Simulation Results

2026-02-02

Simulation Setup

This simulation is performed with $n = 10$ and $d = 4$, 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 2-replication simulation. The parameter vector θ has sparse components other than the following:

Parameter.Index	Value
1	-0.707
3	-0.707

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

The results from our code are not augmented with any comparison method here.

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
theta[1]	0.285
theta[3]	0.741
theta[2]	4.233
theta[4]	0.281
total	1.385

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

	proposed
theta[1]	0.500
theta[3]	0.462
theta[2]	0.320
theta[4]	0.802
total	0.521

proposed

Mean absolute deviation comparison $(\frac{1}{n.sim}\sum_{i=1}^{n.sim} \frac{1}{|\mathcal C|}\|\hat

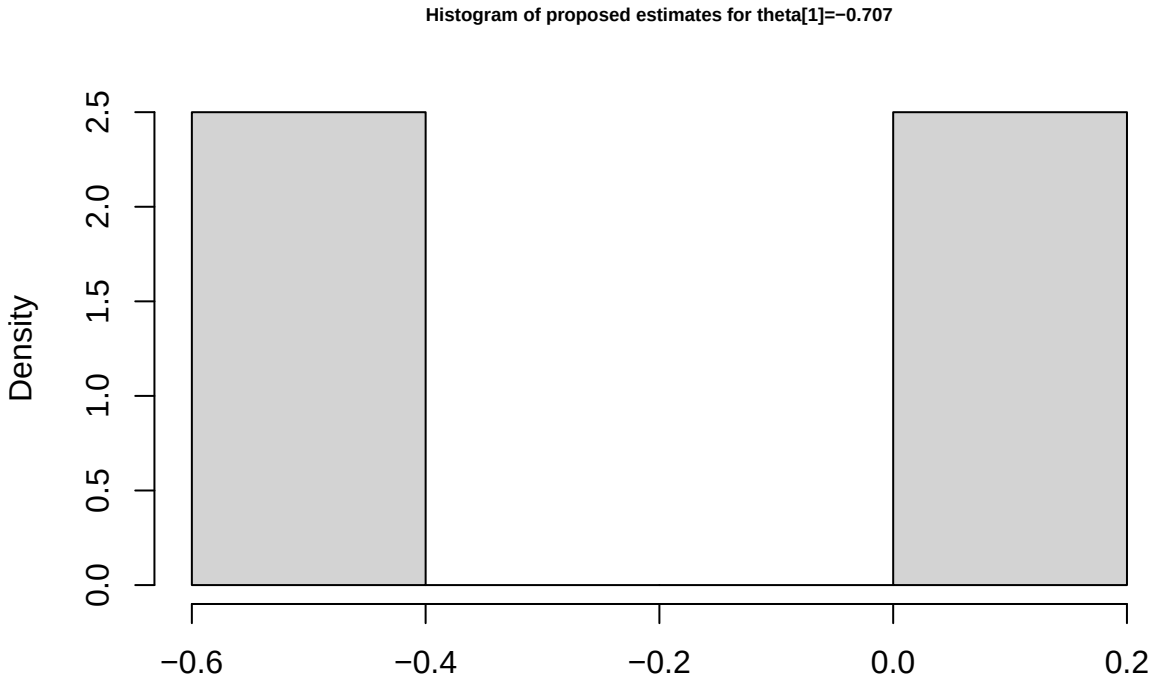
Table 3: Mean Absolute Deviation of Parameter Estimates

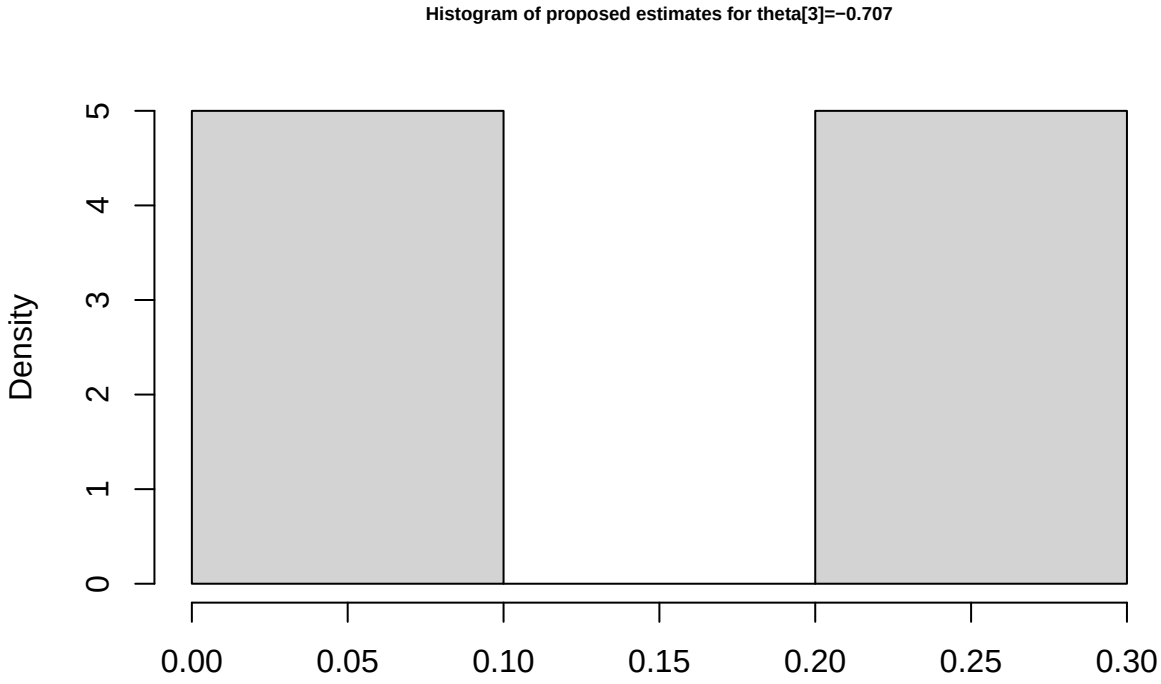
	proposed
theta[1]	0.482
theta[3]	0.849
theta[2]	1.853
theta[4]	0.479
total	0.916

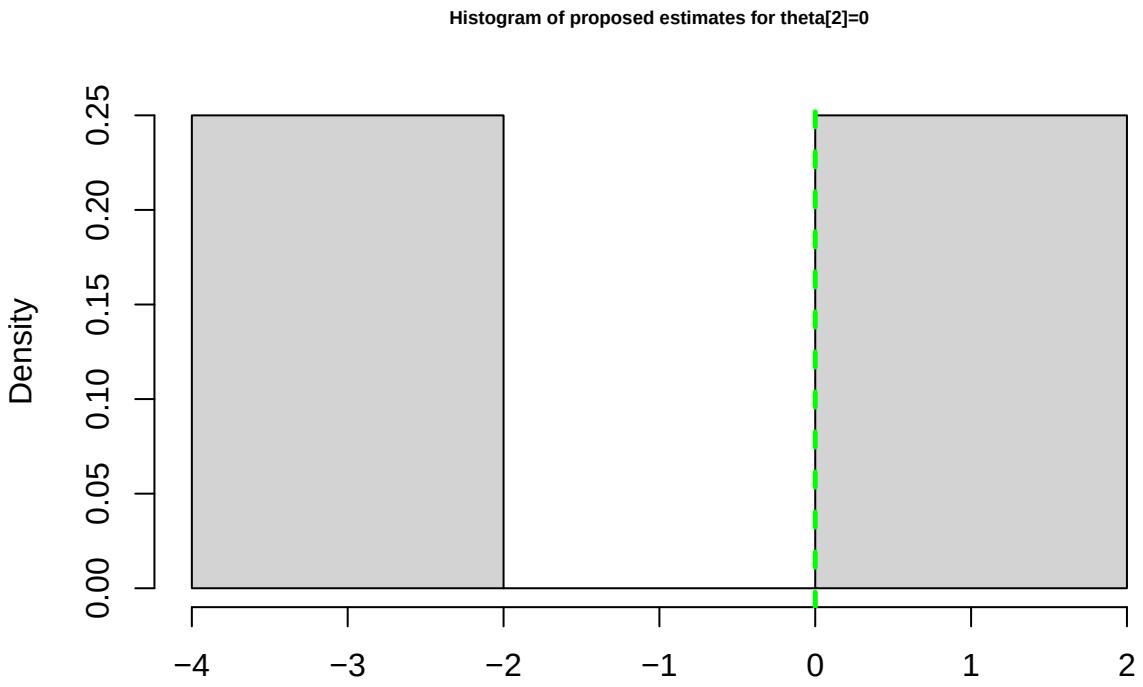
Table 4: Mean Absolute Deviation of First-Step Parameter Estimates

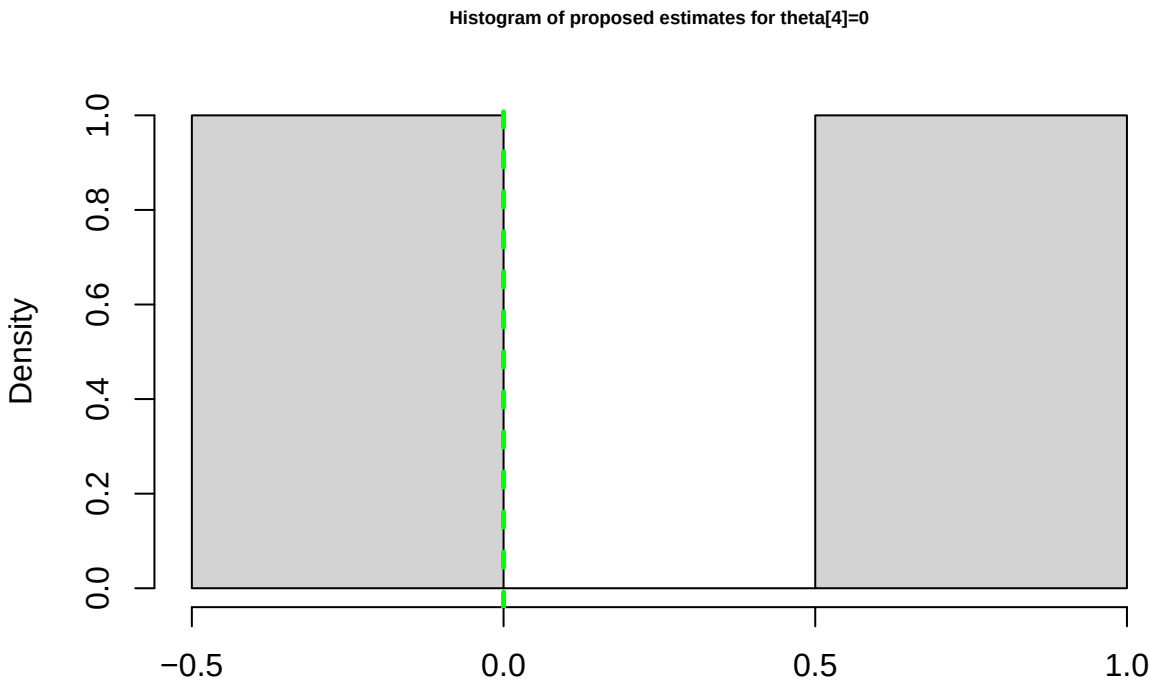
	proposed
theta[1]	0.707
theta[3]	0.679
theta[2]	0.400
theta[4]	0.703
total	0.622

Boxplots


Histogram of proposed estimates for theta[1]=−0.707
Density
0.0
0.5
1.0
1.5
2.0
2.5
−0.6
−0.4
−0.2
0.0
0.2


Histogram of proposed estimates for theta[3]=−0.707
Density
0
1
2
3
4
5
0.00
0.05
0.10
0.15
0.20
0.25
0.30


Histogram of proposed estimates for theta[2]=0
Density
0.00
0.05
0.10
0.15
0.20
0.25
−4
−3
−2
−1
0
1
2


Histogram of proposed estimates for theta[4]=0
Density
0.0
0.2
0.4
0.6
0.8
1.0
−0.5
0.0
0.5
1.0

Statistics and 95% Confidence Intervals from per-Replicate Estimates

Statistics for Theoretical 95% Confidence Intervals

Table 5: Theoretical 95% Confidence Interval Statistics (averaged across replications) for proposed Estimates

	Estimate	SE	lower.CI	upper.CI	cvg
theta[1]	-0.225	0.157	-0.533	0.084	0.5
theta[3]	0.142	0.275	-0.397	0.682	0.0
theta[2]	-0.894	0.536	-1.946	0.157	0.0
theta[4]	0.228	0.466	-0.686	1.141	1.0