

Supplementary Material

Monte Carlo uncertainty summaries for the BSEM robustness simulation (core scenarios S1--S8).

These tables quantify Monte Carlo uncertainty in performance measures reported in the main manuscript. RMSE intervals are bootstrap 95% intervals obtained by resampling replications within each scenario (B=8000). Coverage Monte Carlo standard errors (MCSE) are binomial standard errors computed as $\sqrt{p(1-p)/R}$ with R=50.

Table S1. RMSE with bootstrap 95% intervals

Scenario	n	Error	rho	RMSE(a1) [CI]	RMSE(a2) [CI]	RMSE(b) [CI]	RMSE(IE1) [CI]	RMSE(IE2) [CI]	RMSE(rho) [CI]
S1	22	Normal	0.30	0.228 [0.185, 0.271]	0.263 [0.202, 0.320]	0.217 [0.169, 0.265]	0.124 [0.102, 0.144]	0.143 [0.103, 0.182]	0.219 [0.149, 0.293]
S2	22	Normal	0.80	0.394 [0.301, 0.489]	0.421 [0.322, 0.519]	0.209 [0.163, 0.254]	0.191 [0.150, 0.234]	0.214 [0.147, 0.275]	0.061 [0.046, 0.076]
S3	22	t(5)	0.30	0.263 [0.222, 0.301]	0.233 [0.188, 0.275]	0.232 [0.162, 0.304]	0.128 [0.103, 0.153]	0.137 [0.115, 0.159]	0.201 [0.153, 0.248]
S4	22	t(5)	0.80	0.429 [0.350, 0.504]	0.403 [0.323, 0.478]	0.218 [0.153, 0.284]	0.205 [0.157, 0.251]	0.222 [0.180, 0.261]	0.067 [0.051, 0.082]
S5	75	Normal	0.30	0.139 [0.112, 0.164]	0.109 [0.092, 0.127]	0.095 [0.075, 0.115]	0.079 [0.062, 0.095]	0.061 [0.048, 0.075]	0.103 [0.083, 0.122]
S6	75	Normal	0.80	0.212 [0.174, 0.249]	0.181 [0.152, 0.209]	0.092 [0.073, 0.110]	0.112 [0.089, 0.132]	0.093 [0.077, 0.110]	0.036 [0.029, 0.042]
S7	75	t(5)	0.30	0.120 [0.096, 0.142]	0.124 [0.096, 0.150]	0.088 [0.074, 0.102]	0.072 [0.060, 0.083]	0.069 [0.056, 0.083]	0.103 [0.083, 0.122]
S8	75	t(5)	0.80	0.183 [0.151, 0.215]	0.186 [0.142, 0.231]	0.089 [0.072, 0.104]	0.097 [0.081, 0.113]	0.097 [0.075, 0.120]	0.036 [0.027, 0.045]

Table S2. Coverage with Monte Carlo standard errors

Scenario	n	Error	rho	Cov(a1) (MCSE)	Cov(a2) (MCSE)	Cov(b) (MCSE)	Cov(IE1) (MCSE)	Cov(IE2) (MCSE)	Cov(rho) (MCSE)
S1	22	Normal	0.30	0.98 (0.020)	0.94 (0.034)	0.94 (0.034)	0.98 (0.020)	0.90 (0.042)	0.96 (0.028)
S2	22	Normal	0.80	0.98 (0.020)	0.96 (0.028)	0.96 (0.028)	0.98 (0.020)	0.96 (0.028)	0.94 (0.034)
S3	22	t(5)	0.30	0.94 (0.034)	0.98 (0.020)	0.96 (0.028)	0.98 (0.020)	1.00 (0.000)	0.98 (0.020)
S4	22	t(5)	0.80	0.92 (0.038)	0.98 (0.020)	0.96 (0.028)	0.98 (0.020)	0.96 (0.028)	0.96 (0.028)
S5	75	Normal	0.30	0.94 (0.034)	0.98 (0.020)	0.96 (0.028)	0.92 (0.038)	0.94 (0.034)	0.92 (0.038)
S6	75	Normal	0.80	0.94 (0.034)	1.00 (0.000)	0.96 (0.028)	0.92 (0.038)	1.00 (0.000)	0.94 (0.034)
S7	75	t(5)	0.30	0.94 (0.034)	0.98 (0.020)	0.98 (0.020)	0.96 (0.028)	0.96 (0.028)	0.90 (0.042)
S8	75	t(5)	0.80	0.98 (0.020)	0.98 (0.020)	0.96 (0.028)	0.98 (0.020)	0.98 (0.020)	0.94 (0.034)