Appendix to Paper: Arms, Alliances and Alliance Treaty Design

Joshua Alley*

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1 HMC Diagnostics

There were no divergent iterations in the run of 4 chains for 2,000 iterations in either sample. The $\hat{R}$ is less than 1.1 for all parameters in both samples.

Trace plots in Figure 1 and Figure 2 indicate good mixing of the chains for the alliance-level parameters.

2 Posterior Intervals

I do not present tabular summaries of all the alliance-level parameters in the manuscript for parsimony. The next two tables summarize the posteriors of the alliance-level parameters. The use of 90% credible intervals implies there is a 90% chance the coefficient is between the 5% and 95% values. Because Hypotheses 1 and 2 are directional, I report the positive and negative posterior probabilities in the manuscript.

*Graduate Student, Department of Political Science, Texas A&M University.

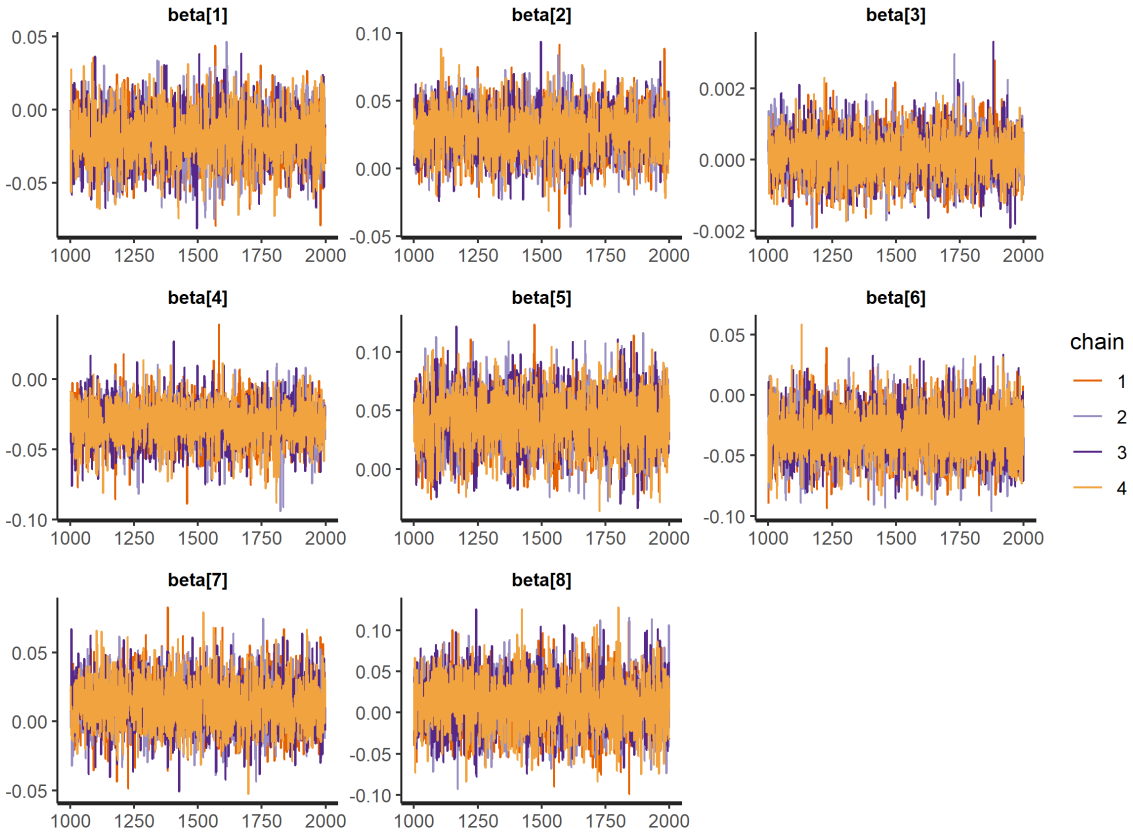

Figure 1: Traceplot of alliance level parameters in the non-major power sample.

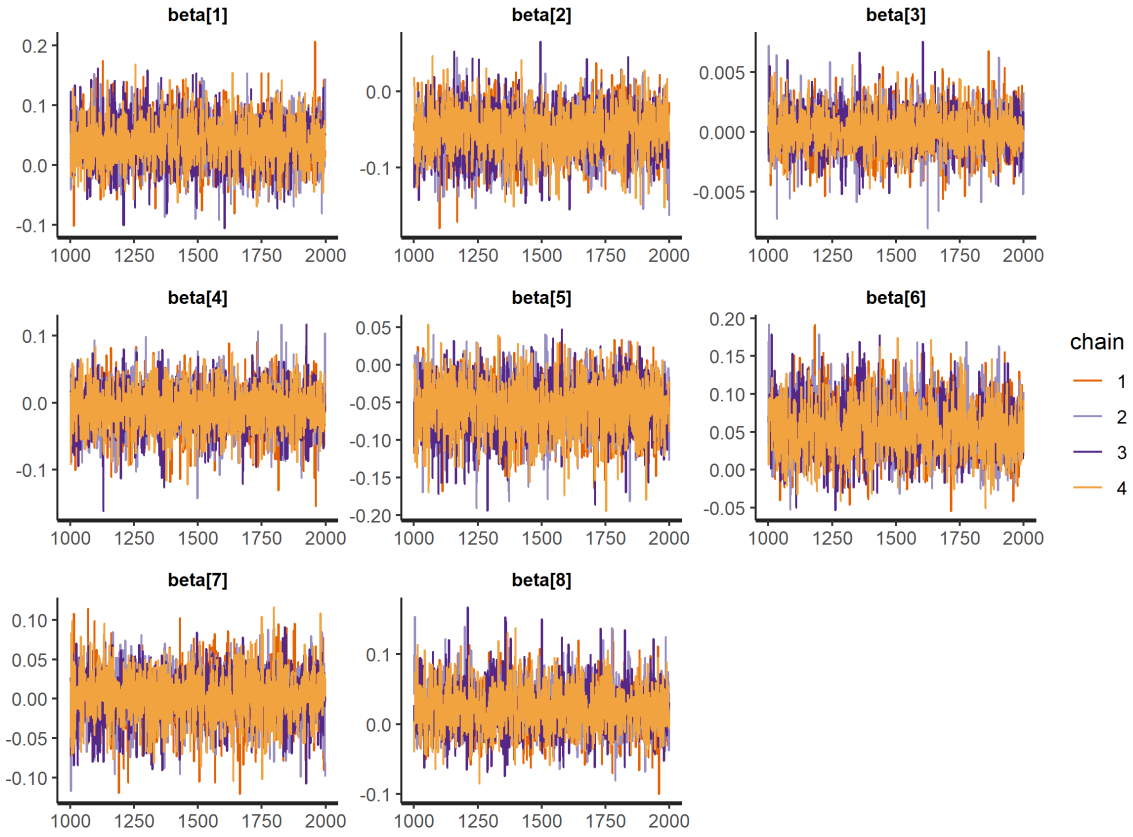

Figure 2: Traceplot of alliance level parameters in the major power sample.

2.1 Major Powers

Table 1 summarizes the 90% credible intervals for the alliance parameters in the major power sample, as well as the number of effective samples and $\hat{R}$ for each marginal posterior.[1] σ Alliances is the variance hyperparameter for the λ estimates.

The $\hat{R}$ statistics are all close to one, indicating convergence. The number of effective samples is adequate for most parameters.

	mean	S.D.	5%	95%	n_eff	$\hat{R}$
Constant	0.038	0.038	-0.025	0.102	3380.954	1.000
Latent Str.	-0.054	0.031	-0.107	-0.005	3278.923	1.000
Number Members	0.000	0.002	-0.003	0.003	4000.000	0.999
Democratic Membership	-0.009	0.033	-0.065	0.042	4000.000	1.000
Wartime	-0.057	0.035	-0.115	-0.001	4000.000	1.001
Asymmetric	0.053	0.035	0.001	0.115	2218.509	1.000
US Member	0.002	0.031	-0.051	0.051	4000.000	1.000
USSR Member	0.023	0.033	-0.028	0.079	4000.000	1.000
σ Alliances	0.066	0.029	0.019	0.117	599.081	1.007

Table 1: 90% Credible intervals for major power alliance-level parameters

2.2 Non-major Powers

Table 2 summarize the 90% credible intervals for the alliance-level regression parameters in the non-major power sample. The $\hat{R}$ statistics are all close to one, indicating convergence. The number of effective samples is adequate for all parameters.

[1] I report 90% credible intervals because 95% interval estimates can be unstable.

	mean	sd	5%	95%	n_eff	$\hat{R}$
Constant	-0.018	0.018	-0.047	0.012	2211.374	1.000
Latent Str.	0.026	0.017	-0.002	0.054	2191.382	1.000
Number Members	0.000	0.001	-0.001	0.001	4000.000	1.000
Democratic Membership	-0.031	0.015	-0.056	-0.009	3213.621	1.000
Wartime	0.041	0.023	0.002	0.078	4000.000	1.000
Asymmetric	-0.031	0.021	-0.065	0.003	4000.000	0.999
US Member	0.013	0.018	-0.016	0.042	2895.419	1.000
USSR Member	0.011	0.031	-0.041	0.062	4000.000	1.000
σ Alliances	0.014	0.009	0.002	0.030	1254.268	1.001

Table 2: 90% Credible intervals non-major power alliance-level parameters