bf<-function(res.data,i) {
  y<-yhat+res.data[i,1]
  ndv-data.frame(y,girth,height)
  model<-glm(y~log(girth)+log(height),data=nd)
  coef(model) }

  Inside the function we create a particular vector of y values by adding the shuffled residuals res.data[i,1] to the fitted values, then put this vector, y, along with the explanatory variables into a new dataframe nd that will be different each time GLM the is fitted. The function returns the three coefficients from the particular fitted model coef(model); the coefficients are the 'statistics' of the bootstrap, hence the name of the function.

  Finally, because we want to shuffle the residuals rather than sample them with replacement, we specify sim="permutation" in the call to the boot function:

  boot(res.data, bf, R=2000, sim="permutation")

DATA PERMUTATION

Call:
  boot(data = res.data, statistic = bf, R = 2000, sim = "permutation")

Bootstrap Statistics :

  original bias   std. error
  t1* -2.899379 0.014278399 0.62166875
  t2*  1.982665 0.001601178 0.07064475
  t3*  1.117138 -0.004586529 0.19938992

Again, the parameter values and their standard errors are very close to those obtained by our other bootstrapping methods. Here are the confidence intervals for the three parameters, specified by index = 1 for the intercept, index = 2 for the slope of the regression on log(g) and index = 3 for the slope of the regression on log(h):

  perms<- boot(res.data, bf, R=2000, sim="permutation")
  boot.ci(perms,index=1)

BOOTSTRAP CONFIDENCE INTERVAL CALCULATIONS

Based on 2000 bootstrap replicates

CALL :
  boot.ci(boot.out = perms, index = 1)

Intervals :

  Level Normal      Basic
  95%  (-4.117, -1.692) (-4.118, -1.680)

  Level Percentile     BCa
  95%  (-4.119, -1.681) (-4.302, -1.784)

Calculations and Intervals on Original Scale
There were 32 warnings (use warnings() to see them)

  boot.ci(perms,index=2)

BOOTSTRAP CONFIDENCE INTERVAL CALCULATIONS

Based on 2000 bootstrap replicates

CALL :
  boot.ci(boot.out = perms, index = 2)
Intervals:
Level Normal Basic
95% ( 1.837, 2.125 ) ( 1.836, 2.124 )

Level Percentile BCa
95% ( 1.841, 2.129 ) ( 1.827, 2.115 )

Calculations and Intervals on Original Scale
There were 32 warnings (use warnings() to see them)

`boot.ci(perms,index=3)`

BOOTSTRAP CONFIDENCE INTERVAL CALCULATIONS
Based on 2000 bootstrap replicates

CALL:
`boot.ci(boot.out = perms, index = 3)`

Intervals:
Level Normal Basic
95% ( 0.730, 1.508 ) ( 0.726, 1.509 )

Level Percentile BCa
95% ( 0.725, 1.508 ) ( 0.758, 1.566 )

Calculations and Intervals on Original Scale
There were 32 warnings (use warnings() to see them)

You can see that all the intervals for the slope on \( \log(g) \) include the value 2.0 and all the intervals for the slope on \( \log(h) \) include 1.0, consistent with the theoretical expectation that the logs are cylindrical, and that the volume of usable timber can be estimated from the length of the log and the square of its girth.