

# Replication File Chapter 4

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## Packages and Data Preparation

### Packages

```
library(brms)
library(dplyr)

# run the following for two lines parallel estimation of brms models
# library(parallel)
# options(mc.cores = parallel::detectCores())

data_paper3_gles <- "../data/"

# load the data
# selected and clean variables from the original data, one subject is
# one observation
load(file = paste0(data_paper3_gles, "befragung_selection.Rda"))
# long dataframe with one subject-politican combination is one observation;
# used to estimate the models
load(file = paste0(data_paper3_gles, "befragung_per_candidate.Rda"))
```

### Model 4.1: All Politicians

```
# This code load the brms-object reported in the Dissertation. If you wish to
# estimate the model again, either change or remove the filename under the
# 'file = ' argument or run the code in comments below.
symp_brm_post_pos5 <- brm(
  symp_post_positive ~
    (1|symp_pre_positive + age_decades + a145 + match_id) +
    (0 + angst_dif + aversion_scale_dif + enth_scale_dif | follower_dummy) +
    female_dummy,
  data = filter(befragung_per_candidate, !name == "herrmann"),
  family=cumulative("logit"),
  control = list(adapt_delta = 0.999, max_treedepth = 15),
  iter = 6000,
  file = paste0(data_paper3_gles, "symp_brm_post_pos5"))

summary(symp_brm_post_pos5)
```

```

## Family: cumulative
## Links: mu = logit; disc = identity
## Formula: symp_post_positive ~ (1 | symp_pre_positive + age_decades + a145 + match_id) + (0 + angst_d
## Data: filter(befragung_per_candidate, !name == "herrmann (Number of observations: 590)
## Samples: 4 chains, each with iter = 6000; warmup = 3000; thin = 1;
## total post-warmup samples = 12000
##
## Group-Level Effects:
## ~a145 (Number of levels: 5)
## Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sd(Intercept) 0.24 0.27 0.01 0.94 1.00 4753 6128
##
## ~age_decades (Number of levels: 6)
## Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sd(Intercept) 0.19 0.17 0.01 0.62 1.00 4545 5065
##
## ~follower_dummy (Number of levels: 2)
## Estimate Est.Error 1-95% CI u-95% CI
## sd(angst_dif) 0.48 0.67 0.02 2.30
## sd(aversion_scale_dif) 0.88 0.88 0.14 3.29
## sd(enth_scale_dif) 0.99 0.89 0.23 3.37
## cor(angst_dif,aversion_scale_dif) 0.12 0.51 -0.84 0.93
## cor(angst_dif,enth_scale_dif) -0.14 0.50 -0.93 0.80
## cor(aversion_scale_dif,enth_scale_dif) -0.16 0.49 -0.93 0.78
## Rhat Bulk_ESS Tail_ESS
## sd(angst_dif) 1.00 4129 3653
## sd(aversion_scale_dif) 1.00 6265 7420
## sd(enth_scale_dif) 1.00 6312 7466
## cor(angst_dif,aversion_scale_dif) 1.00 8552 7601
## cor(angst_dif,enth_scale_dif) 1.00 9735 8209
## cor(aversion_scale_dif,enth_scale_dif) 1.00 9236 9594
##
## ~match_id (Number of levels: 187)
## Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sd(Intercept) 0.62 0.18 0.22 0.95 1.00 1986 1917
##
## ~symp_pre_positive (Number of levels: 11)
## Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sd(Intercept) 4.14 0.92 2.77 6.32 1.00 2717 5008
##
## Population-Level Effects:
## Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## Intercept[1] -4.80 0.92 -6.67 -3.05 1.00 2429 4717
## Intercept[2] -3.82 0.90 -5.64 -2.09 1.00 2401 4700
## Intercept[3] -2.71 0.89 -4.49 -0.99 1.00 2349 4696
## Intercept[4] -1.79 0.88 -3.54 -0.07 1.00 2328 4472
## Intercept[5] -1.15 0.88 -2.90 0.57 1.00 2330 4327
## Intercept[6] -0.06 0.87 -1.82 1.63 1.00 2306 4597
## Intercept[7] 1.20 0.88 -0.54 2.92 1.00 2313 4322
## Intercept[8] 2.83 0.89 1.04 4.59 1.00 2337 4329
## Intercept[9] 4.98 0.92 3.16 6.80 1.00 2383 4555
## Intercept[10] 7.40 0.97 5.46 9.30 1.00 2556 4790
## female_dummy 0.14 0.19 -0.24 0.52 1.00 12705 9716
##

```

```
## Family Specific Parameters:
##      Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## disc      1.00      0.00      1.00      1.00 1.00      12000      12000
##
## Samples were drawn 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).
```

[illegible]

```
##          (vectorized)
##          (unknown)
##          (vectorized)
##          (vectorized)
##          (vectorized)
##          (vectorized)
##          (vectorized)
##          (vectorized)
##          (vectorized)
##          (vectorized)
##          (vectorized)
##          (vectorized)
##          (vectorized)
##          (vectorized)
##          (vectorized)
```

```
rm(symp_brm_post_pos5)
```

```
# # estimate the model from scratch if you wish
# symp_brm_post_pos_new_estimation <- brm(symp_post_positive ~ (1/symp_pre_positive + age_decades + a14
#          data = filter(befragung_per_candidate, !name == "herrmann"),
#          family=cumulative("logit"),
#          control = list(adapt_delta = 0.999, max_treedepth = 15),
#          iter = 6000,
#          file = paste0(data_paper3_gles, "symp_brm_post_pos5_new_estimation"))
```

## Model 4.2: Merkel

```
# loading the object
symp_brm_post_pos_merkel <- brm(
  symp_post_positive ~
    (1|symp_pre_positive + age_decades + a145 + match_id) +
    (0 + angst_dif + aversion_scale_dif + enth_scale_dif | follower_dummy) +
    female_dummy,
  data = filter(befragung_per_candidate, name == "merkel"),
  family=cumulative("logit"),
  control = list(adapt_delta = 0.999, max_treedepth = 15),
  iter = 6000,
  file = paste0(data_paper3_gles, "symp_brm_post_pos_merkel"))

summary(symp_brm_post_pos_merkel)
```

```
## Family: cumulative
## Links: mu = logit; disc = identity
## Formula: symp_post_positive ~ (1 | symp_pre_positive + age_decades + a145 + match_id) + (0 + angst_d
## Data: filter(befragung_per_candidate, name == "merkel") (Number of observations: 180)
## Samples: 4 chains, each with iter = 6000; warmup = 3000; thin = 1;
##          total post-warmup samples = 12000
##
## Group-Level Effects:
## ~a145 (Number of levels: 5)
##          Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
```

```

## sd(Intercept)      0.47      0.52      0.01      1.85 1.00      4489      6473
##
## ~age_decades (Number of levels: 6)
##           Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sd(Intercept)      0.26      0.24      0.01      0.90 1.00      5555      6736
##
## ~follower_dummy (Number of levels: 2)
##
##           Estimate Est.Error 1-95% CI u-95% CI
## sd(angst_dif)      0.76      0.85      0.03      3.06
## sd(aversion_scale_dif) 1.67      1.53      0.04      5.37
## sd(enth_scale_dif)   0.91      0.90      0.06      3.42
## cor(angst_dif,aversion_scale_dif) -0.11      0.50     -0.92      0.85
## cor(angst_dif,enth_scale_dif) -0.02      0.51     -0.89      0.87
## cor(aversion_scale_dif,enth_scale_dif) -0.18      0.48     -0.93      0.78
##
##           Rhat Bulk_ESS Tail_ESS
## sd(angst_dif)      1.00      4552      5313
## sd(aversion_scale_dif) 1.00      3905      4932
## sd(enth_scale_dif)   1.00      5341      5376
## cor(angst_dif,aversion_scale_dif) 1.00      8821      7457
## cor(angst_dif,enth_scale_dif) 1.00      11007      8716
## cor(aversion_scale_dif,enth_scale_dif) 1.00      10003      8176
##
## ~match_id (Number of levels: 180)
##           Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sd(Intercept)      0.74      0.57      0.03      2.20 1.01      527      714
##
## ~symp_pre_positive (Number of levels: 11)
##           Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sd(Intercept)      4.48      1.19      2.82      7.37 1.00      1803      2223
##
## Population-Level Effects:
##           Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## Intercept[1]     -5.98      1.36     -9.02     -3.64 1.00      1472      1608
## Intercept[2]     -4.74      1.22     -7.37     -2.61 1.00      1742      2042
## Intercept[3]     -3.22      1.09     -5.54     -1.21 1.00      2704      3012
## Intercept[4]     -2.02      1.02     -4.11     -0.11 1.00      3526      4693
## Intercept[5]     -1.03      0.98     -3.01      0.85 1.00      3873      5107
## Intercept[6]      0.44      0.98     -1.47      2.40 1.00      3935      5811
## Intercept[7]      1.58      1.01     -0.34      3.65 1.00      3421      4337
## Intercept[8]      3.60      1.14      1.61      6.03 1.00      2176      2497
## Intercept[9]      5.40      1.30      3.21      8.29 1.00      1559      1611
## Intercept[10]     8.49      1.66      5.91     12.50 1.00      1158      1082
## female_dummy     -0.04      0.35     -0.73      0.65 1.00      9796      6798
##
## Family Specific Parameters:
##           Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## disc      1.00      0.00      1.00      1.00 1.00      12000      12000
##
## Samples were drawn 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).

```

```
prior_summary(symp_brm_post_pos_merkel)
```

[illegible]

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

```
rm(symp_brm_post_pos_merkel)
```

## Model 4.3: Schulz

```
symp_brm_post_pos_schulz <- brm(
  symp_post_positive ~
    (1|symp_pre_positive + age_decades + a145 + match_id) +
    (0 + angst_dif + aversion_scale_dif + enth_scale_dif | follower_dummy) +
    female_dummy,
  data = filter(befragung_per_candidate, name == "schulz"),
  family=cumulative("logit"),
  control = list(adapt_delta = 0.999, max_treedepth = 15),
  iter = 6000,
  file = paste0(data_paper3_gles, "symp_brm_post_pos_schulz"))

summary(symp_brm_post_pos_schulz)
```

```
## Family: cumulative
## Links: mu = logit; disc = identity
## Formula: symp_post_positive ~ (1 | symp_pre_positive + age_decades + a145 + match_id) + (0 + angst_d
## Data: filter(befragung_per_candidate, name == "schulz") (Number of observations: 179)
## Samples: 4 chains, each with iter = 6000; warmup = 3000; thin = 1;
##          total post-warmup samples = 12000
##
## Group-Level Effects:
## ~a145 (Number of levels: 5)
##          Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sd(Intercept)    0.55      0.52    0.02    1.88 1.00    3629    5011
##
## ~age_decades (Number of levels: 6)
##          Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sd(Intercept)    0.39      0.35    0.02    1.28 1.00    3521    5797
##
## ~follower_dummy (Number of levels: 2)
##
##          Estimate Est.Error 1-95% CI u-95% CI
## sd(angst_dif)      0.58      0.76    0.01    2.64
## sd(aversion_scale_dif) 1.81      1.37    0.26    5.26
## sd(enth_scale_dif)   0.82      0.87    0.06    3.17
## cor(angst_dif,aversion_scale_dif) 0.09      0.51   -0.85    0.91
## cor(angst_dif,enth_scale_dif) 0.01      0.51   -0.88    0.89
## cor(aversion_scale_dif,enth_scale_dif) -0.03      0.48   -0.87    0.84
##
##          Rhat Bulk_ESS Tail_ESS
## sd(angst_dif) 1.00    5267    6538
## sd(aversion_scale_dif) 1.00    4460    4071
## sd(enth_scale_dif) 1.00    4905    5203
```

```

## cor(angst_dif,aversion_scale_dif)      1.00      6668      7430
## cor(angst_dif,enth_scale_dif)          1.00      9337      8223
## cor(aversion_scale_dif,enth_scale_dif) 1.00      9714      9041
##
## ~match_id (Number of levels: 179)
##      Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sd(Intercept)      1.26      0.75      0.08      2.91 1.01      419      843
##
## ~symp_pre_positive (Number of levels: 11)
##      Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sd(Intercept)      4.88      1.44      2.80      8.39 1.00      962      2175
##
## Population-Level Effects:
##      Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## Intercept[1]      -5.59      1.46     -8.95     -3.17 1.00      1158      1553
## Intercept[2]      -4.62      1.33     -7.58     -2.32 1.00      1434      2003
## Intercept[3]      -3.55      1.20     -6.18     -1.37 1.00      1885      2433
## Intercept[4]      -2.68      1.12     -5.05     -0.58 1.00      2345      2821
## Intercept[5]      -1.96      1.08     -4.18      0.11 1.00      2756      3208
## Intercept[6]      -0.26      1.06     -2.28      1.90 1.00      2755      4164
## Intercept[7]       1.18      1.13     -0.86      3.64 1.00      1426      2230
## Intercept[8]       2.82      1.30      0.64      5.79 1.01      871      1616
## Intercept[9]       5.39      1.66      2.81      9.34 1.01      622      1215
## Intercept[10]      8.06      2.12      4.93     13.16 1.01      565      1102
## female_dummy       0.20      0.39     -0.56      1.01 1.00      8186      5307
##
## Family Specific Parameters:
##      Estimate Est.Error 1-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## disc      1.00      0.00      1.00      1.00 1.00     12000     12000
##
## Samples were drawn 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).

```

```
prior_summary(symp_brm_post_pos_schulz)
```

```

##      prior      class      coef      group resp dpar
##      (flat)      b
##      (flat)      b      female_dummy
## student_t(3, 0, 2.5) Intercept
## student_t(3, 0, 2.5) Intercept      1
## student_t(3, 0, 2.5) Intercept     10
## student_t(3, 0, 2.5) Intercept      2
## student_t(3, 0, 2.5) Intercept      3
## student_t(3, 0, 2.5) Intercept      4
## student_t(3, 0, 2.5) Intercept      5
## student_t(3, 0, 2.5) Intercept      6
## student_t(3, 0, 2.5) Intercept      7
## student_t(3, 0, 2.5) Intercept      8
## student_t(3, 0, 2.5) Intercept      9
## lkj_corr_cholesky(1)      L
## lkj_corr_cholesky(1)      L      follower_dummy
## student_t(3, 0, 2.5)      sd
## student_t(3, 0, 2.5)      sd      a145

```





```
non_angry_merkel <- befragung_per_candidate %>%
  filter(name == "merkel" & follower_dummy == 1 & aversion_scale_dif<=0) %>%
  select(schlechte_seiten_post, angst_dif)
```

```
# t-test
```

```
t.test(angry_merkel$angst_dif, non_angry_merkel$angst_dif, alternative = "g")
```

```
##
```

```
## Welch Two Sample t-test
```

```
##
```

```
## data: angry_merkel$angst_dif and non_angry_merkel$angst_dif
```

```
## t = 2.0901, df = 4.2085, p-value = 0.05069
```

```
## alternative hypothesis: true difference in means is greater than 0
```

```
## 95 percent confidence interval:
```

```
## -0.008096411      Inf
```

```
## sample estimates:
```

```
## mean of x mean of y
```

```
## 1.40000000 -0.03571429
```

```
# Schulz Partisans, who are more angry -> take negative sides and fear
```

```
angry_schulz <- befragung_per_candidate %>%
```

```
  filter(name == "schulz" & follower_dummy == 1 & aversion_scale_dif>0) %>%
```

```
  select(schlechte_seiten_post, gute_seiten_post, angst_dif)
```

```
# Schulz Partisans, who are less or same angry -> take negative sides and fear
```

```
non_angry_schulz <- befragung_per_candidate %>%
```

```
  filter(name == "schulz" & follower_dummy == 1 & aversion_scale_dif<=0) %>%
```

```
  select(schlechte_seiten_post, gute_seiten_post, angst_dif)
```

```
# t-test
```

```
t.test(angry_schulz$angst_dif, non_angry_schulz$angst_dif, alternative = "g")
```

```
##
```

```
## Welch Two Sample t-test
```

```
##
```

```
## data: angry_schulz$angst_dif and non_angry_schulz$angst_dif
```

```
## t = 1.2383, df = 23, p-value = 0.1141
```

```
## alternative hypothesis: true difference in means is greater than 0
```

```
## 95 percent confidence interval:
```

```
## -0.09601903      Inf
```

```
## sample estimates:
```

```
## mean of x mean of y
```

```
## 0.00      -0.25
```

## Print Negative Sides Angry Merkel Follower

```
angry_merkel$schlechte_seiten_post
```

```
## [1] "Nicht ehrlich, redet viel ohne etwas zusagen nicht authentisch"
```

```
## [2] "um den heißen Brei herumreden"
```

```
## [3] "sehr schlecht in solchen Duellen hebt sich nicht ab zu konservativ"  
## [4] "gelegentlich nicht konservativ genug"  
## [5] "Hält mit Entscheidungen zurück. Zu unternehmerfreundlich"
```

## Negative Sides Angry Schulz Follower

```
angry_schulz$schlechte_seiten_post
```

```
## [1] "kampflustig fällt der Kanzlerin ins Wort kommt bei seinen Aussagen nicht auf den Punkt"  
## [2] "aufbrausend"  
## [3] "keine"  
## [4] "/"  
## [5] "-99 keine Angabe"
```