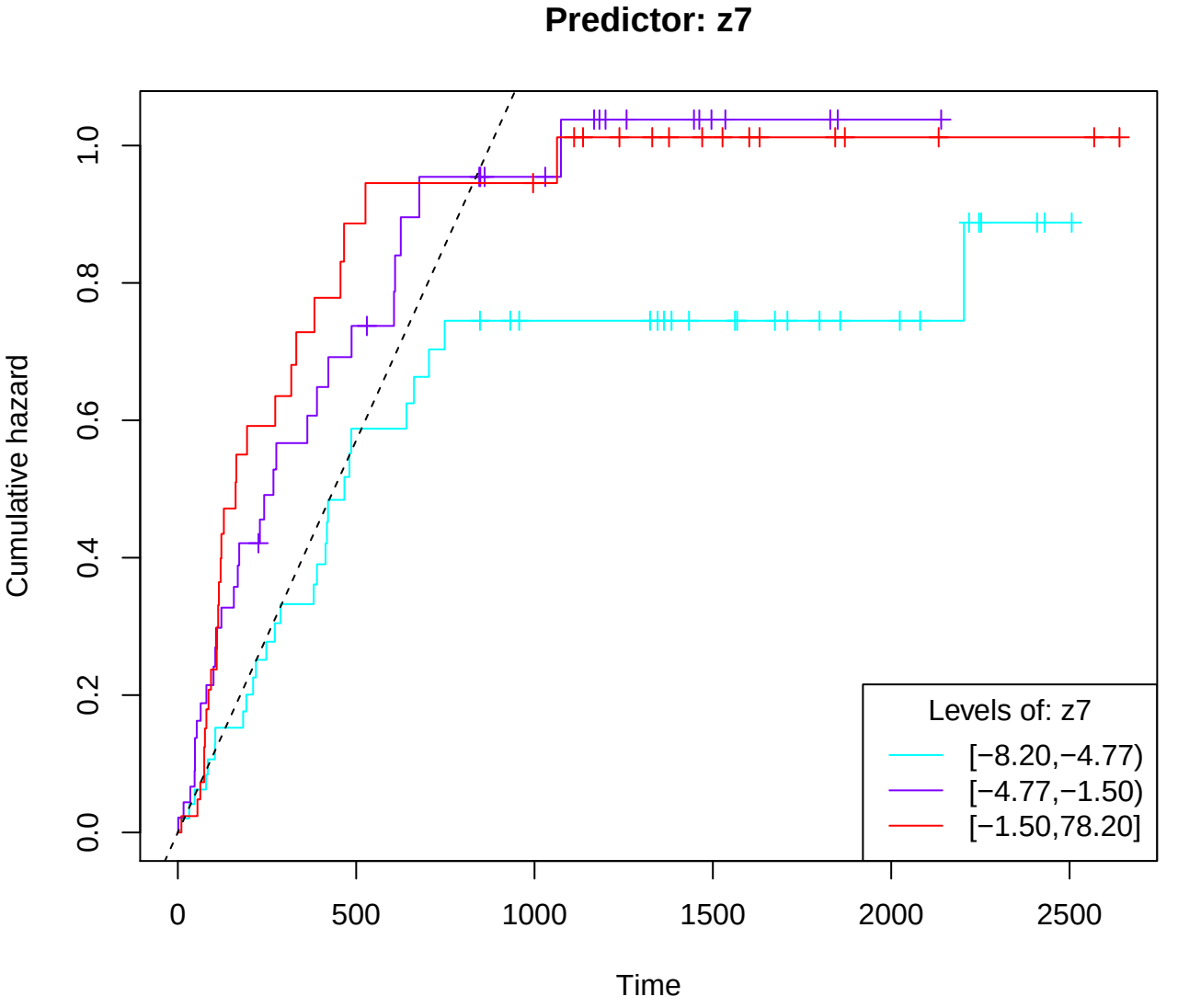



Time vs. hazard, per predictor.
If hazards proportional then curves should be constant multiples of a baseline.
Reference (black) line is 45 degrees.
Predictor: z5
Cumulative hazard
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
0
500
1000
1500
2000
2500
Time
Levels of: z5
0
1

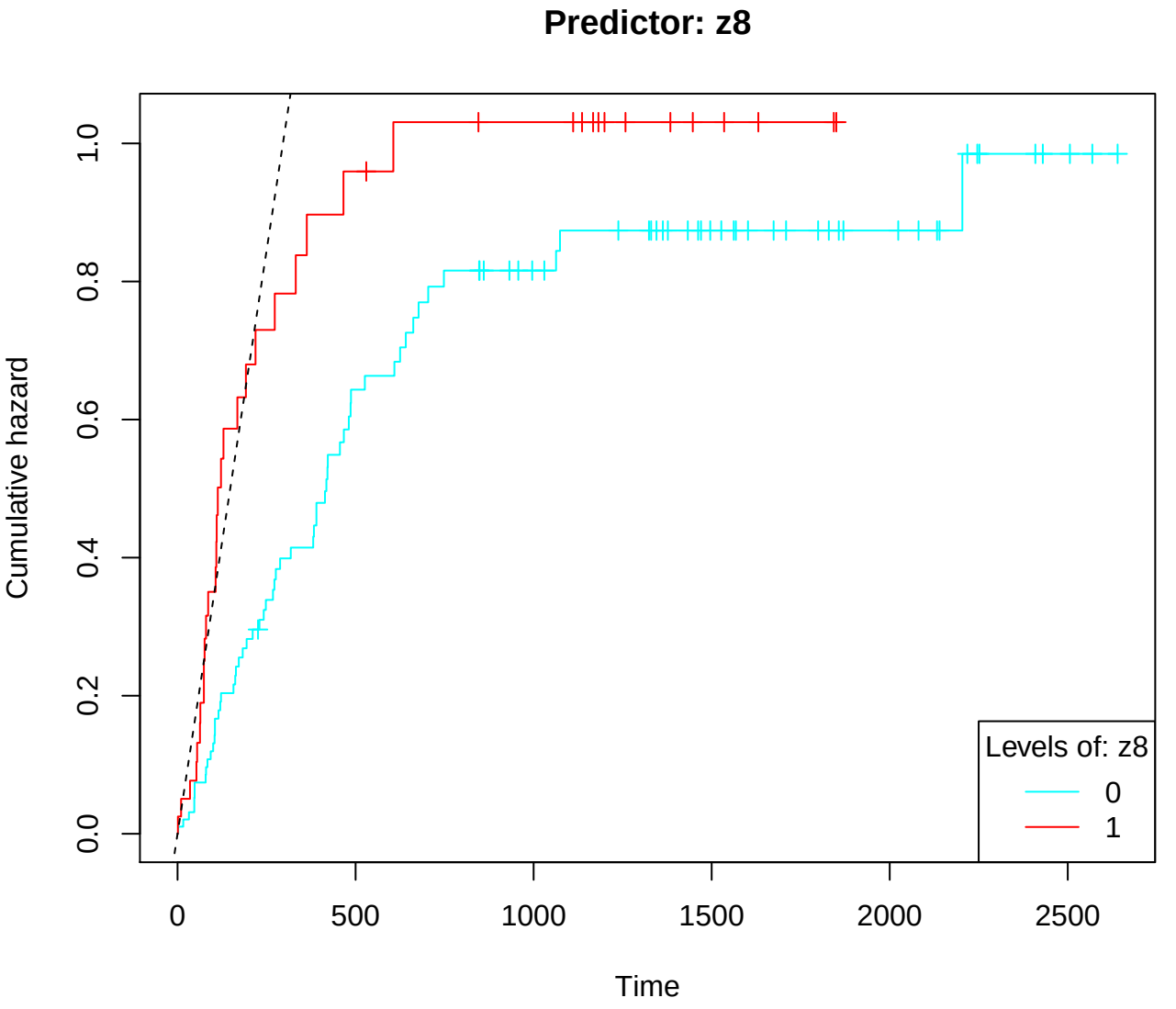
Time vs. hazard, per predictor.
If hazards proportional then curves should be constant multiples of a baseline.
Reference (black) line is 45 degrees.

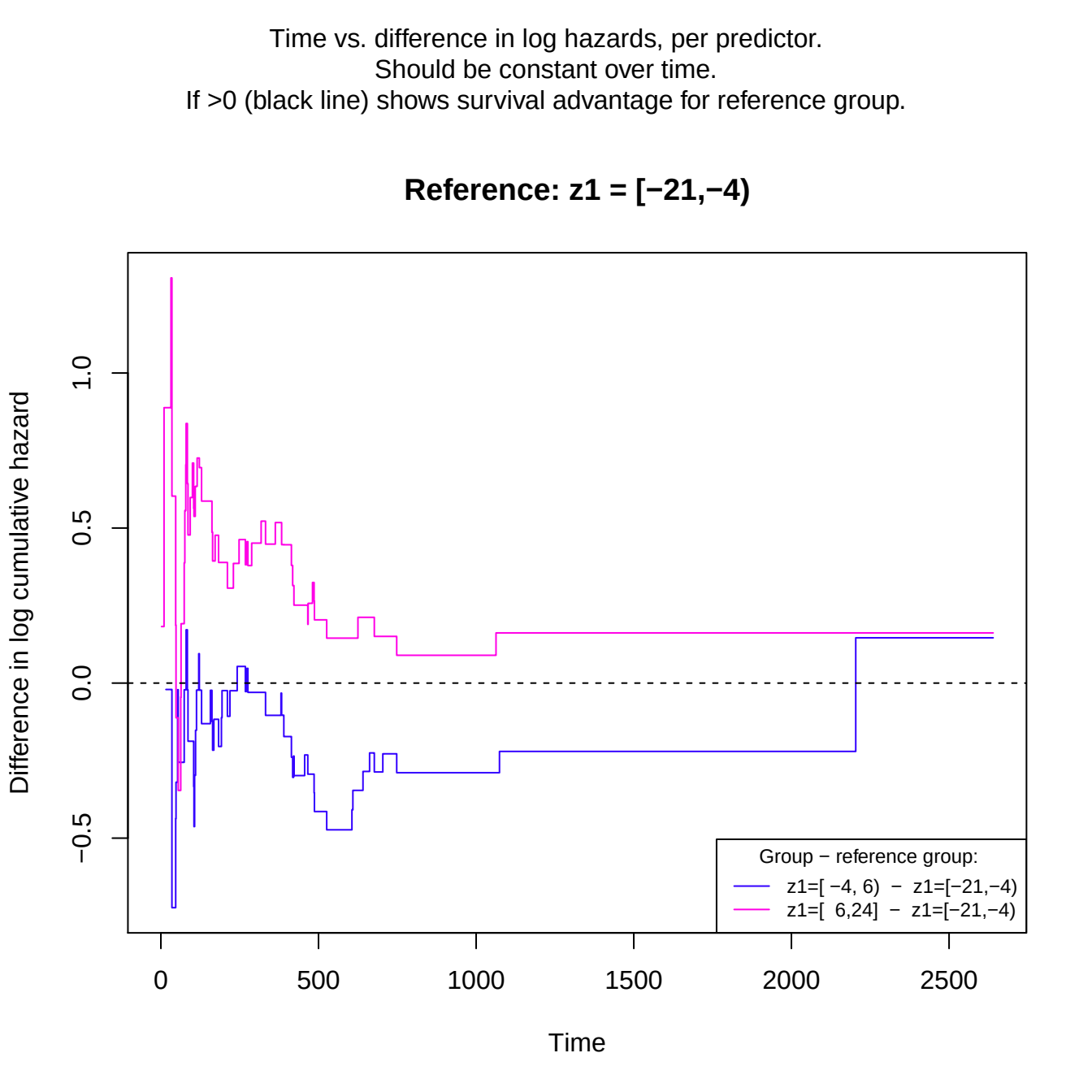


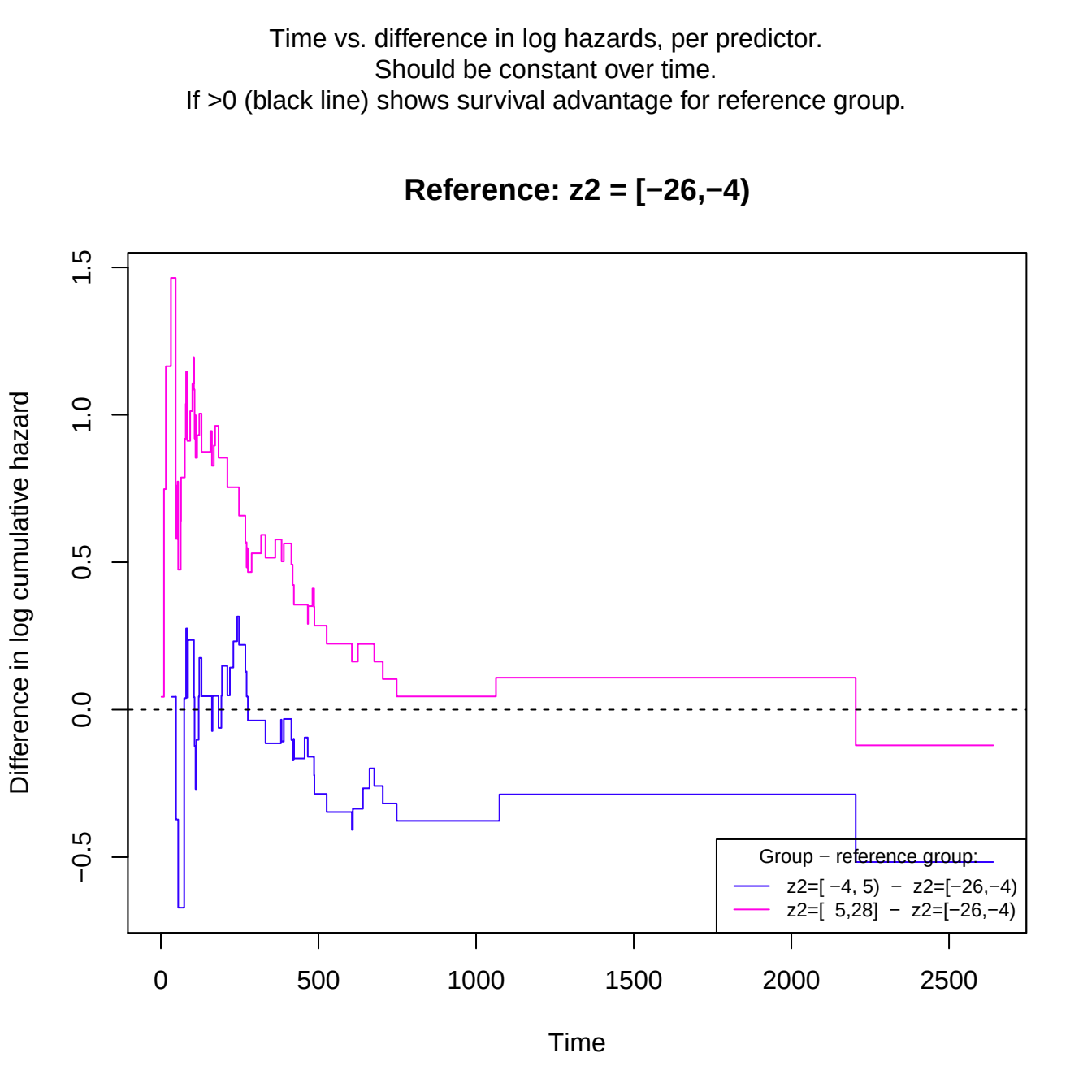
Time vs. hazard, per predictor.
If hazards proportional then curves should be constant multiples of a baseline.
Reference (black) line is 45 degrees.

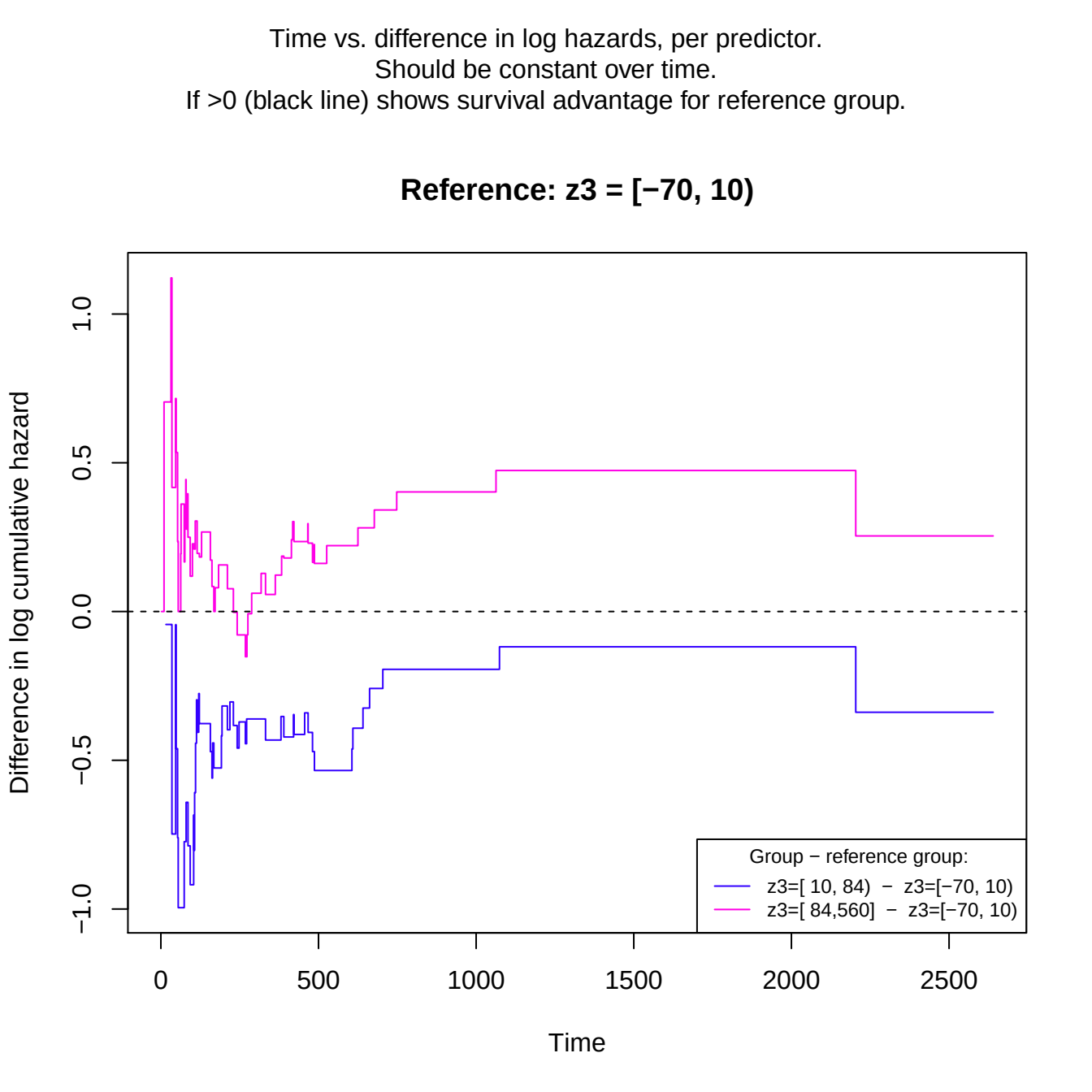


Time vs. hazard, per predictor.
If hazards proportional then curves should be constant multiples of a baseline.
Reference (black) line is 45 degrees.

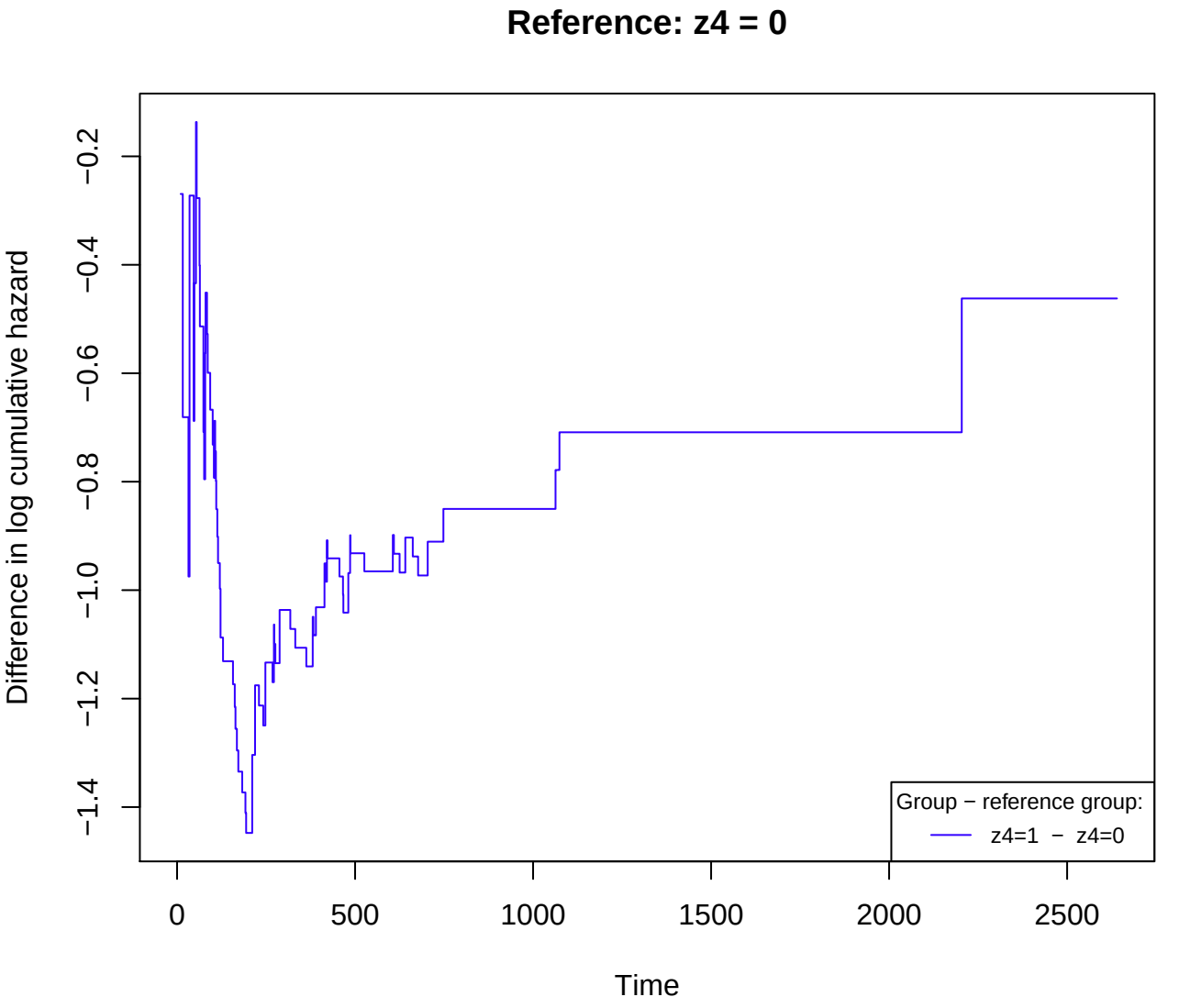


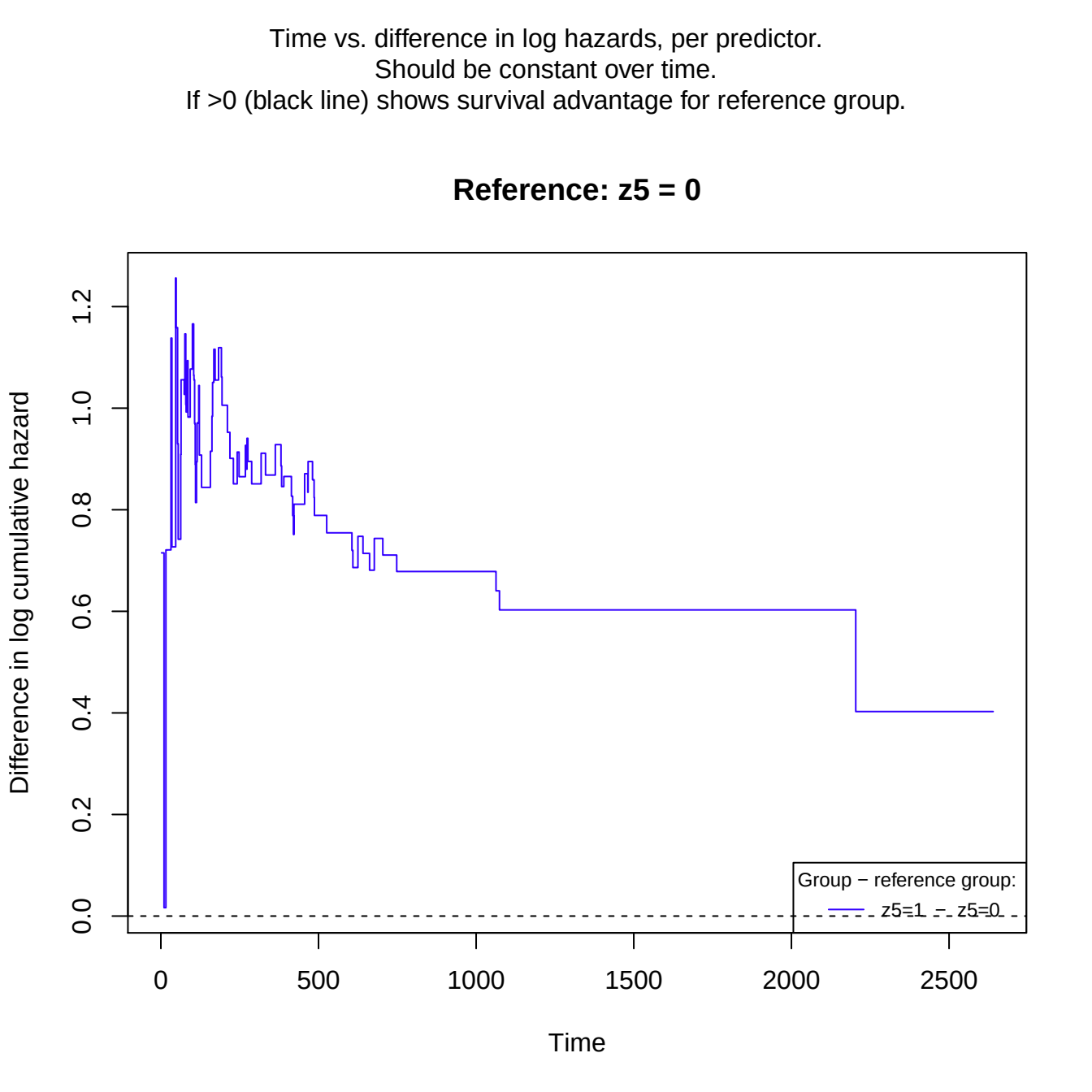

Time vs. difference in log hazards, per predictor.
Should be constant over time.
If >0 (black line) shows survival advantage for reference group.
Reference: z1 = [−21,−4)
Difference in log cumulative hazard
1.0
0.5
0.0
−0.5
0
500
1000
1500
2000
2500
Time
Group − reference group:
z1=[−4, 6) − z1=[−21,−4)
z1=[6,24] − z1=[−21,−4)

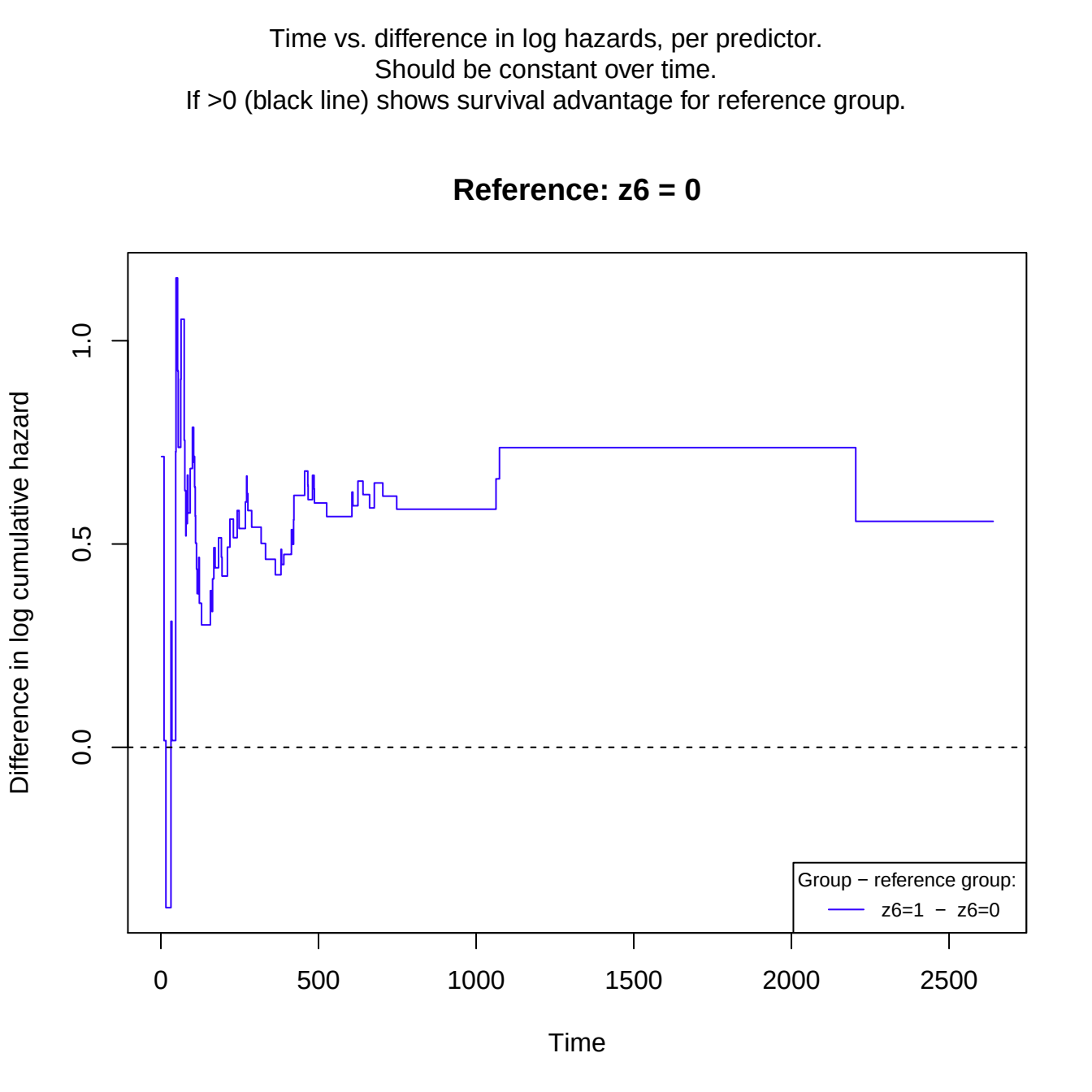

Time vs. difference in log hazards, per predictor.
Should be constant over time.
If >0 (black line) shows survival advantage for reference group.
Reference: z2 = [−26,−4)
Difference in log cumulative hazard
1.5
1.0
0.5
0.0
−0.5
0
500
1000
1500
2000
2500
Time
Group − reference group:
z2=[−4, 5) − z2=[−26,−4)
z2=[5,28] − z2=[−26,−4)

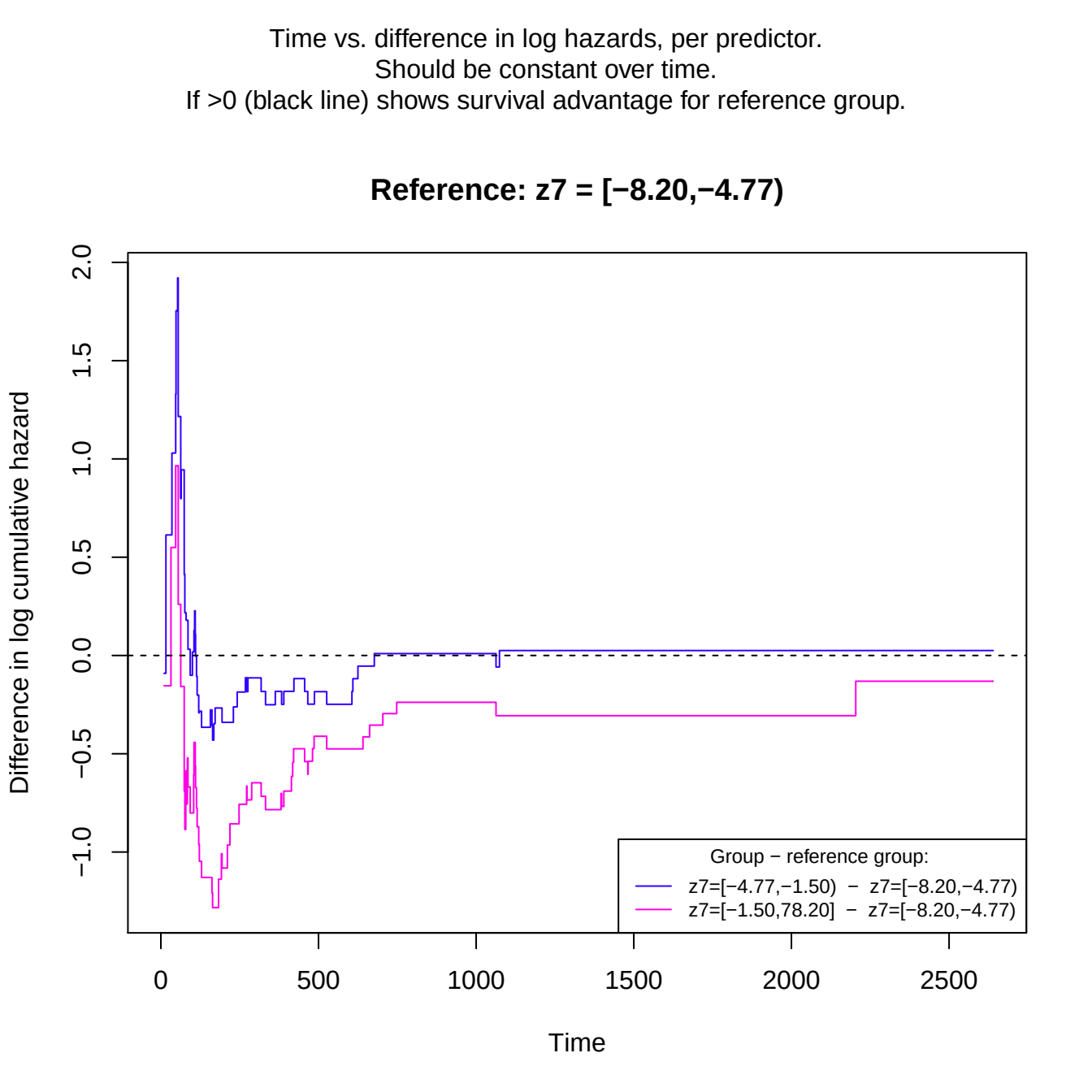

Time vs. difference in log hazards, per predictor.
Should be constant over time.
If >0 (black line) shows survival advantage for reference group.
Reference: z3 = [−70, 10)
Difference in log cumulative hazard
1.0
0.5
0.0
−0.5
−1.0
0
500
1000
1500
2000
2500
Time
Group − reference group:
z3=[10, 84) − z3=[−70, 10)
z3=[84,560] − z3=[−70, 10)

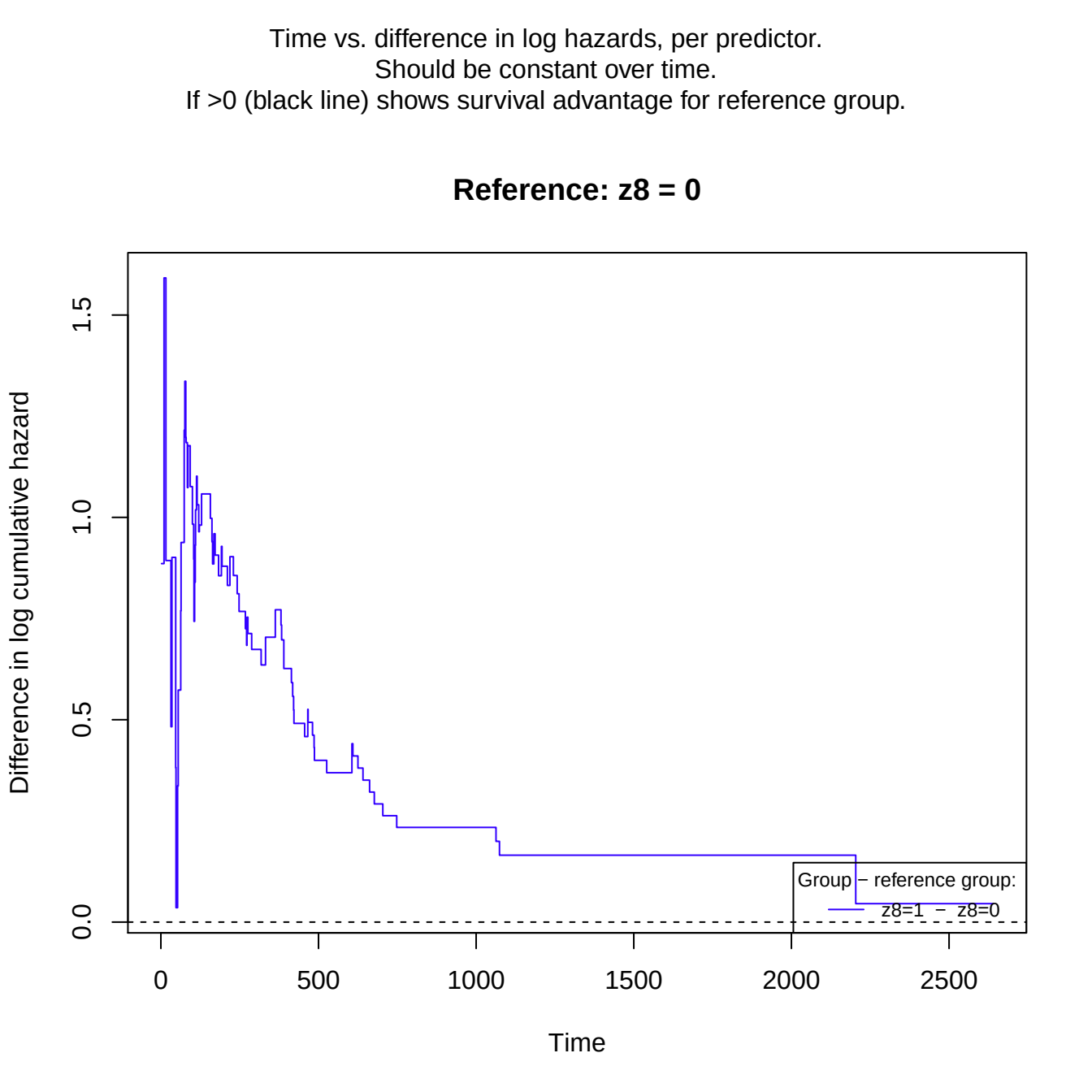
Time vs. difference in log hazards, per predictor.
Should be constant over time.
If >0 (black line) shows survival advantage for reference group.



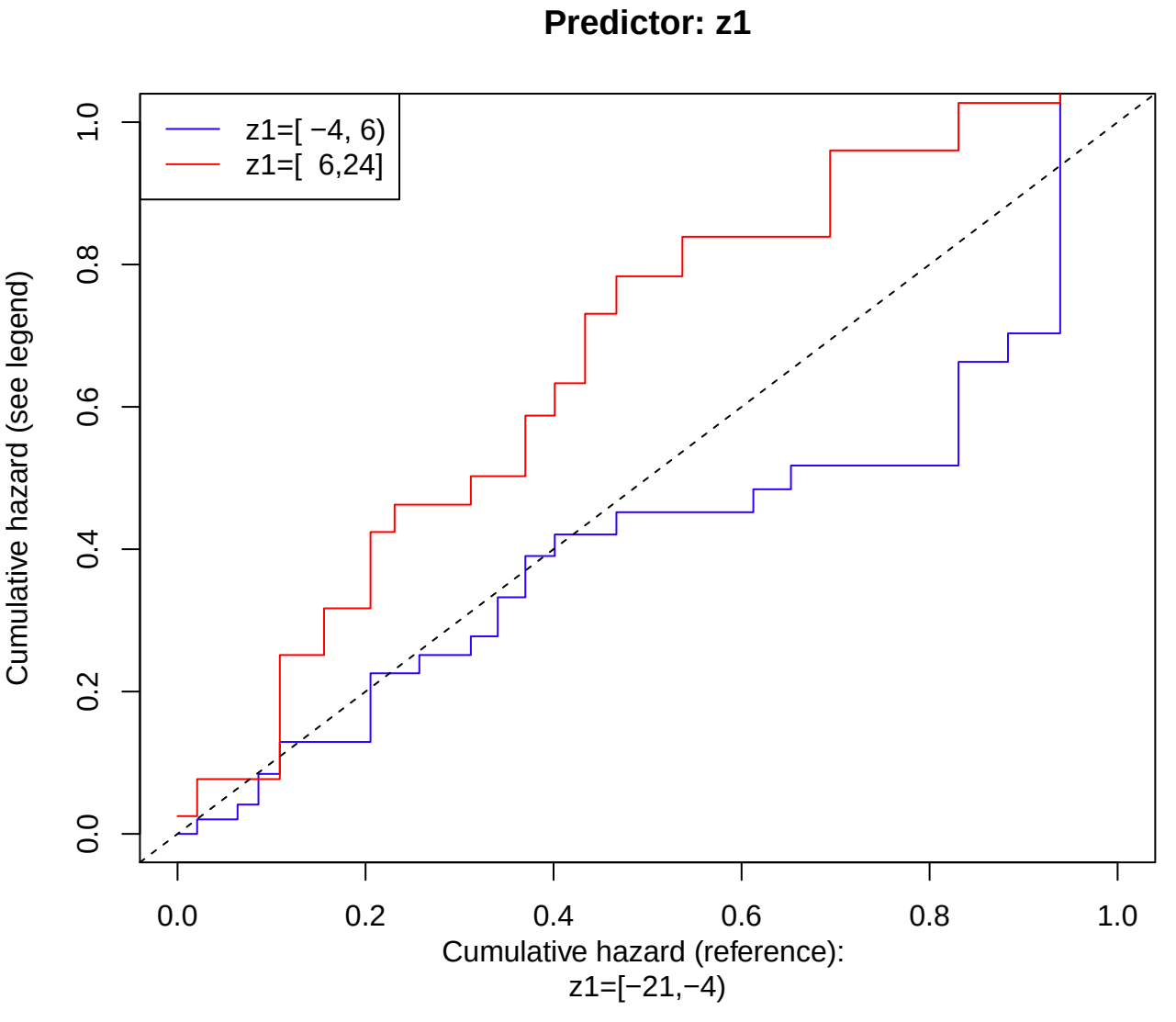

Time vs. difference in log hazards, per predictor.
Should be constant over time.
If >0 (black line) shows survival advantage for reference group.
Reference: z5 = 0
Difference in log cumulative hazard
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0
500
1000
1500
2000
2500
Time
Group − reference group:
z5=1
z5=0


Time vs. difference in log hazards, per predictor.
Should be constant over time.
If >0 (black line) shows survival advantage for reference group.
Reference: z6 = 0
Difference in log cumulative hazard
1.0
0.5
0.0
0
500
1000
1500
2000
2500
Time
Group − reference group:
z6=1 − z6=0

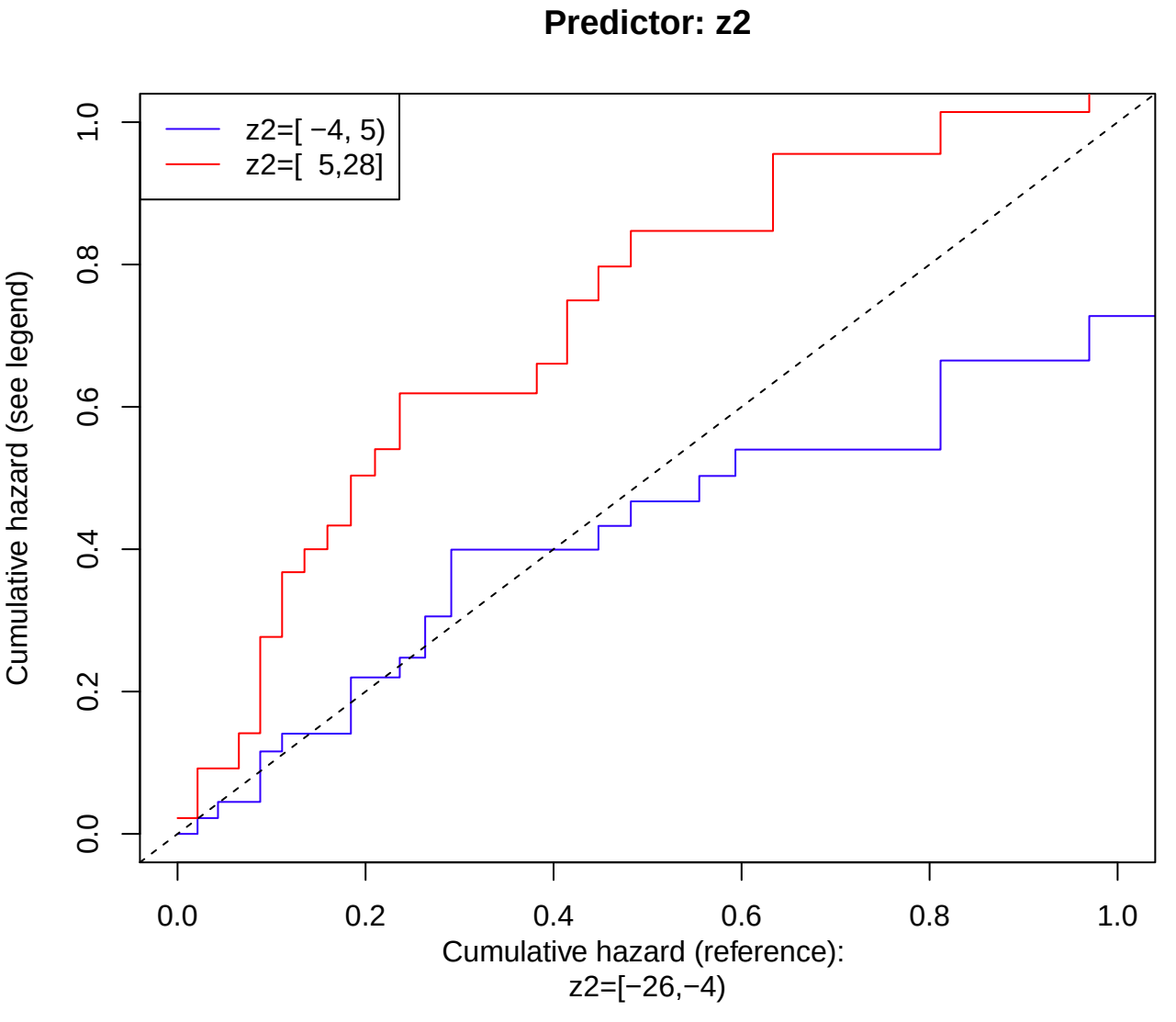

Time vs. difference in log hazards, per predictor.
Should be constant over time.
If >0 (black line) shows survival advantage for reference group.
Reference: z7 = [−8.20,−4.77)
Difference in log cumulative hazard
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
0
500
1000
1500
2000
2500
Time
Group − reference group:
z7=[−4.77,−1.50) − z7=[−8.20,−4.77)
z7=[−1.50,78.20] − z7=[−8.20,−4.77)


Time vs. difference in log hazards, per predictor.
Should be constant over time.
If >0 (black line) shows survival advantage for reference group.
Reference: z8 = 0
Difference in log cumulative hazard
0.0
0.5
1.0
1.5
0
500
1000
1500
2000
2500
Time
Group − reference group:
z8=1 − z8=0

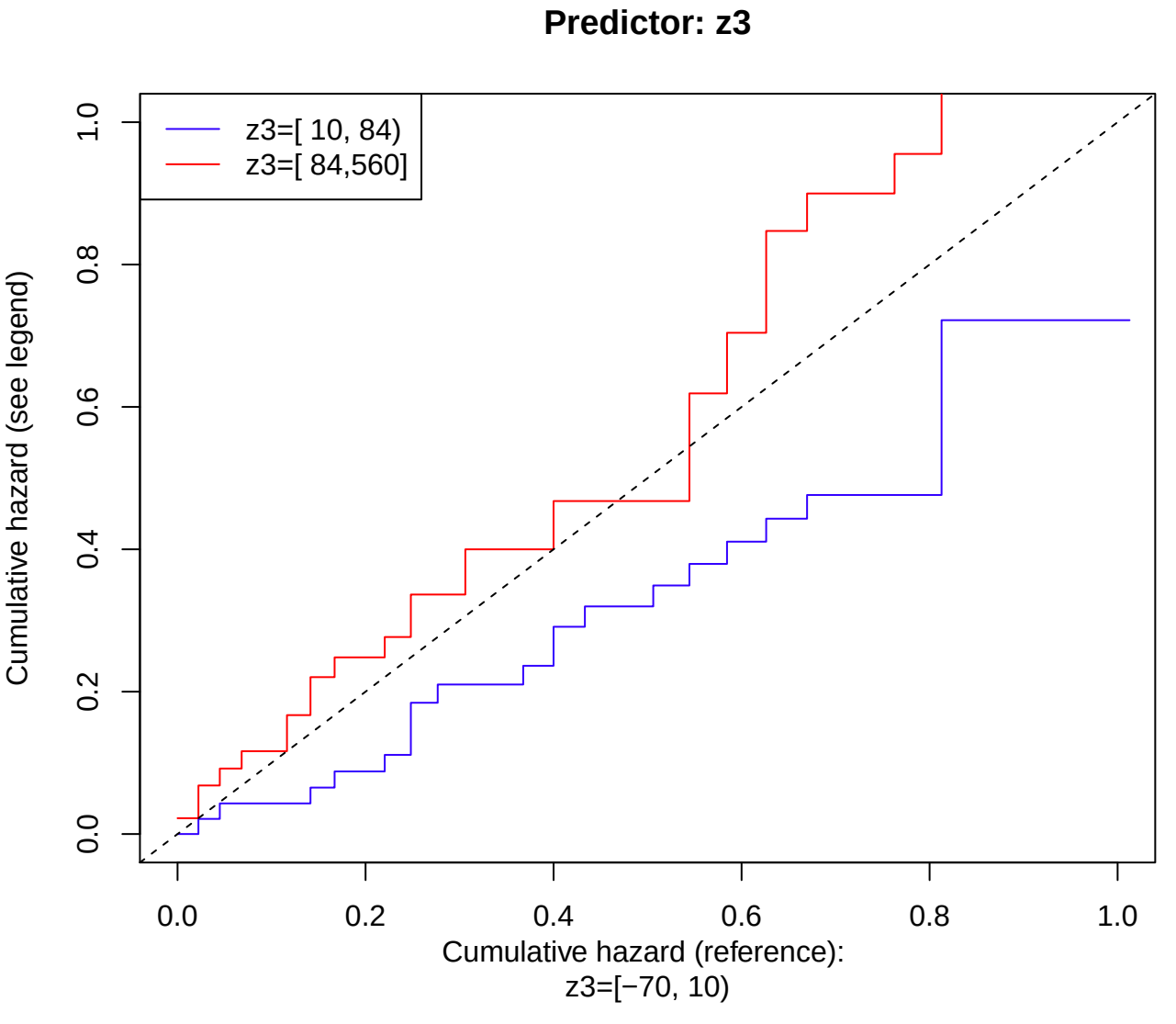
Cumulative hazard vs. reference group. Should be linear plot through origin.
If convex (towards top left) shows ratio of hazards is increasing over time.
Reference line (black) is at 45 degrees.



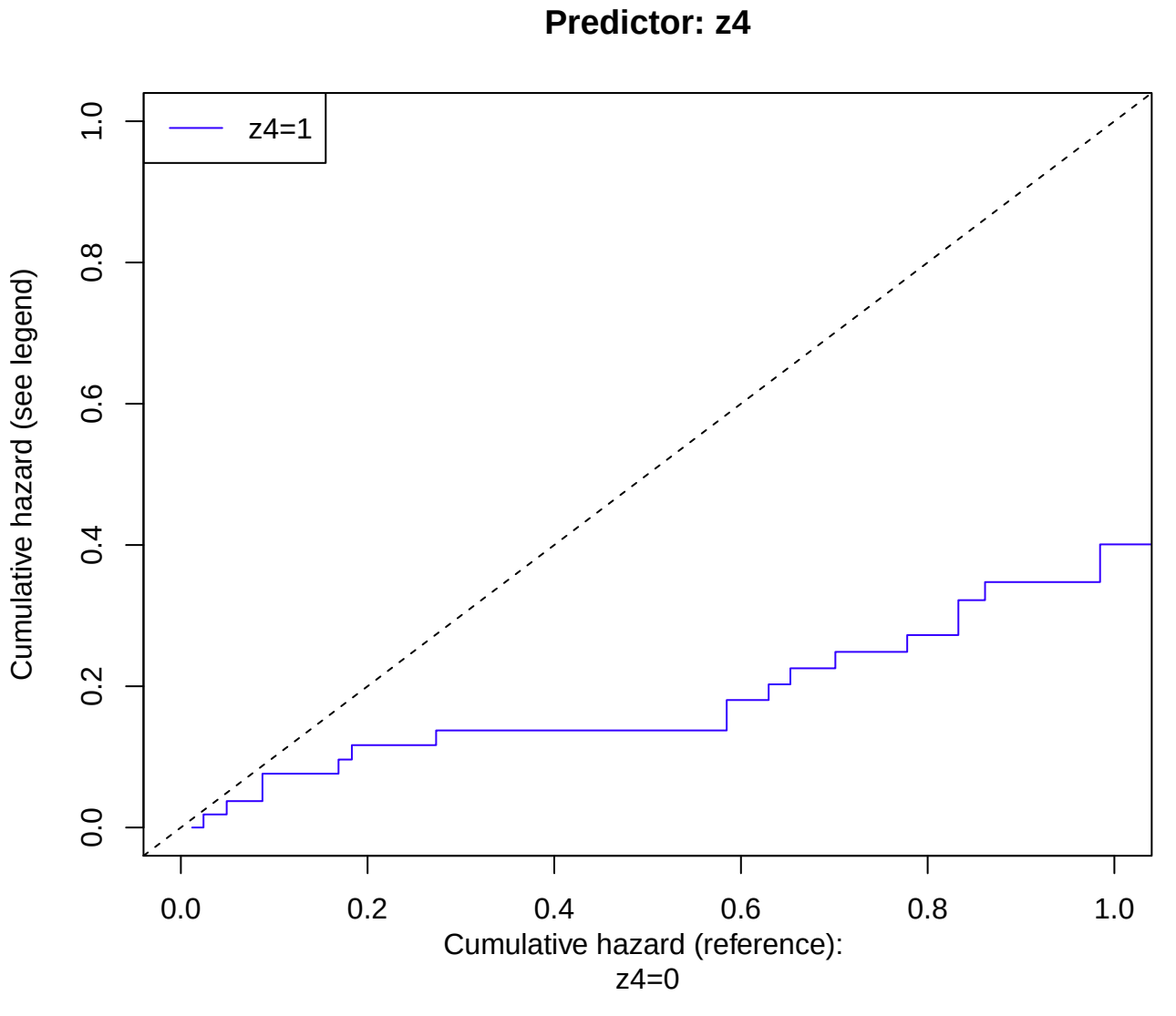
Cumulative hazard vs. reference group. Should be linear plot through origin.
If convex (towards top left) shows ratio of hazards is increasing over time.
Reference line (black) is at 45 degrees.



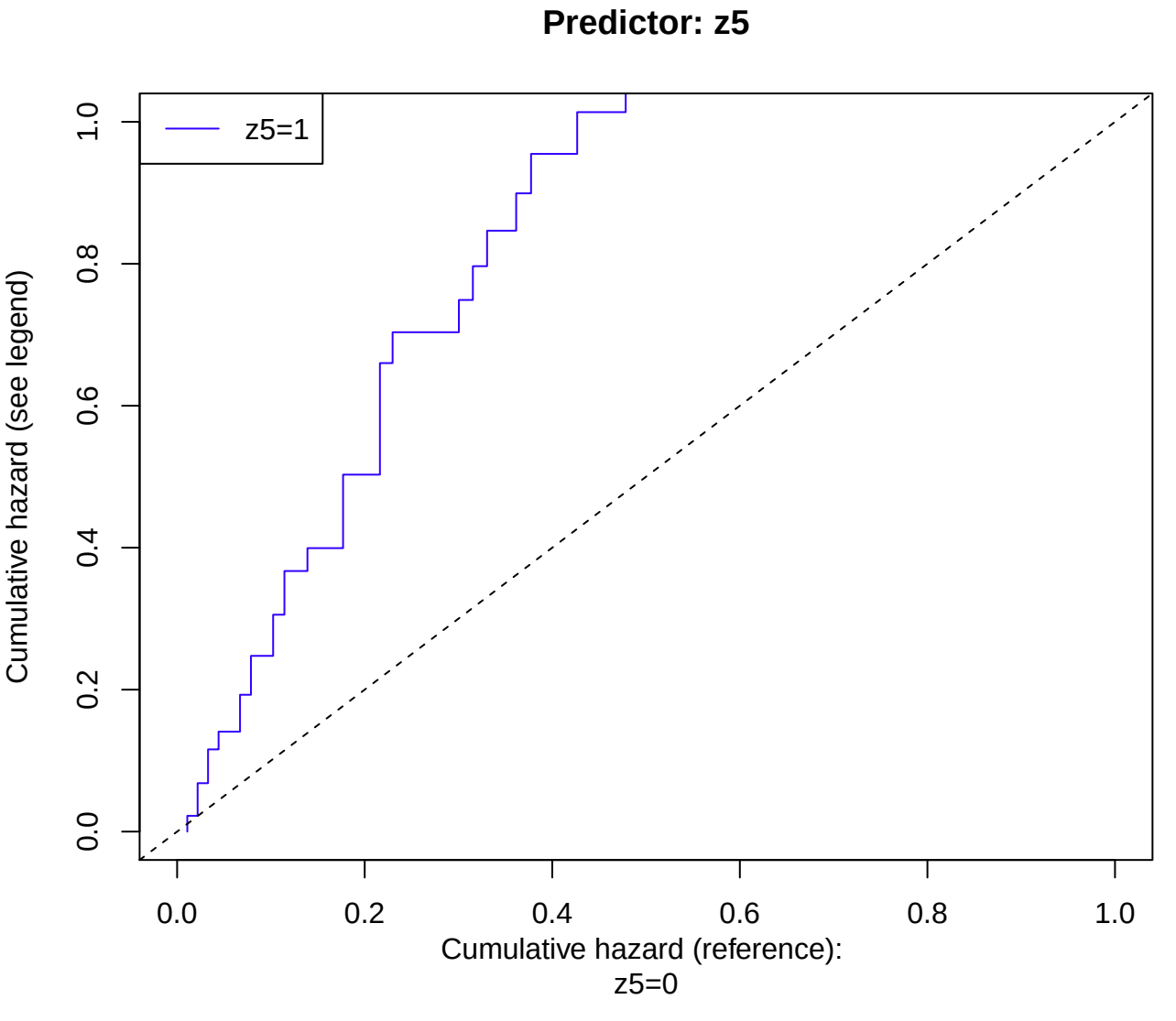
Cumulative hazard vs. reference group. Should be linear plot through origin.
If convex (towards top left) shows ratio of hazards is increasing over time.
Reference line (black) is at 45 degrees.



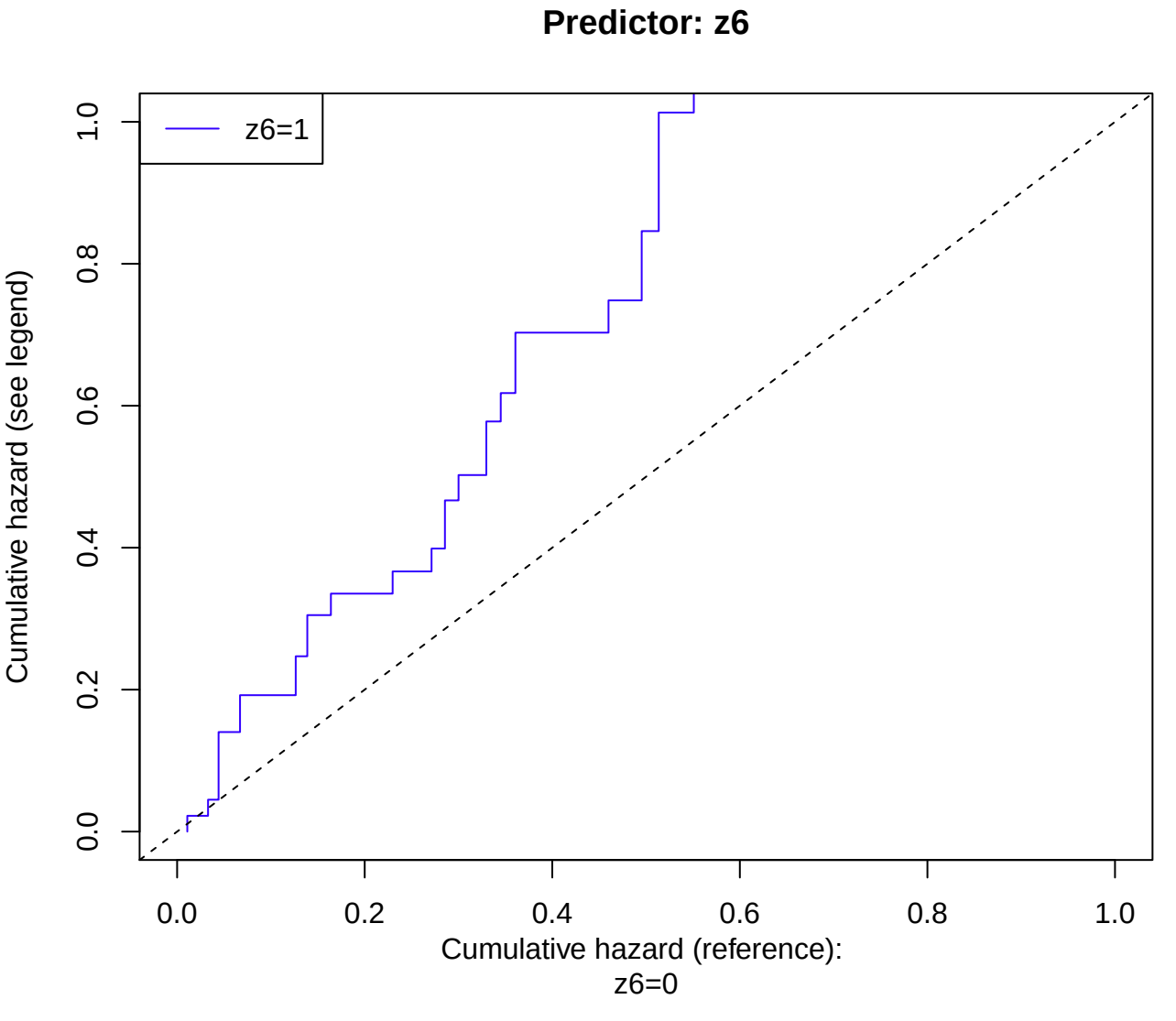
Cumulative hazard vs. reference group. Should be linear plot through origin.
If convex (towards top left) shows ratio of hazards is increasing over time.
Reference line (black) is at 45 degrees.



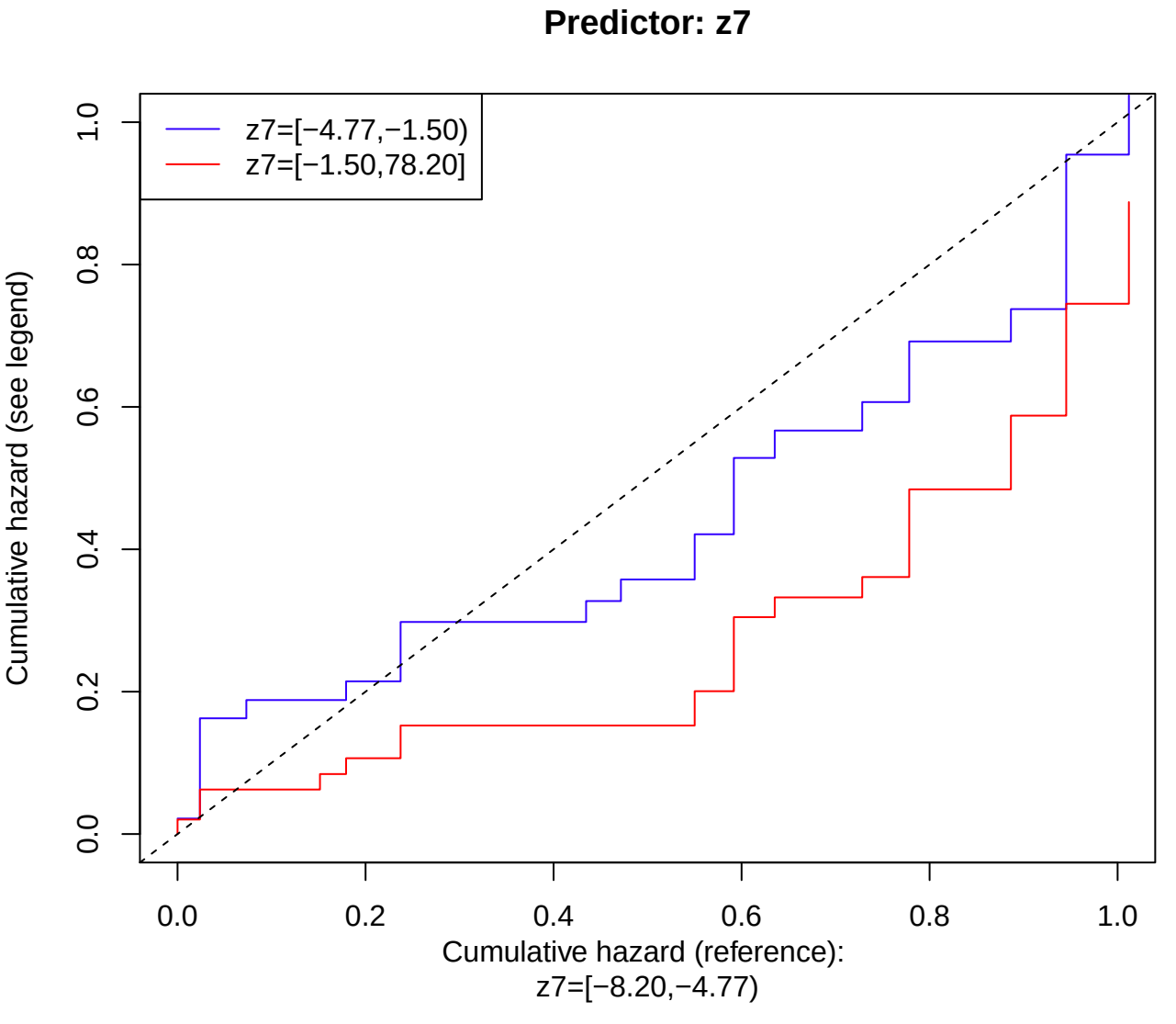
Cumulative hazard vs. reference group. Should be linear plot through origin.
If convex (towards top left) shows ratio of hazards is increasing over time.
Reference line (black) is at 45 degrees.



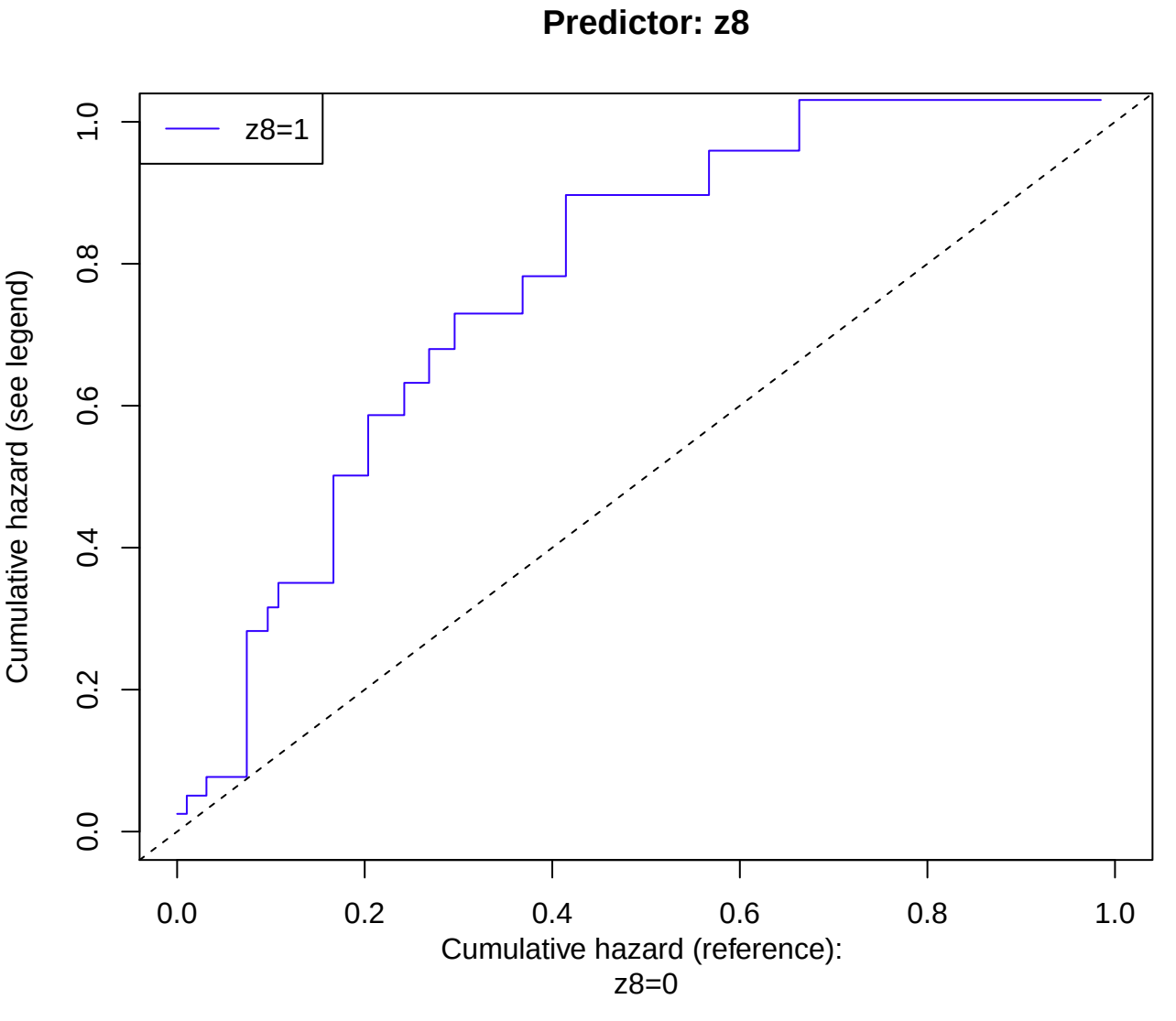
Cumulative hazard vs. reference group. Should be linear plot through origin.
If convex (towards top left) shows ratio of hazards is increasing over time.
Reference line (black) is at 45 degrees.



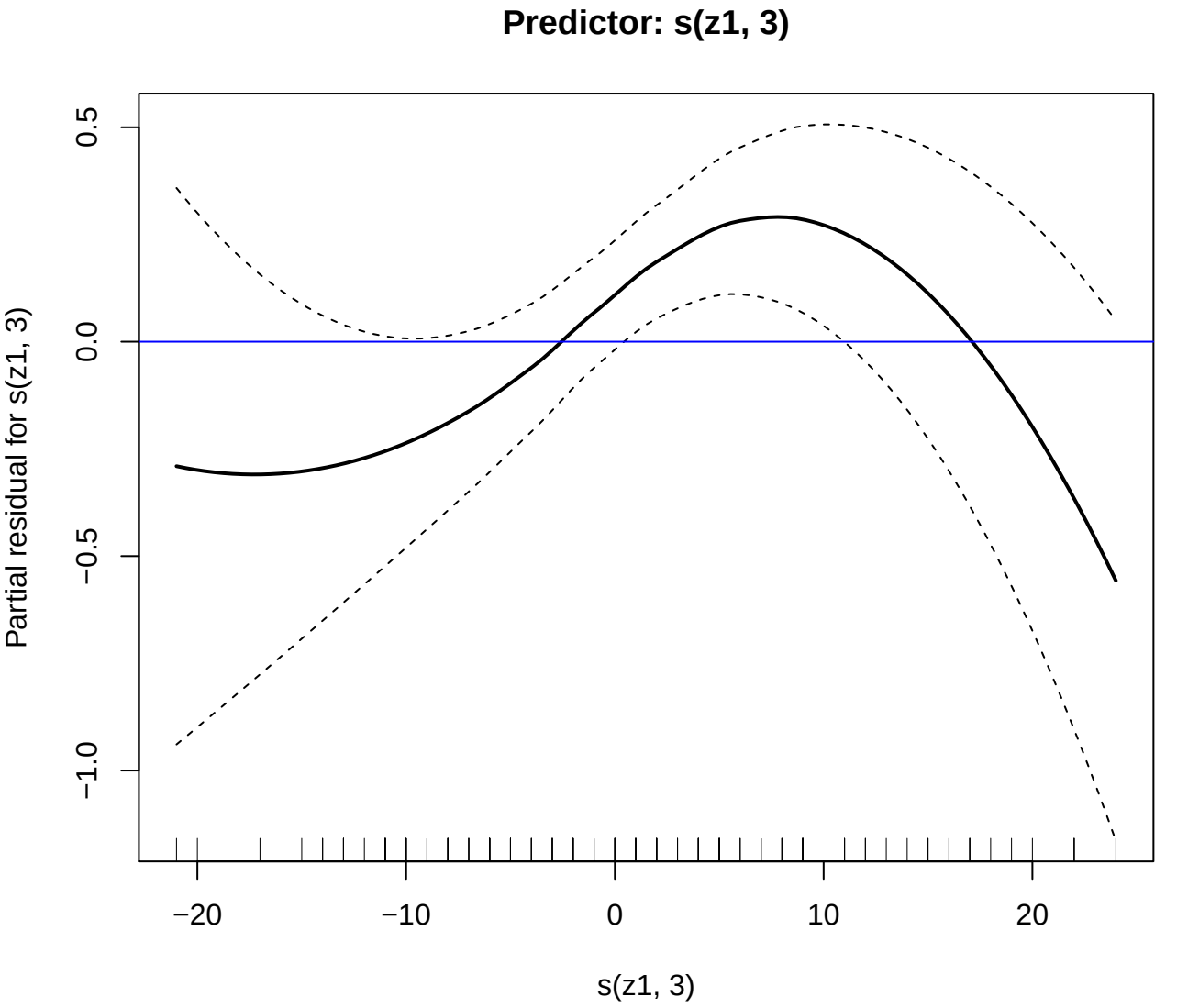
Cumulative hazard vs. reference group. Should be linear plot through origin.
If convex (towards top left) shows ratio of hazards is increasing over time.
Reference line (black) is at 45 degrees.



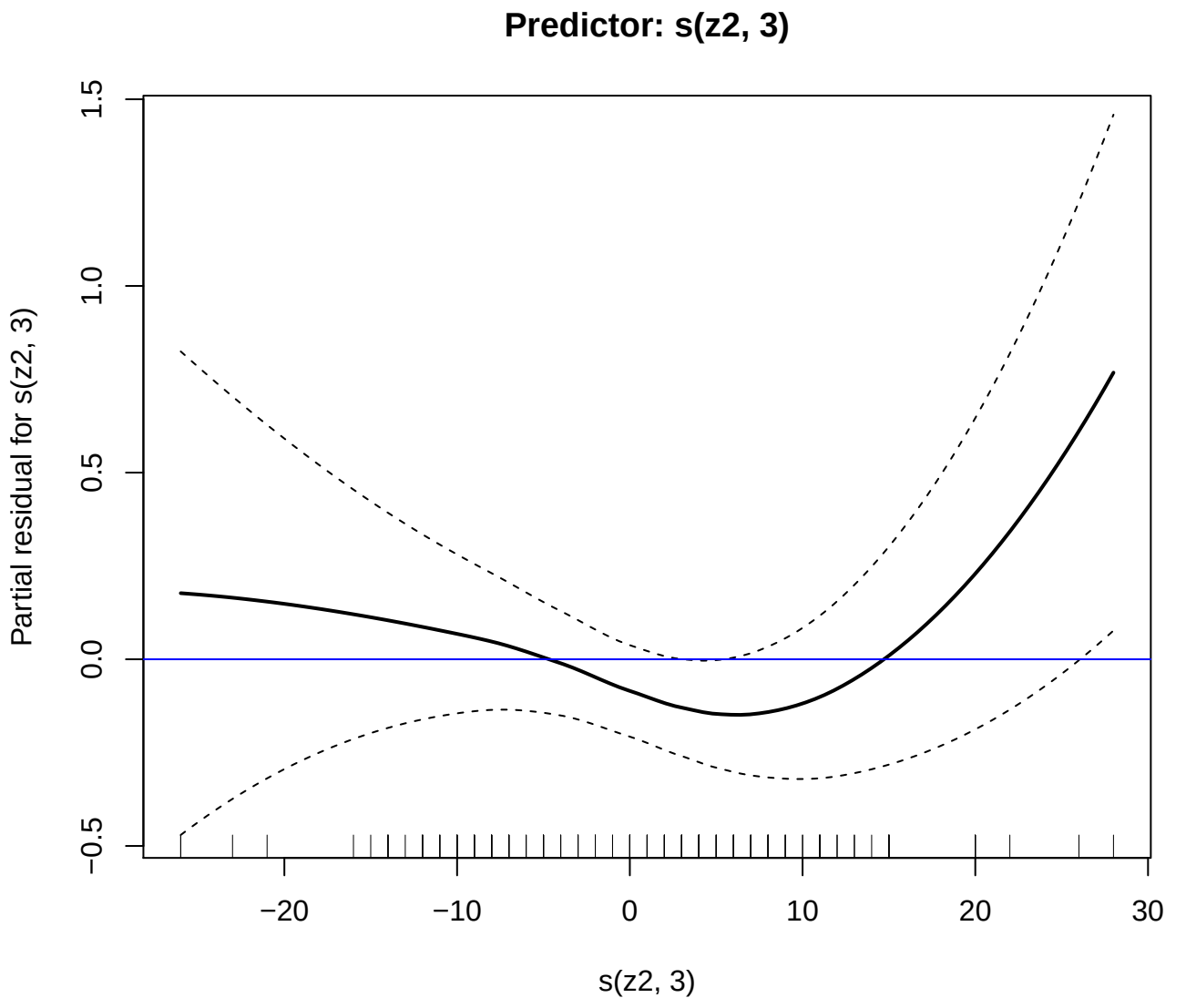
Cumulative hazard vs. reference group. Should be linear plot through origin.
If convex (towards top left) shows ratio of hazards is increasing over time.
Reference line (black) is at 45 degrees.



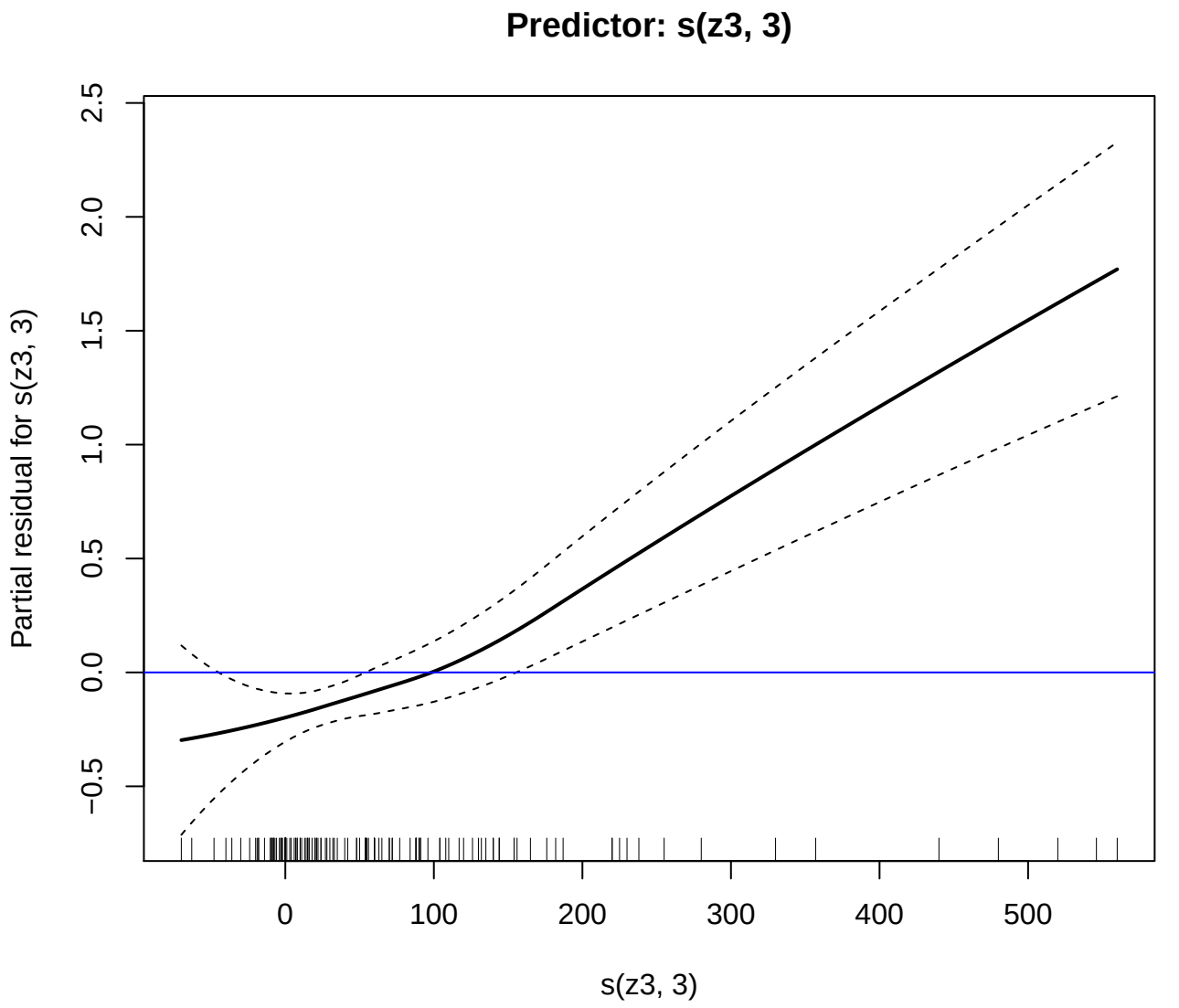
Poisson approach to determine non−linearity.
Predictor (with smoothing spline) vs. residuals from GAM plot.
If linear should be horizontal line with intercept=0 (blue).

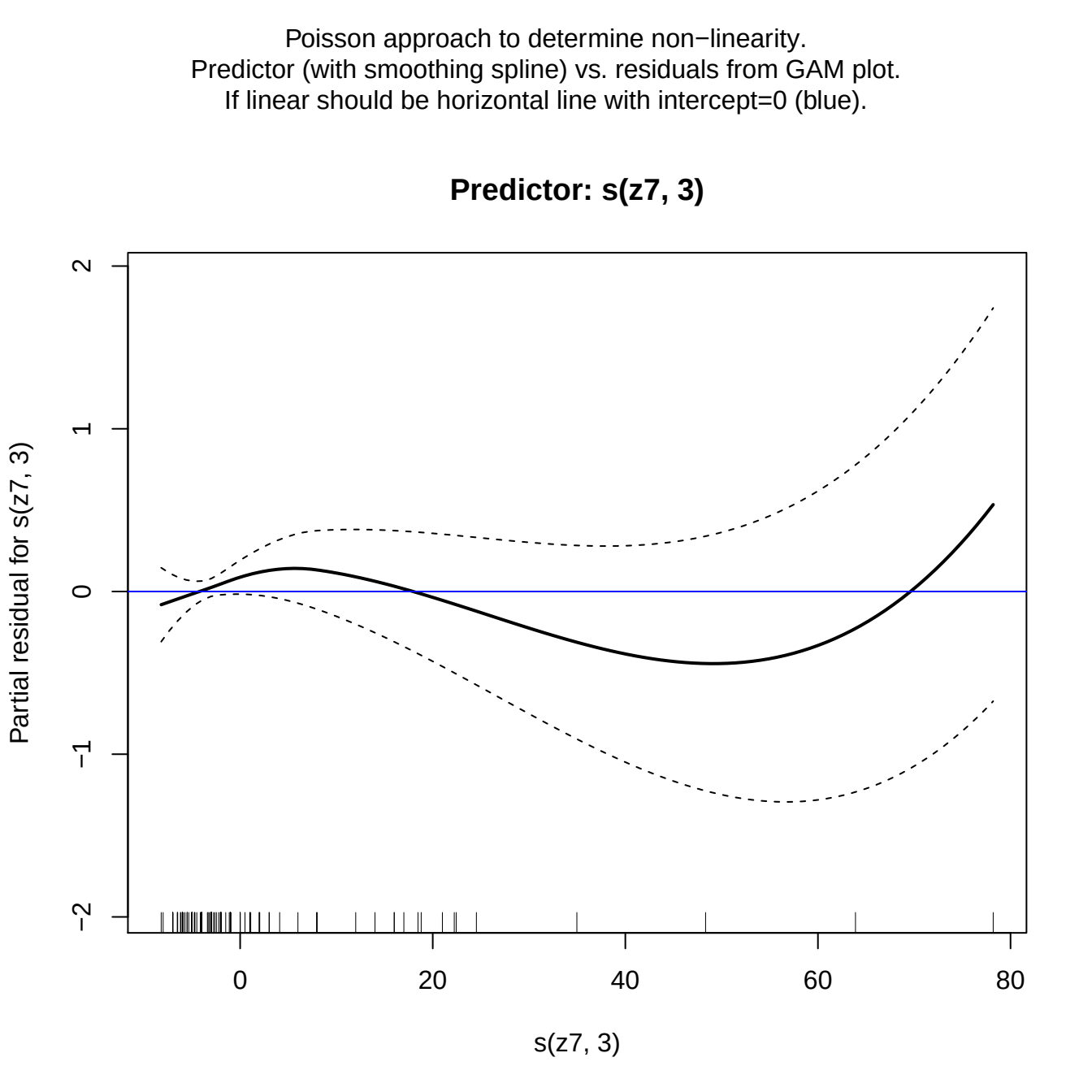


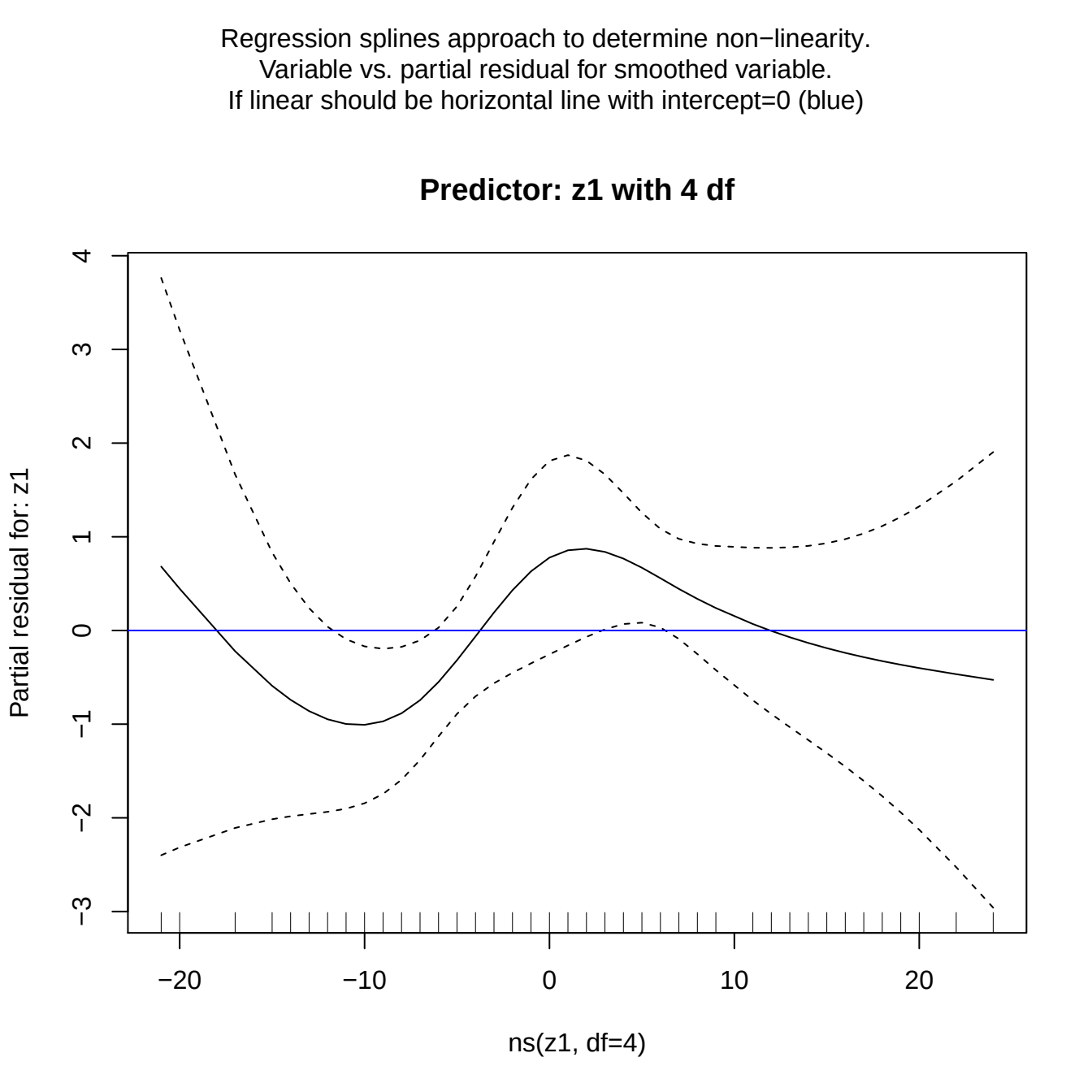
Poisson approach to determine non−linearity.
Predictor (with smoothing spline) vs. residuals from GAM plot.
If linear should be horizontal line with intercept=0 (blue).

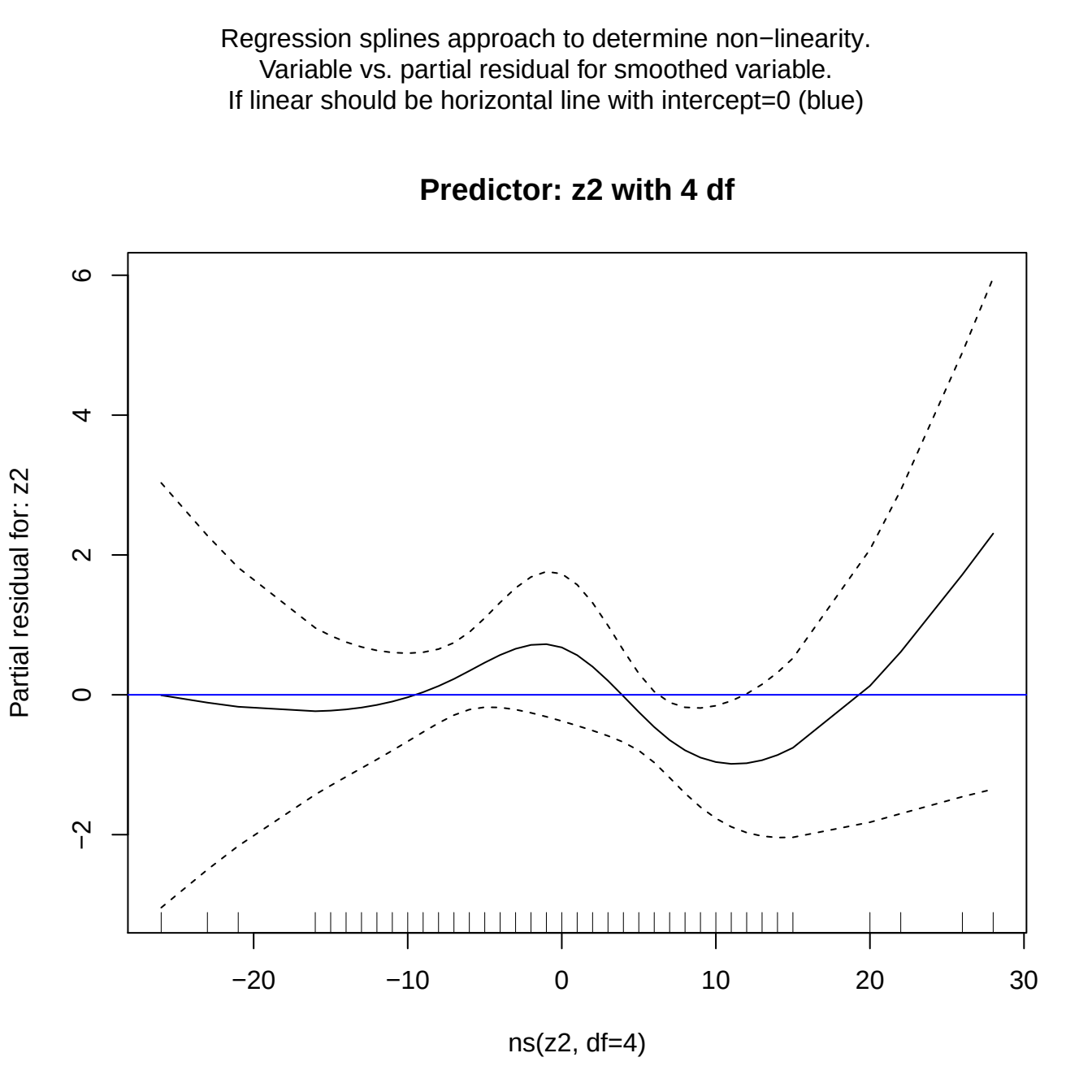


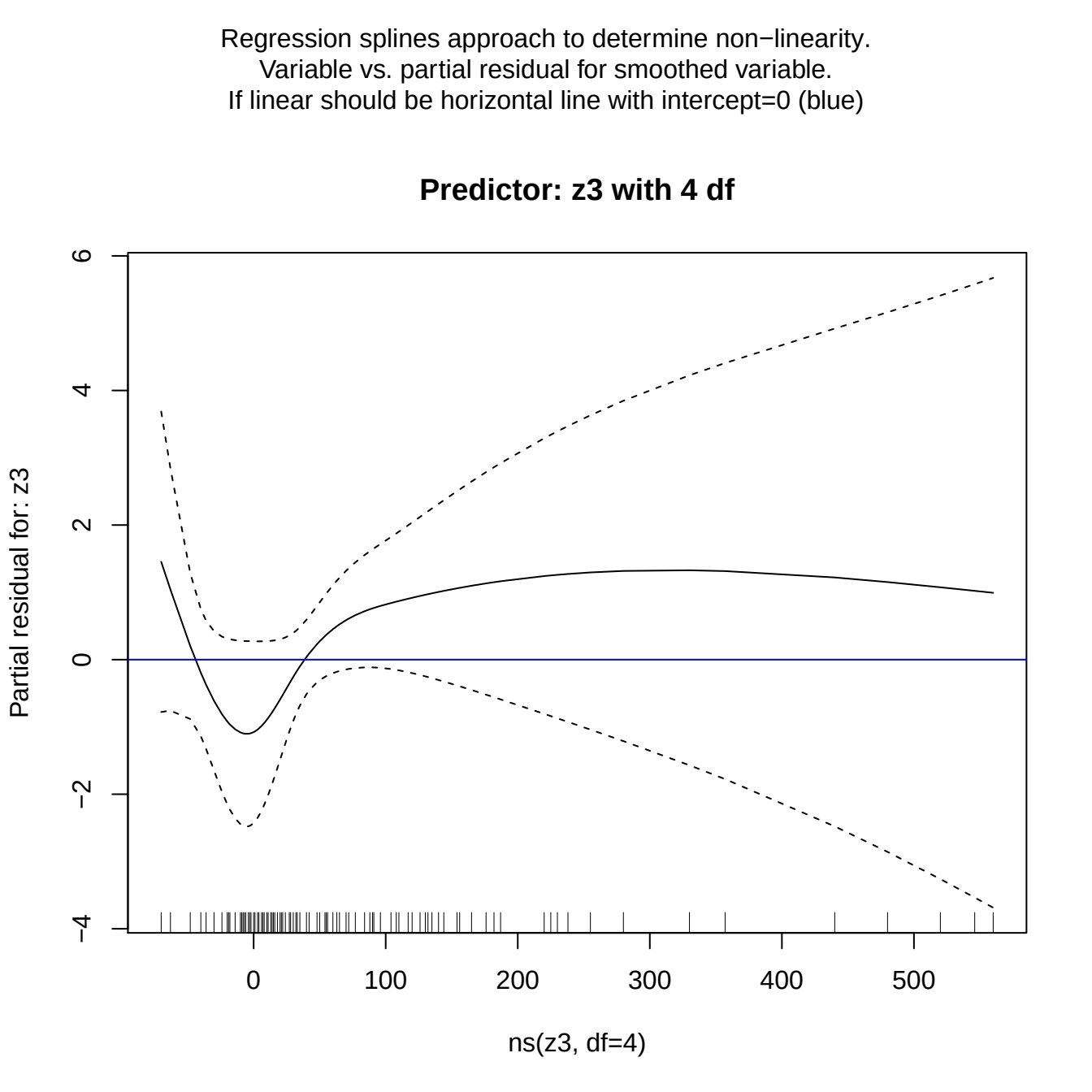
Poisson approach to determine non−linearity.
Predictor (with smoothing spline) vs. residuals from GAM plot.
If linear should be horizontal line with intercept=0 (blue).



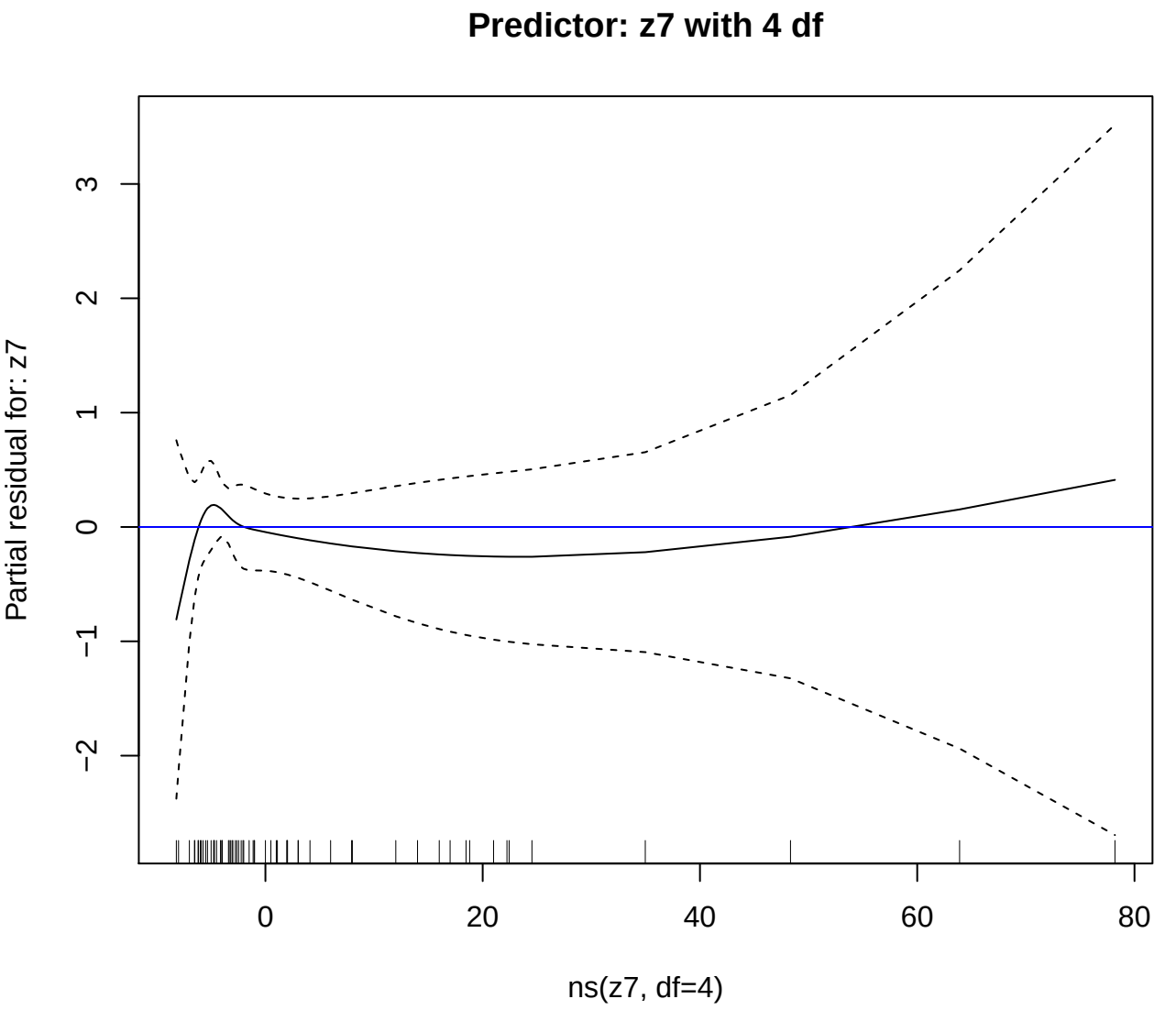

Poisson approach to determine non−linearity.
Predictor (with smoothing spline) vs. residuals from GAM plot.
If linear should be horizontal line with intercept=0 (blue).
Predictor: s(z7, 3)
Partial residual for s(z7, 3)
2
1
0
−1
−2
0
20
40
60
80
s(z7, 3)

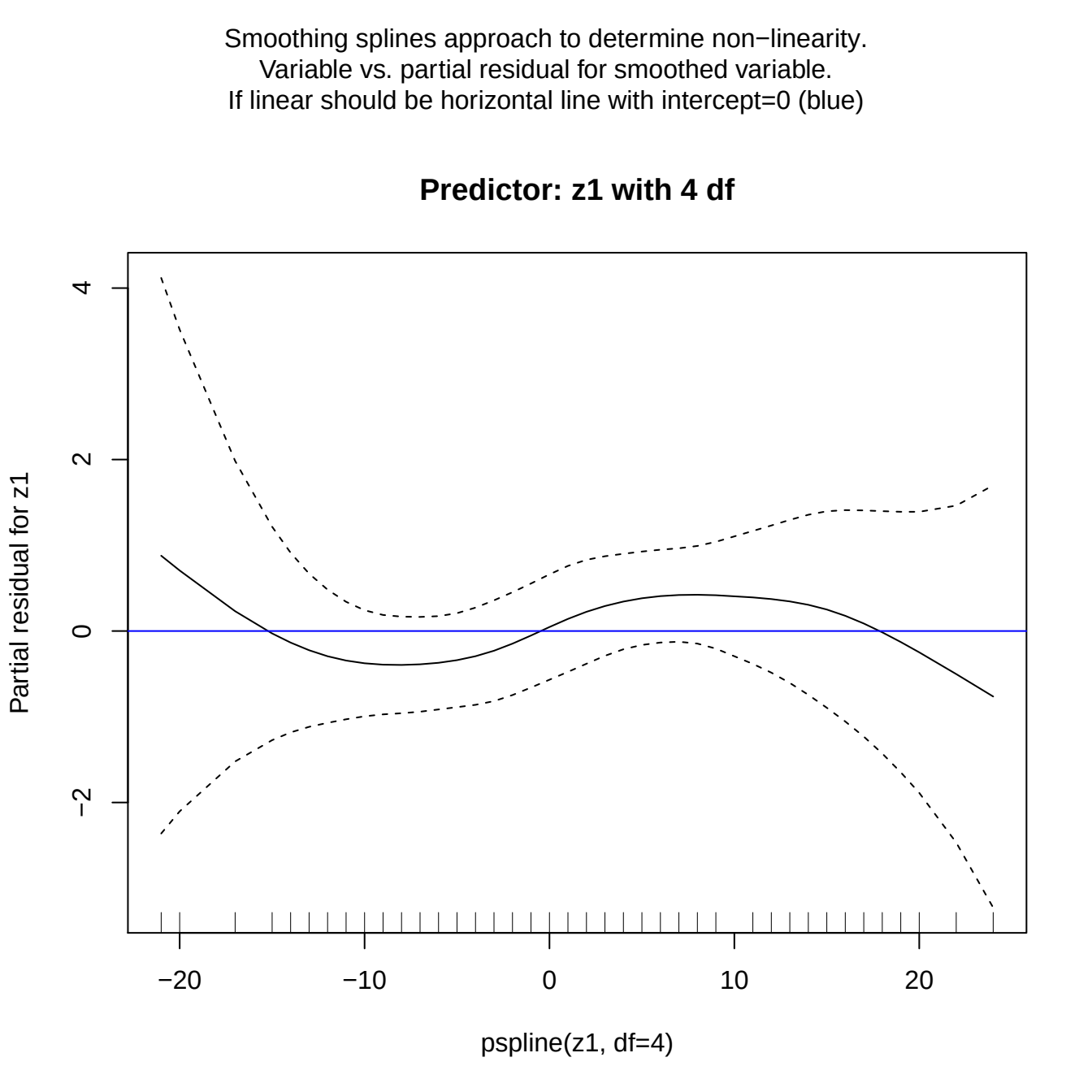

Regression splines approach to determine non−linearity.
Variable vs. partial residual for smoothed variable.
If linear should be horizontal line with intercept=0 (blue)
Predictor: z1 with 4 df
Partial residual for: z1
4
3
2
1
0
−1
−2
−3
−20
−10
0
10
20
ns(z1, df=4)

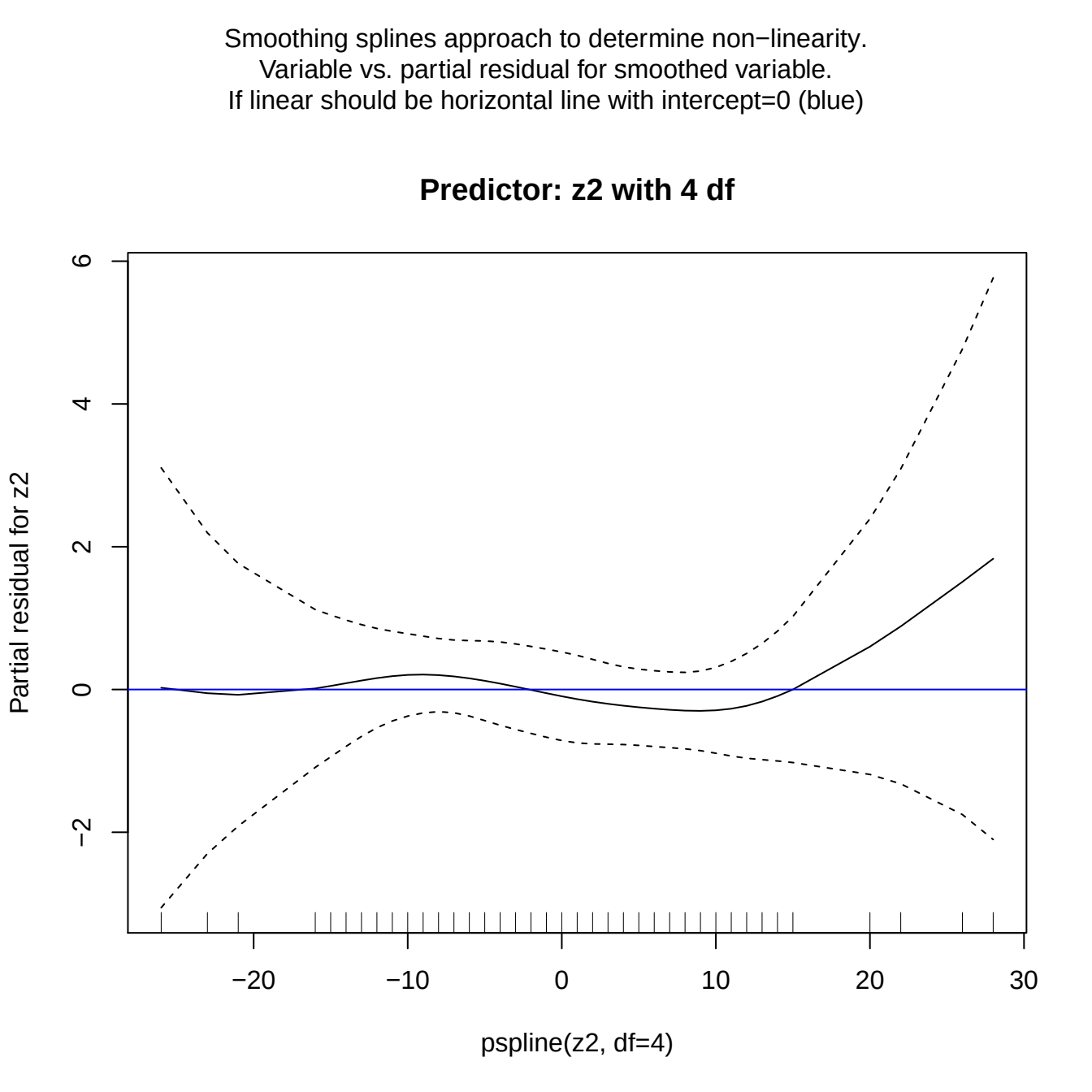

Regression splines approach to determine non−linearity.
Variable vs. partial residual for smoothed variable.
If linear should be horizontal line with intercept=0 (blue)
Predictor: z2 with 4 df
Partial residual for: z2
6
4
2
0
−2
−20
−10
0
10
20
30
ns(z2, df=4)

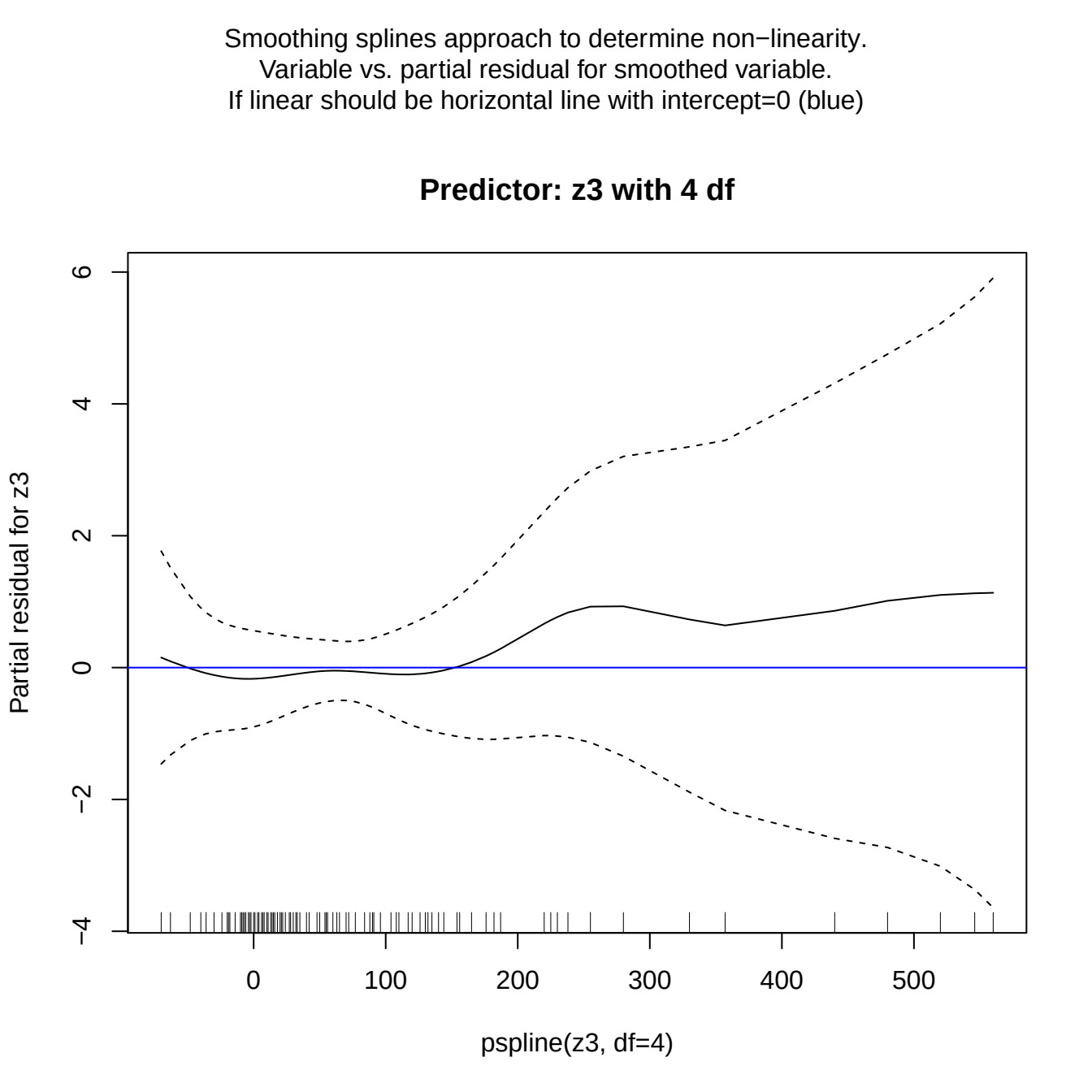

Regression splines approach to determine non−linearity.
Variable vs. partial residual for smoothed variable.
If linear should be horizontal line with intercept=0 (blue)
Predictor: z3 with 4 df
Partial residual for: z3
6
4
2
0
−2
−4
0
100
200
300
400
500
ns(z3, df=4)

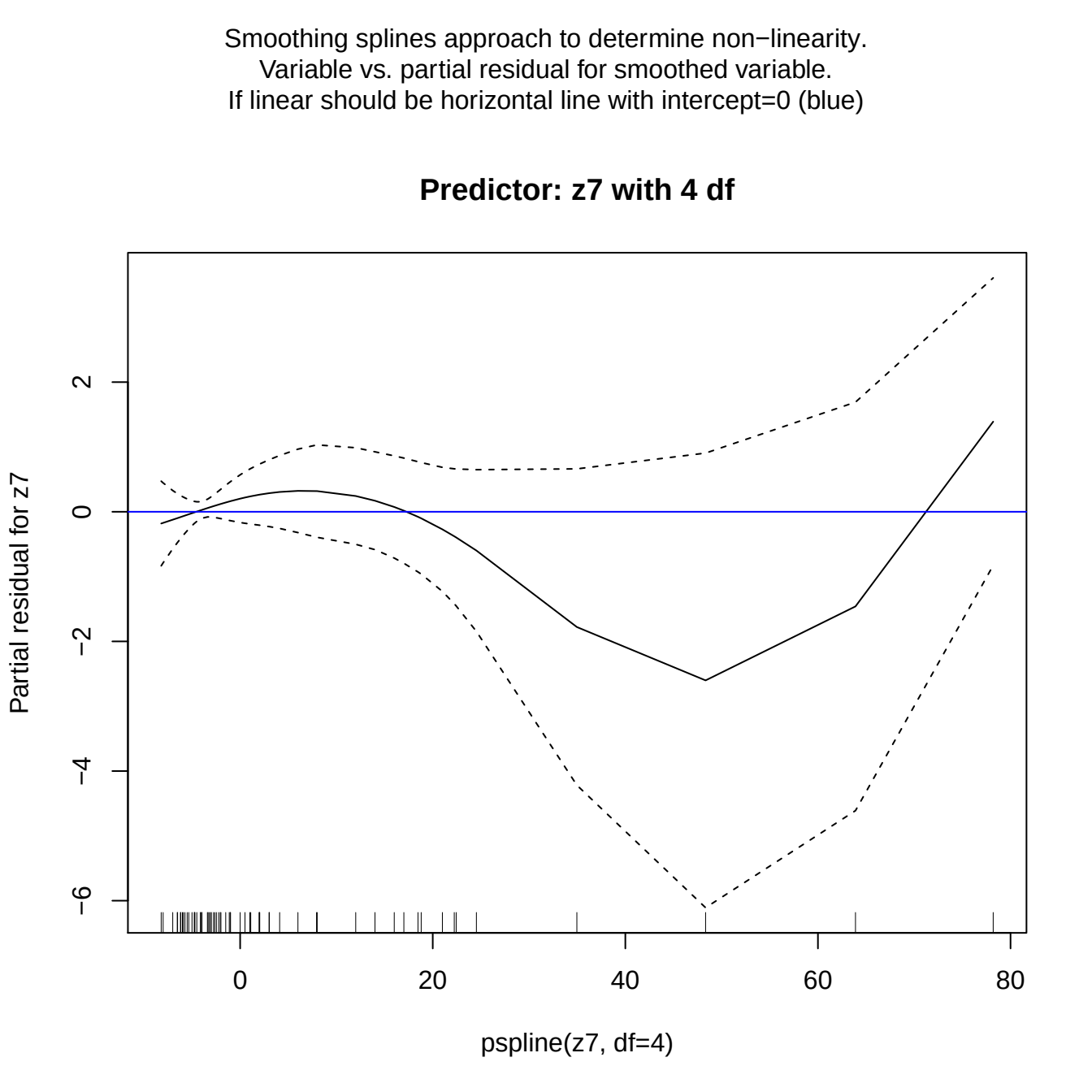
Regression splines approach to determine non−linearity.
Variable vs. partial residual for smoothed variable.
If linear should be horizontal line with intercept=0 (blue)



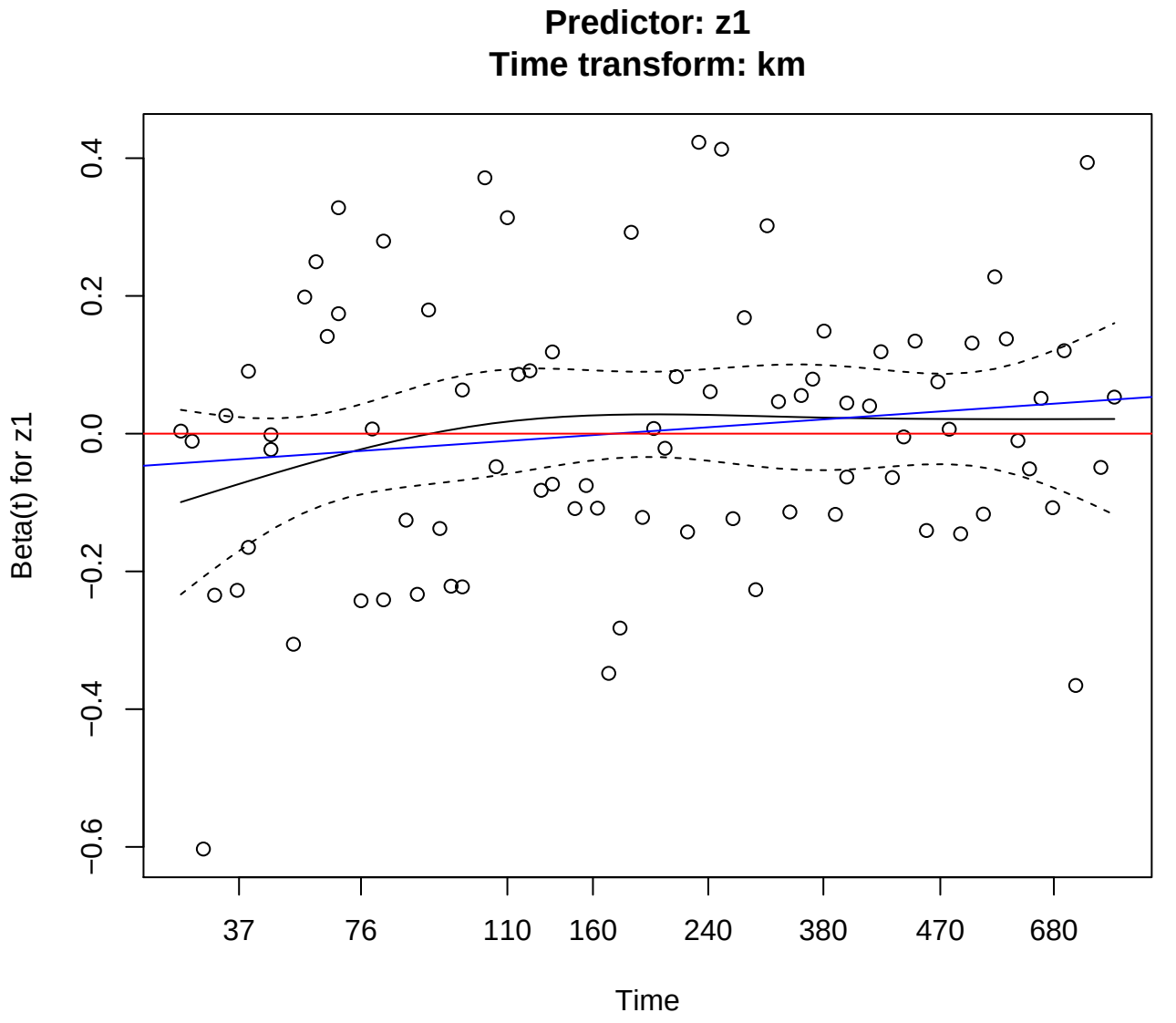

Smoothing splines approach to determine non−linearity.
Variable vs. partial residual for smoothed variable.
If linear should be horizontal line with intercept=0 (blue)
Predictor: z1 with 4 df
Partial residual for z1
4
2
0
−2
−20
−10
0
10
20
pspline(z1, df=4)


Smoothing splines approach to determine non−linearity.
Variable vs. partial residual for smoothed variable.
If linear should be horizontal line with intercept=0 (blue)
Predictor: z2 with 4 df
Partial residual for z2
6
4
2
0
−2
−20
−10
0
10
20
30
pspline(z2, df=4)

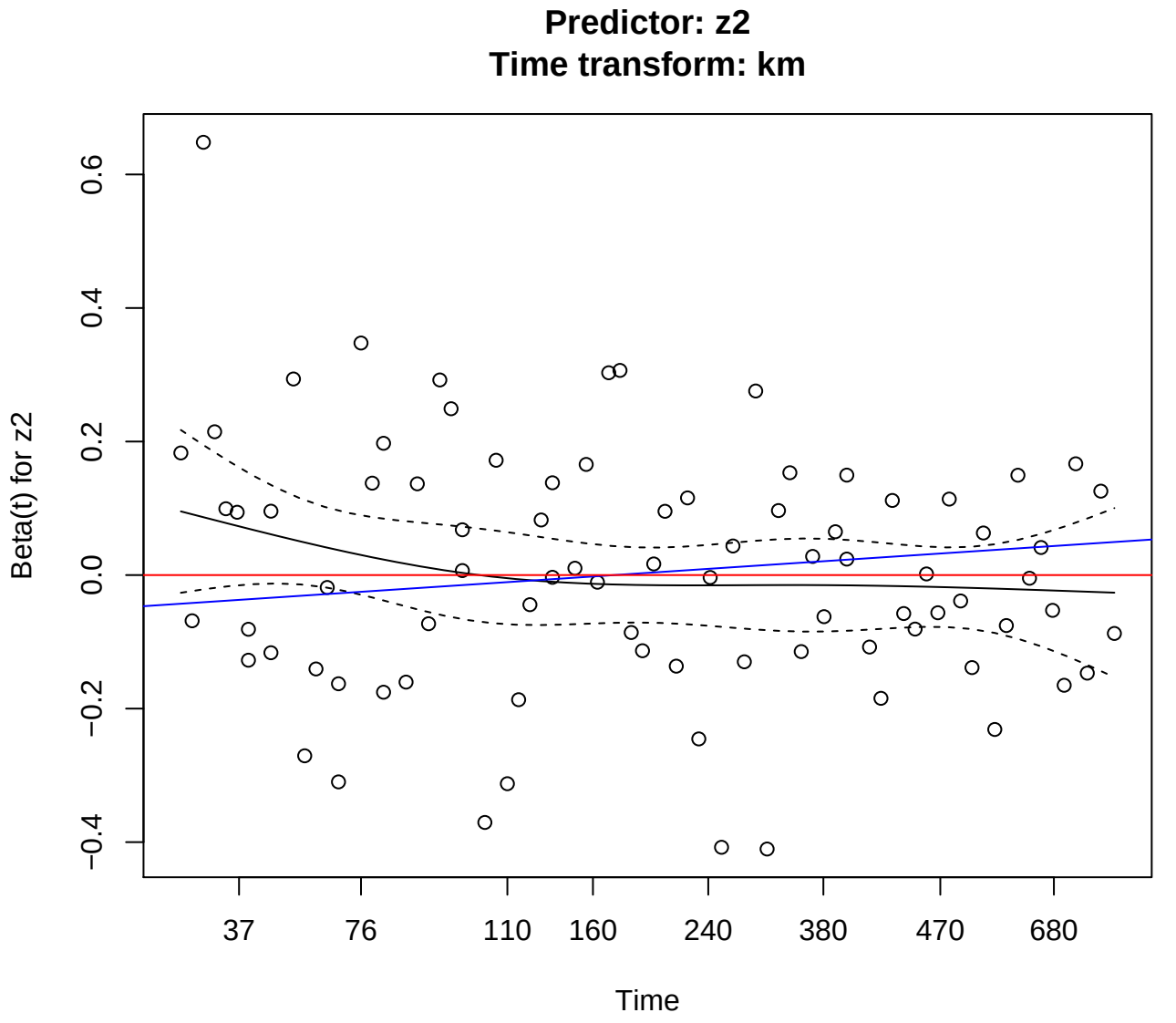

Smoothing splines approach to determine non−linearity.
Variable vs. partial residual for smoothed variable.
If linear should be horizontal line with intercept=0 (blue)
Predictor: z3 with 4 df
Partial residual for z3
6
4
2
0
−2
−4
0
100
200
300
400
500
pspline(z3, df=4)


Smoothing splines approach to determine non−linearity.
Variable vs. partial residual for smoothed variable.
If linear should be horizontal line with intercept=0 (blue)
Predictor: z7 with 4 df
Partial residual for z7
2
0
−2
−4
−6
0
20
40
60
80
pspline(z7, df=4)

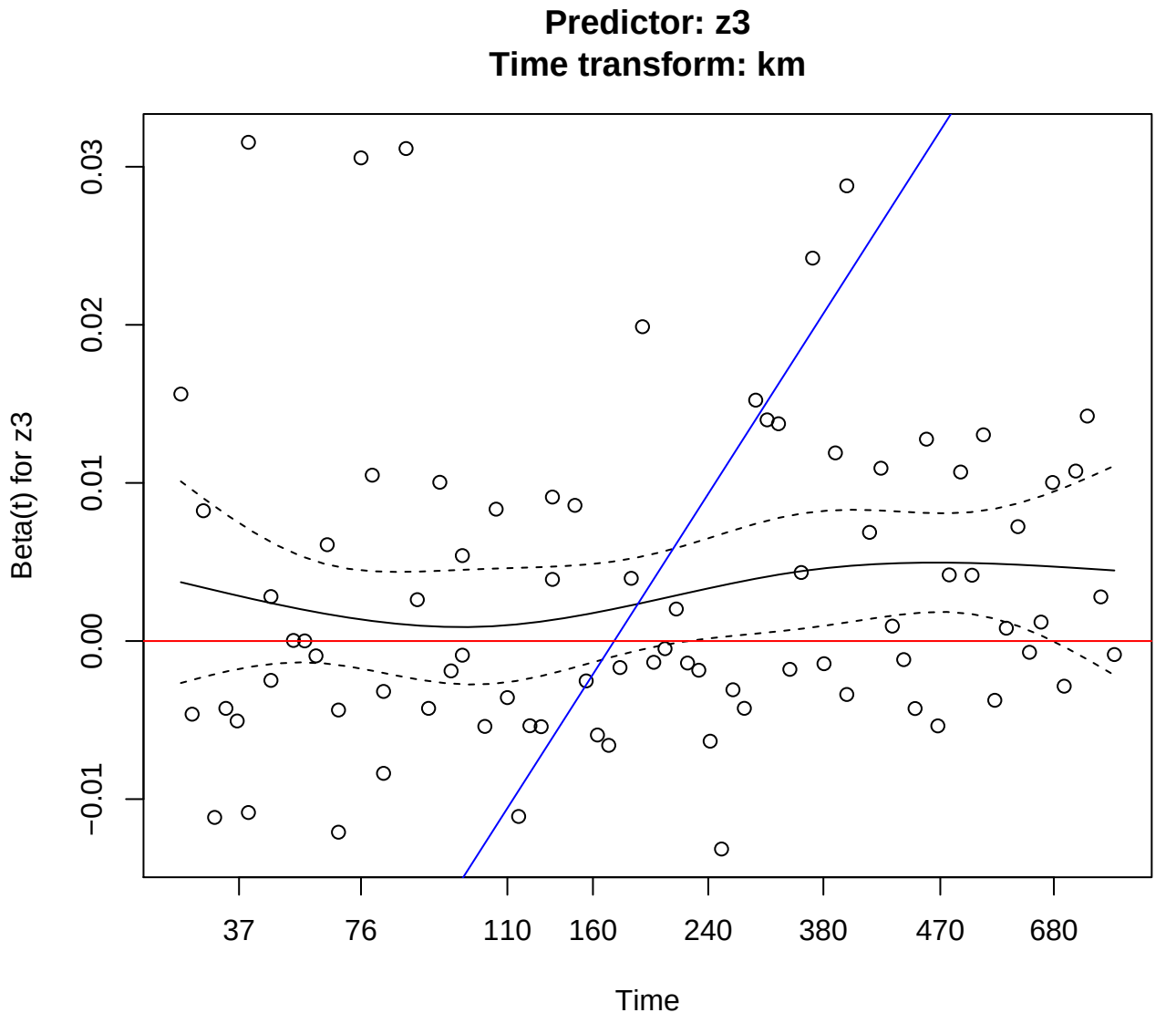
Time vs. scaled Schoenfeld residuals, with smoothed spline (black).
If <0 (red line), indicates a protective effect.
Regression line (blue) should be horizontal if model well fit.

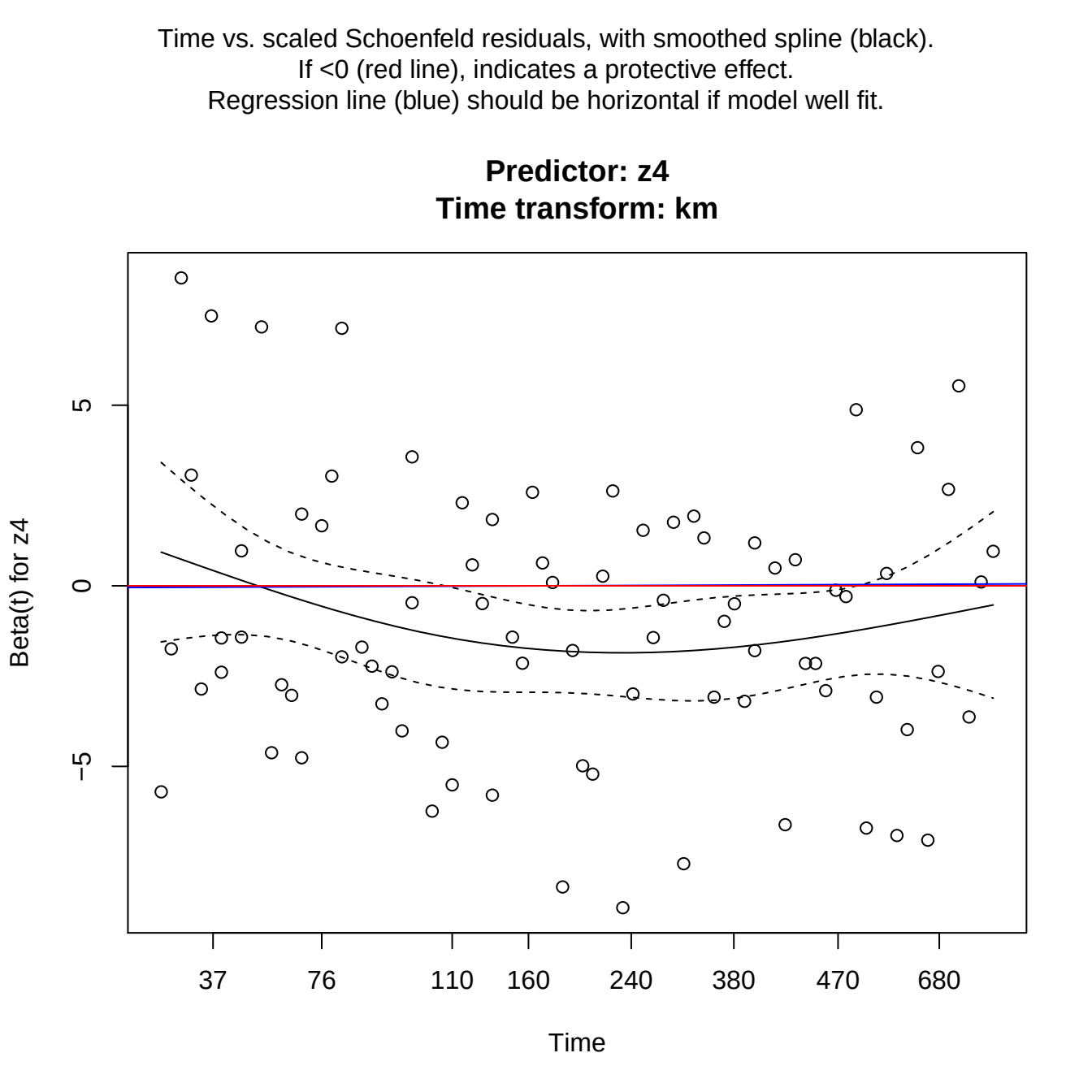


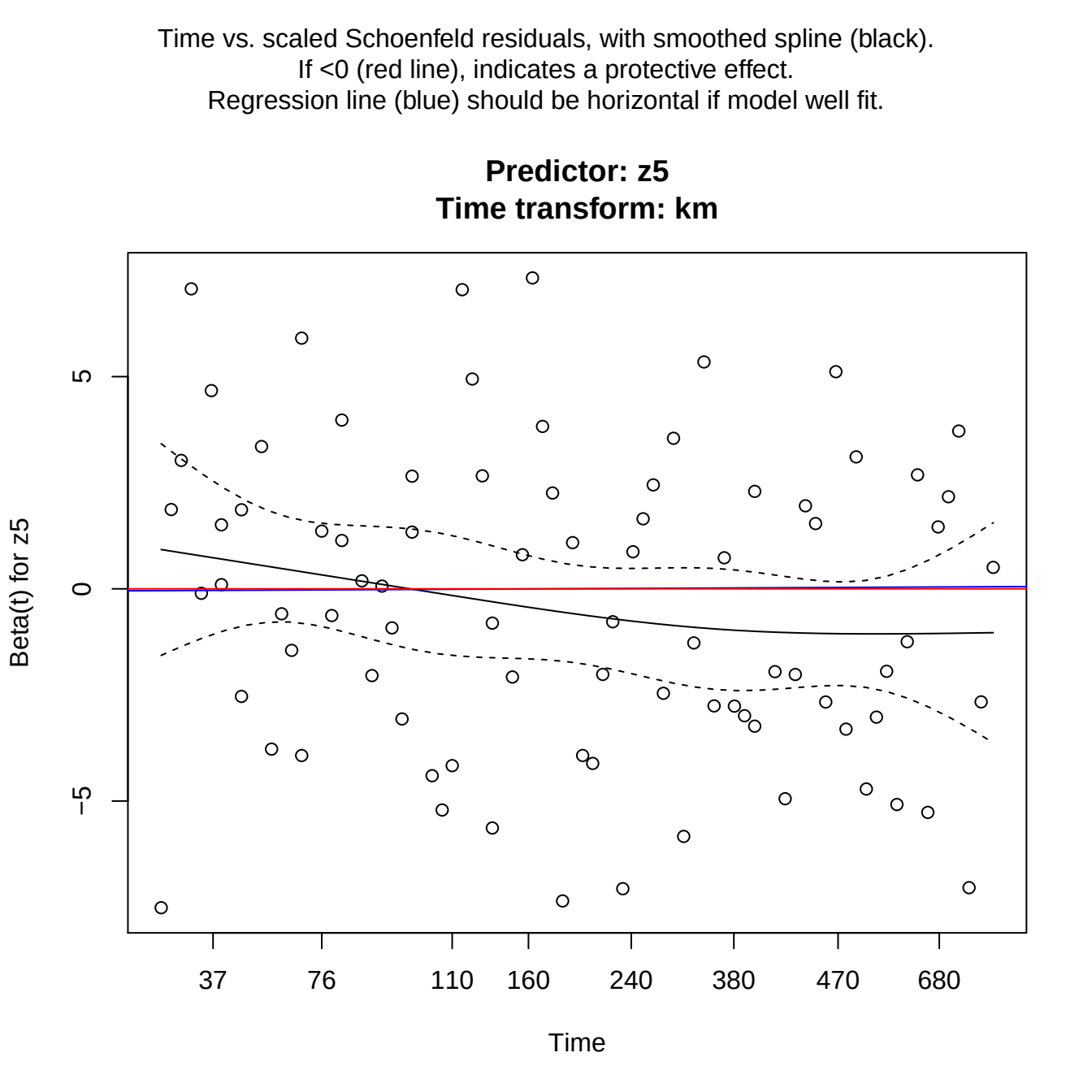
Time vs. scaled Schoenfeld residuals, with smoothed spline (black).
If <0 (red line), indicates a protective effect.
Regression line (blue) should be horizontal if model well fit.



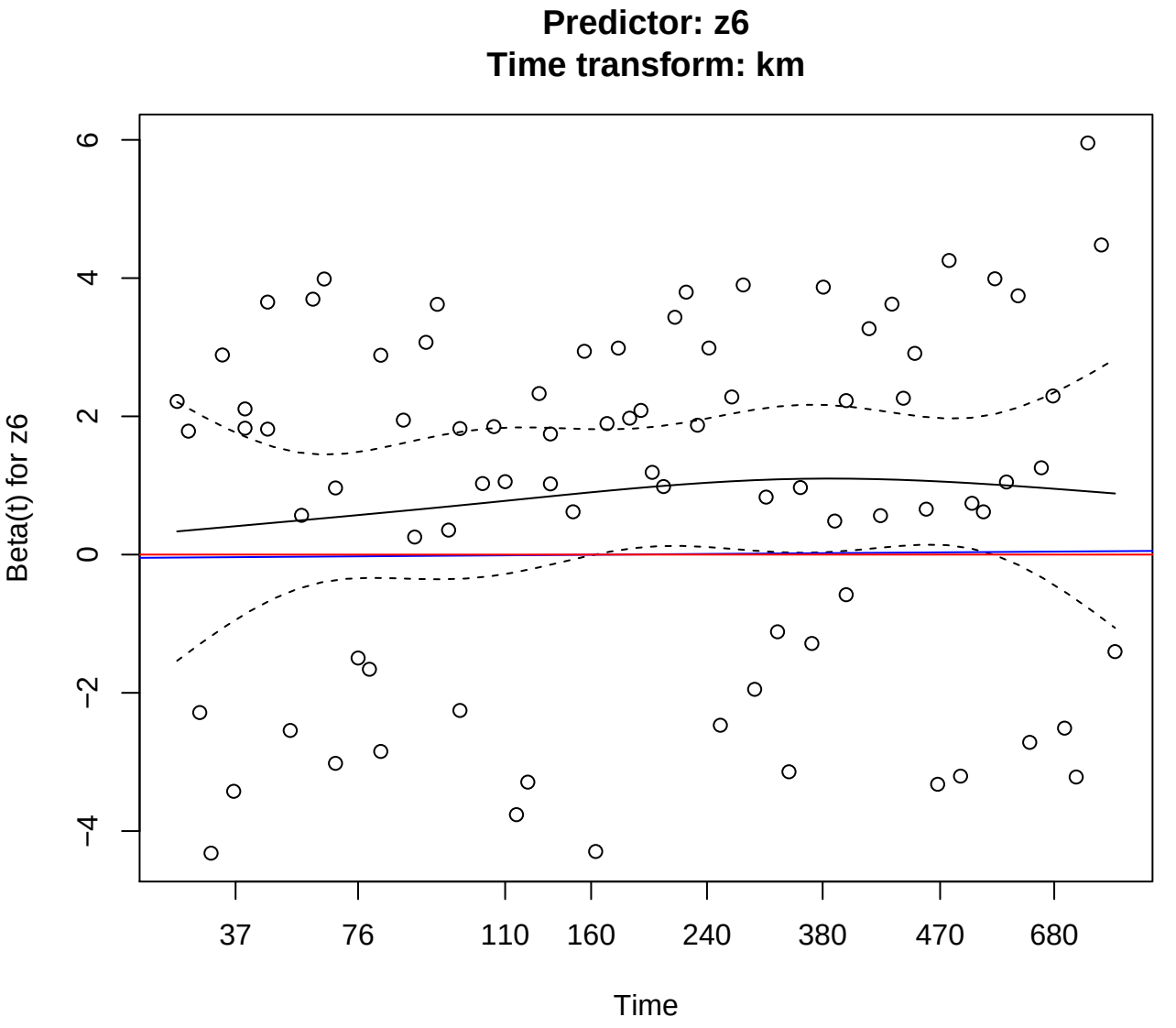
Time vs. scaled Schoenfeld residuals, with smoothed spline (black).
If <0 (red line), indicates a protective effect.
Regression line (blue) should be horizontal if model well fit.

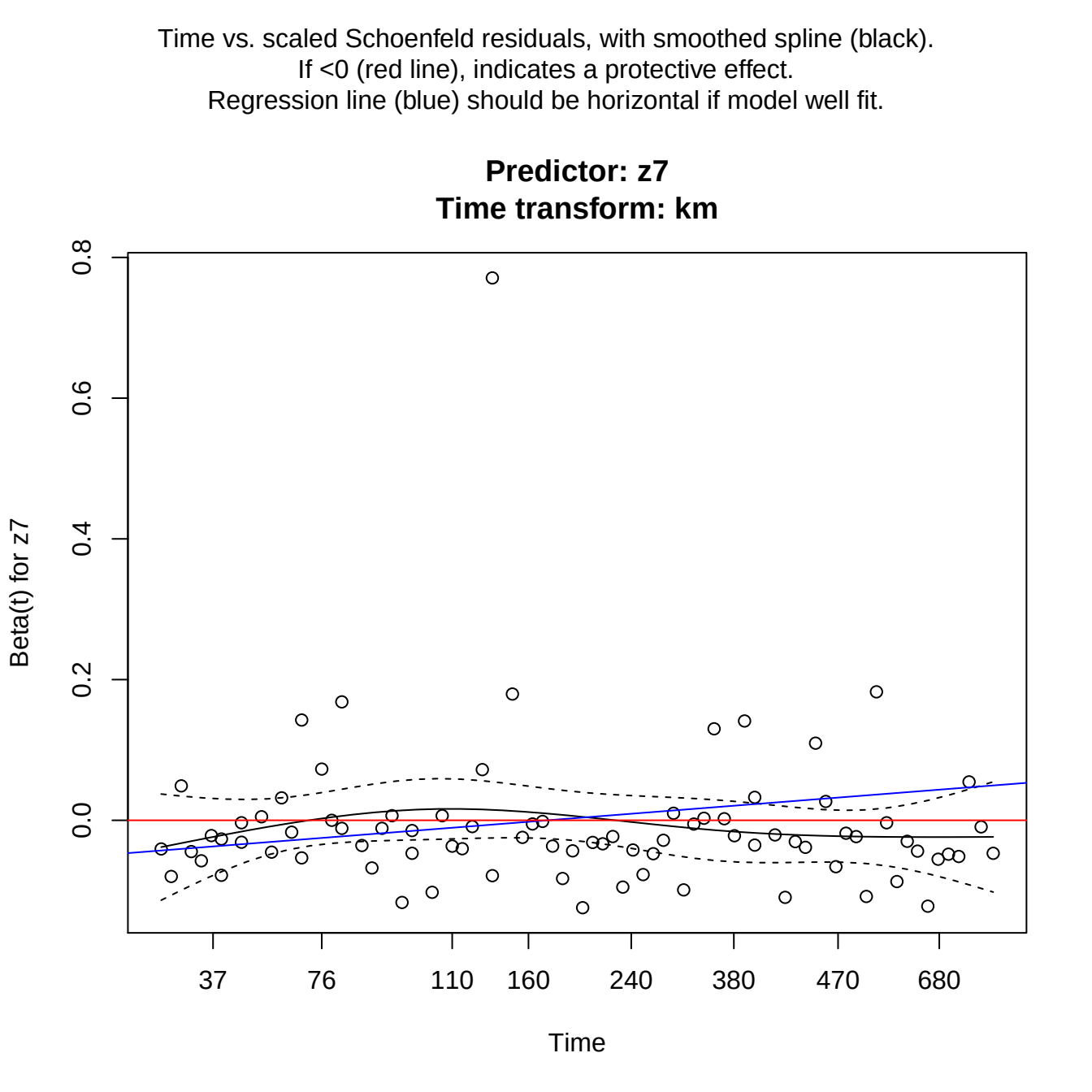


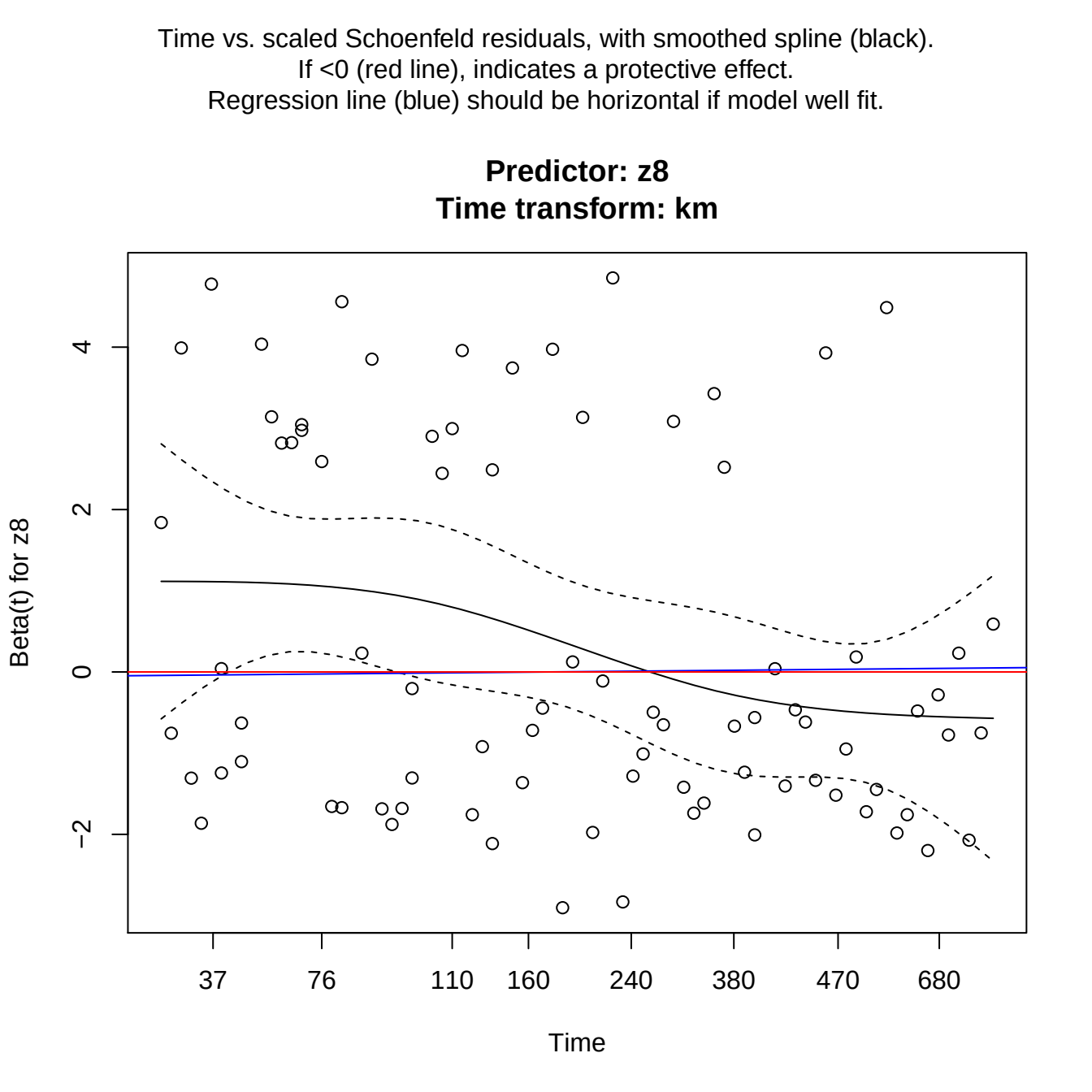

Time vs. scaled Schoenfeld residuals, with smoothed spline (black).
If <0 (red line), indicates a protective effect.
Regression line (blue) should be horizontal if model well fit.
Predictor: z4
Time transform: km
Beta(t) for z4
5
0
−5
37
76
110
160
240
380
470
680
Time

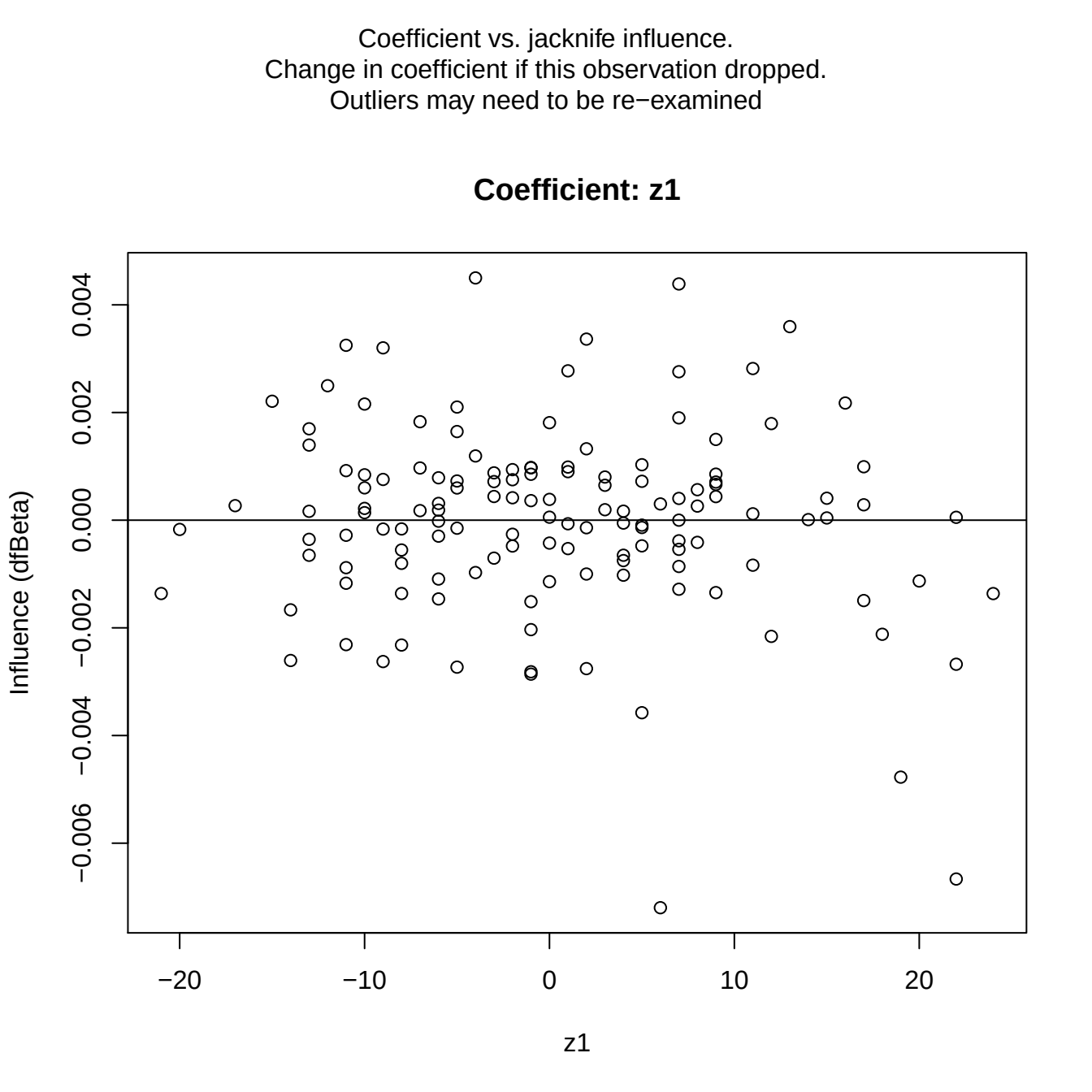

Time vs. scaled Schoenfeld residuals, with smoothed spline (black).
If <0 (red line), indicates a protective effect.
Regression line (blue) should be horizontal if model well fit.
Predictor: z5
Time transform: km
Beta(t) for z5
5
0
−5
37
76
110
160
240
380
470
680
Time

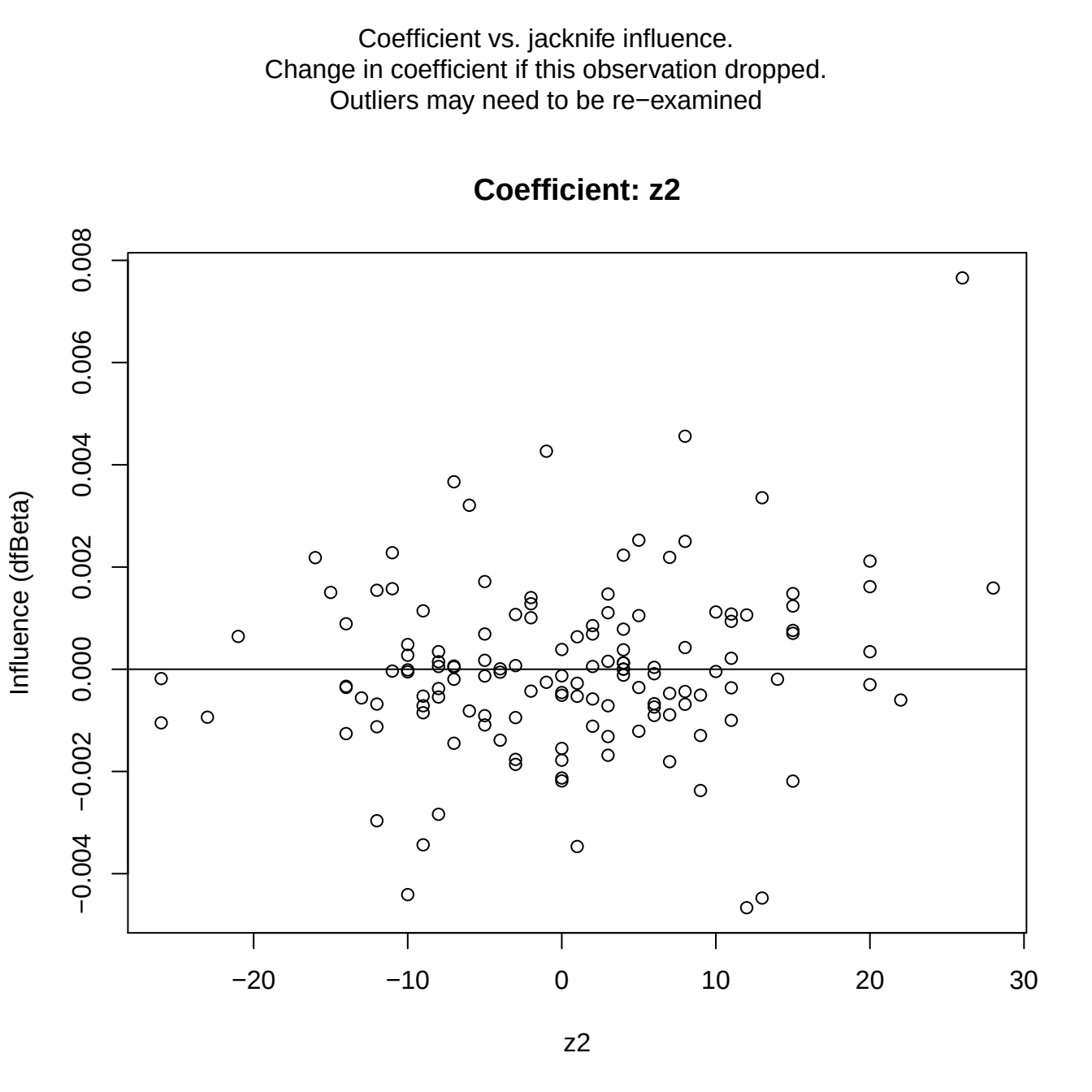
Time vs. scaled Schoenfeld residuals, with smoothed spline (black).
If <0 (red line), indicates a protective effect.
Regression line (blue) should be horizontal if model well fit.

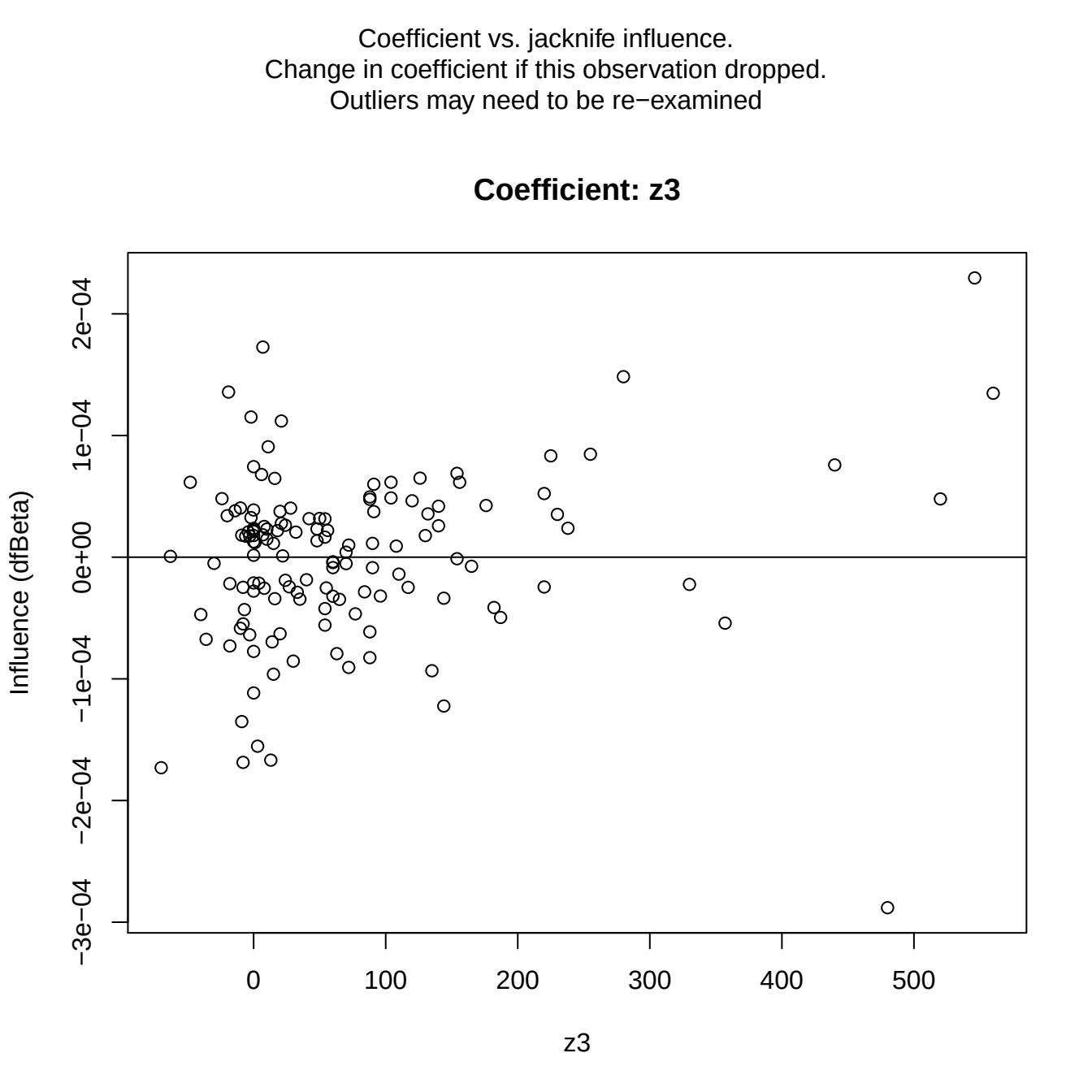


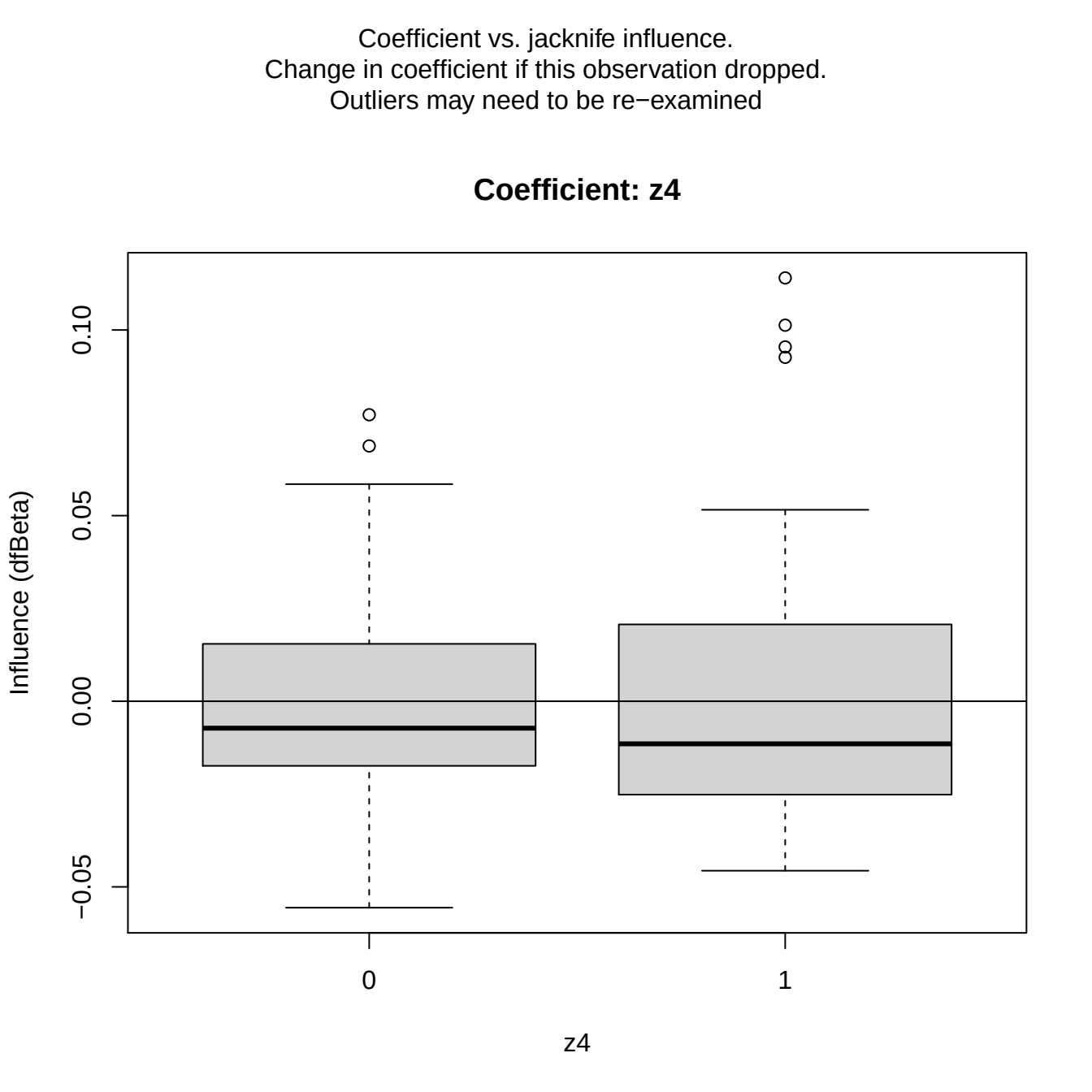

Time vs. scaled Schoenfeld residuals, with smoothed spline (black).
If <0 (red line), indicates a protective effect.
Regression line (blue) should be horizontal if model well fit.
Predictor: z7
Time transform: km
Beta(t) for z7
0.0
0.2
0.4
0.6
0.8
37
76
110
160
240
380
470
680
Time

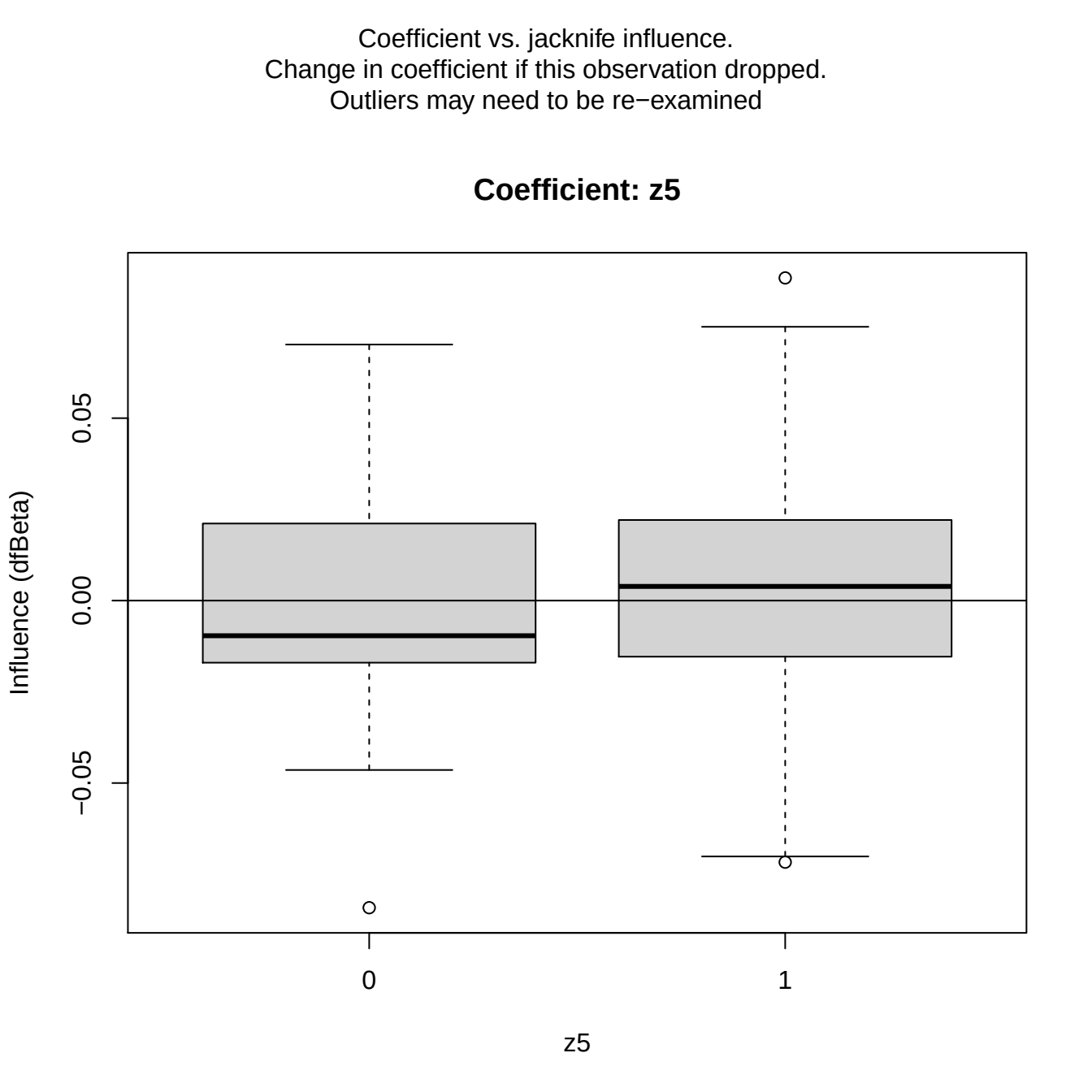

Time vs. scaled Schoenfeld residuals, with smoothed spline (black).
If <0 (red line), indicates a protective effect.
Regression line (blue) should be horizontal if model well fit.
Predictor: z8
Time transform: km
Beta(t) for z8
4
2
0
−2
37
76
110
160
240
380
470
680
Time

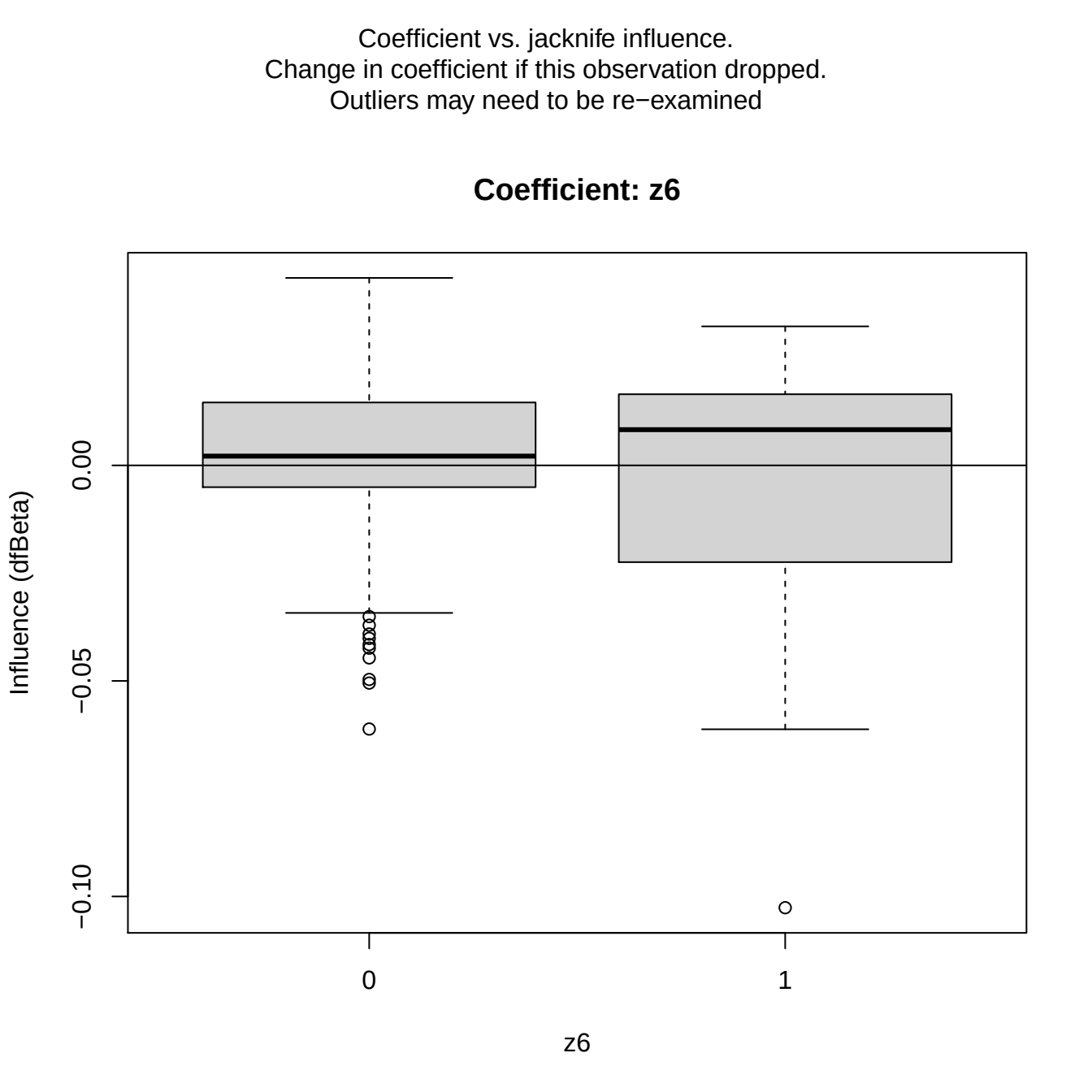

Coefficient vs. jacknife influence.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z1
Influence (dfBeta)
0.004
0.002
0.000
−0.002
−0.004
−0.006
−20
−10
0
10
20
z1

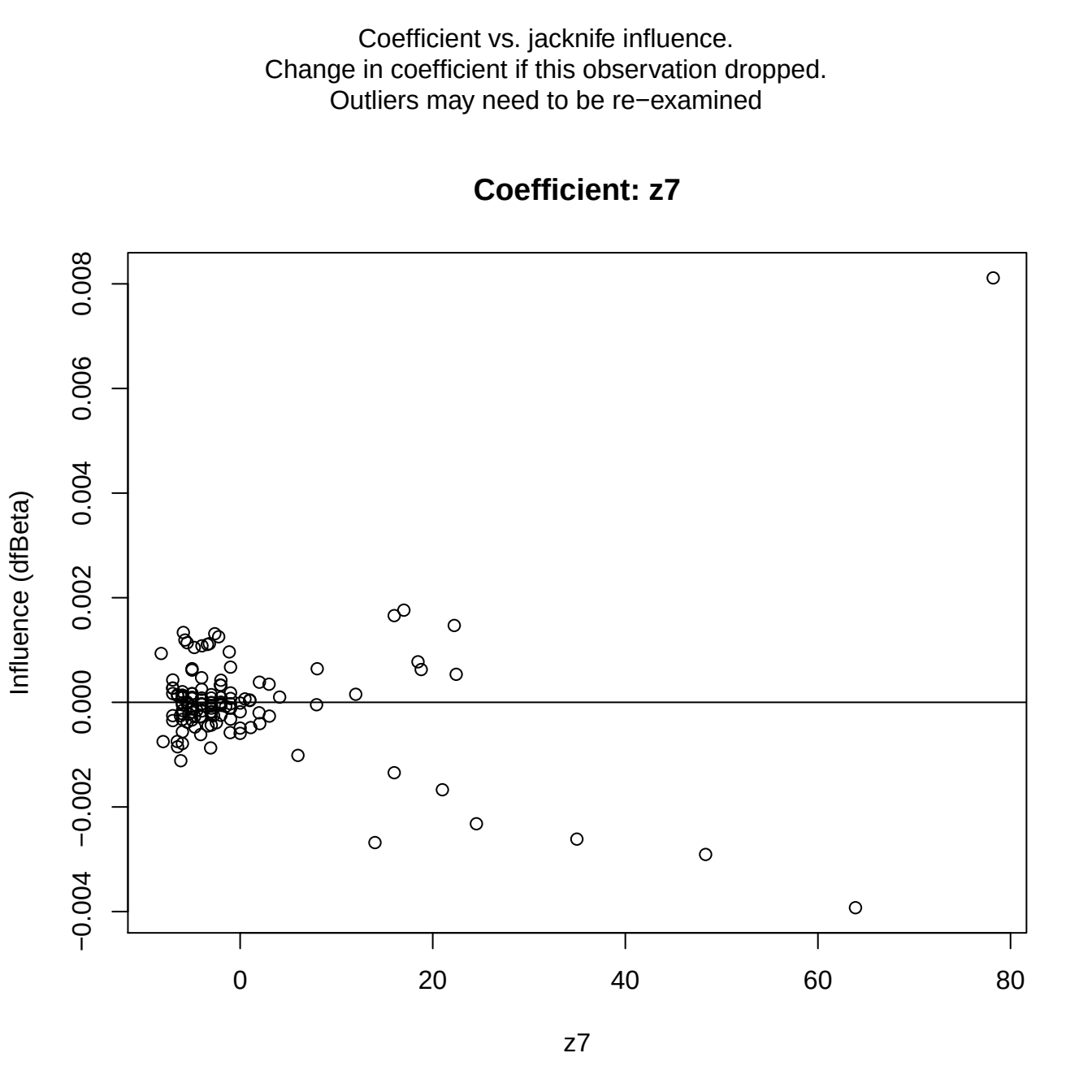

Coefficient vs. jacknife influence.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z2
Influence (dfBeta)
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−20
−10
0
10
20
30
z2

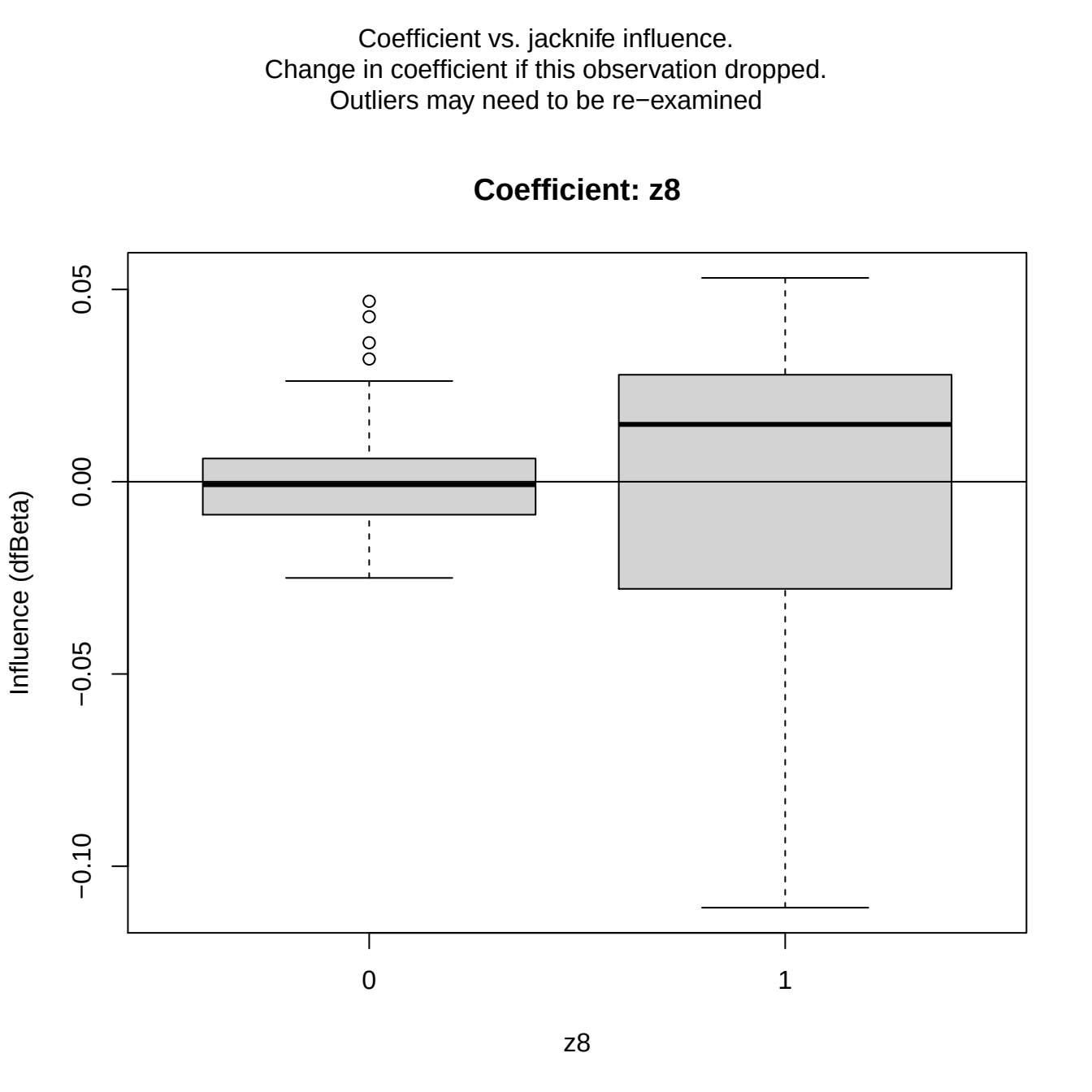

Coefficient vs. jacknife influence.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z3
Influence (dfBeta)
2e−04
1e−04
0e+00
−1e−04
−2e−04
−3e−04
0
100
200
300
400
500
z3

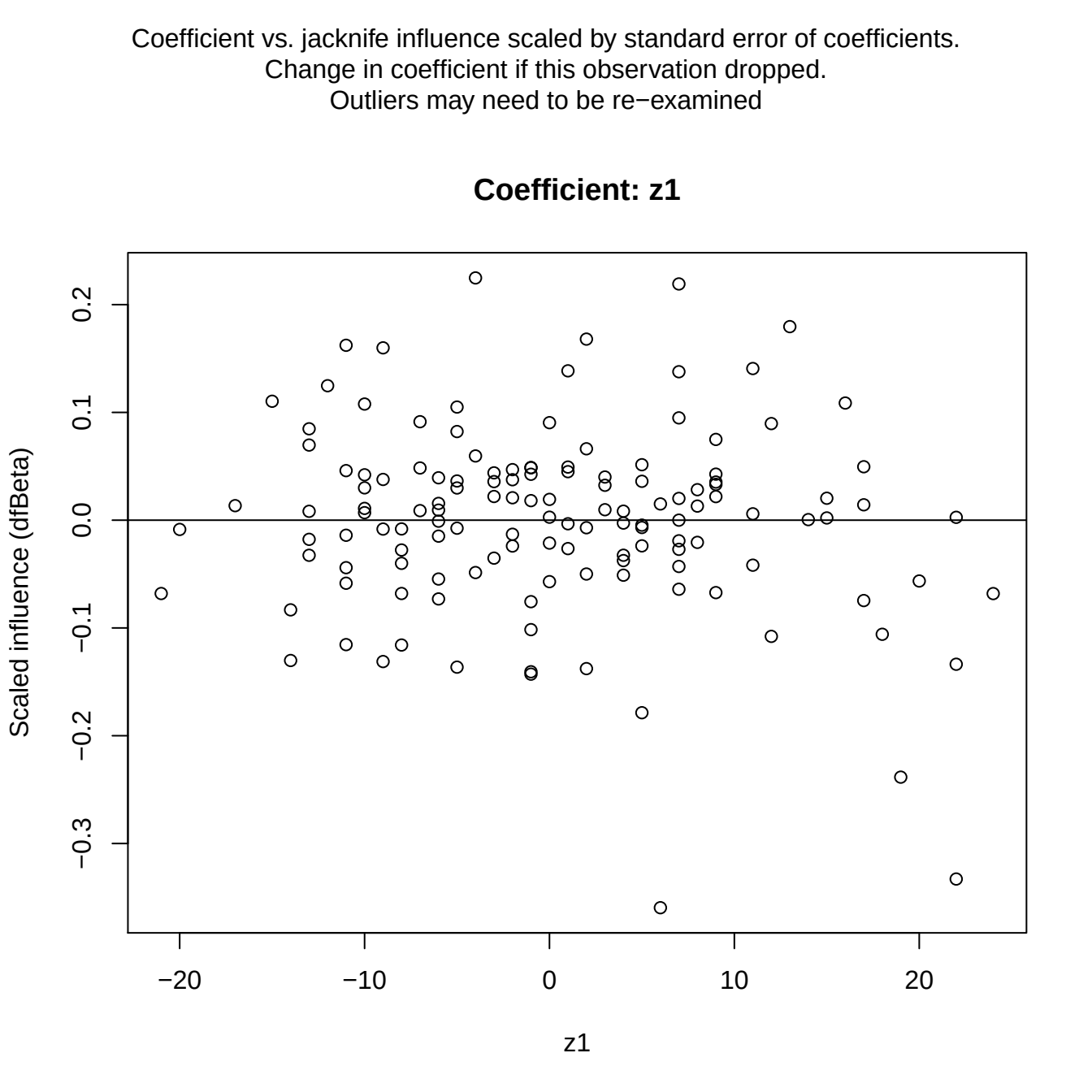

Coefficient vs. jacknife influence.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z4
Influence (dfBeta)
0.10
0.05
0.00
−0.05
0
1
z4

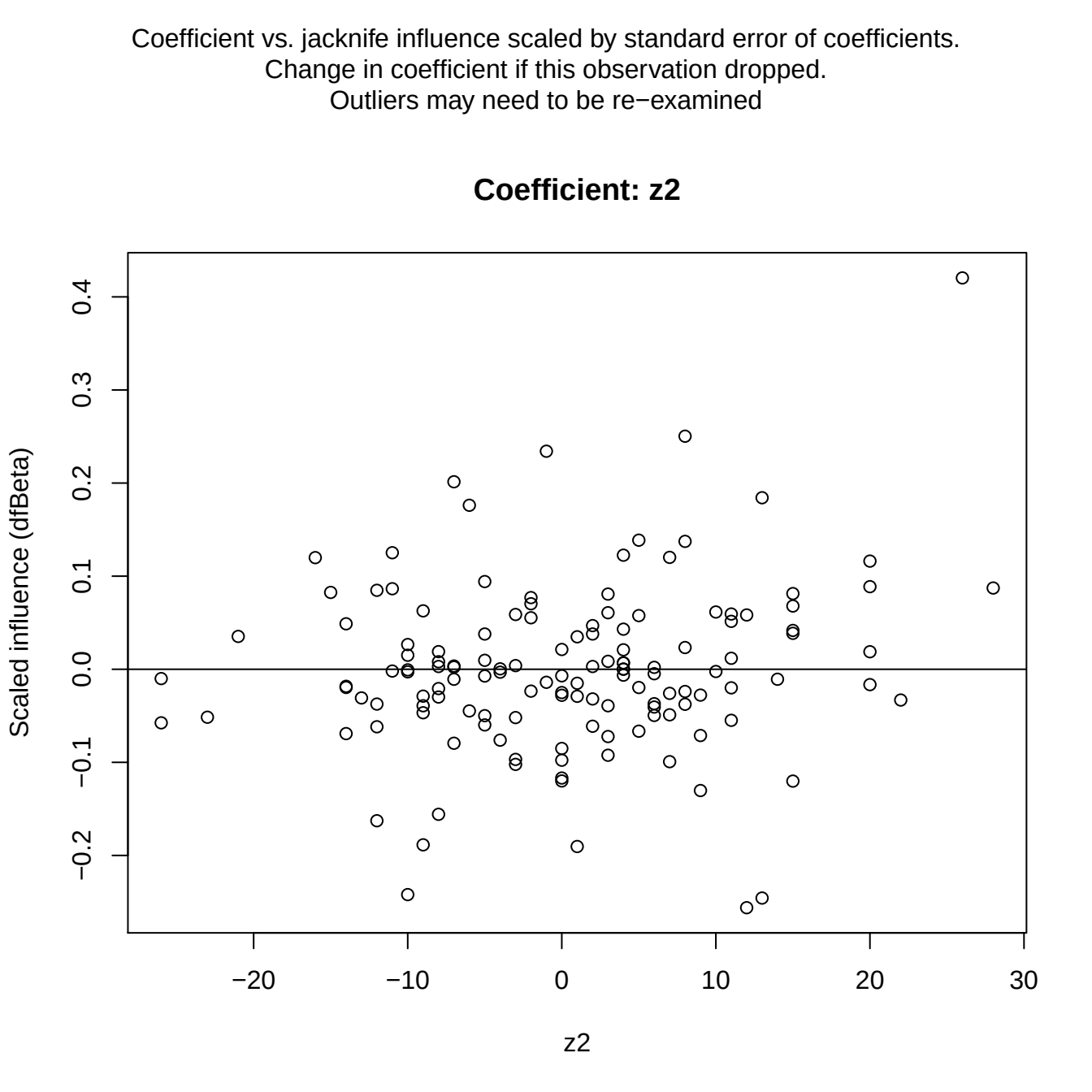

Coefficient vs. jacknife influence.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z5
Influence (dfBeta)
0.05
0.00
−0.05
0
1
z5

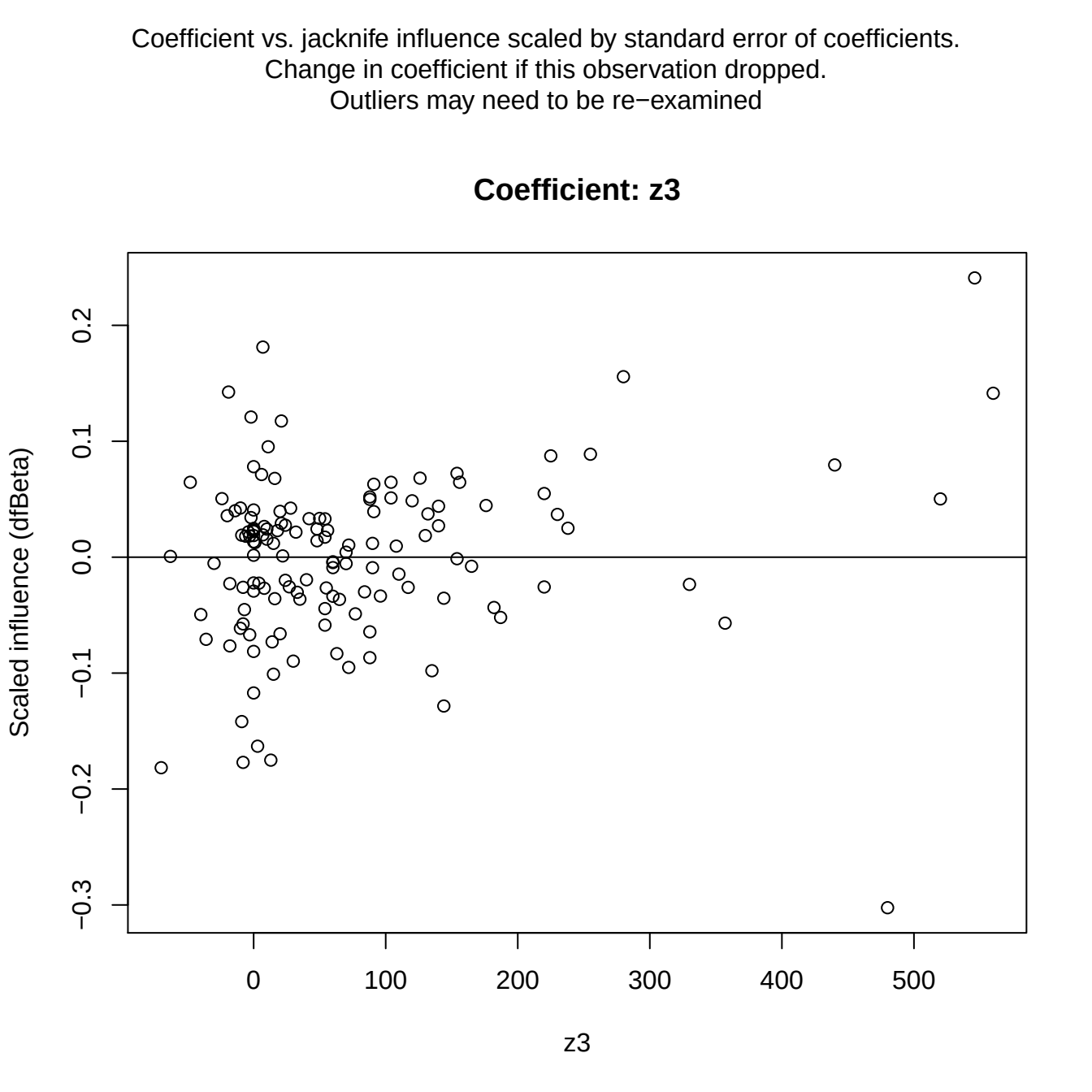

Coefficient vs. jacknife influence.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z6
Influence (dfBeta)
0.00
−0.05
−0.10
0
1
z6

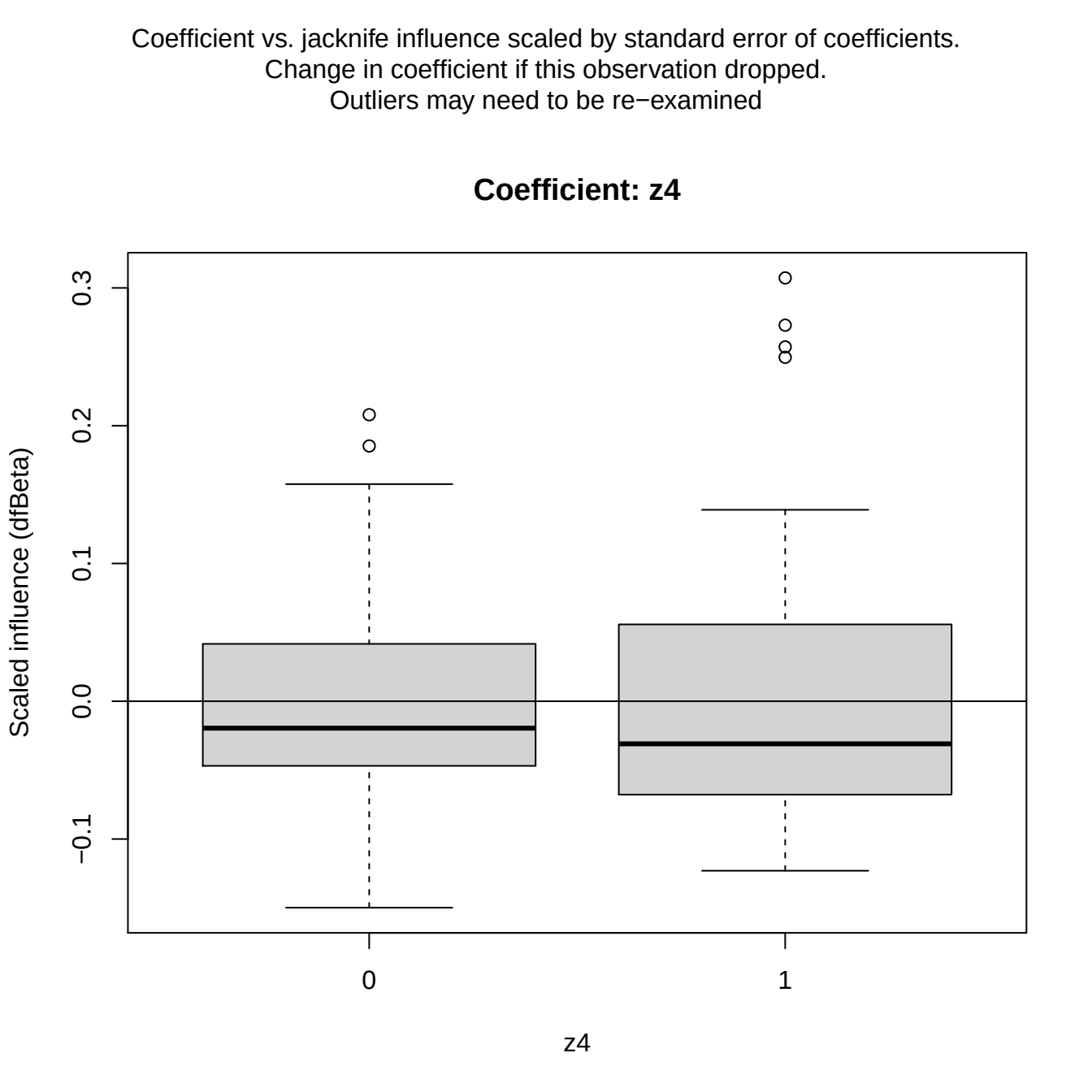

Coefficient vs. jacknife influence.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z7
Influence (dfBeta)
−0.004
−0.002
0.000
0.002
0.004
0.006
0.008
0
20
40
60
80
z7

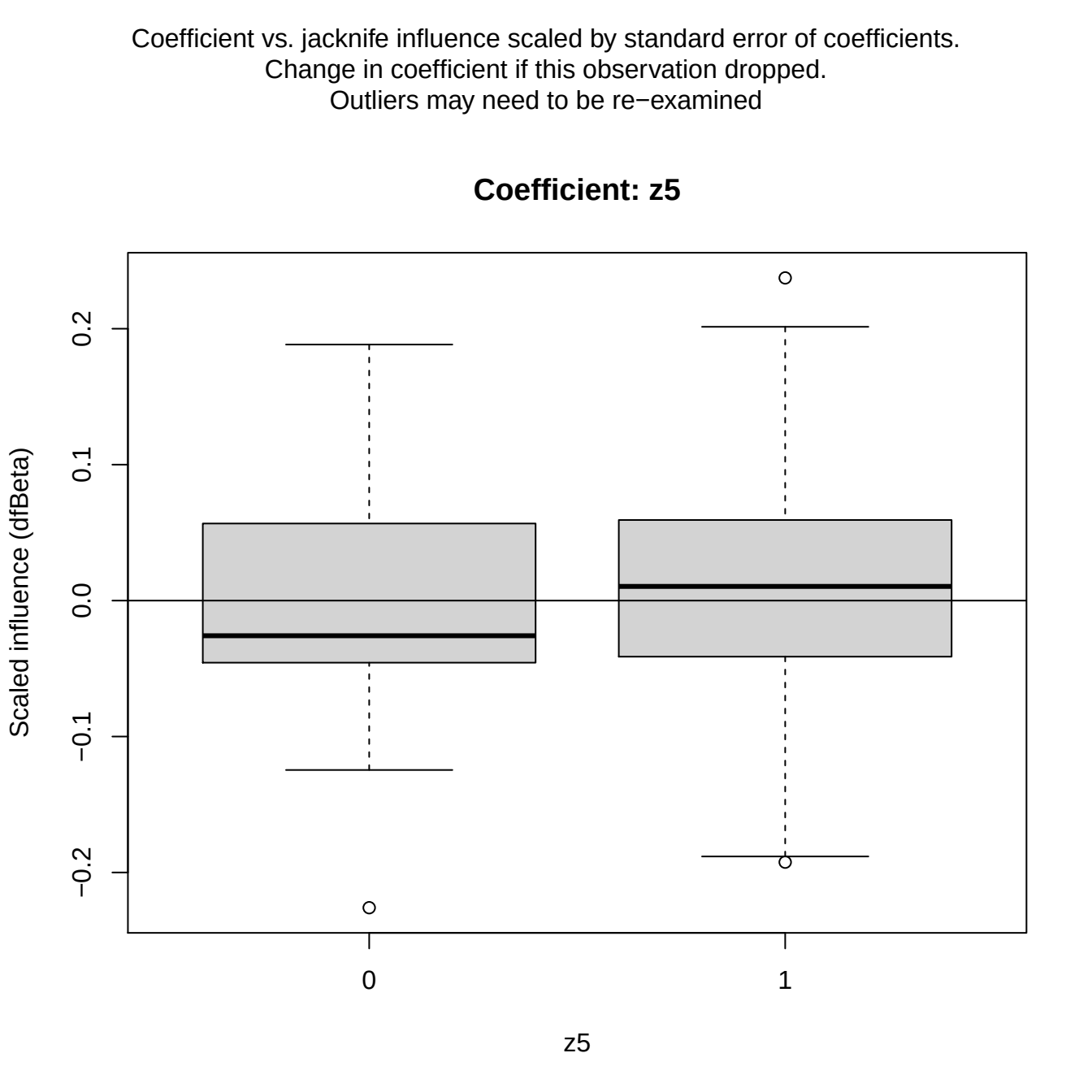

Coefficient vs. jacknife influence.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z8
Influence (dfBeta)
0.05
0.00
−0.05
−0.10
0
1
z8

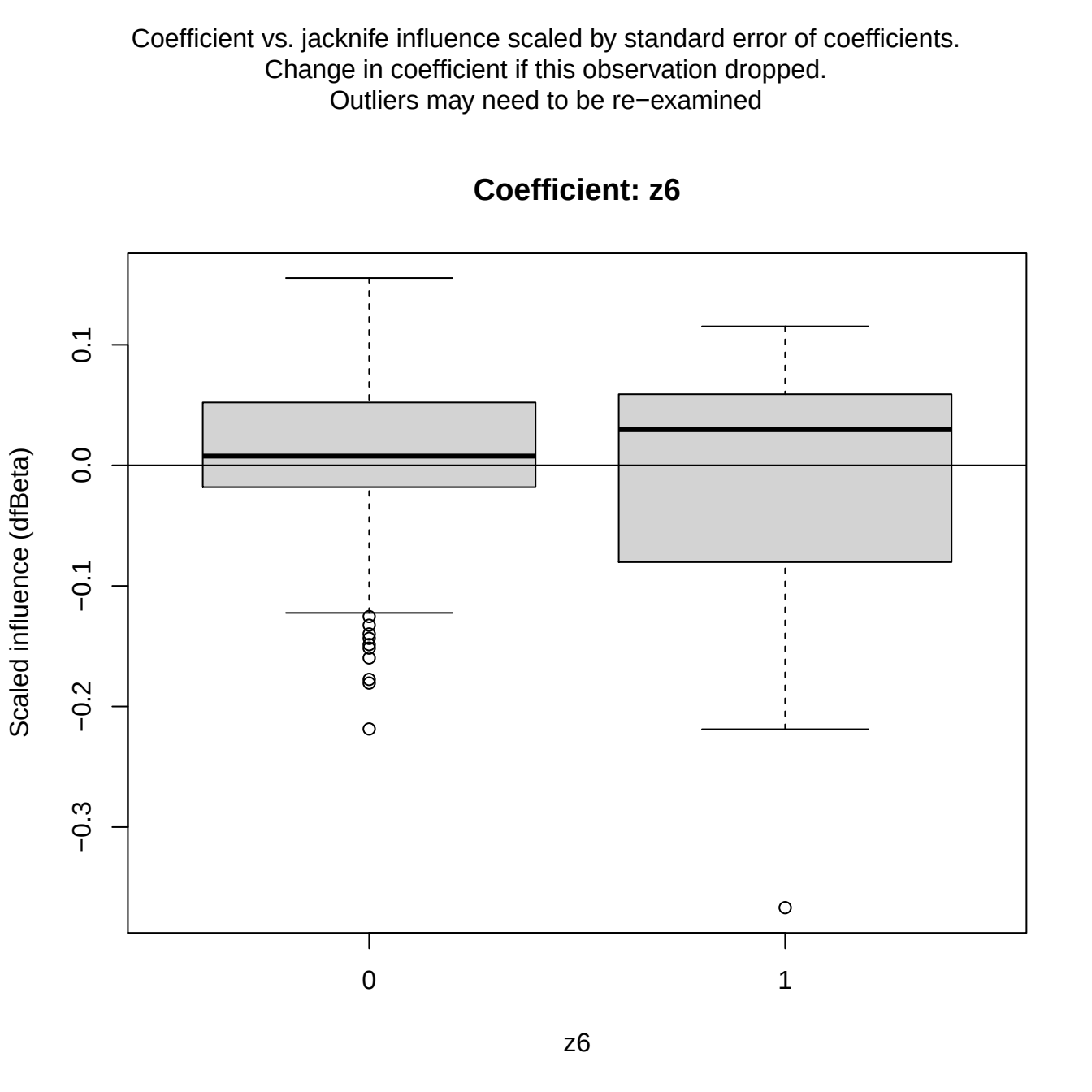

Coefficient vs. jacknife influence scaled by standard error of coefficients.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z1
Scaled influence (dfBeta)
0.2
0.1
0.0
−0.1
−0.2
−0.3
−20
−10
0
10
20
z1

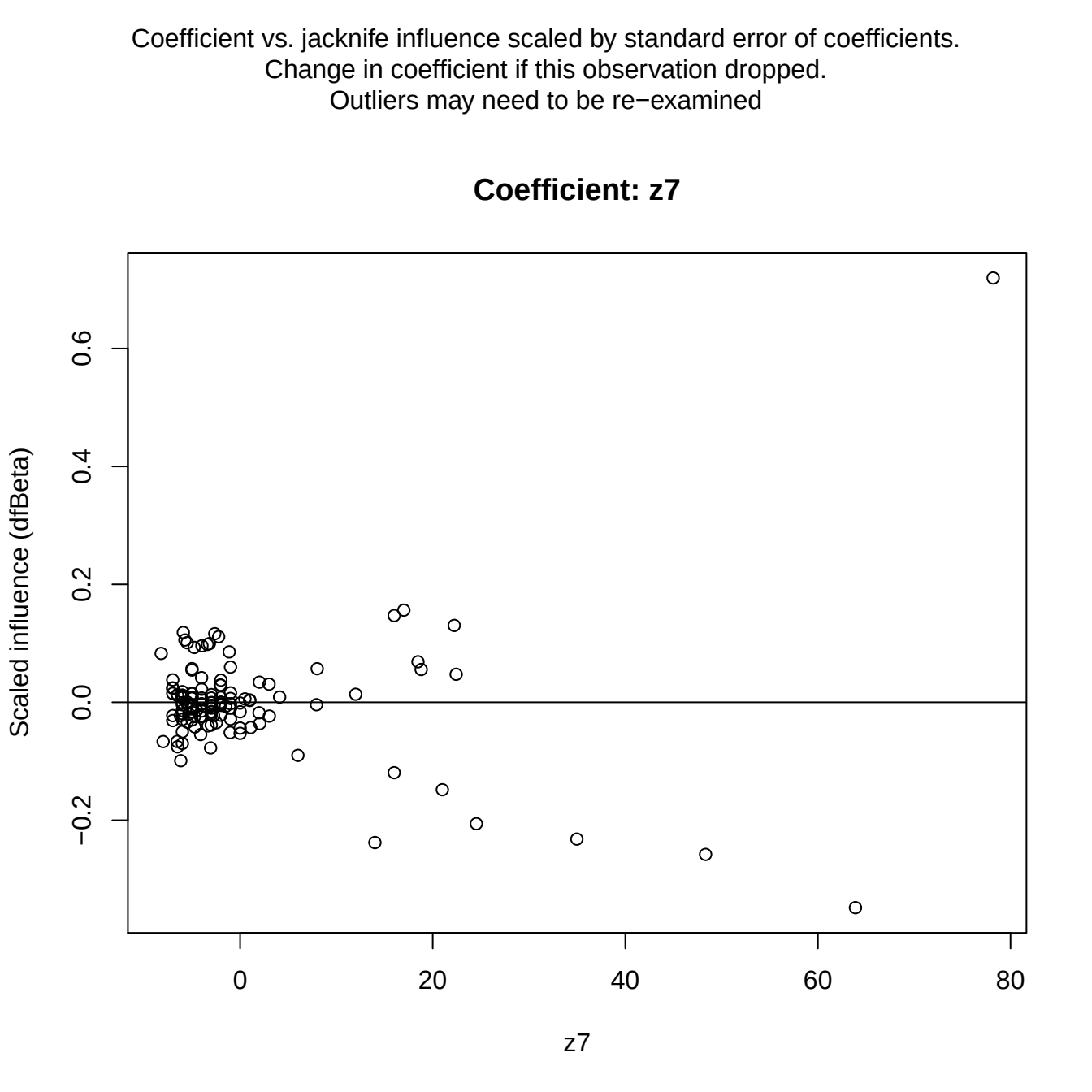

Coefficient vs. jacknife influence scaled by standard error of coefficients.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z2
Scaled influence (dfBeta)
0.4
0.3
0.2
0.1
0.0
−0.1
−0.2
−20
−10
0
10
20
30
z2

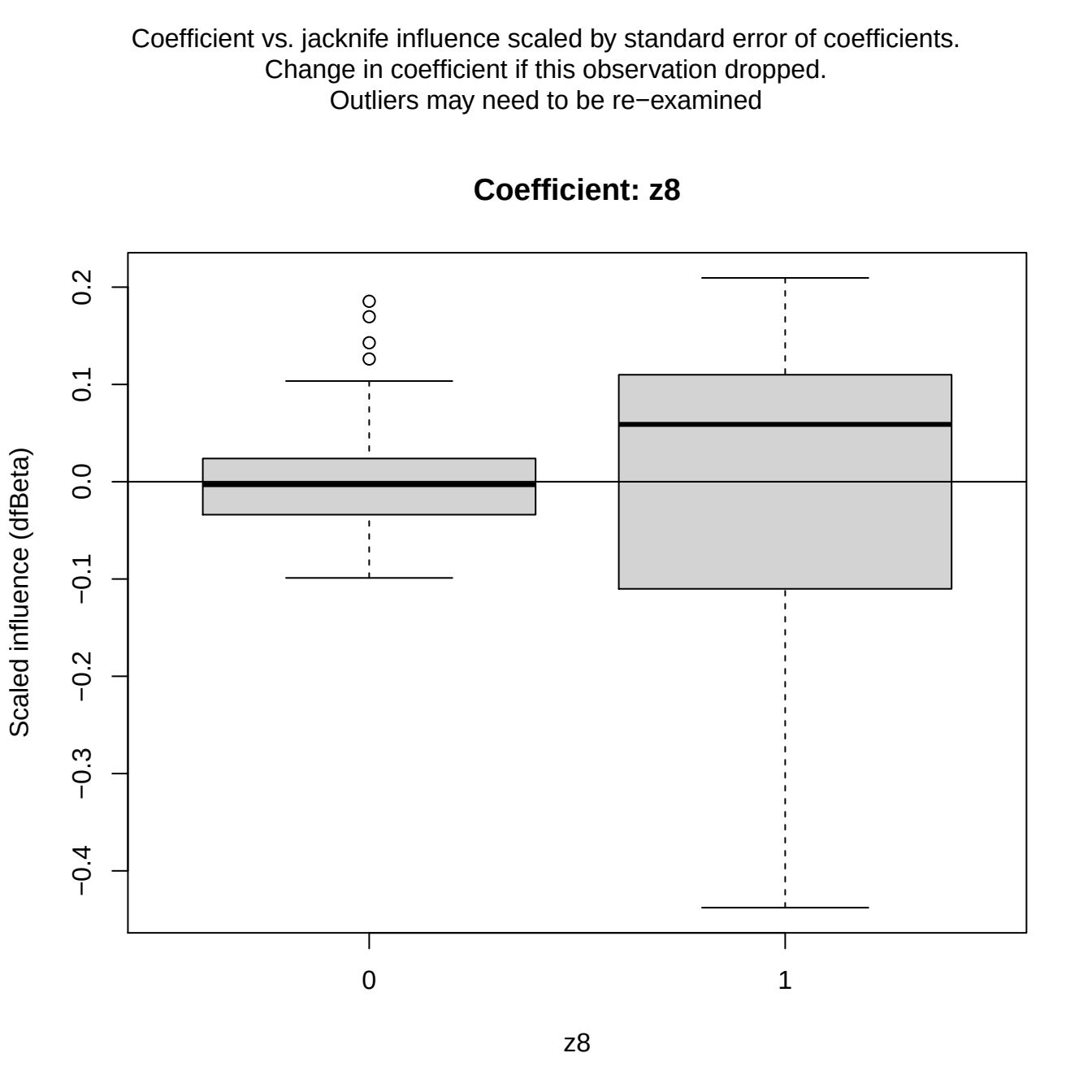

Coefficient vs. jacknife influence scaled by standard error of coefficients.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z3
Scaled influence (dfBeta)
0.2
0.1
0.0
−0.1
−0.2
−0.3
0
100
200
300
400
500
z3

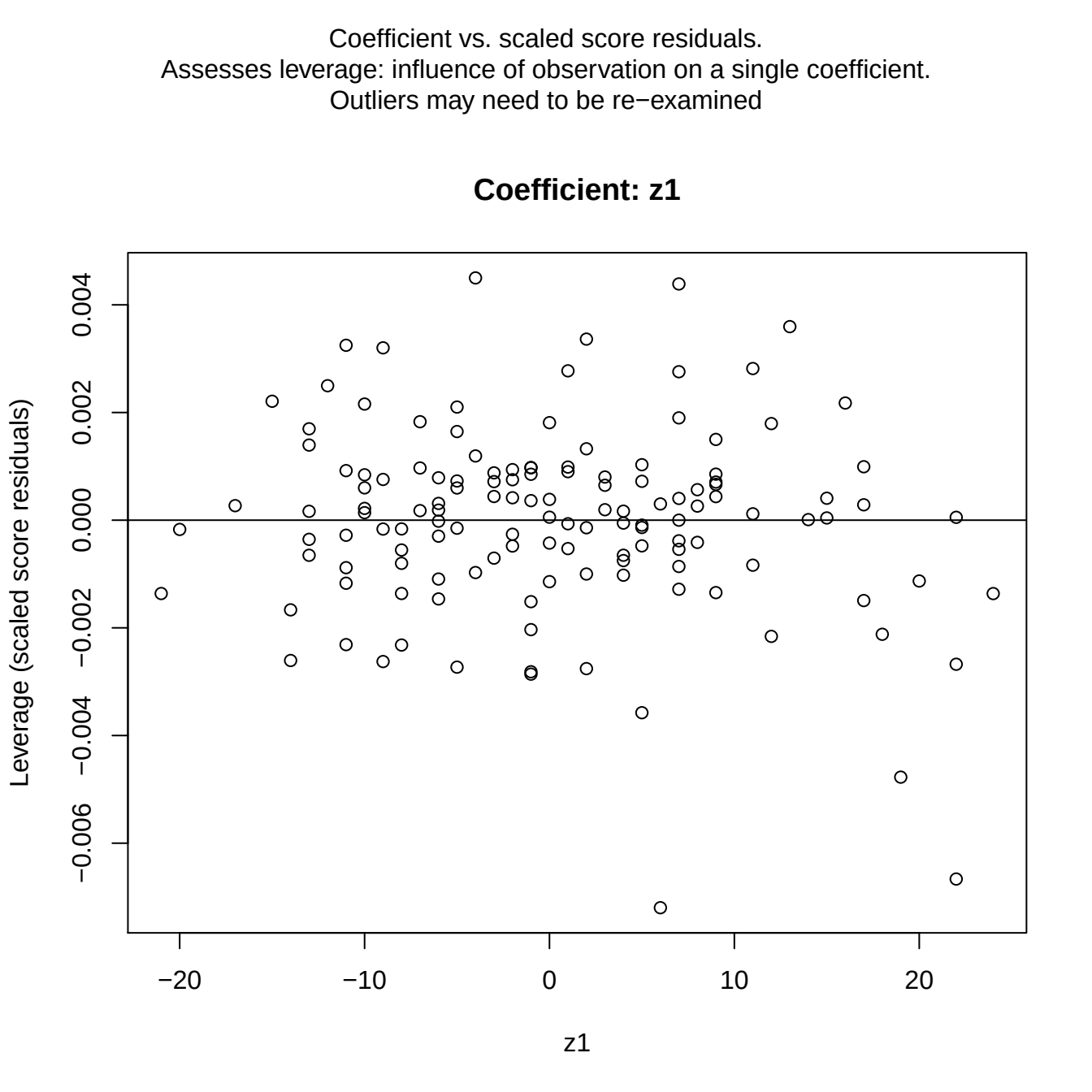

Coefficient vs. jacknife influence scaled by standard error of coefficients.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z4
Scaled influence (dfBeta)
0.3
0.2
0.1
0.0
−0.1
0
1
z4

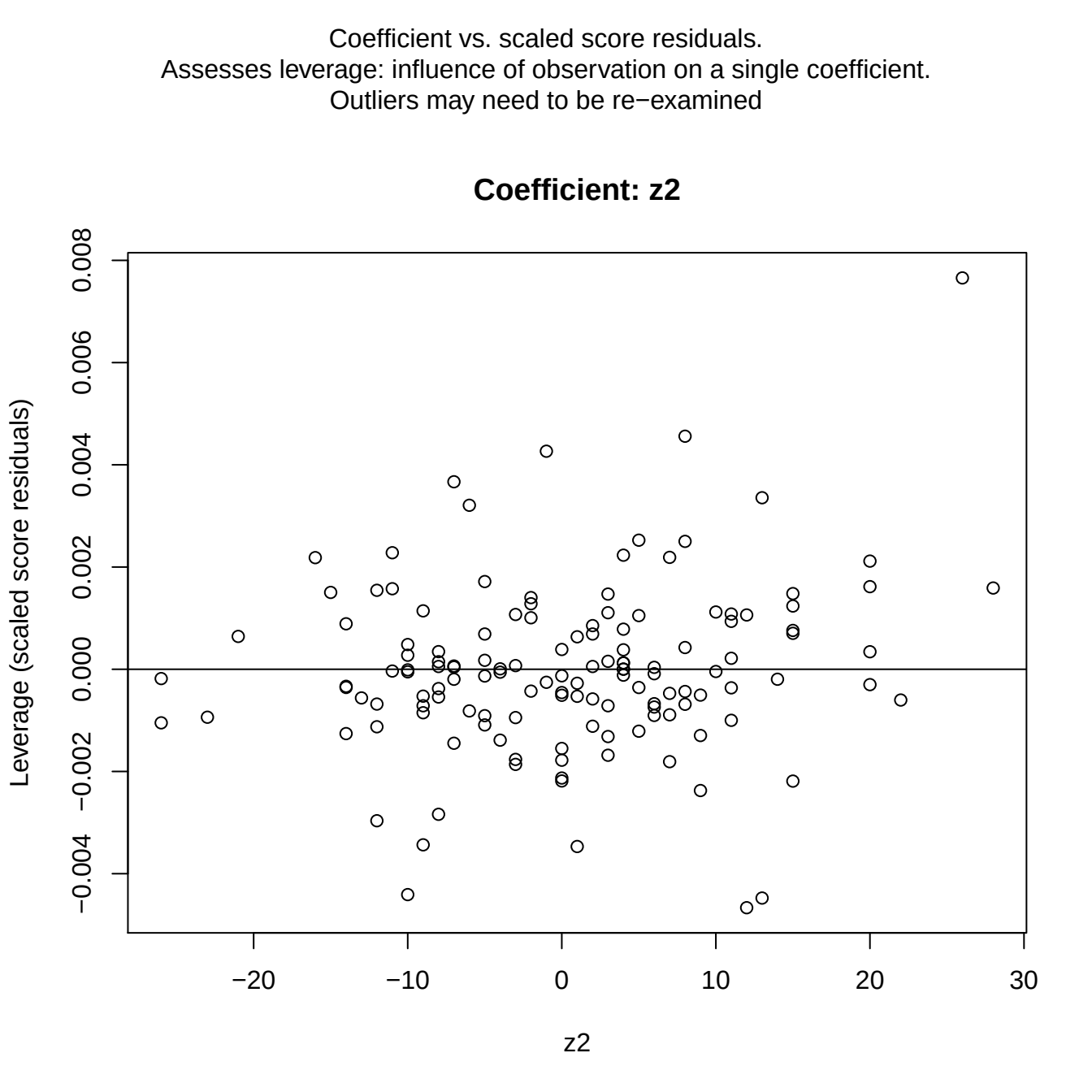

Coefficient vs. jacknife influence scaled by standard error of coefficients.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z5
Scaled influence (dfBeta)
0.2
0.1
0.0
−0.1
−0.2
0
1
z5

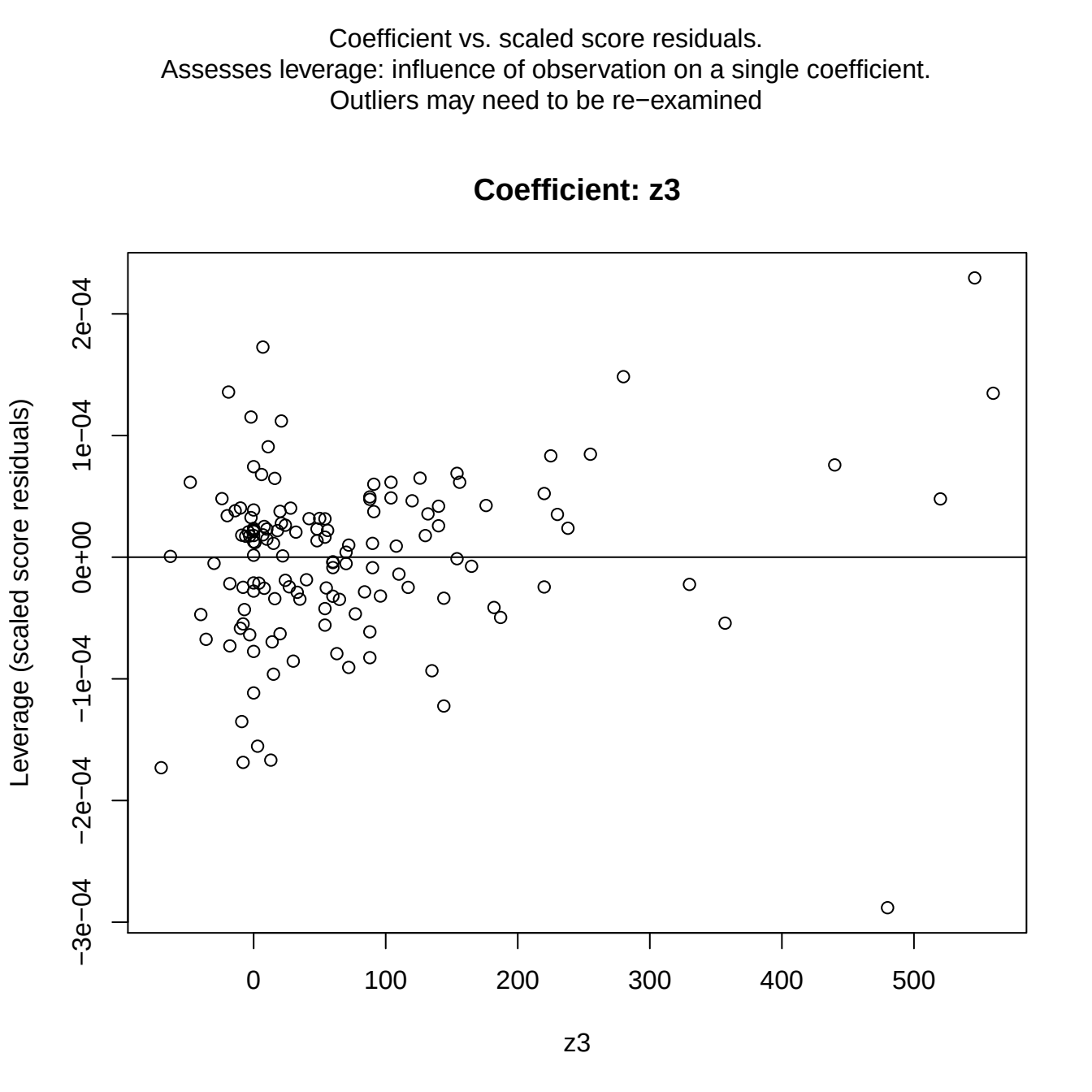

Coefficient vs. jacknife influence scaled by standard error of coefficients.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z6
Scaled influence (dfBeta)
0.1
0.0
−0.1
−0.2
−0.3
0
1
z6

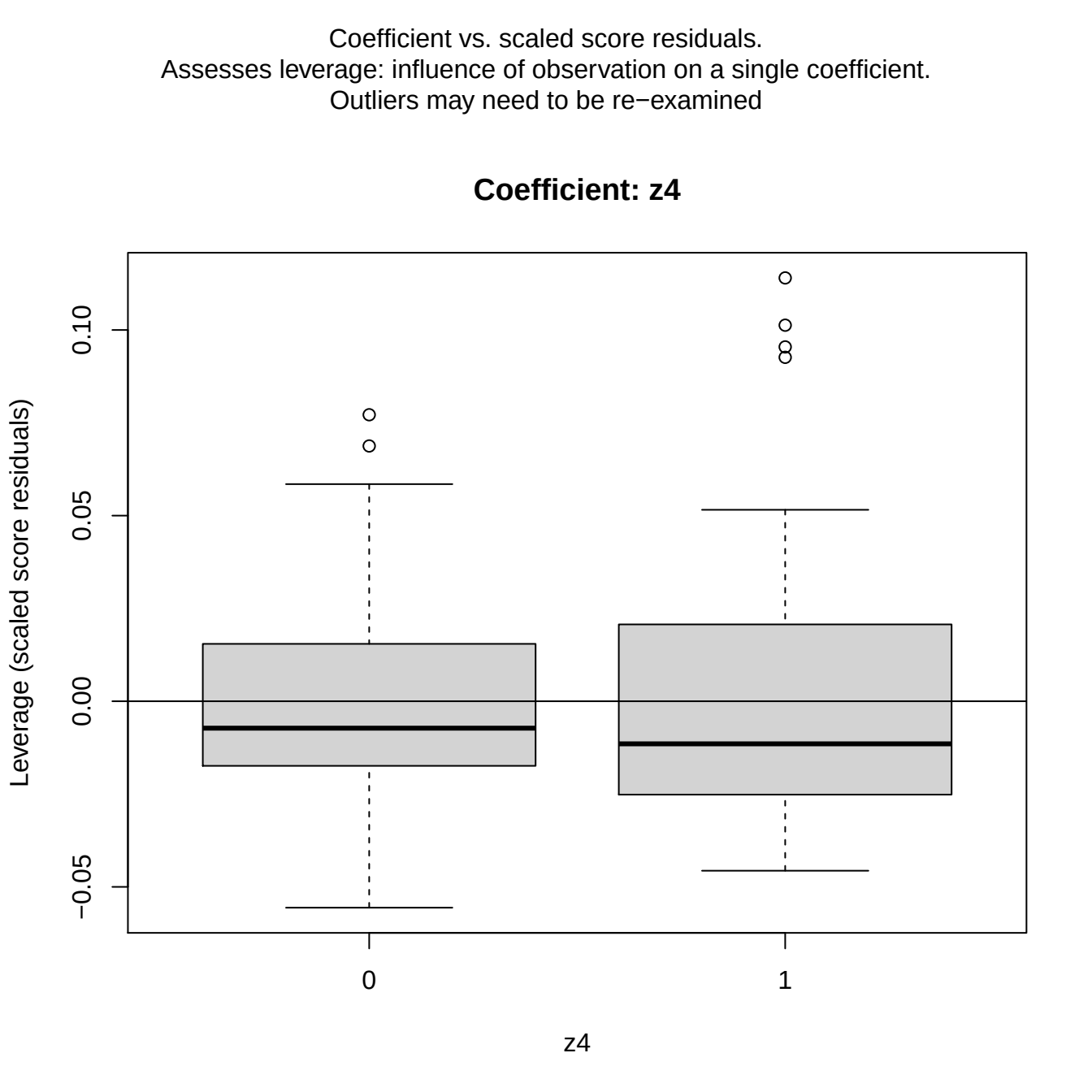

Coefficient vs. jacknife influence scaled by standard error of coefficients.
Change in coefficient if this observation dropped.
Outliers may need to be re−examined
Coefficient: z7
Scaled influence (dfBeta)
0.6
0.4
0.2
0.0
−0.2
0
20
40
60
80
z7


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: z8
Scaled influence (dfBeta)
0.2
0.1
0.0
−0.1
−0.2
−0.3
−0.4
0
1
z8

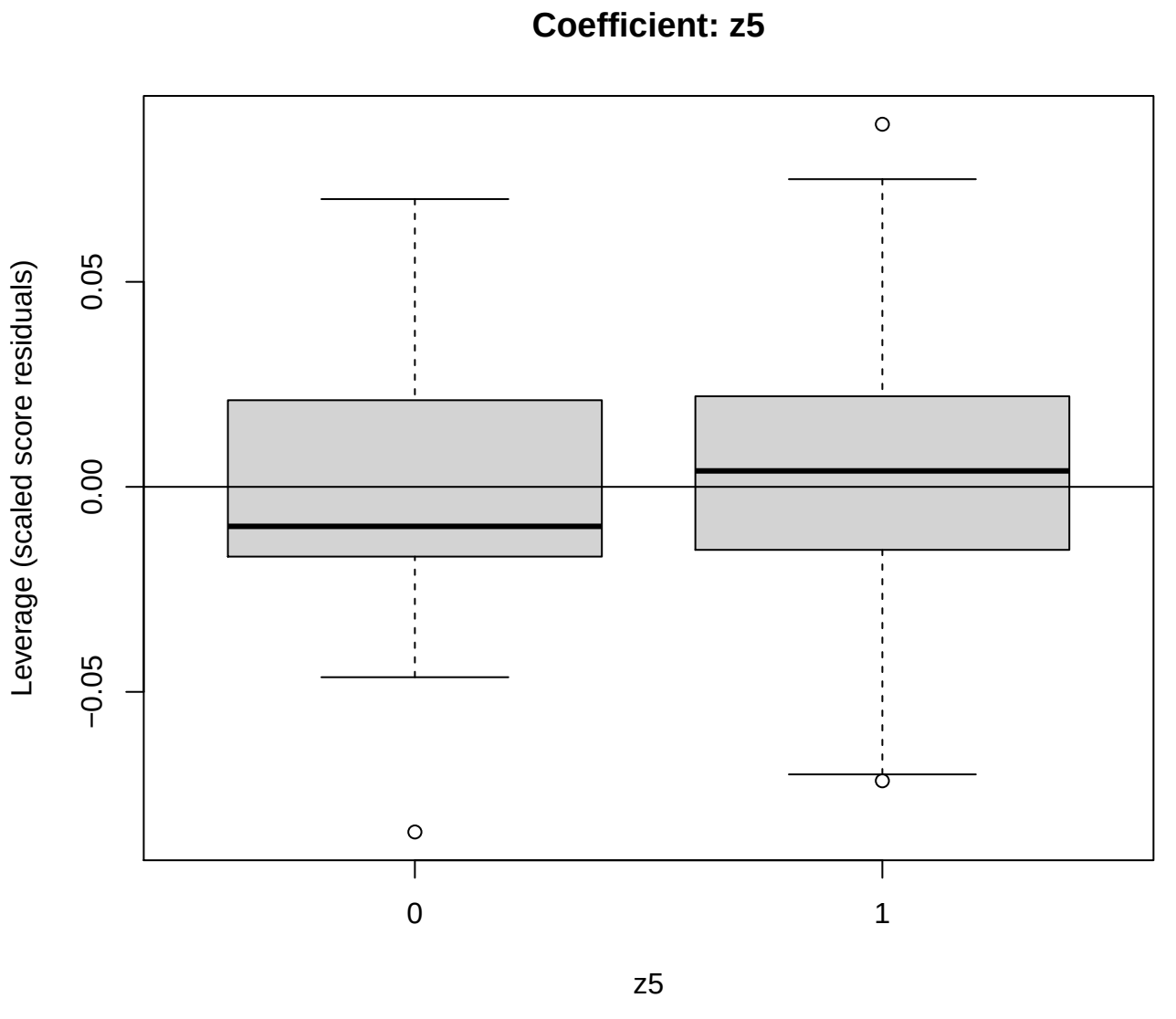

Coefficient vs. scaled score residuals.
Assesses leverage: influence of observation on a single coefficient.
Outliers may need to be re−examined
Coefficient: z1
Leverage (scaled score residuals)
0.004
0.002
0.000
−0.002
−0.004
−0.006
−20
−10
0
10
20
z1

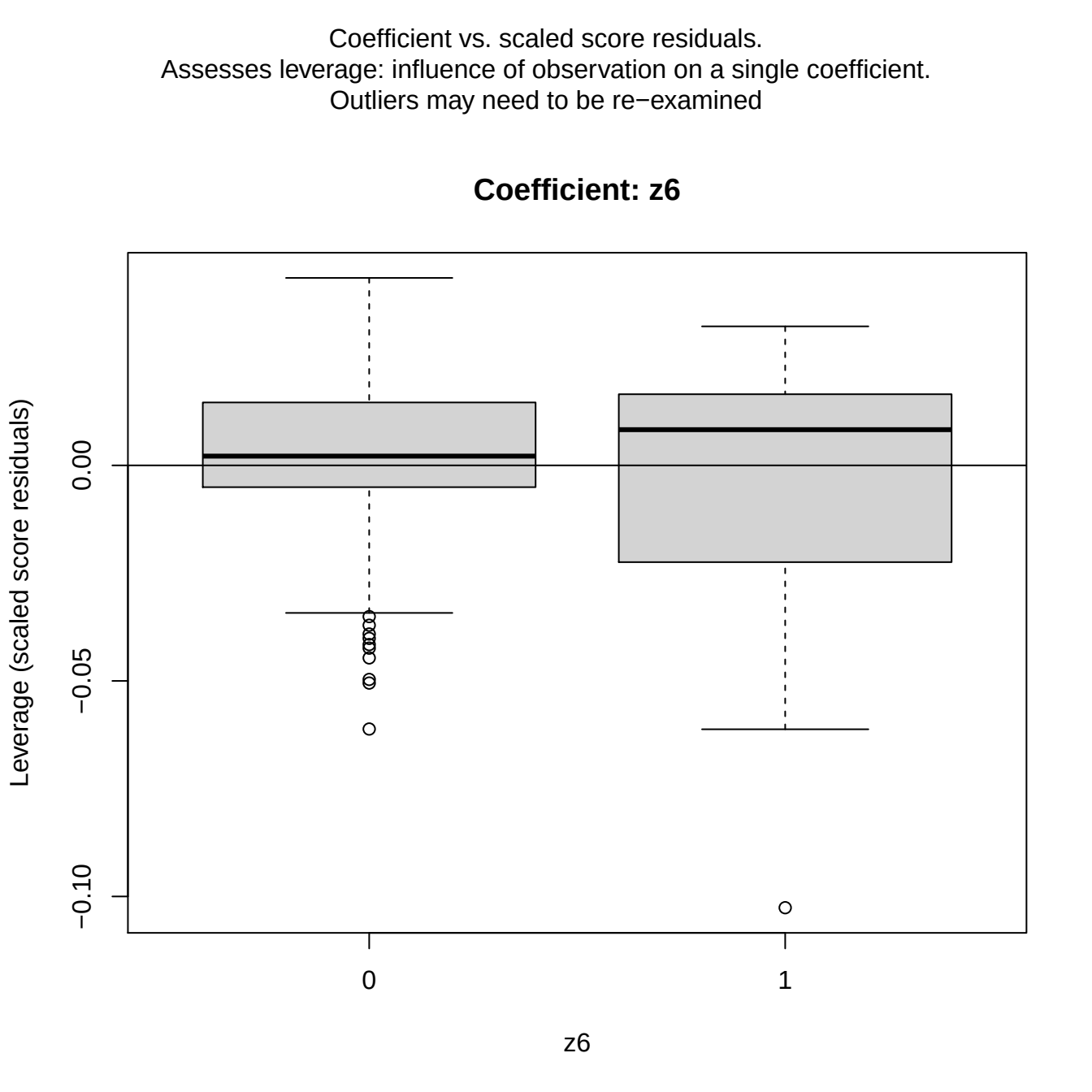

Coefficient vs. scaled score residuals.
Assesses leverage: influence of observation on a single coefficient.
Outliers may need to be re−examined
Coefficient: z2
Leverage (scaled score residuals)
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−20
−10
0
10
20
30
z2

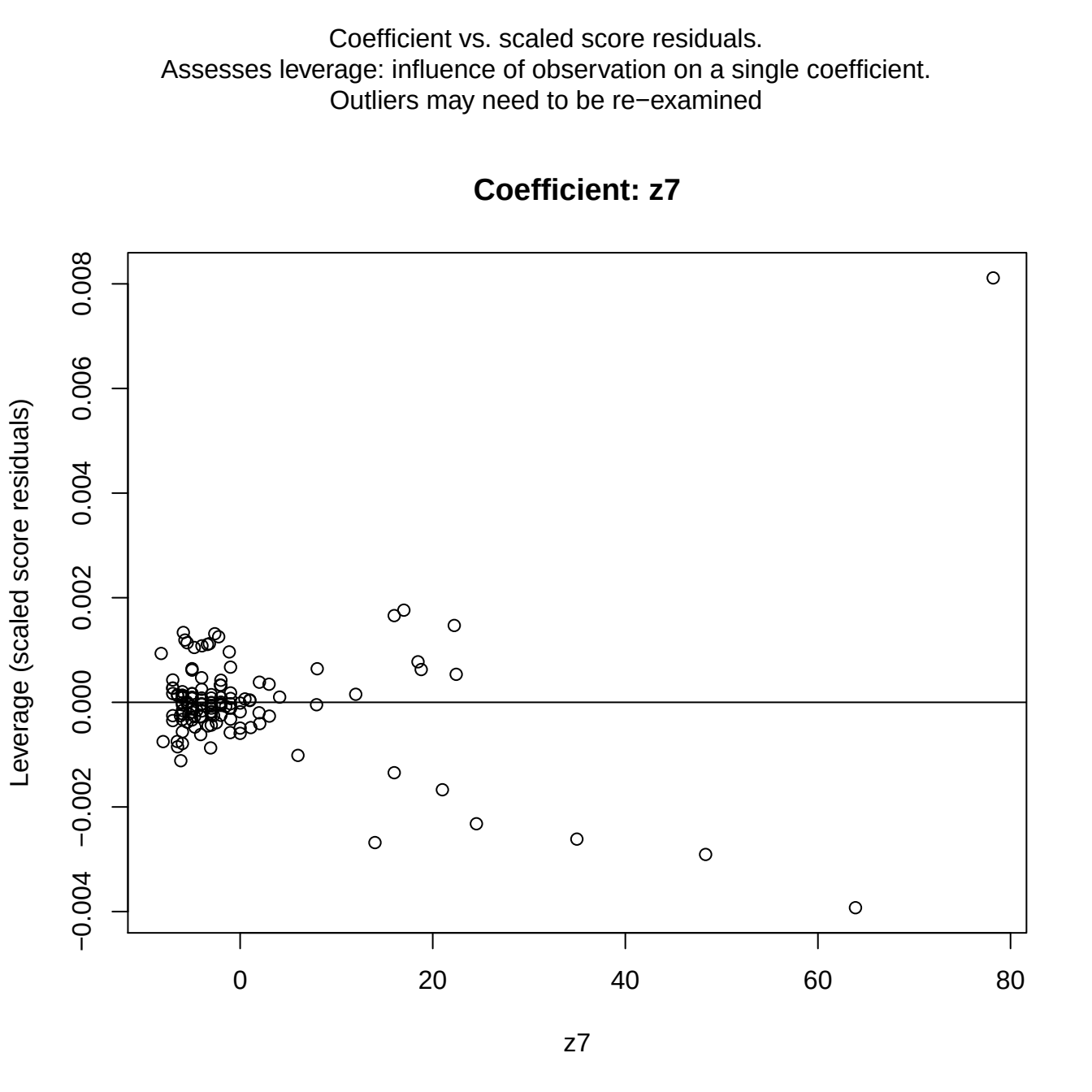

Coefficient vs. scaled score residuals.
Assesses leverage: influence of observation on a single coefficient.
Outliers may need to be re−examined
Coefficient: z3
Leverage (scaled score residuals)
2e−04
1e−04
0e+00
−1e−04
−2e−04
−3e−04
0
100
200
300
400
500
z3


Coefficient vs. scaled score residuals.
Assesses leverage: influence of observation on a single coefficient.
Outliers may need to be re−examined
Coefficient: z4
Leverage (scaled score residuals)
0.10
0.05
0.00
−0.05
0
1
z4

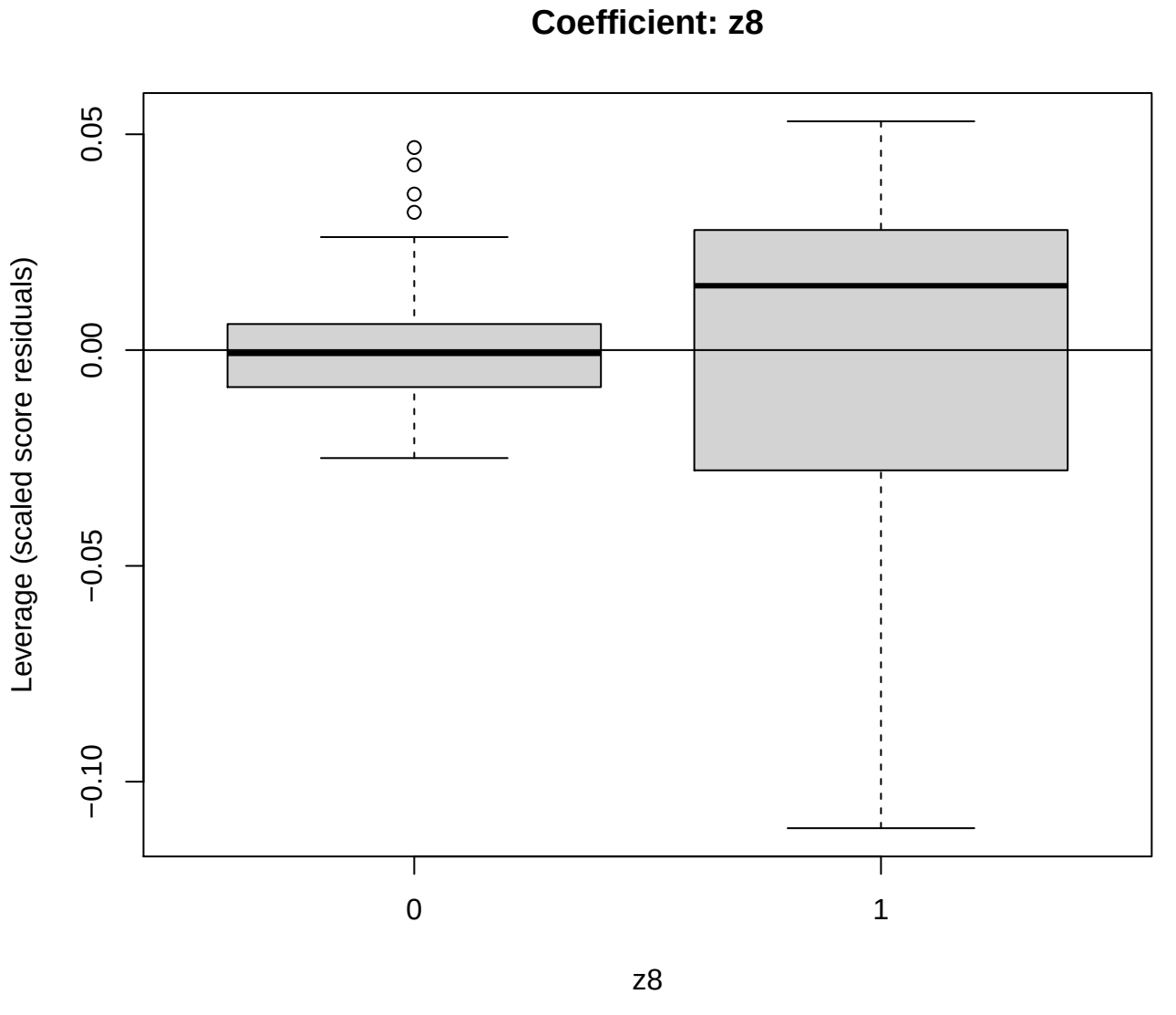
Coefficient vs. scaled score residuals.
Assesses leverage: influence of observation on a single coefficient.
Outliers may need to be re−examined

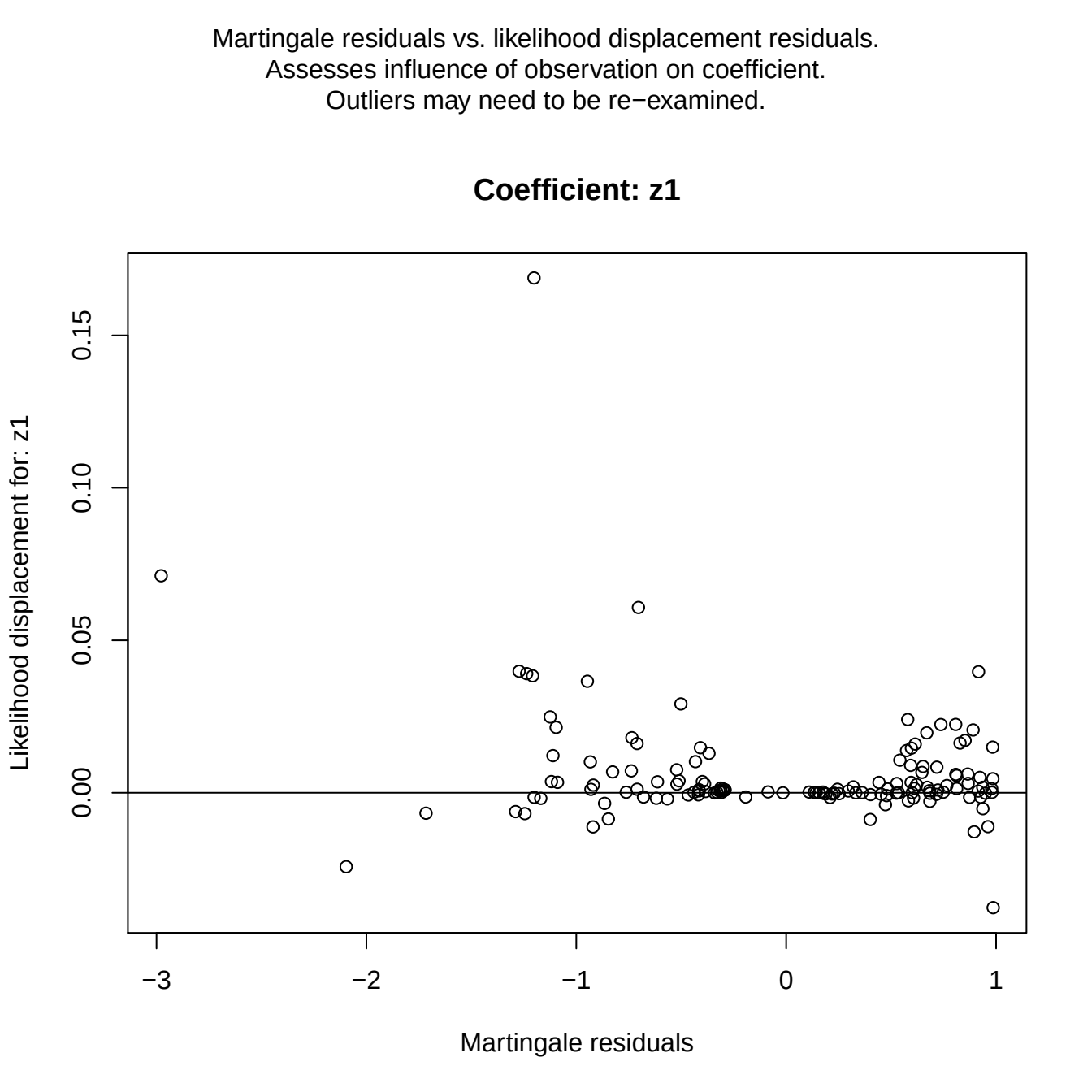


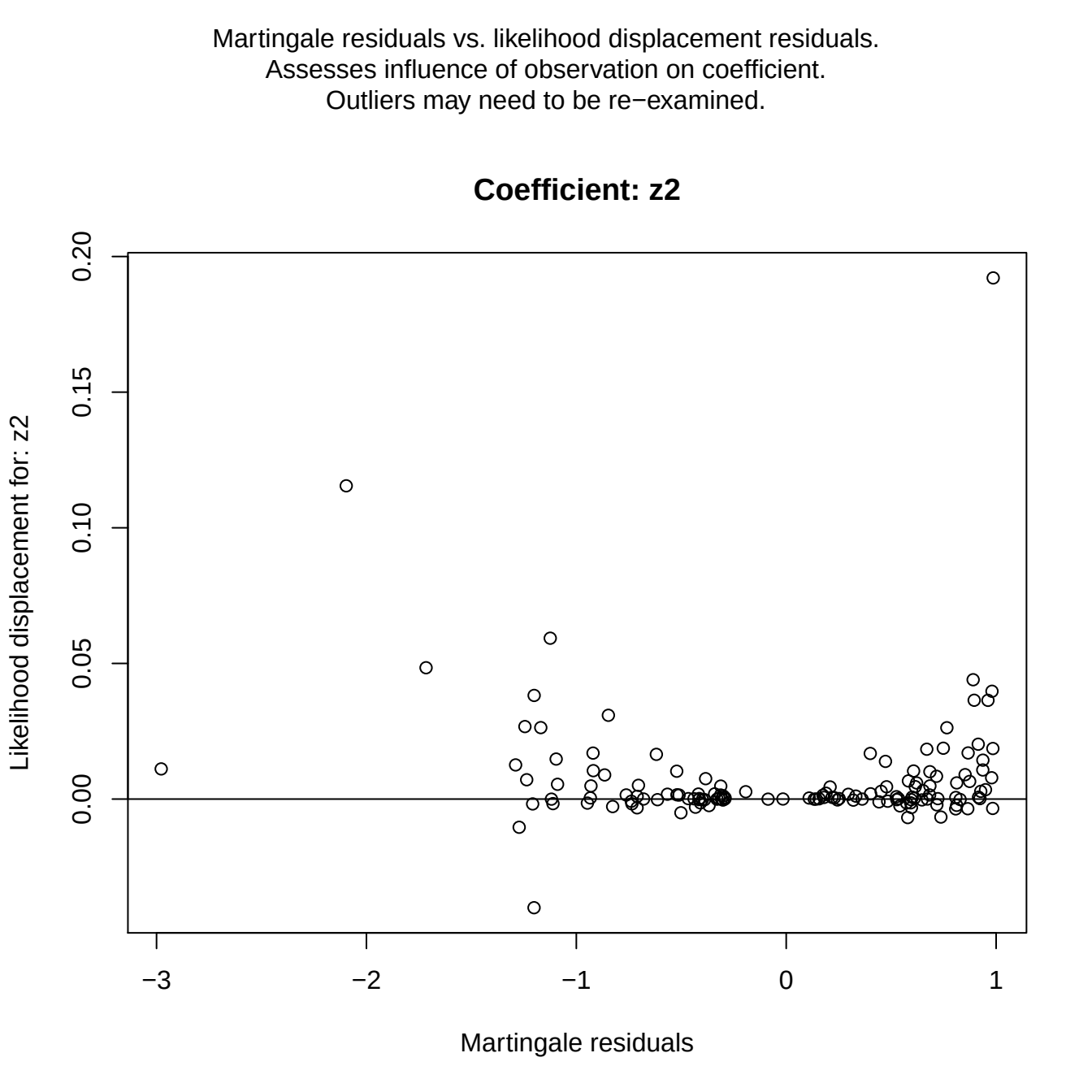

Coefficient vs. scaled score residuals.
Assesses leverage: influence of observation on a single coefficient.
Outliers may need to be re−examined
Coefficient: z6
Leverage (scaled score residuals)
0.00
−0.05
−0.10
0
1
z6

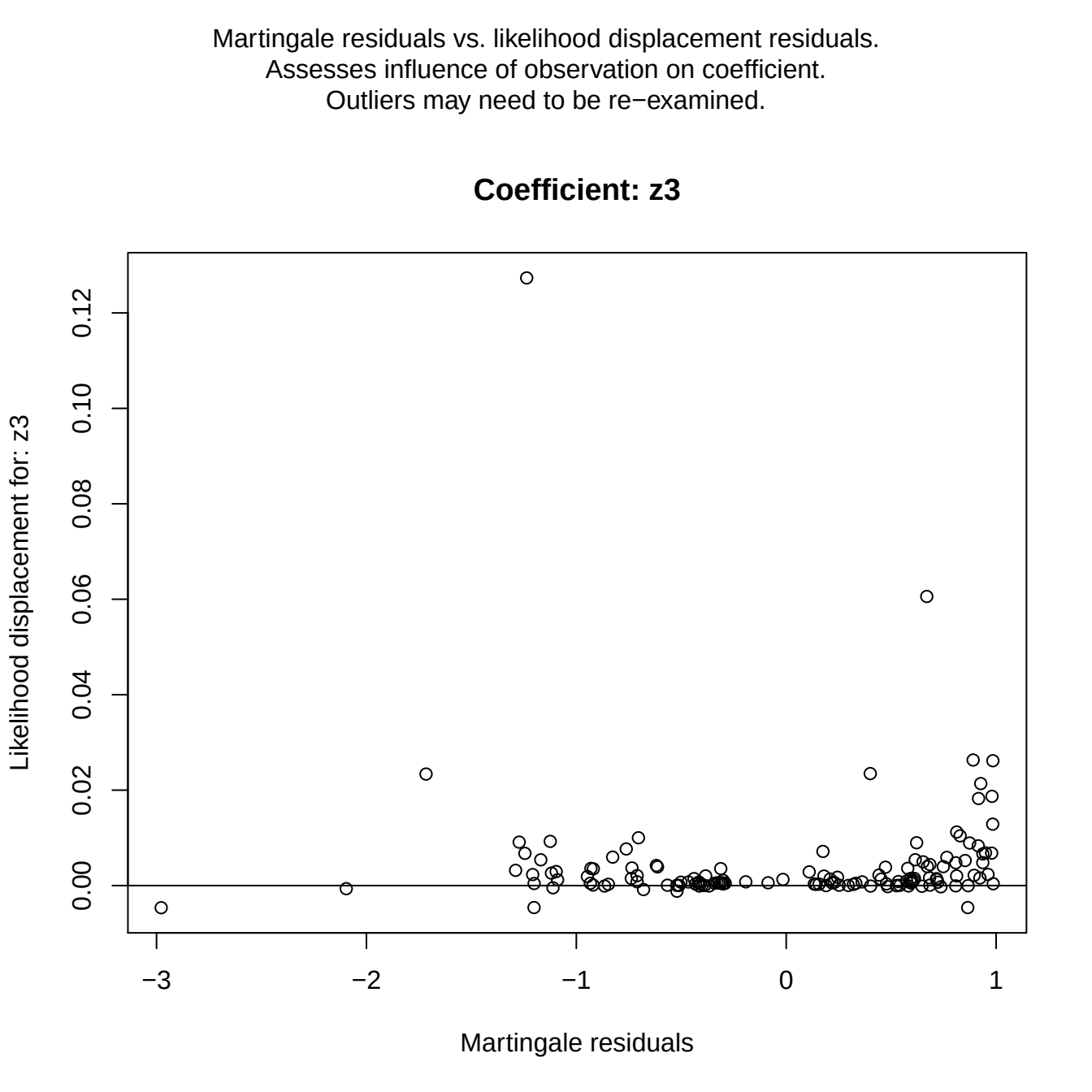

Coefficient vs. scaled score residuals.
Assesses leverage: influence of observation on a single coefficient.
Outliers may need to be re−examined
Coefficient: z7
Leverage (scaled score residuals)
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
0
20
40
60
80
z7

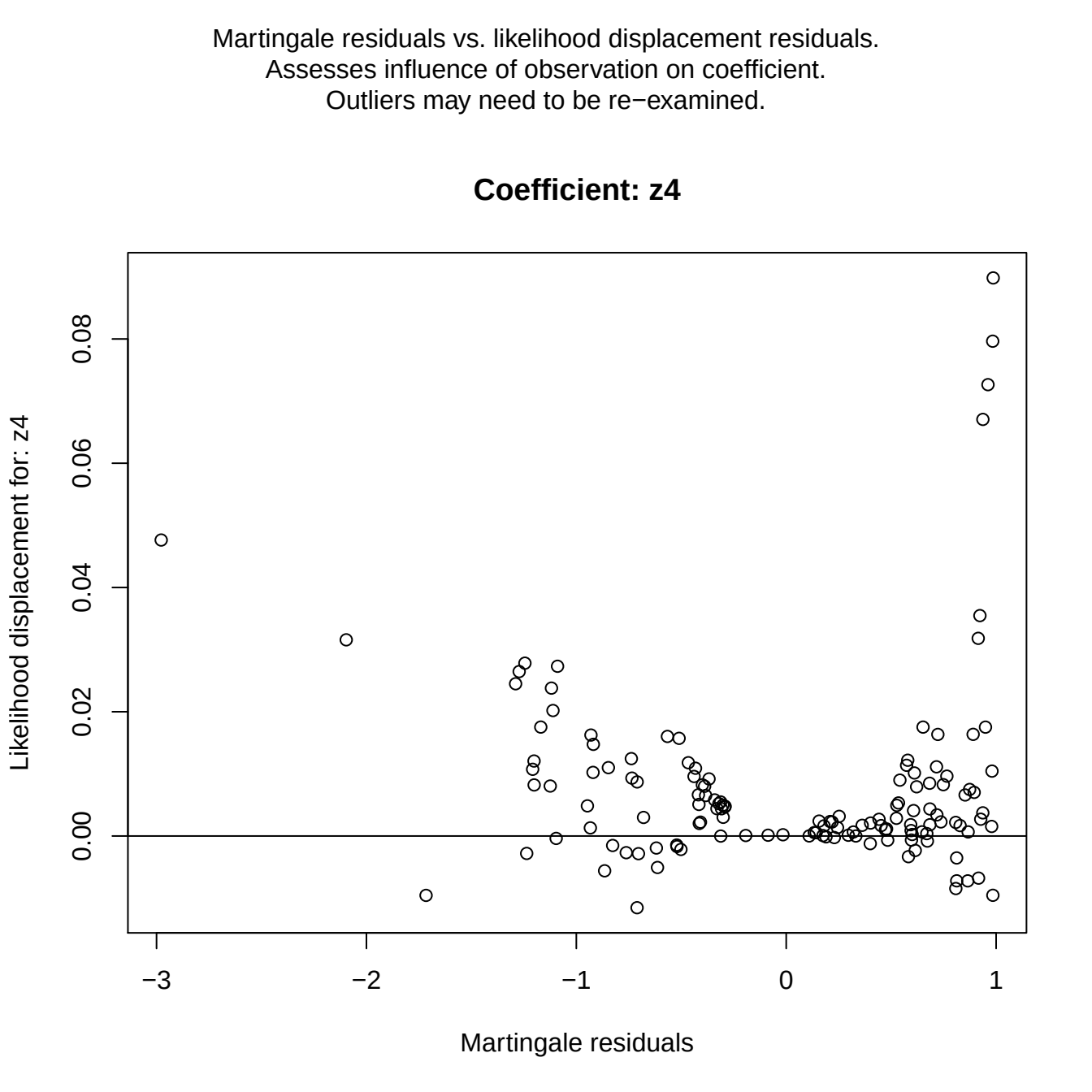
Coefficient vs. scaled score residuals.
Assesses leverage: influence of observation on a single coefficient.
Outliers may need to be re−examined

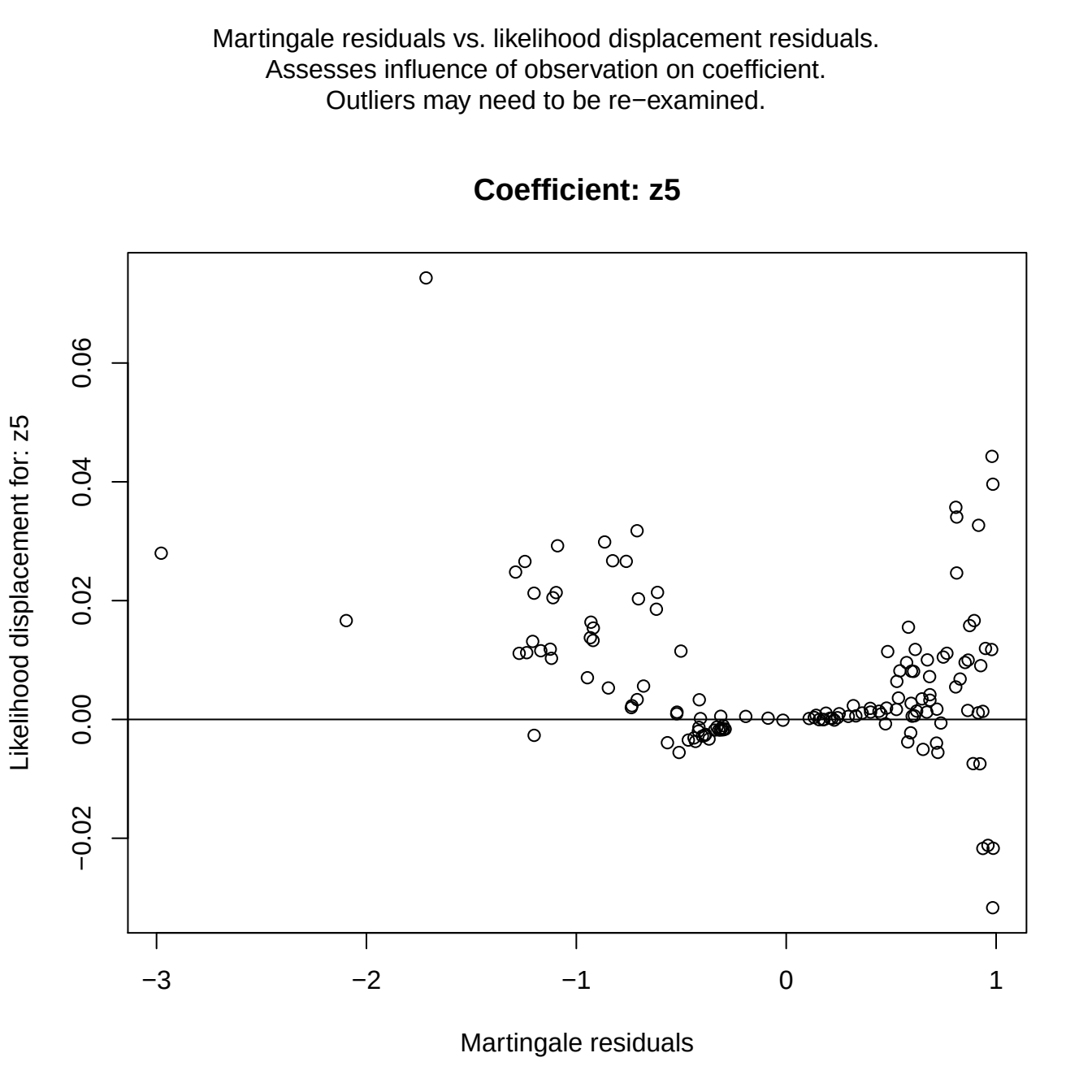


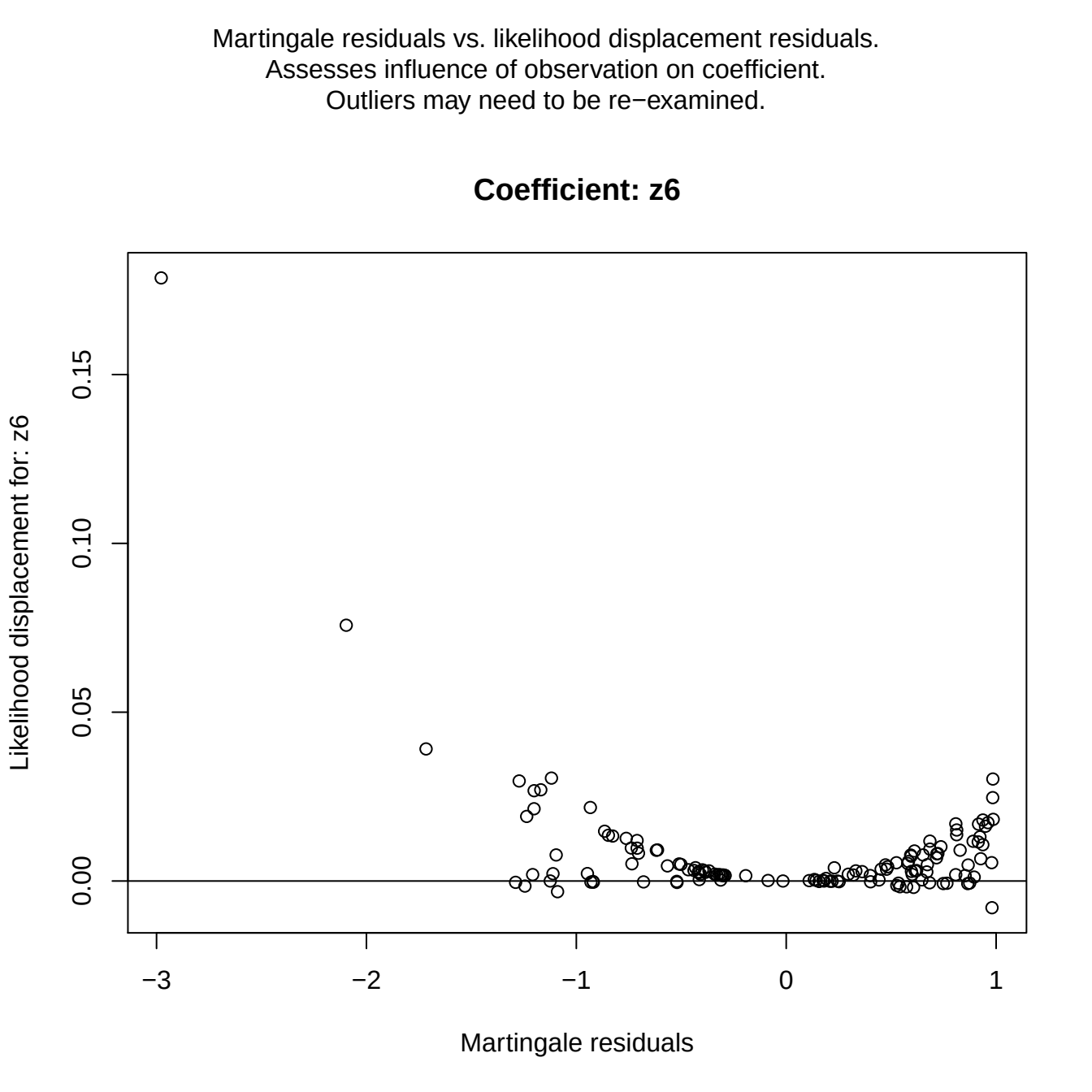

Martingale residuals vs. likelihood displacement residuals.
Assesses influence of observation on coefficient.
Outliers may need to be re−examined.
Coefficient: z1
Likelihood displacement for: z1
0.00
0.05
0.10
0.15
−3
−2
−1
0
1
Martingale residuals

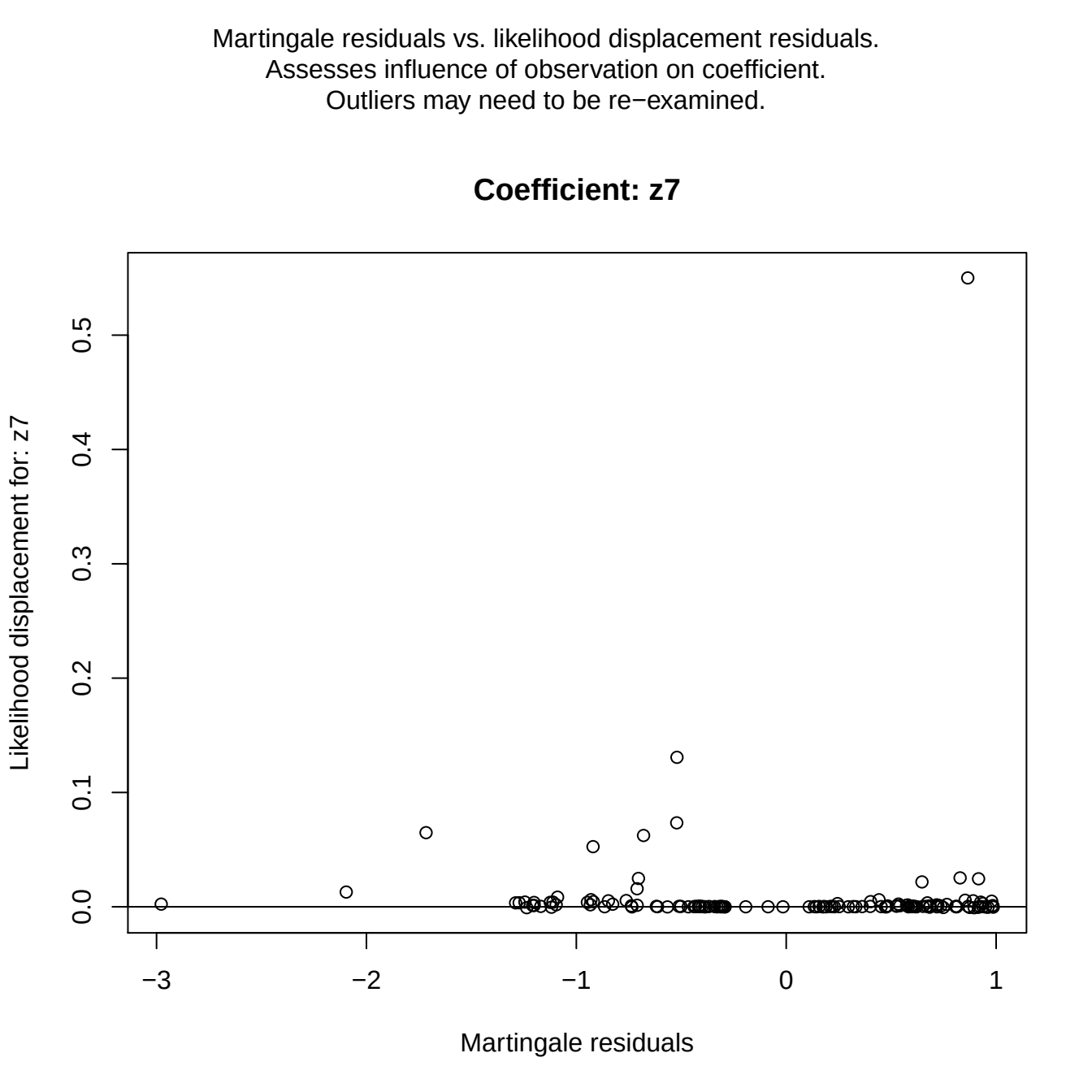

Martingale residuals vs. likelihood displacement residuals.
Assesses influence of observation on coefficient.
Outliers may need to be re−examined.
Coefficient: z2
Likelihood displacement for: z2
0.00
0.05
0.10
0.15
0.20
−3
−2
−1
0
1
Martingale residuals

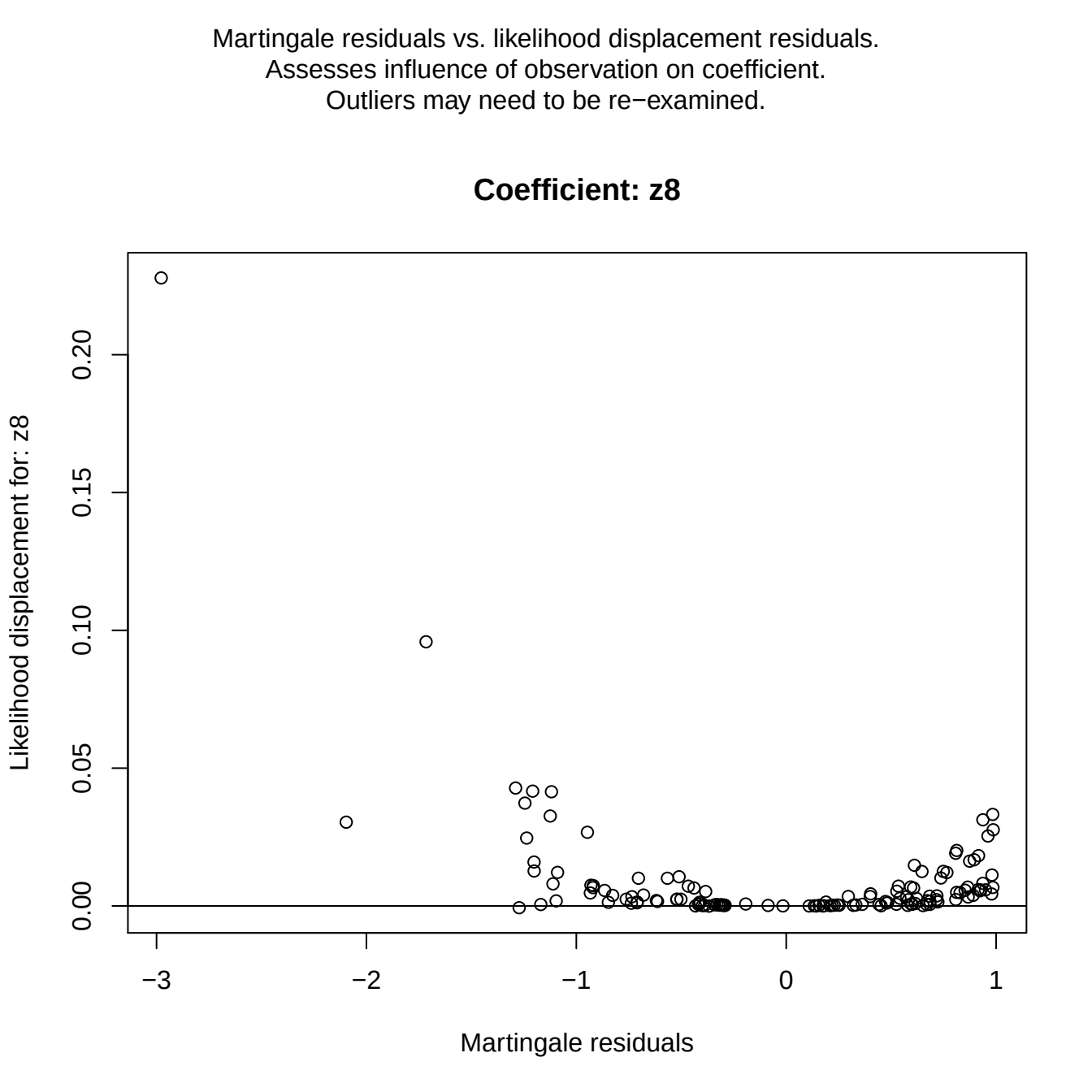

Martingale residuals vs. likelihood displacement residuals.
Assesses influence of observation on coefficient.
Outliers may need to be re−examined.
Coefficient: z3
Likelihood displacement for: z3
0.00
0.02
0.04
0.06
0.08
0.10
0.12
−3
−2
−1
0
1
Martingale residuals


Martingale residuals vs. likelihood displacement residuals.
Assesses influence of observation on coefficient.
Outliers may need to be re−examined.
Coefficient: z4
Likelihood displacement for: z4
0.00
0.02
0.04
0.06
0.08
−3
−2
−1
0
1
Martingale residuals


Martingale residuals vs. likelihood displacement residuals.
Assesses influence of observation on coefficient.
Outliers may need to be re−examined.
Coefficient: z5
Likelihood displacement for: z5
0.06
0.04
0.02
0.00
−0.02
−3
−2
−1
0
1
Martingale residuals


Martingale residuals vs. likelihood displacement residuals.
Assesses influence of observation on coefficient.
Outliers may need to be re−examined.
Coefficient: z6
Likelihood displacement for: z6
0.00
0.05
0.10
0.15
−3
−2
−1
0
1
Martingale residuals


Martingale residuals vs. likelihood displacement residuals.
Assesses influence of observation on coefficient.
Outliers may need to be re−examined.
Coefficient: z7
Likelihood displacement for: z7
0.0
0.1
0.2
0.3
0.4
0.5
−3
−2
−1
0
1
Martingale residuals


Martingale residuals vs. likelihood displacement residuals.
Assesses influence of observation on coefficient.
Outliers may need to be re−examined.
Coefficient: z8
Likelihood displacement for: z8
0.00
0.05
0.10
0.15
0.20
−3
−2
−1
0
1
Martingale residuals