Results Summary

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Four methods are used to generate base forecasts. Either base forecasts are drawn from an independent distribution or dependent distribution (all DGPs actually have dependence). Also base forecasts are Gaussian or use bootstrapping (the DGPs may be Gaussian or non-Gaussian). The following reconciliation methods are considered

- Base: Not a reconciliation method, just the base forecasts.
- BottomUp: Bottom up
- BTTH: Ben Taieb, Taylor Hyndman (2020). This is like bottom up but reorders a sample from probabilistic forecast to match the empirical copula. Also the mean is adjusted to be the same as that from MinT reconciliation.
- JPP: Jeon Panagiotelis Petropoulos (2019). This reorders a sample from the probabilistic forecast to be perfectly dependent, i.e. it reconciles quantiles. Reconciliation is done by WLS (structural)
- MinTSam: MinT with the usual sample covariance estimator
- MinTShr: MinT with shrinkage covariance estimator
- OLS: OLS reconciliation
- ScoreOptE: Energy score Optimisation by stochastic gradient descent.
- ScoreOptEIn: Energy score Optimisation by stochastic gradient descent but with predicted values (in-sample) used instead of rolling window forecasts.
- ScoreOptV: Variogram score Optimisation by stochastic gradient descent.
- ScoreOptVIn: Variogram score Optimisation by stochastic gradient descent but with predicted values (in-sample) used instead of rolling window forecasts.
- WLS: Weighted least squares using structural scaling.

Table 1: Mean energy score for ets modelling with a gaussian nonstationary DGP

Method	independent_bootstrap	independent_gaussian	joint_bootstrap	joint_gaussian
Base	12.8745	12.8457	12.6189	12.5893
BottomUp	15.0398	14.9865	14.8186	14.7516
BTTH	27.4503	27.4224	27.4915	27.4427
JPP	26.0352	26.0365	26.0145	25.9771
MinTSam	11.6081	11.5882	11.2376	11.2210
MinTShr	11.4795	11.4565	11.2566	11.2411
OLS	12.1525	12.1213	11.8631	11.8412
ScoreOptE	11.9224	11.8726	11.7431	11.7287
ScoreOptEIn	12.1378	12.0871	11.8339	11.8421
ScoreOptV	12.1250	12.1265	11.9087	11.9342
ScoreOptVIn	12.1092	12.1416	11.8346	11.8790
WLS	12.6316	12.5951	12.4012	12.3683

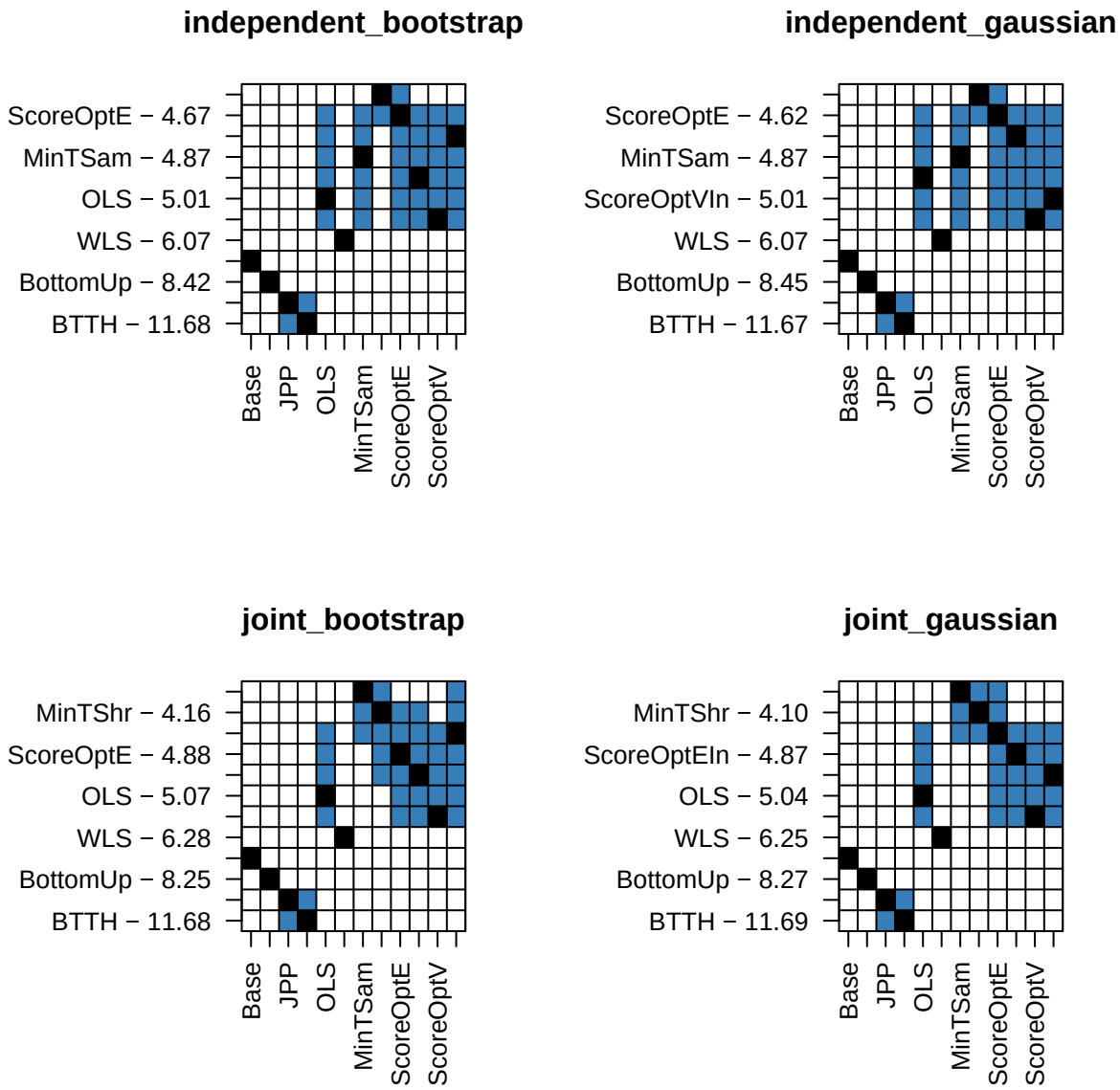

Figure 1: Nemenyi matrix for ets modelling with a gaussian nonstationary DGP using energy score

Table 2: Mean variogram score for ets modelling with a gaussian nonstationary DGP

Method	independent_bootstrap	independent_gaussian	joint_bootstrap	joint_gaussian
Base	2162.406	2157.342	2162.960	2157.692
BottomUp	2502.044	2493.100	2485.050	2474.936
BTTH	2658.561	2663.373	2653.882	2664.854
JPP	2130.696	2124.259	2131.133	2124.833
MinTSam	1912.506	1906.681	1910.133	1905.503
MinTShr	1913.126	1907.674	1916.381	1911.832
OLS	2064.646	2058.681	2073.471	2067.536
ScoreOptE	2081.869	2068.973	2072.550	2067.910
ScoreOptEIn	2059.643	2046.662	2055.363	2054.216
ScoreOptV	2049.790	2049.262	2048.352	2055.604
ScoreOptVIn	2025.672	2034.647	2029.454	2043.564
WLS	2118.802	2112.210	2127.693	2121.011

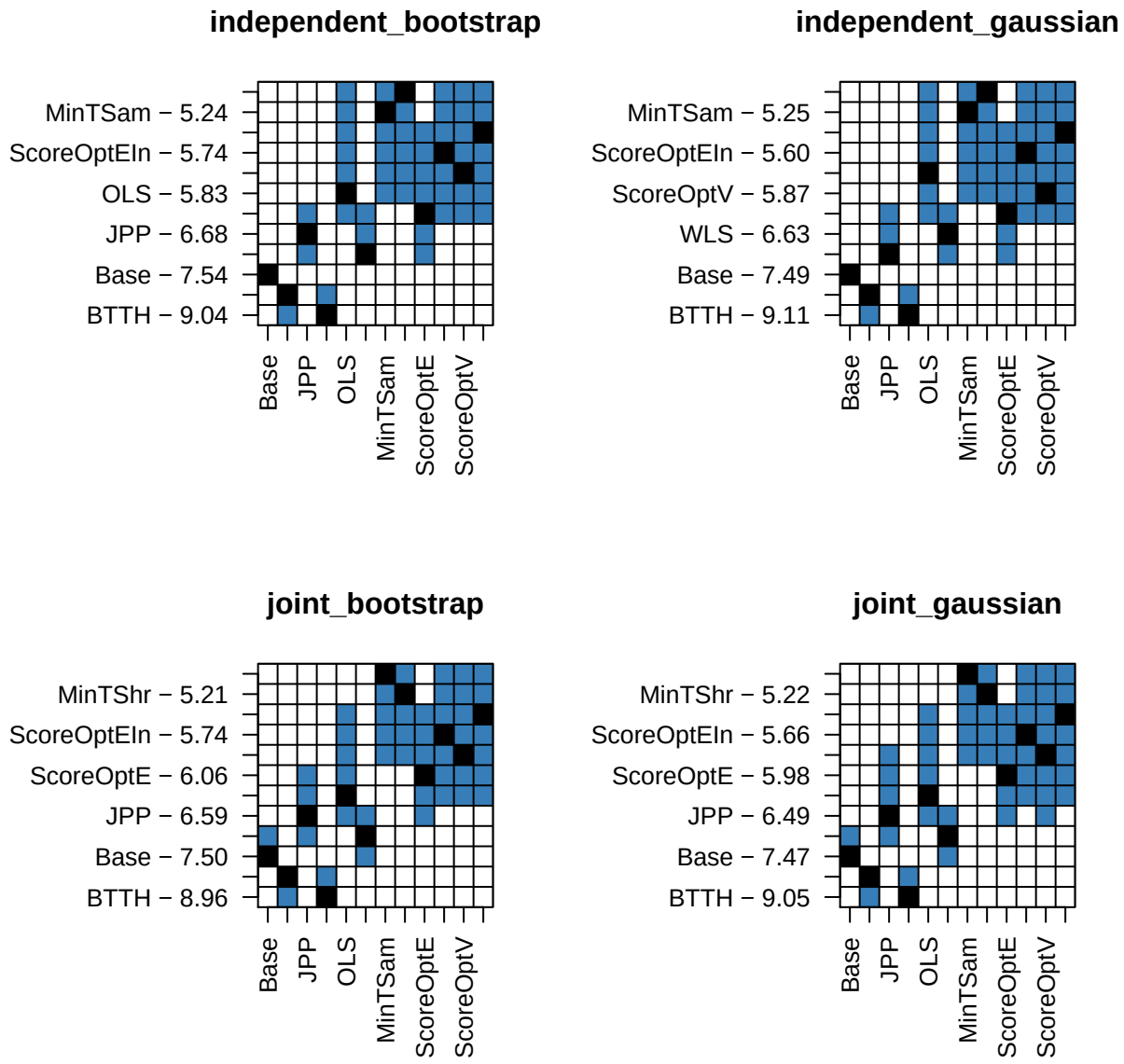

Figure 2: Nemenyi matrix for ets modelling with a gaussian nonstationary DGP using variogram score