Supplementary Materials for "A Regression Tree Method for Longitudinal and Clustered Data with Multivariate Responses"

A Additional results for simpler bivariate tree

A.1 Object-level PMSE for all of the competitor methods

We present the full results for all of the methods in Figures 1–4 here for completeness. It is clear from the results that the RE-EM methods always outperform the linear methods and the non-longitudinal tree method.

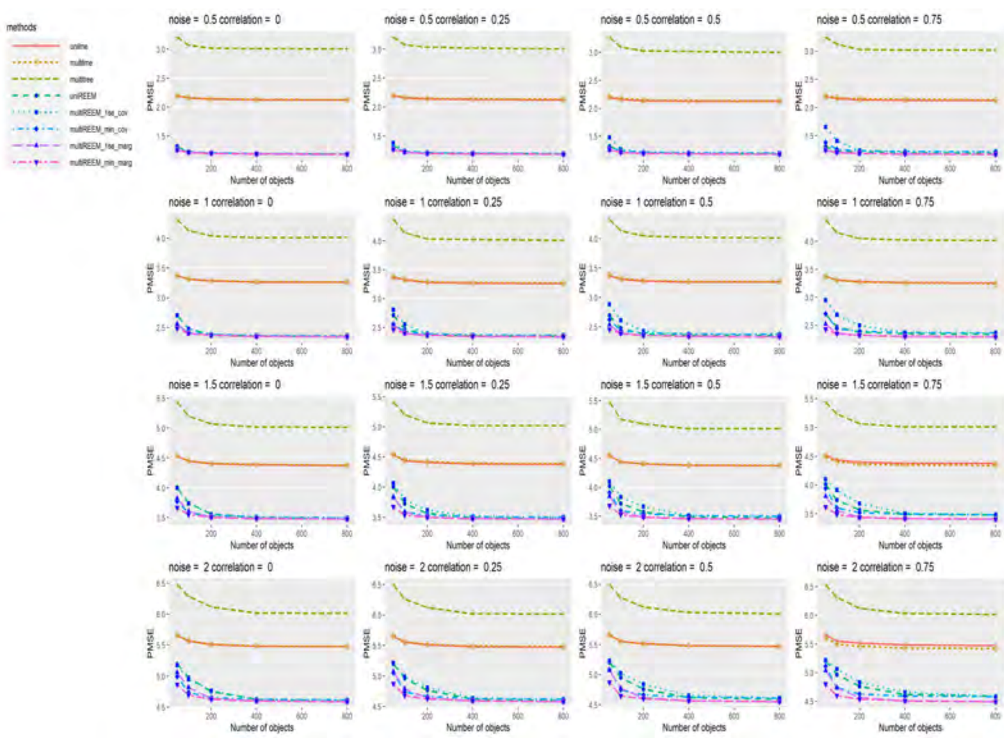

Figure 1: PMSE in object for $T_i = 5$ for the simpler bivariate tree structure.

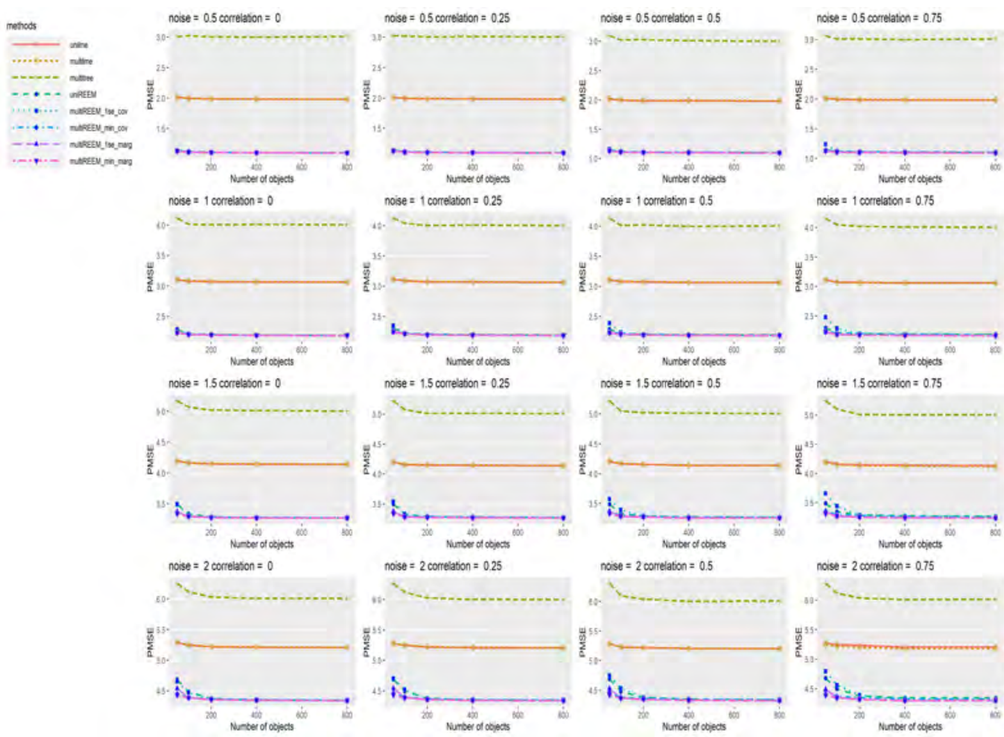

Figure 2: PMSE in object for $T_i = 10$ for the simpler bivariate tree structure.

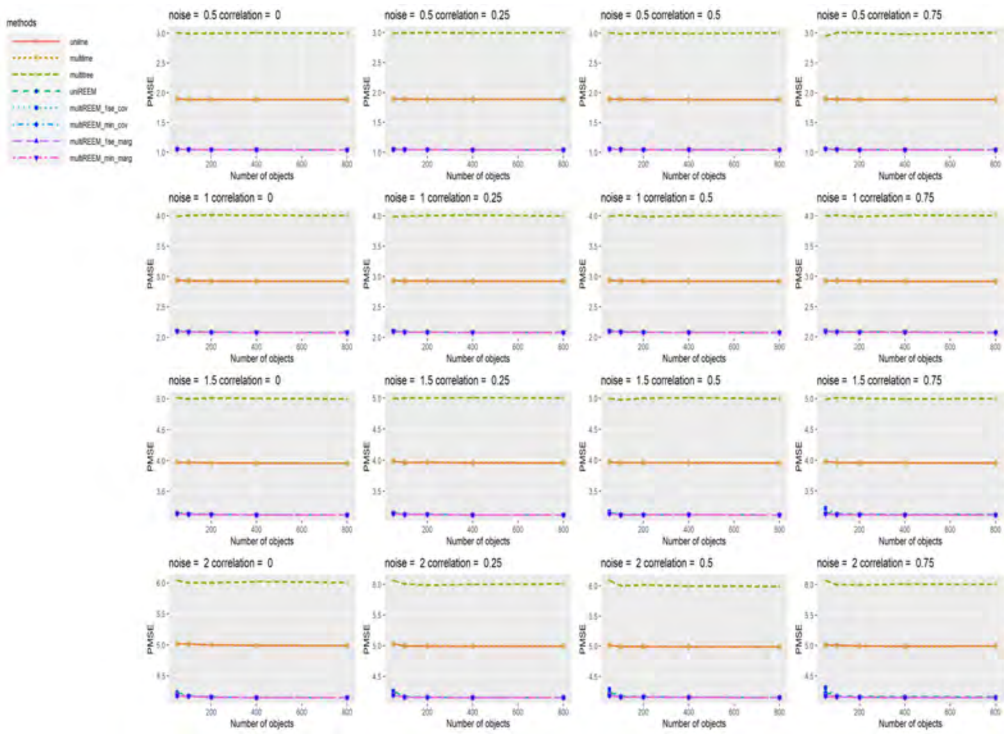

Figure 3: PMSE in object for $T_i = 25$ for the simpler bivariate tree structure..

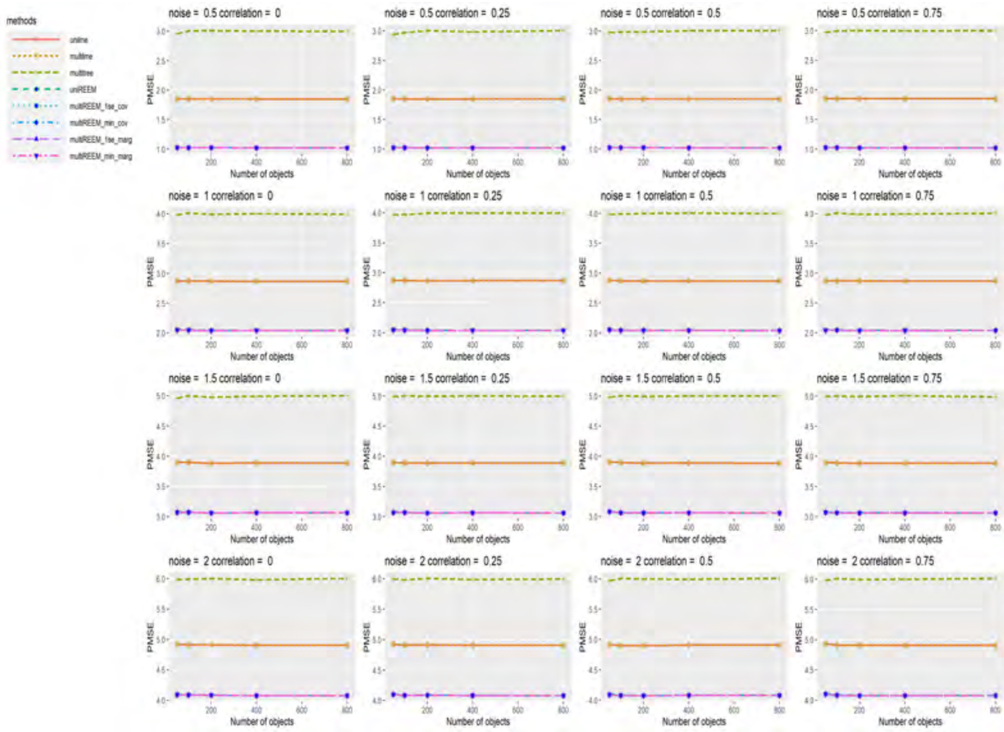

Figure 4: PMSE in object for $T_i = 50$ for the simpler bivariate tree structure..

A.2 Fixed Effects Estimation and Random Effects Prediction

Figures 5–12 summarize the Estimation Mean Squared Error for the fixed effects and the Prediction Mean Squared Error for the random effects in the simpler bivariate tree setting. The Multivariate RE-EM tree method always estimates the fixed effects slightly better than "uniREEM", although their recovering rates are almost the same. This indicates that separate univariate RE-EM trees are able to recover the tree structure correctly but cannot estimate the true values on each terminal node as well as the Multivariate RE-EM tree. For the random effects, the Multivariate RE-EM tree also performs no worse than "uniREEM", and it significantly outperforms "uniREEM" as the noise or the correlation increases.

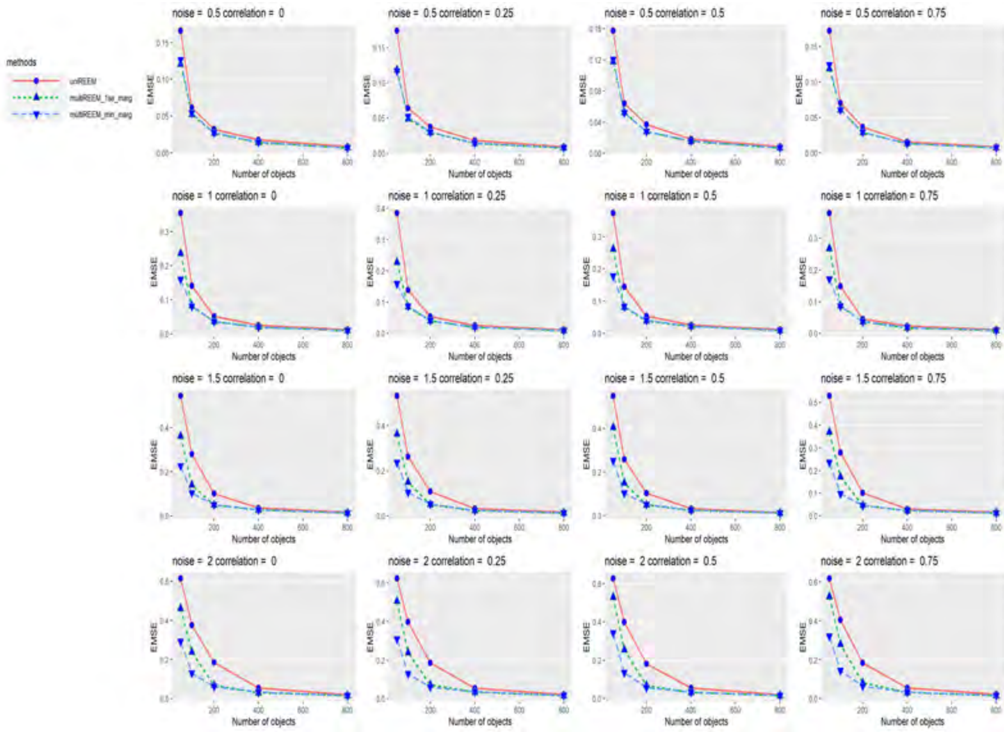

Figure 5: Estimation Mean Squared Error for fixed effects with $T_i = 5$

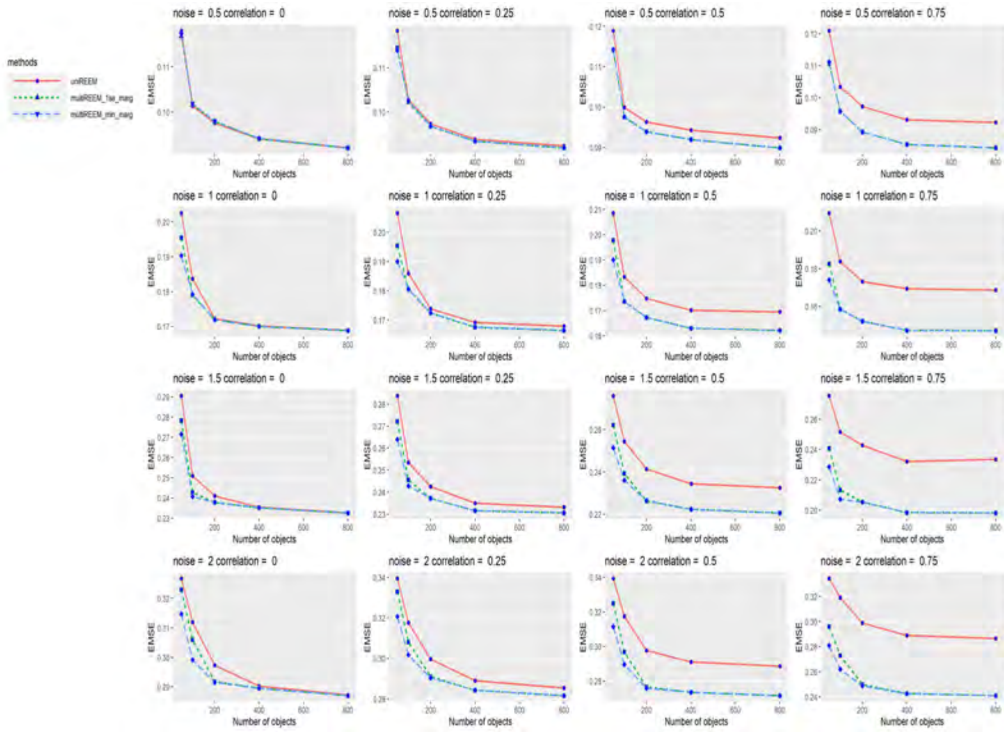

Figure 6: Prediction Mean Squared Error for random effects with $T_i = 5$

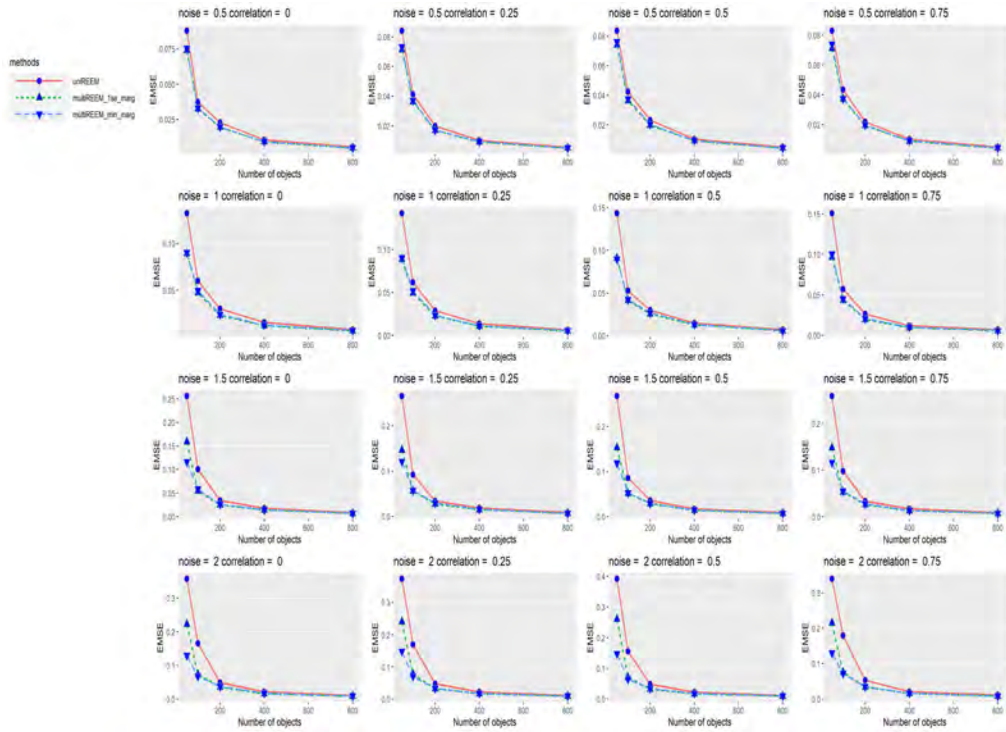

Figure 7: Estimation Mean Squared Error for fixed effects with $T_i = 10$

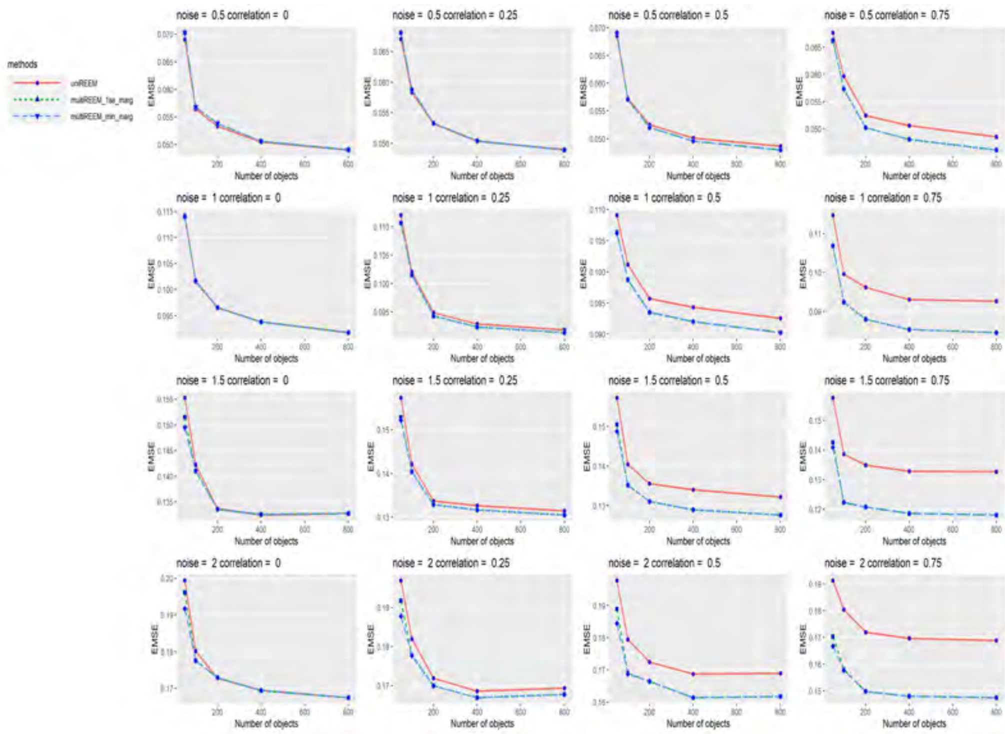

Figure 8: Prediction Mean Squared Error for random effects with $T_i = 10$

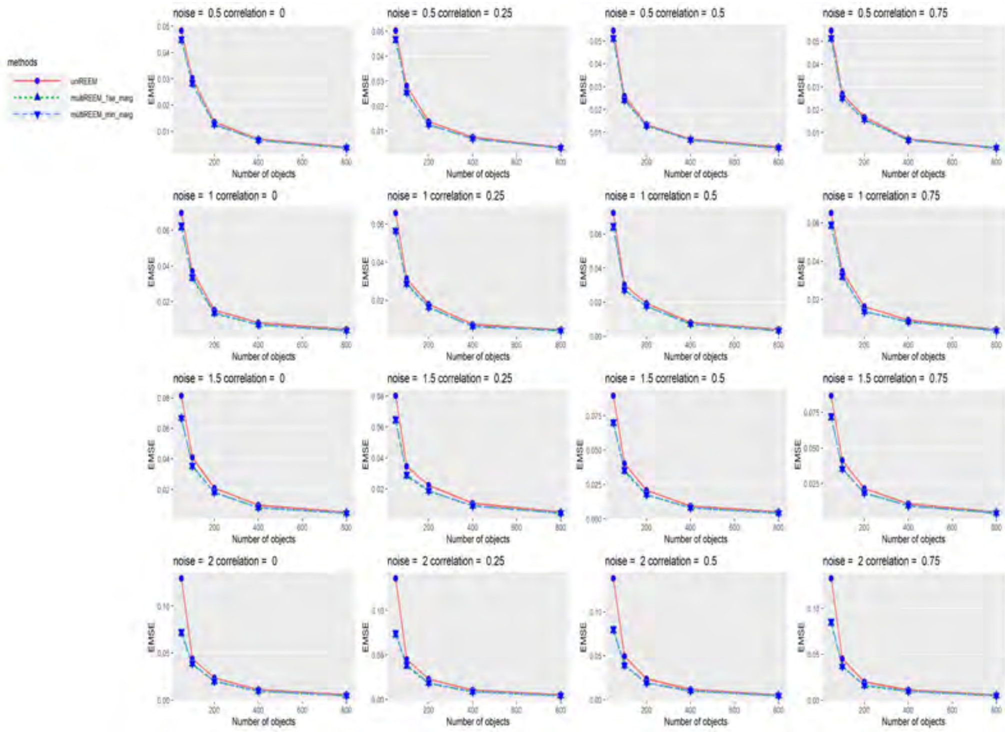

Figure 9: Estimation Mean Squared Error for fixed effects with $T_i = 25$

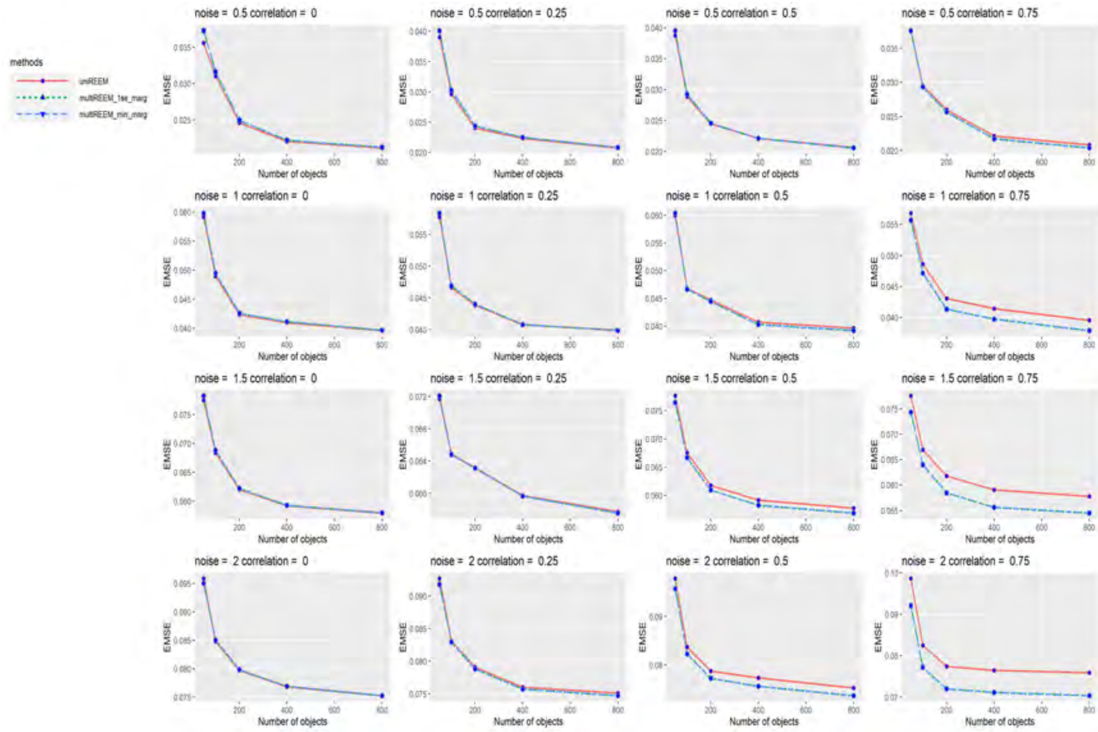

Figure 10: Prediction Mean Squared Error for random effects with $T_i = 25$

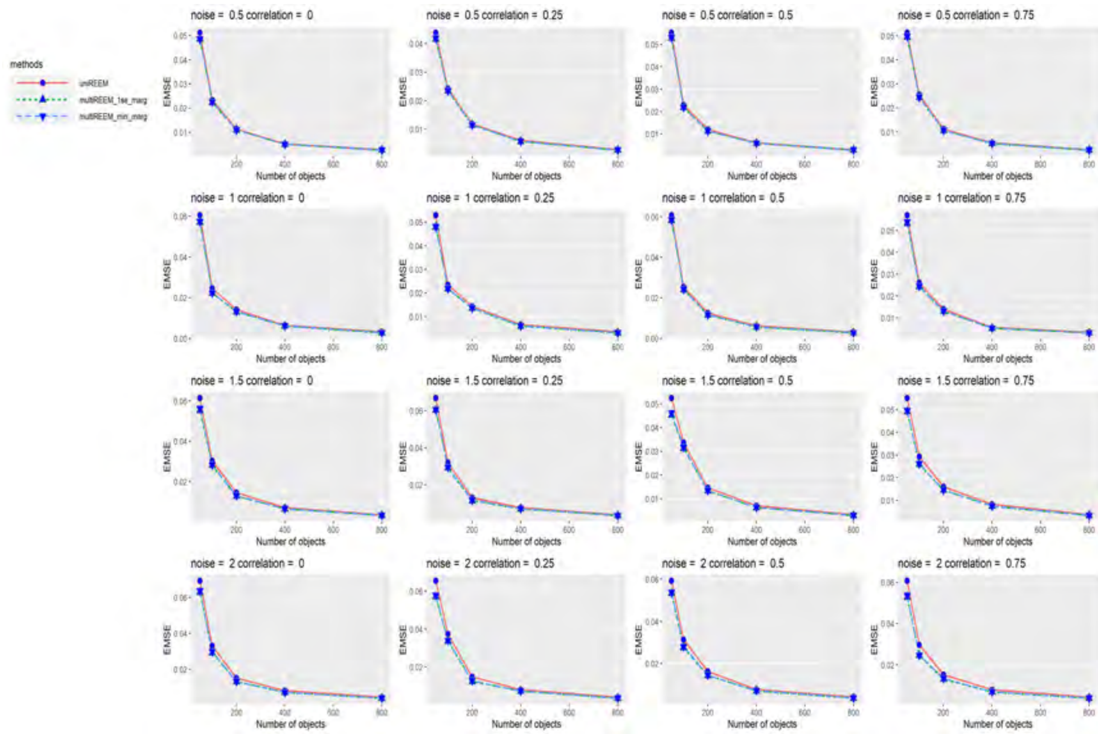

Figure 11: Estimation Mean Squared Error for fixed effects with $T_i = 50$

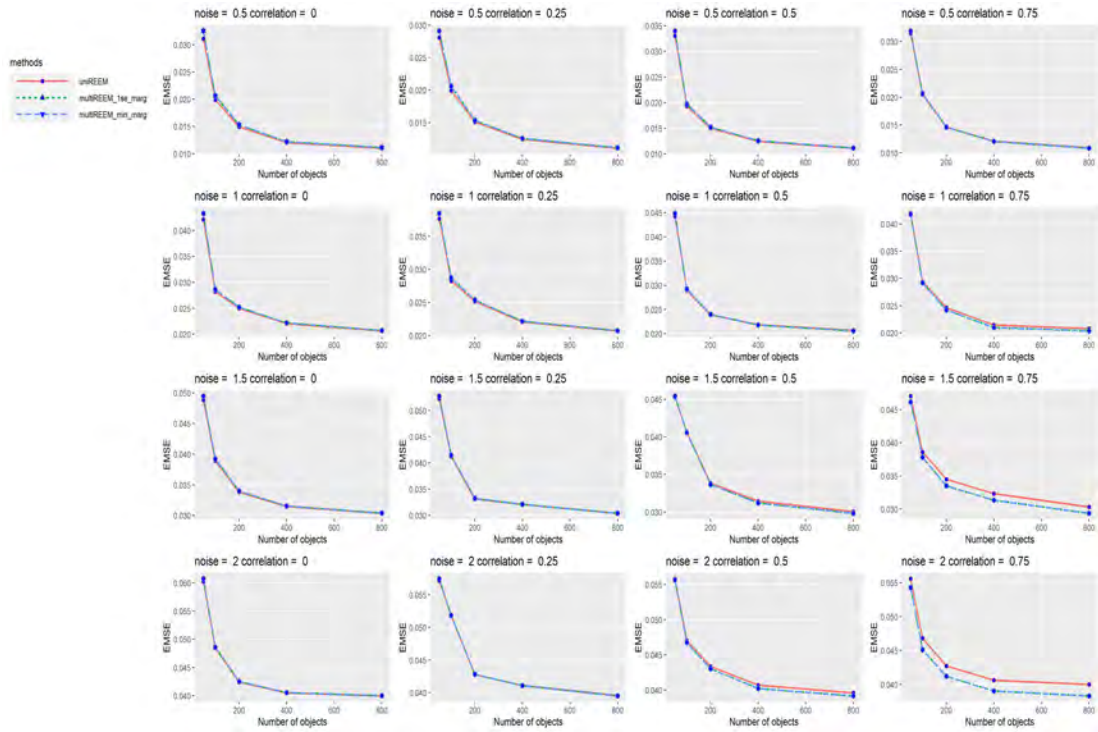

Figure 12: Prediction Mean Squared Error for random effects with $T_i = 50$

B Additional results for the complex bivariate tree structure

The PMSEs and the tree recovering rates for $T_i = 10, 25, 50$ with the complex bivariate tree structure are shown in Figures 13–18.

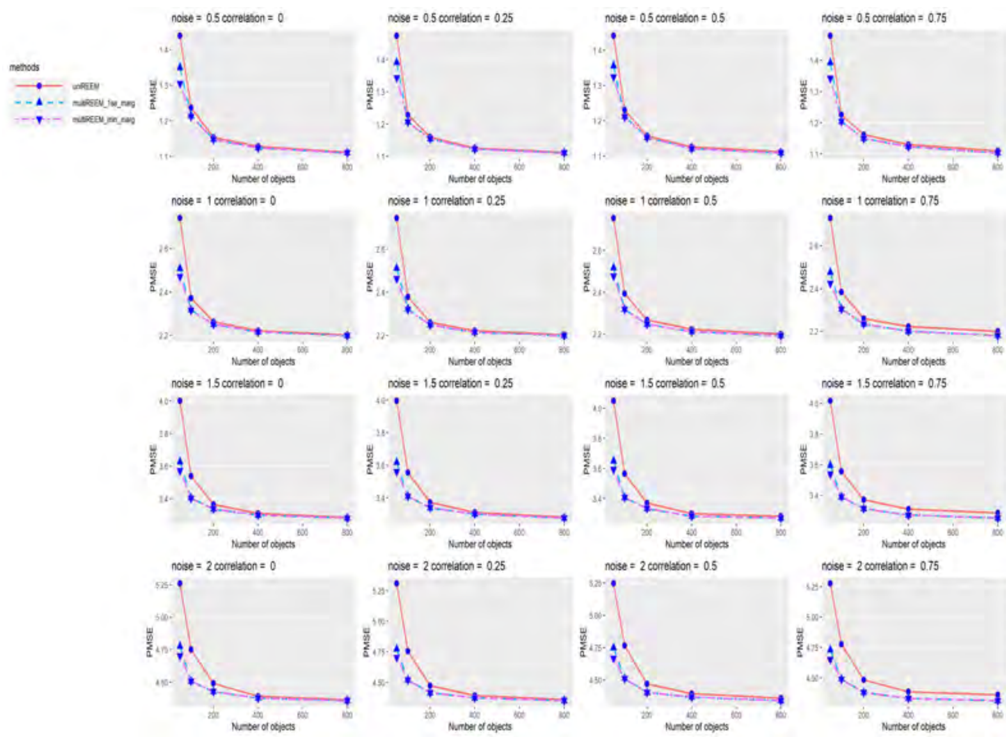

Figure 13: PMSE in object for $T_i = 10$ for the complex bivariate tree

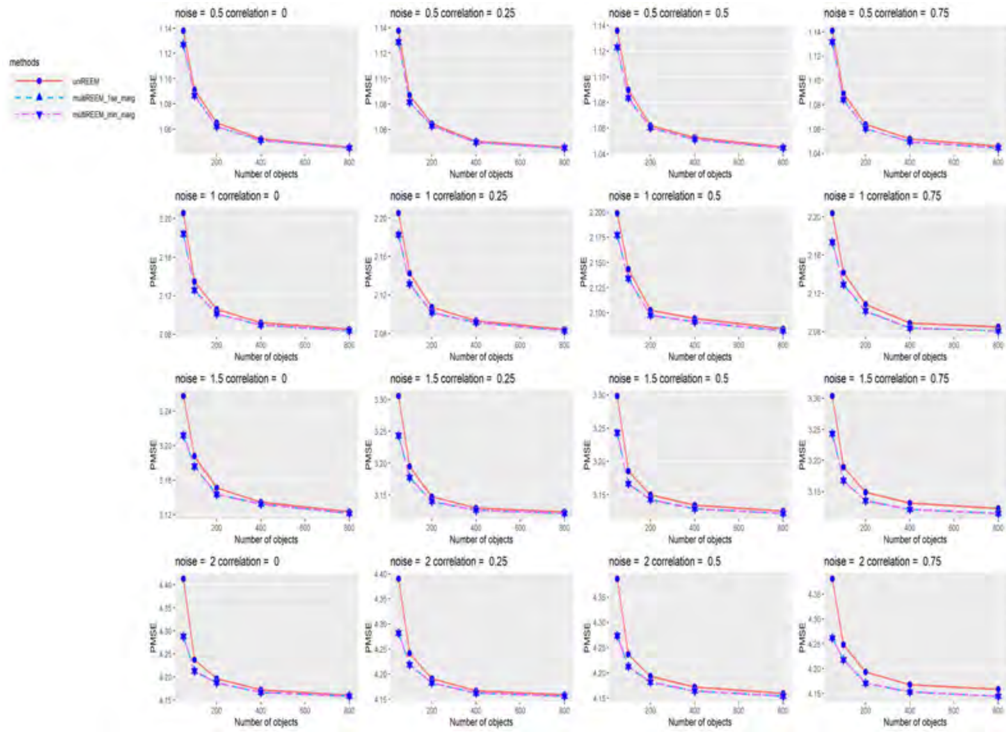

Figure 14: PMSE in object for $T_i = 25$ for the complex bivariate tree

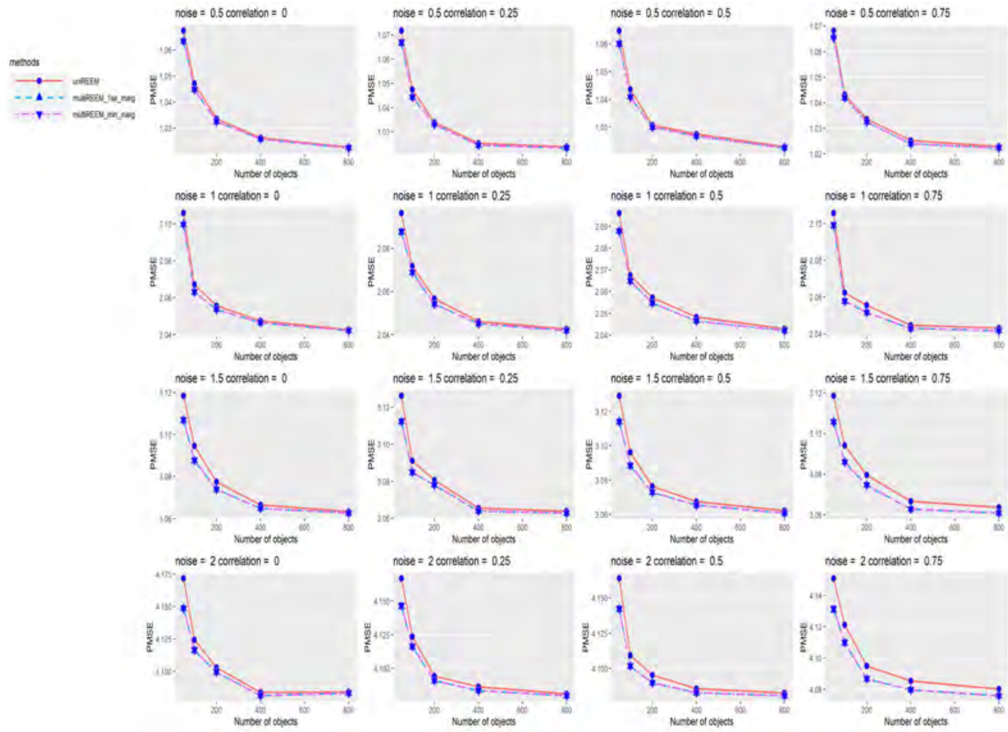

Figure 15: PMSE in object for $T_i = 50$ for the complex bivariate tree

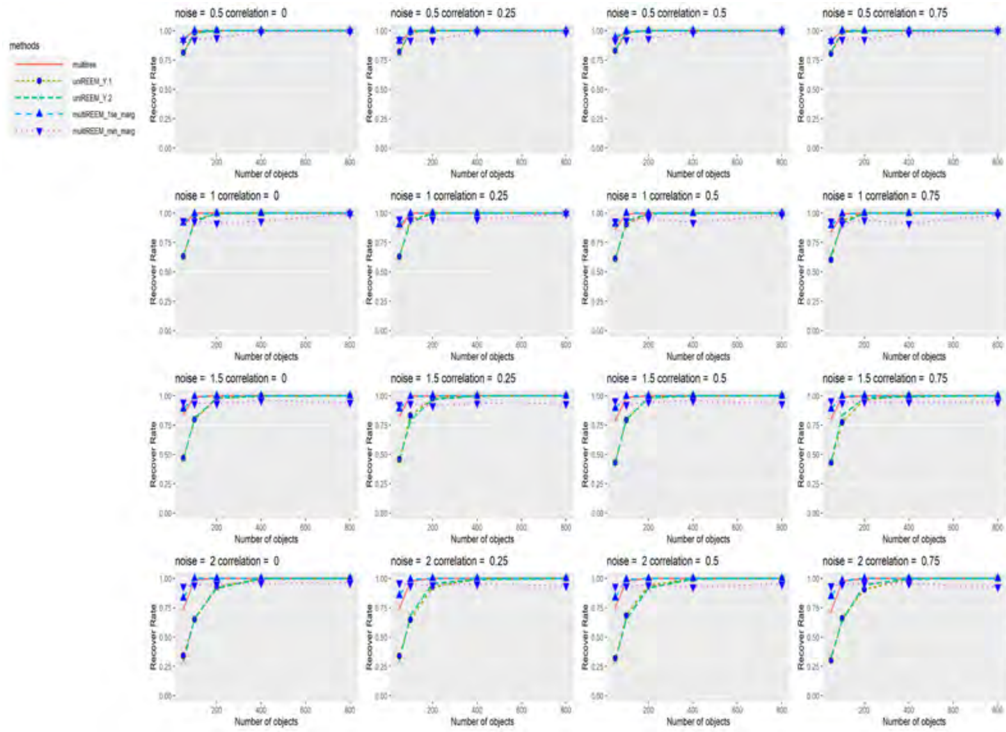

Figure 16: Recovering rate for $T_i = 10$ for the complex bivariate tree

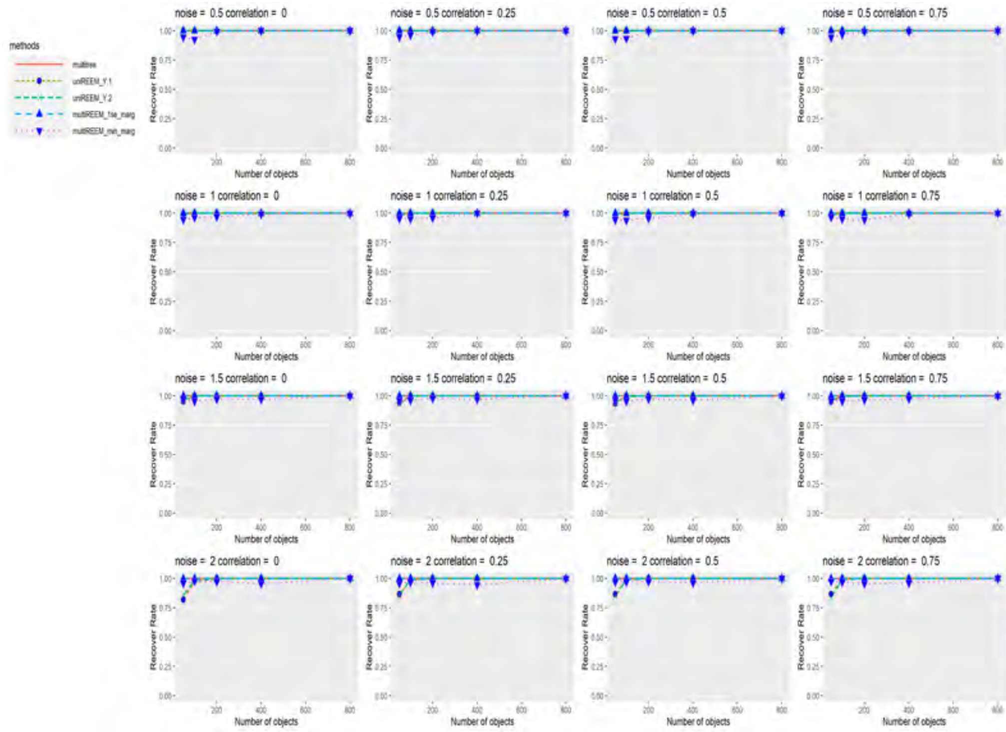

Figure 17: Recovering rate for $T_i = 25$ for the complex bivariate tree

Figure 18: Recovering rate for $T_i = 50$ for the complex bivariate tree

C Additional results for multivariate tree with five response variables

The PMSEs and the tree recovering rates for $T_i = 10, 25, 50$ with the five-response tree structure are shown in Figures 19–25.

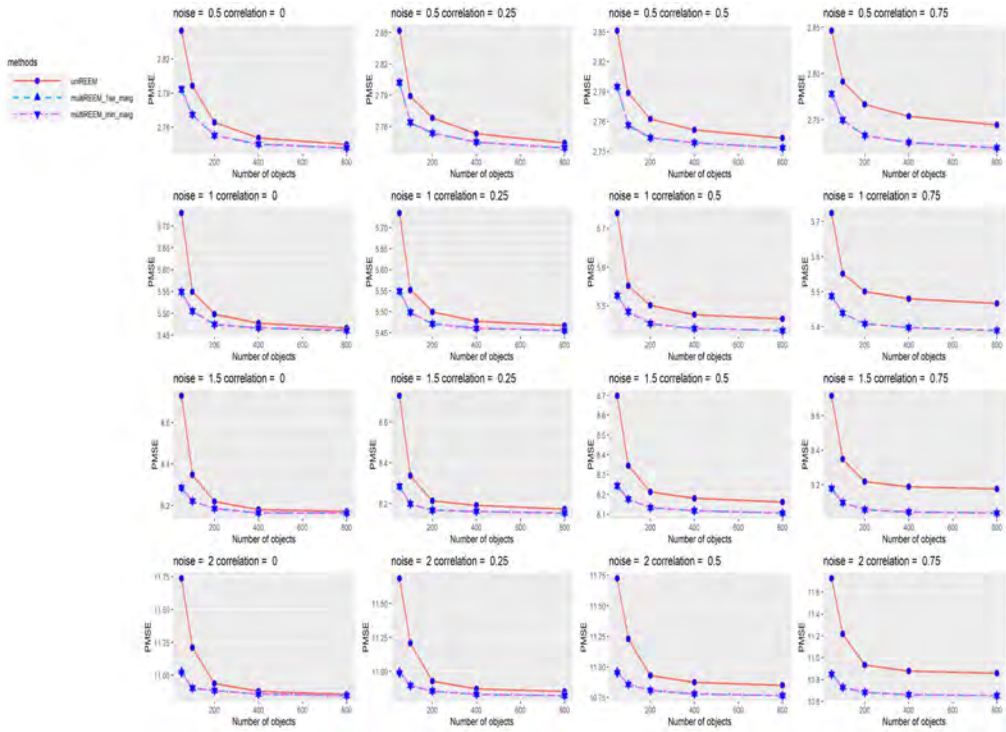

Figure 19: PMSE in object for $T_i = 10$ for multivariate tree with five response variables

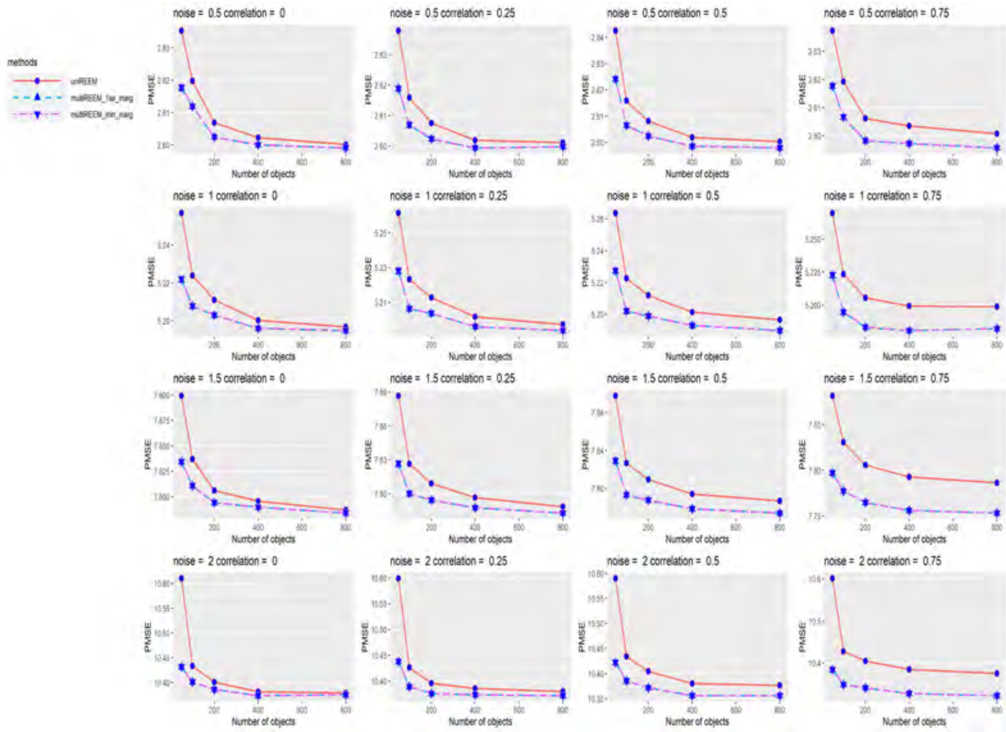

Figure 20: PMSE in object for $T_i = 25$ multivariate tree with five response variables

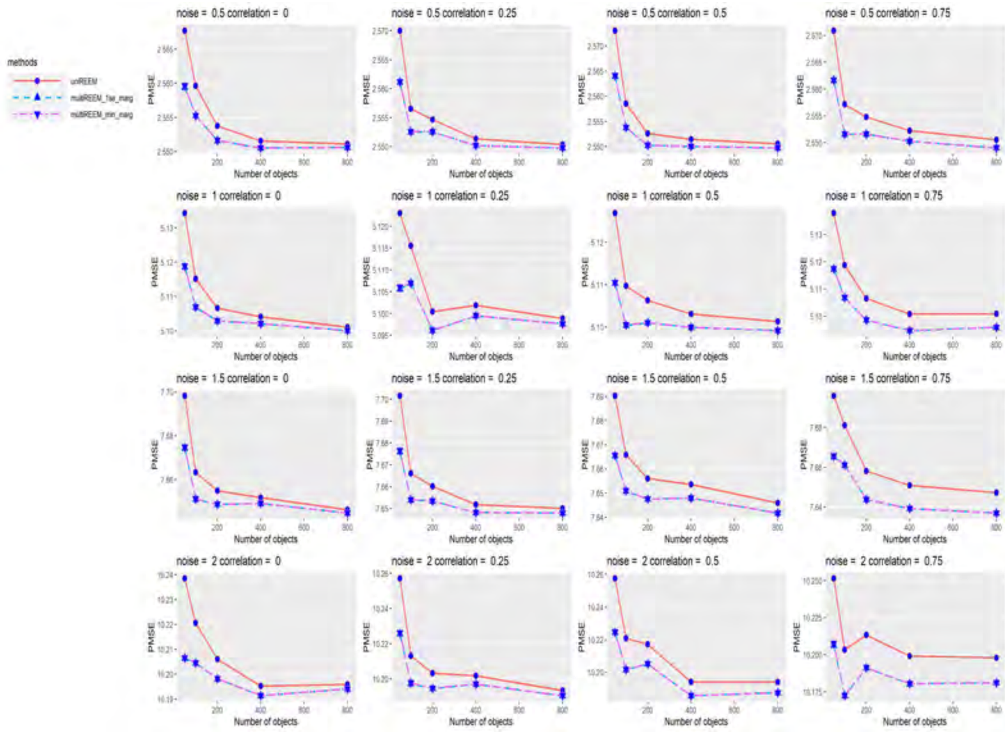

Figure 21: PMSE in object for $T_i = 50$ multivariate tree with five response variables

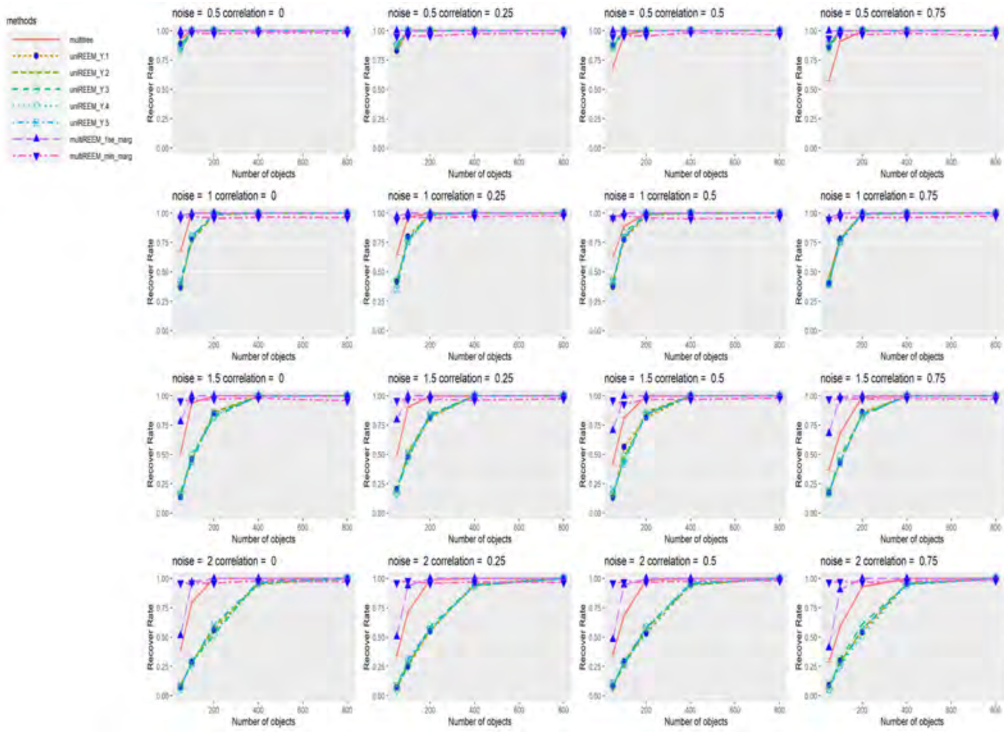

Figure 22: Recovering rate for $T_i = 5$ multivariate tree with five response variables

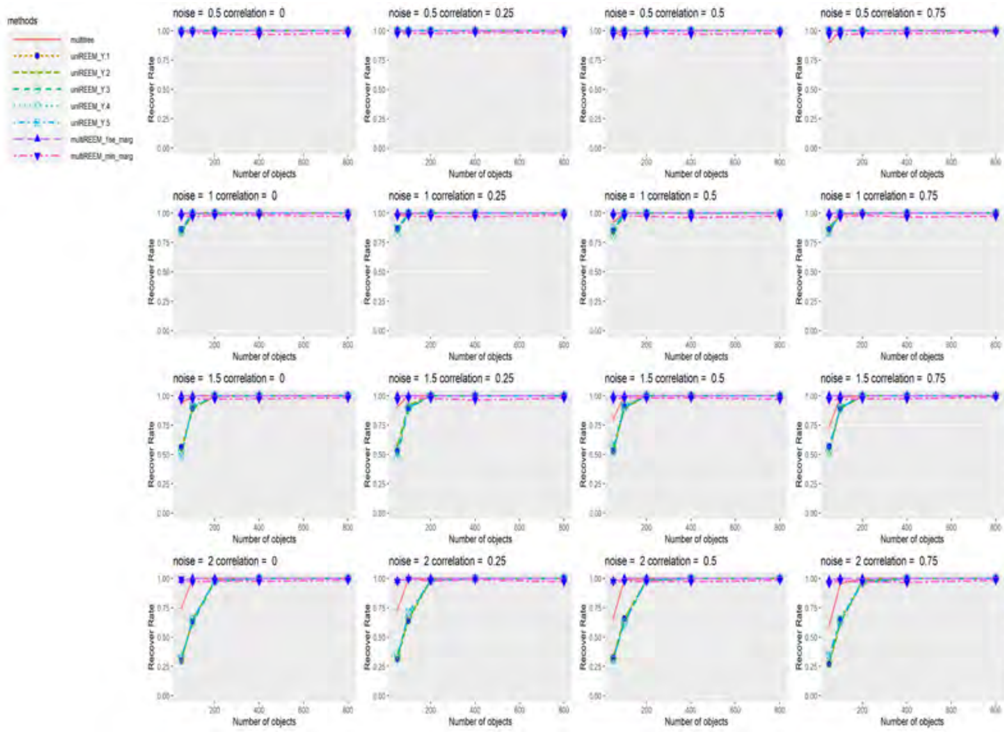

Figure 23: Recovering rate for $T_i = 10$ multivariate tree with five response variables

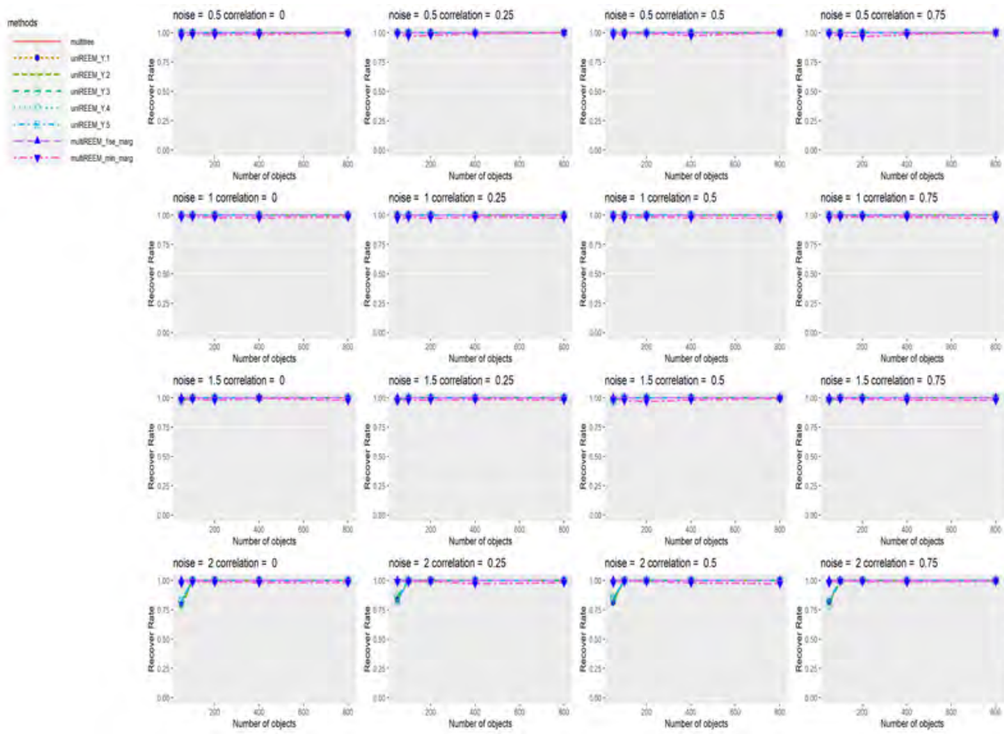

Figure 24: Recovering rate for $T_i = 25$ multivariate tree with five response variables

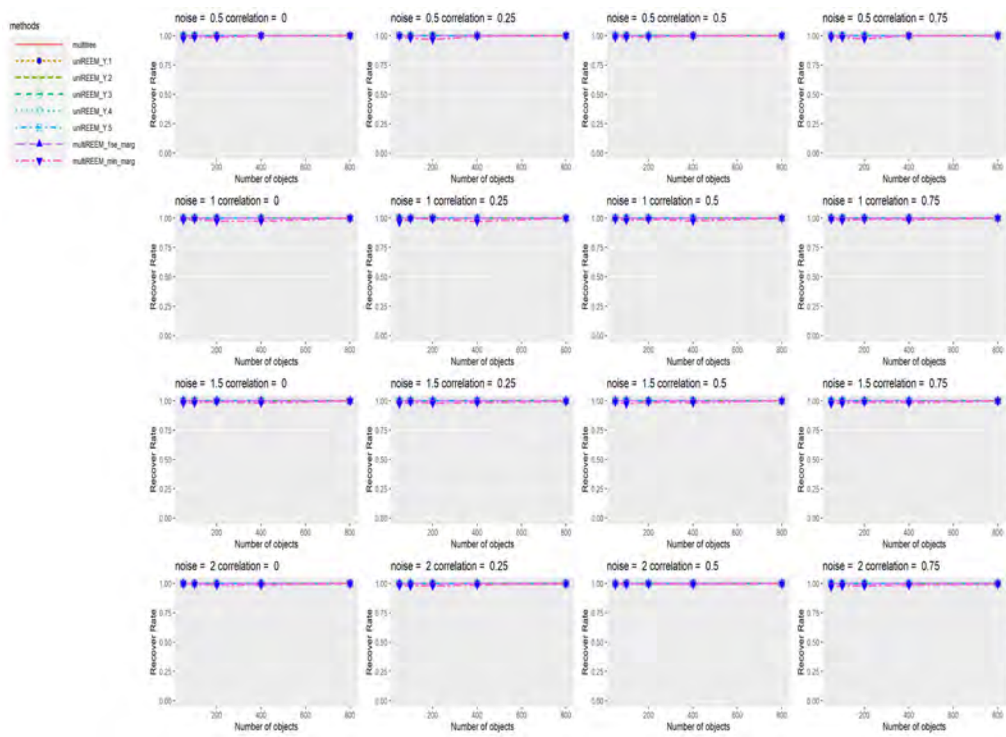

Figure 25: Recovering rate for $T_i = 50$ multivariate tree with five response variables