

# Cumulative Scores Teacher Ed Pre Post

Bradley D. Celestin, PhD

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## Summary

Models below increase in complexity from least to greatest. All models indicate post-test scores increase meaningfully relative to pre-test scores.

## Load and Transform Data

```
theData = read.csv("~/Dropbox/Bethel/data/teacherEdPrePost/cumulativeDataTeacherEdPrePost.csv")

longFormData = theData %>% select(student, preTestScore, postTestScore) %>% pivot_longer(c(pre
TestScore,postTestScore), names_to = "prePost", values_to = "score")

longFormData$prePost = factor(longFormData$prePost, levels = c("preTestScore","postTestScore"))
```

## View Structure of Data

```
# Examine the data
str(longFormData)
```

```
## tibble [74 × 3] (S3: tbl_df/tbl/data.frame)
## $ student: chr [1:74] "Student 1" "Student 1" "Student 2" "Student 2" ...
## $ prePost: Factor w/ 2 levels "preTestScore",...: 1 2 1 2 1 2 1 2 1 2 ...
## $ score : int [1:74] 10 95 0 29 0 57 0 57 10 24 ...
```

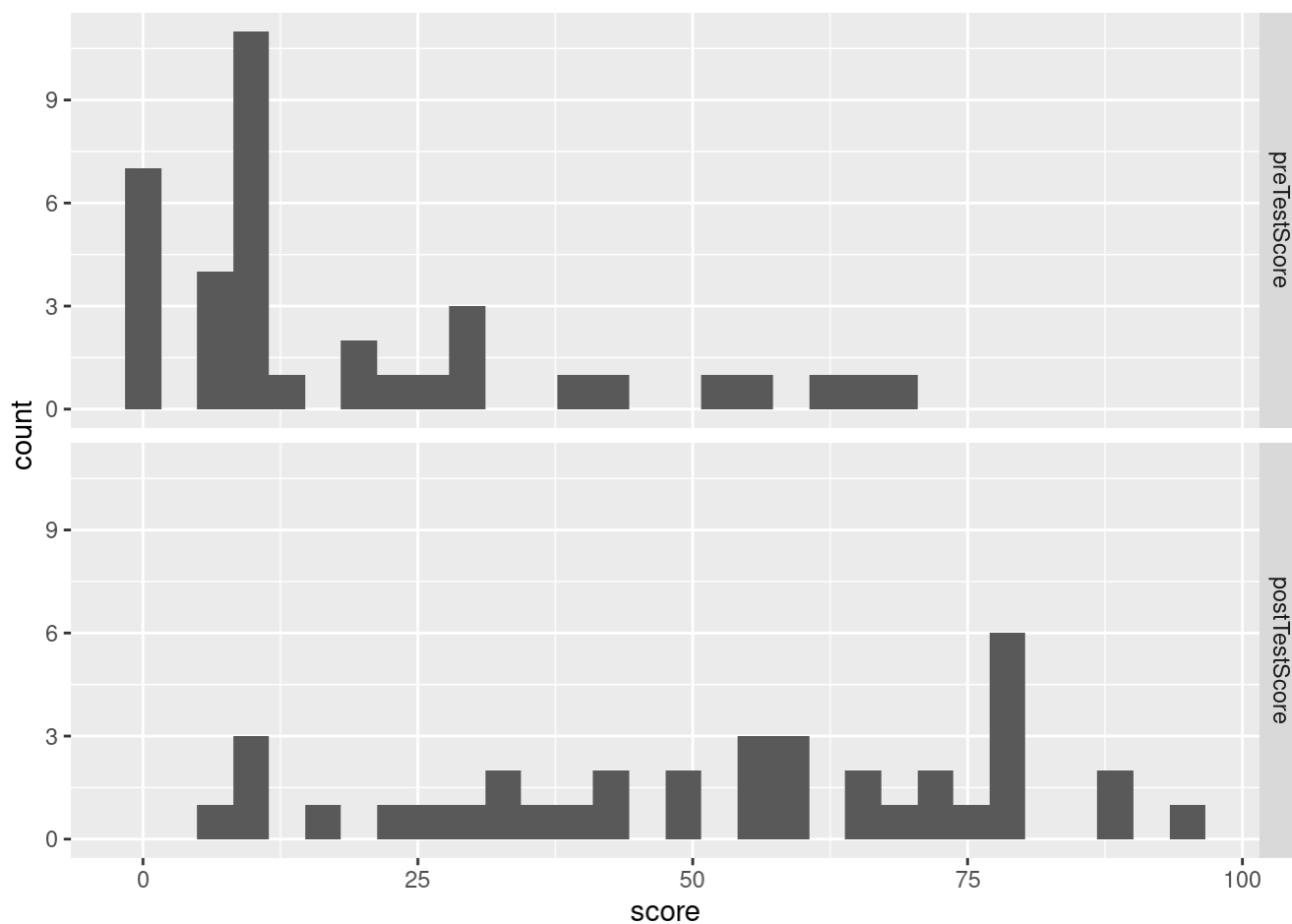
```
head(longFormData)
```

```
## # A tibble: 6 × 3
##   student prePost      score
##   <chr>    <fct>    <int>
## 1 Student 1 preTestScore    10
## 2 Student 1 postTestScore   95
## 3 Student 2 preTestScore     0
## 4 Student 2 postTestScore   29
## 5 Student 3 preTestScore     0
## 6 Student 3 postTestScore   57
```

## Pre vs Post Plot

```
# Plot the data
longFormData %>%
  ggplot() +
  aes(x=score) +
  geom_histogram() +
  facet_grid(rows = vars(prePost))
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



## Paired t-test

```
t.test(score ~ prePost, data = longFormData, paired=TRUE)
```

```
##
## Paired t-test
##
## data: score by prePost
## t = -7.4153, df = 36, p-value = 9.435e-09
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -43.74644 -24.95627
## sample estimates:
## mean of the differences
```

```
## -34.35135
```

## Frequentist linear model and assumed equal variances

```
lmFit = lm (score ~ 1 + prePost, data = longFormData)
summary(lmFit)
```

```
##
## Call:
## lm(formula = score ~ 1 + prePost, data = longFormData)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -45.649 -14.311  -4.473   17.851   49.703
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      19.297      3.769   5.121 2.45e-06 ***
## prePostpostTestScore  34.351      5.330   6.445 1.14e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 22.92 on 72 degrees of freedom
## Multiple R-squared:  0.3659, Adjusted R-squared:  0.3571
## F-statistic: 41.54 on 1 and 72 DF, p-value: 1.144e-08
```

## Bayesian linear model with normal distribution and assumed equal variances

```
eqVarBayesFit = brm(score ~ 1 + prePost, data = longFormData)
```

```
## Compiling Stan program...
```

```
## Trying to compile a simple C file
```

```
## Running /usr/lib/R/bin/R CMD SHLIB foo.c
## gcc -std=gnu99 -I"/usr/share/R/include" -DNDEBUG -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/Rcpp/include/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/unsupported" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/BH/include" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/src/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppParallel/include/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/rstan/include" -DEIGEN_NO_DEBUG -DBOOST_DISABLE_ASSERTS -DBOOST_PENDING_INTEGER_LOG2_HPP -DSTAN_THREADS -DBOOST_NO_AUTO_PTR -include '/home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/stan/math/prim/mat/fun/Eigen.hpp' -D_REENTRANT -DRCPP_PARALLEL_USE_TBB=1 -fpic -g -O2 -fdebug-prefix-map=/build/r-base-QwogzP/r-base-4.1.1=. -fstack-protector-strong -Wformat -Werror=format-security -Wdate-time -D_FORTIFY_SOURCE=2
```

```

-g -c foo.c -o foo.o
## In file included from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/
Core:88,
##           from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/
Dense:1,
##           from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/stan
/math/prim/mat/fun/Eigen.hpp:13,
##           from <command-line>:
## /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/src/Core/util/Macros.h
:628:1: error: unknown type name 'namespace'
##   628 | namespace Eigen {
##       | ^~~~~~
## /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/src/Core/util/Macros.h
:628:17: error: expected '=', ',', ';', 'asm' or '__attribute__' before '{' token
##   628 | namespace Eigen {
##       |           ^
## In file included from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/
Dense:1,
##           from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/stan
/math/prim/mat/fun/Eigen.hpp:13,
##           from <command-line>:
## /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/Core:96:10: fatal erro
r: complex: No such file or directory
##   96 | #include <complex>
##       |           ^~~~~~
## compilation terminated.
## make: *** [/usr/lib/R/etc/Makeconf:168: foo.o] Error 1

```

```
## Start sampling
```

```

##
## SAMPLING FOR MODEL '93accee2ac2b0c475683c4b2bf7c7561' NOW (CHAIN 1).
## Chain 1:
## Chain 1: Gradient evaluation took 7e-06 seconds
## Chain 1: 1000 transitions using 10 leapfrog steps per transition would take 0.07 seconds.
## Chain 1: Adjust your expectations accordingly!
## Chain 1:
## Chain 1:
## Chain 1: Iteration:    1 / 2000 [  0%] (Warmup)
## Chain 1: Iteration:   200 / 2000 [ 10%] (Warmup)
## Chain 1: Iteration:   400 / 2000 [ 20%] (Warmup)
## Chain 1: Iteration:   600 / 2000 [ 30%] (Warmup)
## Chain 1: Iteration:   800 / 2000 [ 40%] (Warmup)
## Chain 1: Iteration:  1000 / 2000 [ 50%] (Warmup)
## Chain 1: Iteration:  1001 / 2000 [ 50%] (Sampling)
## Chain 1: Iteration:  1200 / 2000 [ 60%] (Sampling)
## Chain 1: Iteration:  1400 / 2000 [ 70%] (Sampling)
## Chain 1: Iteration:  1600 / 2000 [ 80%] (Sampling)
## Chain 1: Iteration:  1800 / 2000 [ 90%] (Sampling)
## Chain 1: Iteration:  2000 / 2000 [100%] (Sampling)
## Chain 1:
## Chain 1: Elapsed Time: 0.022276 seconds (Warm-up)
## Chain 1:                0.009592 seconds (Sampling)

```

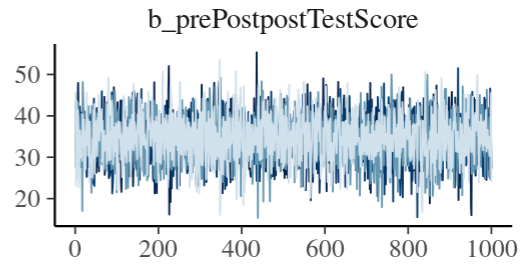
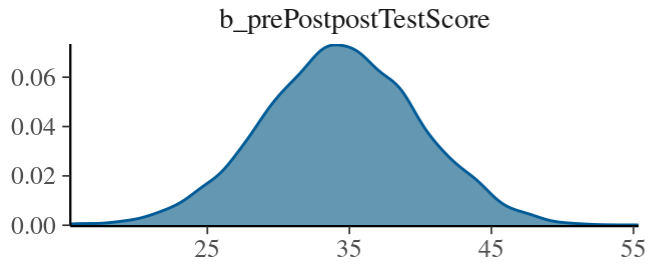
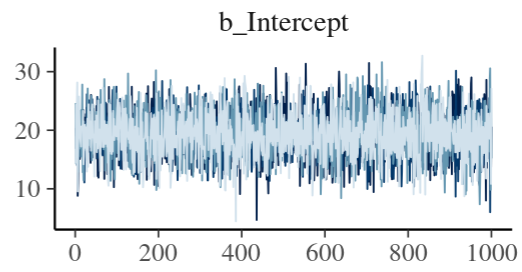
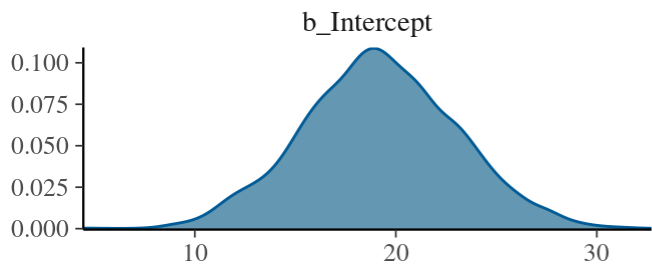
```
## Chain 1:          0.031868 seconds (Total)
## Chain 1:
##
## SAMPLING FOR MODEL '93accee2ac2b0c475683c4b2bf7c7561' NOW (CHAIN 2).
## Chain 2:
## Chain 2: Gradient evaluation took 4e-06 seconds
## Chain 2: 1000 transitions using 10 leapfrog steps per transition would take 0.04 seconds.
## Chain 2: Adjust your expectations accordingly!
## Chain 2:
## Chain 2:
## Chain 2: Iteration:    1 / 2000 [  0%] (Warmup)
## Chain 2: Iteration:   200 / 2000 [ 10%] (Warmup)
## Chain 2: Iteration:   400 / 2000 [ 20%] (Warmup)
## Chain 2: Iteration:   600 / 2000 [ 30%] (Warmup)
## Chain 2: Iteration:   800 / 2000 [ 40%] (Warmup)
## Chain 2: Iteration:  1000 / 2000 [ 50%] (Warmup)
## Chain 2: Iteration:  1001 / 2000 [ 50%] (Sampling)
## Chain 2: Iteration:  1200 / 2000 [ 60%] (Sampling)
## Chain 2: Iteration:  1400 / 2000 [ 70%] (Sampling)
## Chain 2: Iteration:  1600 / 2000 [ 80%] (Sampling)
## Chain 2: Iteration:  1800 / 2000 [ 90%] (Sampling)
## Chain 2: Iteration:  2000 / 2000 [100%] (Sampling)
## Chain 2:
## Chain 2: Elapsed Time: 0.025644 seconds (Warm-up)
## Chain 2:          0.008812 seconds (Sampling)
## Chain 2:          0.034456 seconds (Total)
## Chain 2:
##
## SAMPLING FOR MODEL '93accee2ac2b0c475683c4b2bf7c7561' NOW (CHAIN 3).
## Chain 3:
## Chain 3: Gradient evaluation took 6e-06 seconds
## Chain 3: 1000 transitions using 10 leapfrog steps per transition would take 0.06 seconds.
## Chain 3: Adjust your expectations accordingly!
## Chain 3:
## Chain 3:
## Chain 3: Iteration:    1 / 2000 [  0%] (Warmup)
## Chain 3: Iteration:   200 / 2000 [ 10%] (Warmup)
## Chain 3: Iteration:   400 / 2000 [ 20%] (Warmup)
## Chain 3: Iteration:   600 / 2000 [ 30%] (Warmup)
## Chain 3: Iteration:   800 / 2000 [ 40%] (Warmup)
## Chain 3: Iteration:  1000 / 2000 [ 50%] (Warmup)
## Chain 3: Iteration:  1001 / 2000 [ 50%] (Sampling)
## Chain 3: Iteration:  1200 / 2000 [ 60%] (Sampling)
## Chain 3: Iteration:  1400 / 2000 [ 70%] (Sampling)
## Chain 3: Iteration:  1600 / 2000 [ 80%] (Sampling)
## Chain 3: Iteration:  1800 / 2000 [ 90%] (Sampling)
## Chain 3: Iteration:  2000 / 2000 [100%] (Sampling)
## Chain 3:
## Chain 3: Elapsed Time: 0.022726 seconds (Warm-up)
## Chain 3:          0.008986 seconds (Sampling)
## Chain 3:          0.031712 seconds (Total)
## Chain 3:
##
## SAMPLING FOR MODEL '93accee2ac2b0c475683c4b2bf7c7561' NOW (CHAIN 4).
```

```
## Chain 4:
## Chain 4: Gradient evaluation took 1e-05 seconds
## Chain 4: 1000 transitions using 10 leapfrog steps per transition would take 0.1 seconds.
## Chain 4: Adjust your expectations accordingly!
## Chain 4:
## Chain 4:
## Chain 4: Iteration:    1 / 2000 [  0%] (Warmup)
## Chain 4: Iteration:   200 / 2000 [ 10%] (Warmup)
## Chain 4: Iteration:   400 / 2000 [ 20%] (Warmup)
## Chain 4: Iteration:   600 / 2000 [ 30%] (Warmup)
## Chain 4: Iteration:   800 / 2000 [ 40%] (Warmup)
## Chain 4: Iteration:  1000 / 2000 [ 50%] (Warmup)
## Chain 4: Iteration:  1001 / 2000 [ 50%] (Sampling)
## Chain 4: Iteration:  1200 / 2000 [ 60%] (Sampling)
## Chain 4: Iteration:  1400 / 2000 [ 70%] (Sampling)
## Chain 4: Iteration:  1600 / 2000 [ 80%] (Sampling)
## Chain 4: Iteration:  1800 / 2000 [ 90%] (Sampling)
## Chain 4: Iteration:  2000 / 2000 [100%] (Sampling)
## Chain 4:
## Chain 4: Elapsed Time: 0.025923 seconds (Warm-up)
## Chain 4:                0.012335 seconds (Sampling)
## Chain 4:                0.038258 seconds (Total)
## Chain 4:
```

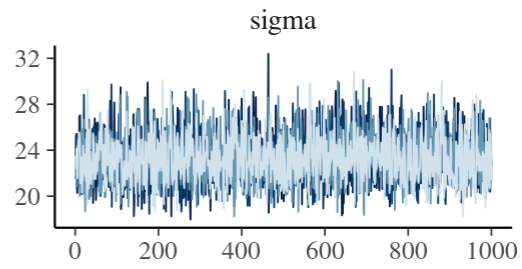
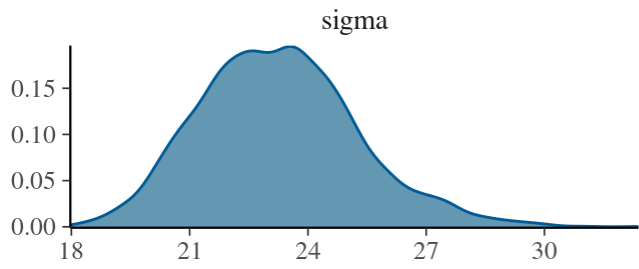
```
summary(eqVarBayesFit)
```

```
## Family: gaussian
## Links: mu = identity; sigma = identity
## Formula: score ~ 1 + prePost
## Data: longFormData (Number of observations: 74)
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;
## total post-warmup draws = 4000
##
## Population-Level Effects:
##           Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS
## Intercept          19.20      3.83   11.66   26.78 1.00    4447
## prePostpostTestScore 34.41      5.51   23.57   45.09 1.00    4156
##           Tail_ESS
## Intercept           2990
## prePostpostTestScore 3109
##
## Family Specific Parameters:
##           Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sigma      23.25      2.00   19.76   27.60 1.00    4392    3096
##
## Draws were sampled using sampling(NUTS). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

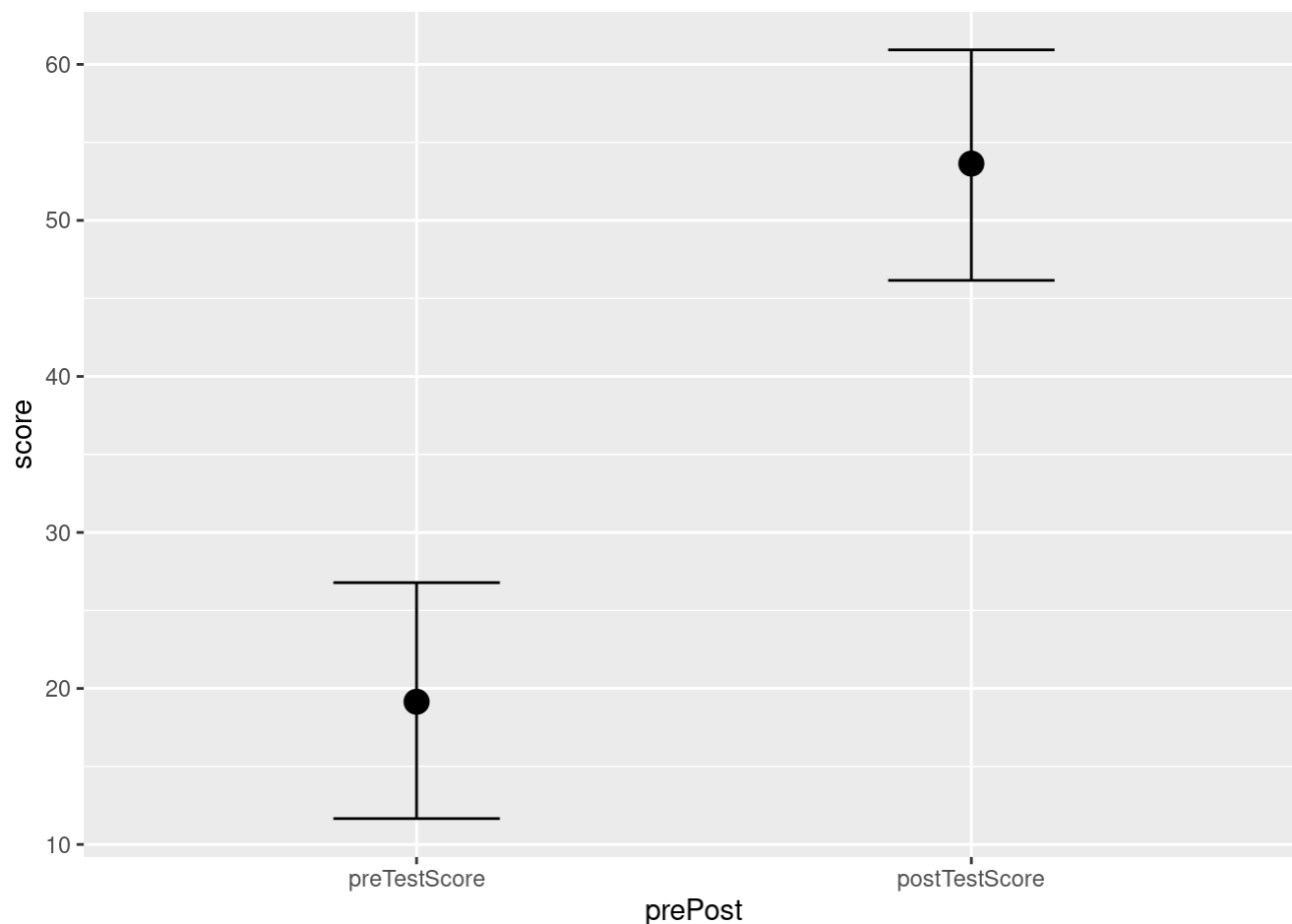
```
plot(eqVarBayesFit) # Check chain convergence
```



Chain  
— 1  
— 2  
— 3  
— 4



```
conditional_effects(eqVarBayesFit)
```



## Bayesian linear model with normal distribution and unequal variances

```

hetVarBayesFit = brm(
  bf(score ~ 1 + prePost, sigma ~ 1 + prePost),
  data = longFormData,
  cores = 4
)

```

```
## Compiling Stan program...
```

```
## Trying to compile a simple C file
```

```

## Running /usr/lib/R/bin/R CMD SHLIB foo.c
## gcc -std=gnu99 -I"/usr/share/R/include" -DNDEBUG -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/Rcpp/include/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/unsupported" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/BH/include" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/src/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppParallel/include/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/rstan/include" -DEIGEN_NO_DEBUG -DBOOST_DISABLE_ASSERTS -DBOOST_PENDING_INTEGER_LOG2_HPP -DSTAN_THREADS -DBOOST_NO_AUTO_PTR -include '/home/brad/R/x86_64-

```



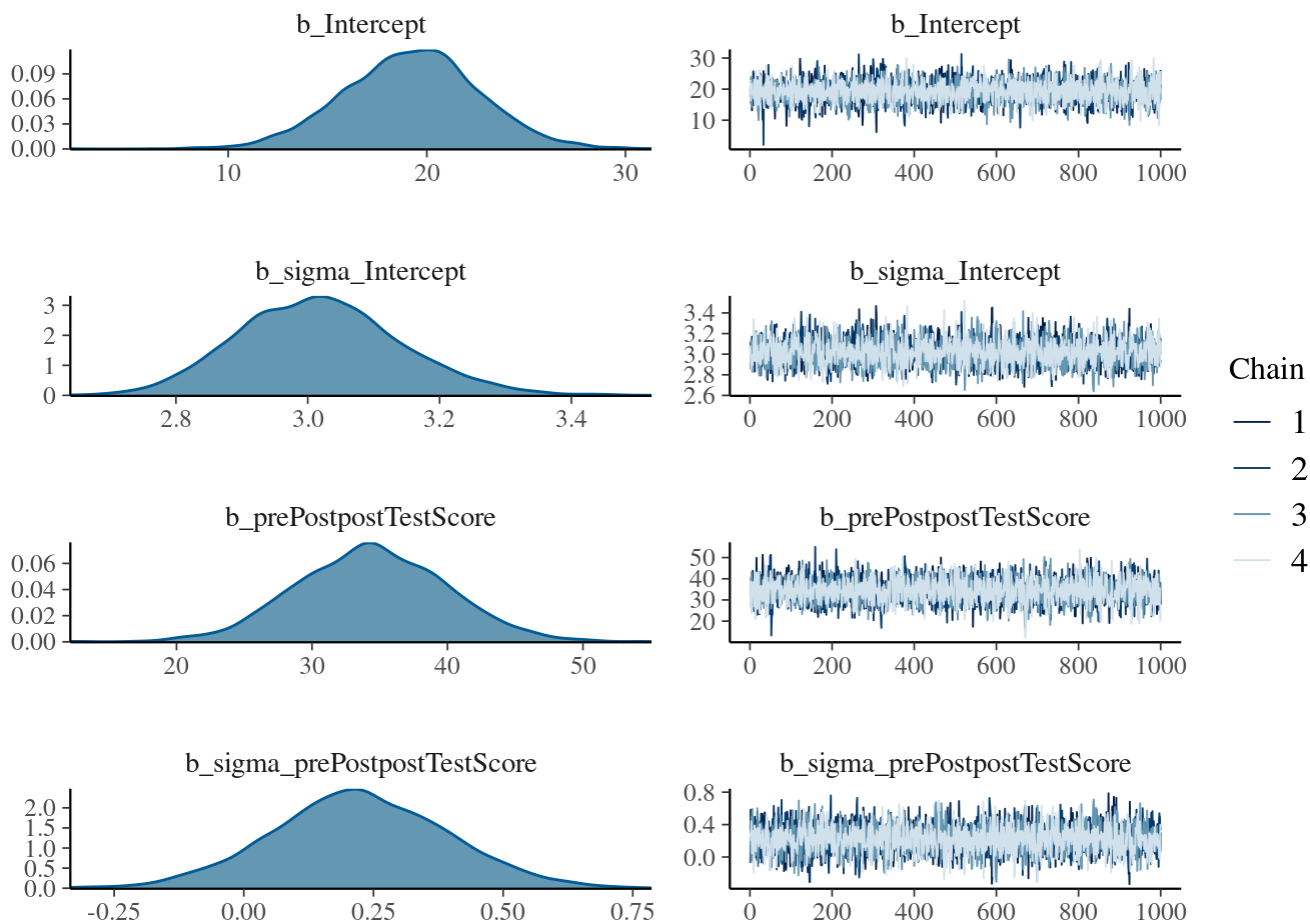
```

pc-linux-gnu-library/4.1/StanHeaders/include/stan/math/prim/mat/fun/Eigen.hpp' -D_REENTRANT -
DRCPP_PARALLEL_USE_TBB=1 -fpic -g -O2 -fdebug-prefix-map=/build/r-base-QwogzP/r-base-4.1
.1=. -fstack-protector-strong -Wformat -Werror=format-security -Wdate-time -D_FORTIFY_SOURCE=2
-g -c foo.c -o foo.o
## In file included from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/
Core:88,
## from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/
Dense:1,
## from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/stan
/math/prim/mat/fun/Eigen.hpp:13,
## from <command-line>:
## /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/src/Core/util/Macros.h
:628:1: error: unknown type name 'namespace'
## 628 | namespace Eigen {
## | ^~~~~~
## /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/src/Core/util/Macros.h
:628:17: error: expected '=', ',', ';', 'asm' or '__attribute__' before '{' token
## 628 | namespace Eigen {
## | ^
## In file included from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/
Dense:1,
## from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/stan
/math/prim/mat/fun/Eigen.hpp:13,
## from <command-line>:
## /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/Core:96:10: fatal erro
r: complex: No such file or directory
## 96 | #include <complex>
## | ^~~~~~
## compilation terminated.
## make: *** [/usr/lib/R/etc/Makeconf:168: foo.o] Error 1

```

```
## Start sampling
```

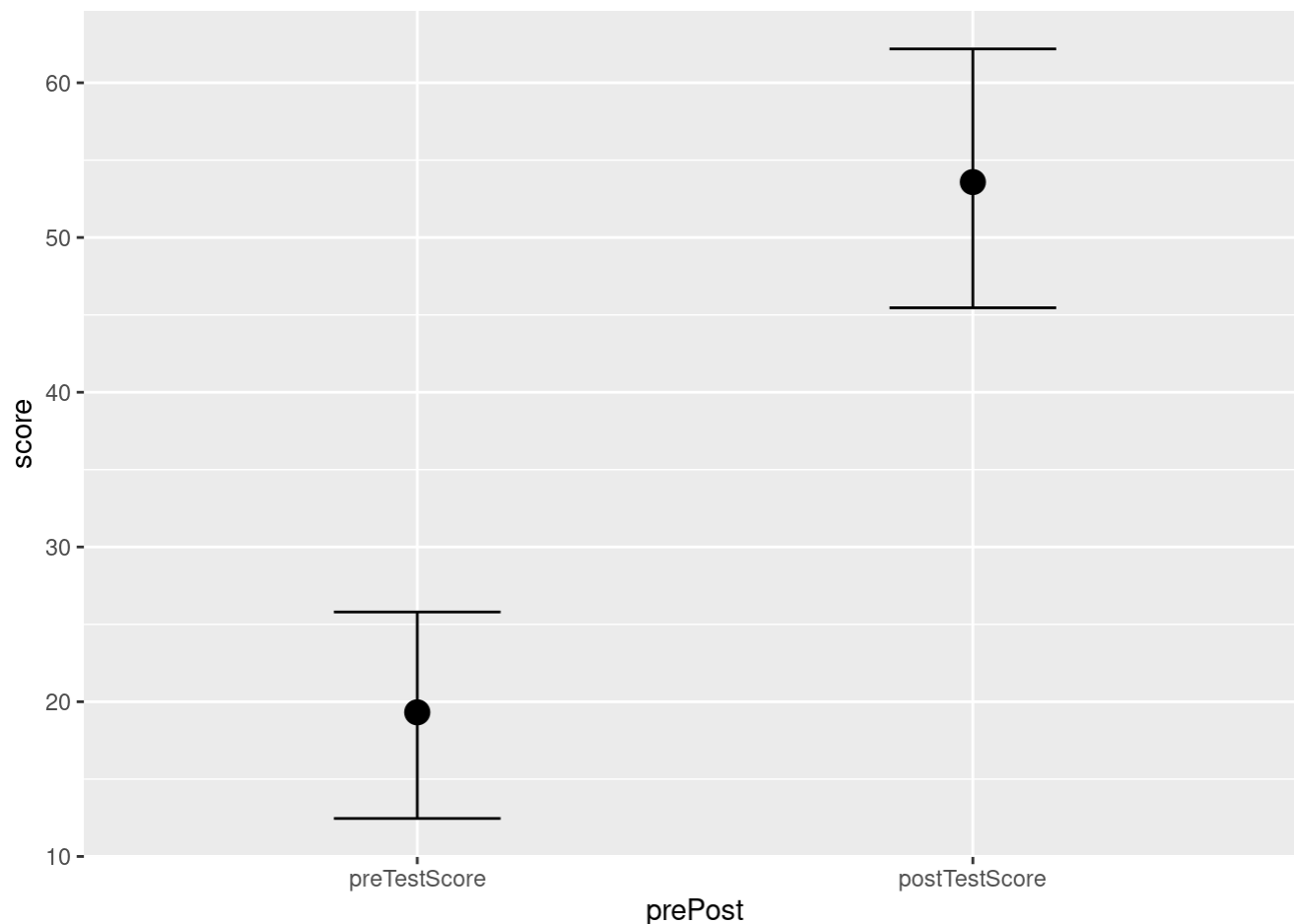
```
plot(hetVarBayesFit)
```



```
summary(hetVarBayesFit)
```

```
## Family: gaussian
## Links: mu = identity; sigma = log
## Formula: score ~ 1 + prePost
##          sigma ~ 1 + prePost
## Data: longFormData (Number of observations: 74)
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;
##        total post-warmup draws = 4000
##
## Population-Level Effects:
##              Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS
## Intercept          19.23      3.40   12.45   25.80 1.00    4180
## sigma_Intercept     3.02     0.12    2.79    3.27 1.00    3758
## prePostpostTestScore 34.40     5.52   23.68   45.36 1.00    3934
## sigma_prePostpostTestScore 0.22     0.17   -0.11    0.56 1.00    3869
##
##              Tail_ESS
## Intercept          3111
## sigma_Intercept     2921
## prePostpostTestScore 2746
## sigma_prePostpostTestScore 2645
##
## Draws were sampled using sampling(NUTS). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

```
conditional_effects(hetVarBayesFit)
```



## Bayesian linear model with t noise distribution (robust to outliers) and unequal variances

```
# display default prior values for the model
prior = get_prior(bf(score ~ 1 + prePost, sigma ~ 1 + prePost), data = longFormData, family =
student)
show(prior)
```

```
##           prior      class      coef group resp  dpar nlpar
##           (flat)         b              prePostpostTestScore
##           (flat)         b prePostpostTestScore
## student_t(3, 30.5, 33.4) Intercept
##           gamma(2, 0.1)      nu
##           (flat)         b              sigma
##           (flat)         b prePostpostTestScore      sigma
##           student_t(3, 0, 2.5) Intercept      sigma
## bound      source
##           default
##           (vectorized)
##           default
```

```
##          default
##      (vectorized)
##      (vectorized)
##          default
```

```
# model
hetVarBayesRobust = brm(
  bf(score ~ 1 + prePost, sigma ~ 1 + prePost),
  data = longFormData,
  cores = 4,
  family = student,
  prior = prior,
  chains = 4,
  iter = 2000,
  thin = 1,
  file = NULL # change this to save model output
)
```

```
## Compiling Stan program...
```

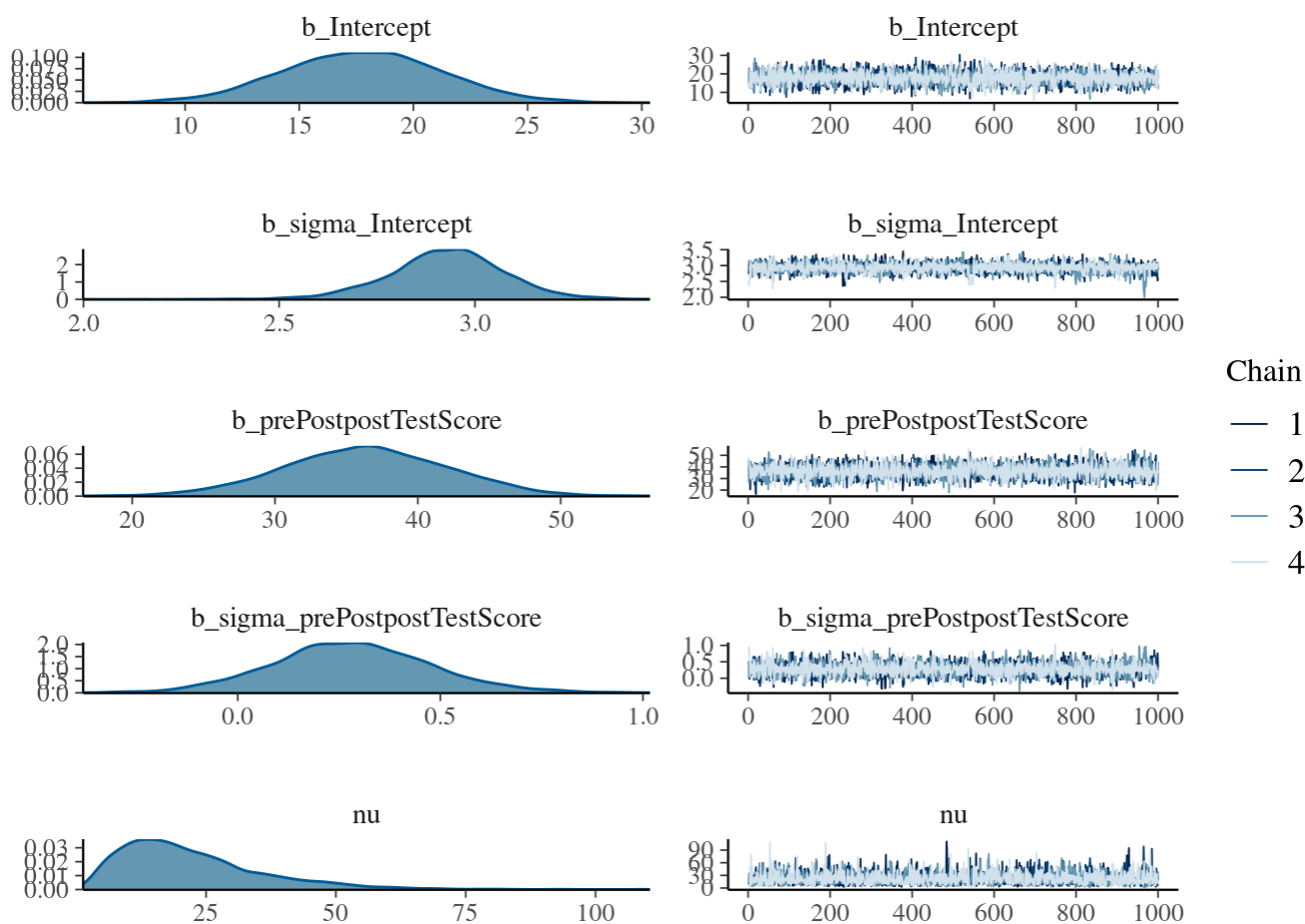
```
## Trying to compile a simple C file
```

```
## Running /usr/lib/R/bin/R CMD SHLIB foo.c
## gcc -std=gnu99 -I"/usr/share/R/include" -DNDEBUG -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/Rcpp/include/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/unsupported" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/BH/include" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/src/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppParallel/include/" -I"/home/brad/R/x86_64-pc-linux-gnu-library/4.1/rstan/include" -DEIGEN_NO_DEBUG -DBOOST_DISABLE_ASSERTS -DBOOST_PENDING_INTEGER_LOG2_HPP -DSTAN_THREADS -DBOOST_NO_AUTO_PTR -include '/home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/stan/math/prim/mat/fun/Eigen.hpp' -D_REENTRANT -DRCPP_PARALLEL_USE_TBB=1 -fpic -g -O2 -fdebug-prefix-map=/build/r-base-QwogzP/r-base-4.1.1=. -fstack-protector-strong -Wformat -Werror=format-security -Wdate-time -D_FORTIFY_SOURCE=2 -g -c foo.c -o foo.o
## In file included from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/Core:88,
##          from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/Dense:1,
##          from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/stan/math/prim/mat/fun/Eigen.hpp:13,
##          from <command-line>:
## /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/src/Core/util/Macros.h:628:1: error: unknown type name 'namespace'
##   628 | namespace Eigen {
##       | ^~~~~~
## /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/src/Core/util/Macros.h:628:17: error: expected '=', ',', ';', 'asm' or '__attribute__' before '{' token
##   628 | namespace Eigen {
##       |           ^
```

```
Dense:1,
##           from /home/brad/R/x86_64-pc-linux-gnu-library/4.1/StanHeaders/include/stan
/math/prim/mat/fun/Eigen.hpp:13,
##           from <command-line>:
## /home/brad/R/x86_64-pc-linux-gnu-library/4.1/RcppEigen/include/Eigen/Core:96:10: fatal erro
r: complex: No such file or directory
##    96 | #include <complex>
##       |         ^~~~~~
## compilation terminated.
## make: *** [/usr/lib/R/etc/Makeconf:168: foo.o] Error 1
```

```
## Start sampling
```

```
# Examine the chains
plot(hetVarBayesRobust)
```



```
summary(hetVarBayesRobust)
```

```
## Family: student
## Links: mu = identity; sigma = log; nu = identity
## Formula: score ~ 1 + prePost
##          sigma ~ 1 + prePost
## Data: longFormData (Number of observations: 74)
## Draws: 4 chains, each with iter = 2000; warmup = 1000; thin = 1;
```

```
##          total post-warmup draws = 4000
##
## Population-Level Effects:
##          Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS
## Intercept          17.76      3.46   11.00   24.49 1.00    4142
## sigma_Intercept     2.93      0.15    2.62    3.22 1.00    2304
## prePostpostTestScore 36.38     5.72   25.12   47.39 1.00    4020
## sigma_prePostpostTestScore 0.28     0.20   -0.10    0.69 1.00    3554
##
##          Tail_ESS
## Intercept           3012
## sigma_Intercept     1704
## prePostpostTestScore 3204
## sigma_prePostpostTestScore 2462
##
## Family Specific Parameters:
##          Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## nu      22.12     13.74    4.51   55.29 1.00    2596    1658
##
## Draws were sampled using sampling(NUTS). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

conditional\_effects(hetVarBayesRobust)

