

Simulation Results

2026-02-02

Simulation Setup

This simulation is performed with $n = 30$ and $d = 5$, using the 2-d lattice as the underlying graph. $s = 2$ parameters are set to be nonzero, and the beta parameter is chosen to be $\beta = 0$. The attached results are for a 3-replication simulation. The parameter vector θ has sparse components other than the following:

Parameter.Index	Value
2	-0.707
4	-0.707

but for brevity, our simulation only estimates the indices of θ in $\mathcal{C} = \{2, 4, 1, 3\}$ elements of θ . Accordingly, **all statistics and visuals are indicative of performance only on the set \mathcal{C} .**

The results from our code are compared to those of Cai, Guo, and Ma (2021).

The attached results include the mean-squared error for each parameter estimate, as well as boxplots for a selection of nonzero and zero-valued parameters. In the boxplots, the green line represents the true value of the estimated parameter.

After these, I show coverage statistics for 95% symmetric confidence intervals for each of the parameters.

Results

Mean-squared error comparison

Table 1: Mean-Squared Error of Parameter Estimates

	proposed	cgm
theta[2]	1.491	0.278
theta[4]	2.747	0.114
theta[1]	0.283	0.010
theta[3]	0.334	0.098
total	1.214	0.125

Table 2: Mean-Squared Error of First-Step Parameter Estimates

	proposed	cgm
theta[2]	1.157	0.173
theta[4]	2.318	0.178
theta[1]	0.000	0.001
theta[3]	0.122	0.000
total	0.899	0.088

proposed	cgm
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Mean absolute deviation comparison $\frac{1}{n.\text{sim}} \sum_{i=1}^{n.\text{sim}} \frac{1}{|\mathcal{C}|} |\hat{\theta}_i - \theta|$

Table 3: Mean Absolute Deviation of Parameter Estimates

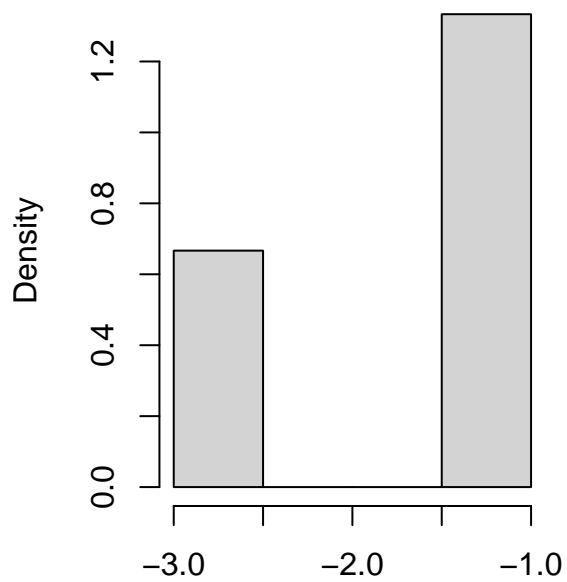
	proposed	cgm
theta[2]	1.015	0.395
theta[4]	1.625	0.334
theta[1]	0.431	0.090
theta[3]	0.557	0.268
total	0.907	0.272

Table 4: Mean Absolute Deviation of First-Step Parameter Estimates

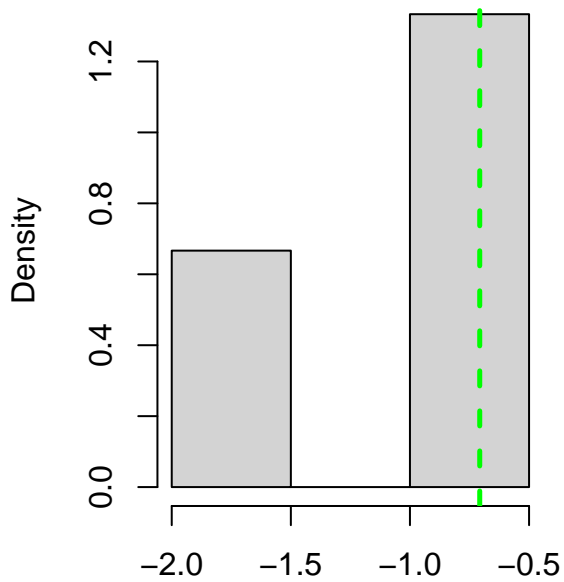
	proposed	cgm
theta[2]	0.857	0.401
theta[4]	1.272	0.414
theta[1]	0.000	0.022
theta[3]	0.202	0.000
total	0.583	0.209

Boxplots

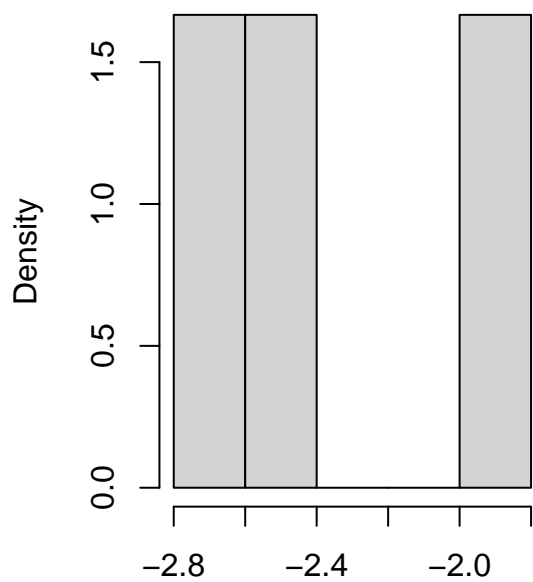
Histogram of proposed estimates for $\theta[2] = -0.707$



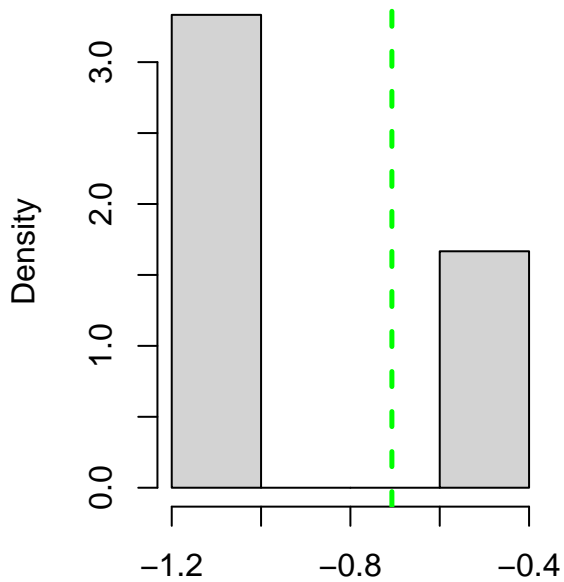
Histogram of cgm estimates for $\theta[2] = -0.707$

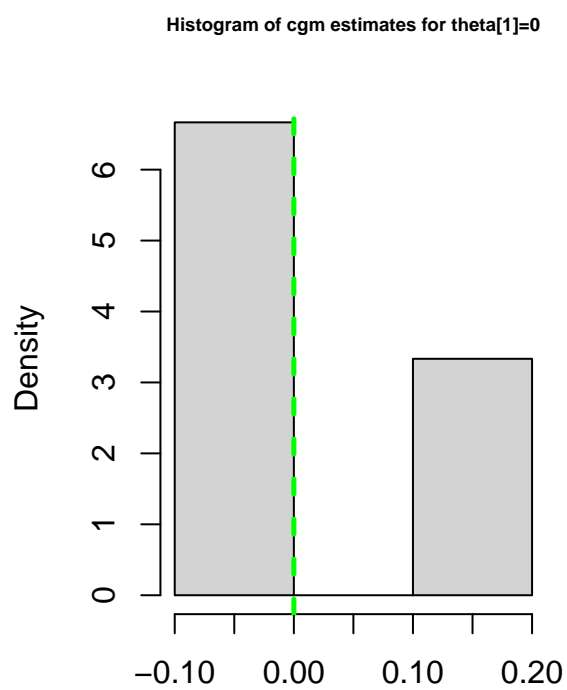
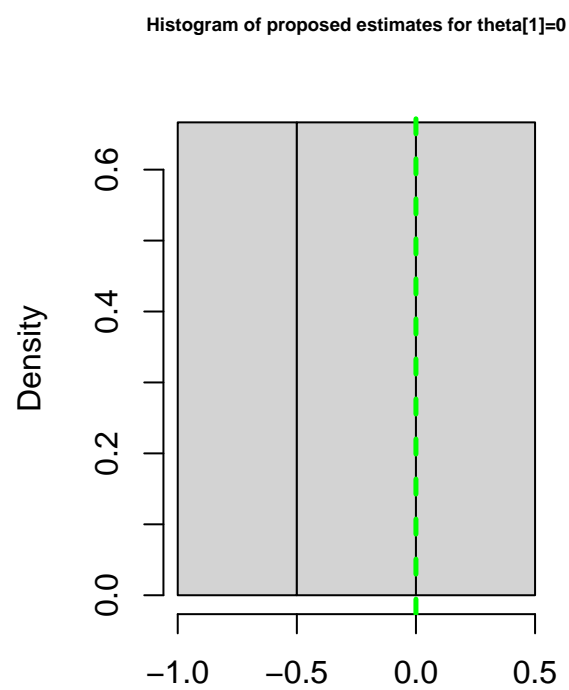


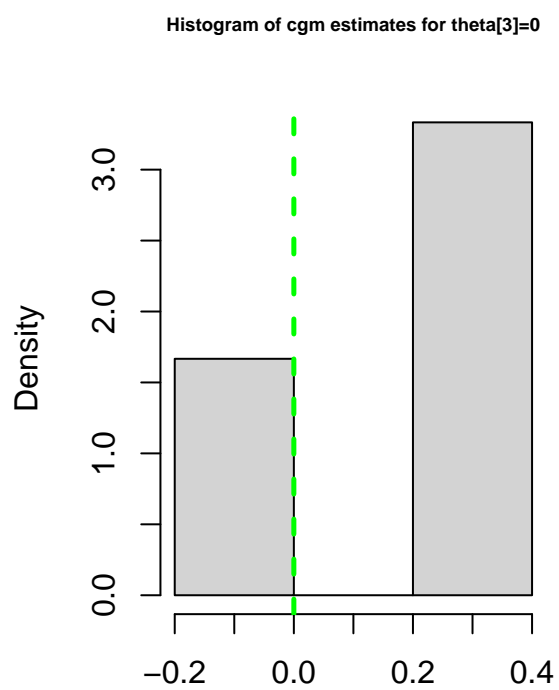
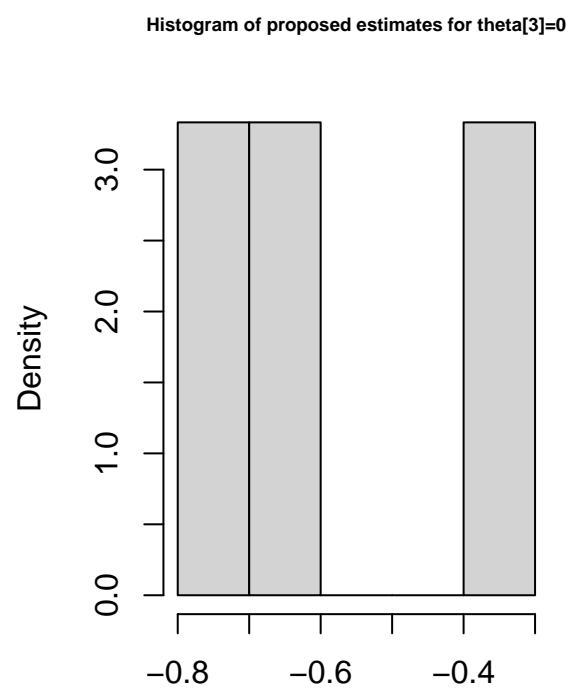
Histogram of proposed estimates for $\theta[4] = -0.707$



Histogram of cgm estimates for $\theta[4] = -0.707$







Statistics and 95% Confidence Intervals from per-Replicate Estimates

Statistics for Theoretical 95% Confidence Intervals