HW 9 Template

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Introduction

Research Question

Is there difference in student evaluation rating for native and non-native English-speaking instructors?

Method

Variables

- `profevaluation`: evaluation rating of the instructor: 1 (very unsatisfactory) to 5 (excellent)
- `nonenglish`: 1 = non-native English speakers, 0 = native-English speakers

Variable Summary

Table 1 shows the summary statistics of evaluationg ratings by groups.

Model

Let Y = profevaluation, G = nonenglish

Model:

$$Y_{i,G=0} \sim N(\mu_1, \sigma_1)$$

$$Y_{i,G=1} \sim N(\mu_2, \sigma_2)$$

Prior:

$$\mu_1 \sim N(3, 2)$$

$$\mu_2 \sim N(3, 2)$$

$$\sigma_1 \sim N^+(0, 2)$$

$$\sigma_2 \sim N^+(0, 2)$$

Running Stan

We used 4 chains, each with 4,000 iterations (first 2,000 as warm-ups).

Results

As shown in the rank histograms (Vehtari et al., 2021) in Figure 1, the chains mixed well.

Table 2 shows the posterior distributions of μ_1, μ_2, σ_1, σ_2, and $\mu_2 - \mu_1$.

The analysis showed that on average, non-native speaking instructors received a lower evaluation rating than native speaker instructors, with a posterior mean of -0.25 and a 90% CI of [-0.40, -0.10].

References

Vehtari, A., Gelman, A., Simpson, D., Carpenter, B., & Bürkner, P.-C. (2021). Rank-normalization, folding, and localization: An improved R^ for assessing convergence of MCMC (with discussion). *Bayesian Analysis*, *16*(2). https://doi.org/10.1214/20-BA1221

Table 1

Summary Statistics

		Native	Non-Native
profevaluation	N	435	28
	Mean	4.19	3.94
	SD	0.55	0.43
	Min	2.30	3.40
	Max	5.00	4.80

SD = standard deviation

Table 2

Posterior summary of model parameters.

variable	mean	median	sd	mad	q5	q95	rhat	ess_bulk	ess_tail
mu1	4.19	4.19	0.03	0.03	4.15	4.23	1.00	9,815.02	5,526.92
mu2	3.94	3.94	0.09	0.09	3.79	4.09	1.00	8,060.94	5,497.07
sigma1	0.55	0.55	0.02	0.02	0.52	0.58	1.00	9,254.43	6,005.89
sigma2	0.46	0.45	0.07	0.06	0.36	0.57	1.00	8,234.16	5,538.75
mu2 - mu1	-0.25	-0.25	0.09	0.09	-0.40	-0.10	1.00	7,760.00	5,688.86

Note. sd = standard deviation. ess = effective sample size.

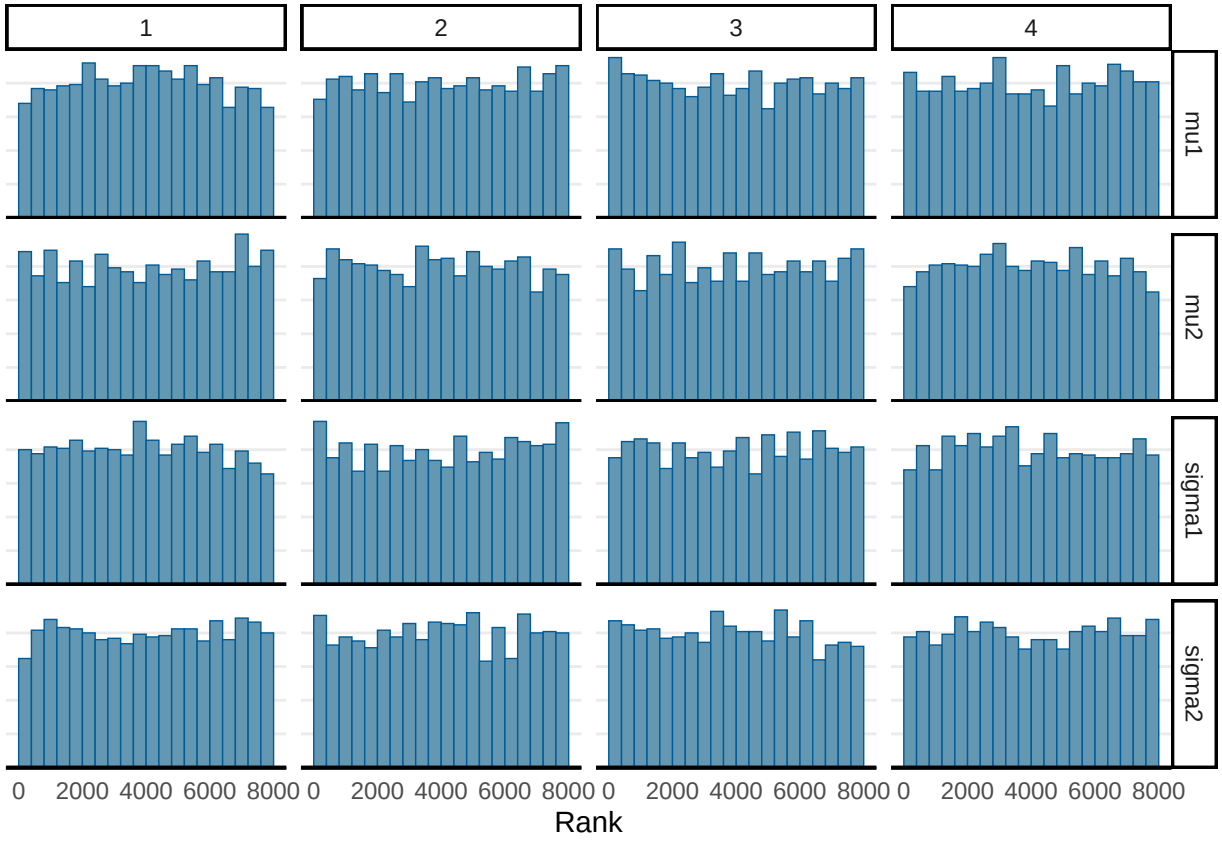

Figure 1

Rank histograms showing convergence of the MCMC chains.