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 arima modelling with a nongaussian nonstationary DGP

Method	independent_bootstrap	independent_gaussian	joint_bootstrap	joint_gaussian
Base	1.5717	1.5742	1.5349	1.5360
BottomUp	1.7415	1.7451	1.7183	1.7202
BTTH	3.2291	3.2714	3.2378	3.2766
JPP	3.1979	3.2326	3.1968	3.2232
MinTSam	1.4949	1.4985	1.4120	1.4126
MinTShr	1.4422	1.4435	1.4110	1.4118
OLS	1.4929	1.4931	1.4620	1.4635
ScoreOptE	1.5221	1.5211	1.4985	1.4927
ScoreOptEIn	2.3435	2.3008	2.4011	2.2946
ScoreOptV	1.5097	1.5164	1.4838	1.4817
ScoreOptVIn	1.5165	1.5115	1.5122	1.4830
WLS	1.5485	1.5490	1.5201	1.5216

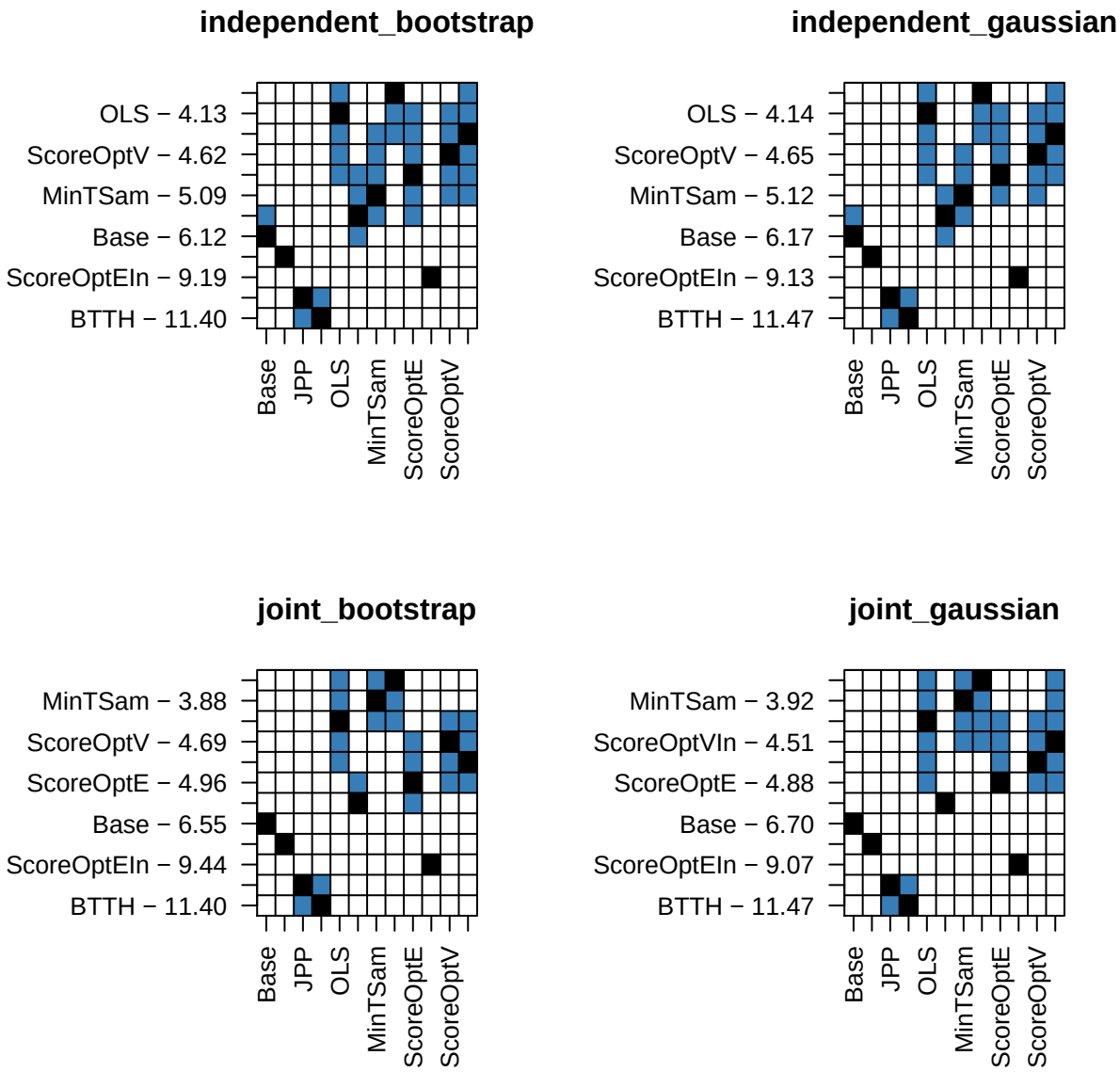

Figure 1: Nemenyi matrix for arima modelling with a nongaussian nonstationary DGP using energy score

Table 2: Mean variogram score for arima modelling with a nongaussian nonstationary DGP

Method	independent_bootstrap	independent_gaussian	joint_bootstrap	joint_gaussian
Base	34.3813	34.3777	34.3621	34.3544
BottomUp	37.1513	37.1481	37.1603	37.1775
BTTH	40.5555	40.5664	40.5026	40.5375
JPP	34.1331	34.1407	34.1326	34.1342
MinTSam	32.4393	32.4265	32.4405	32.4336
MinTShr	32.3988	32.3912	32.4028	32.3938
OLS	33.5498	33.5567	33.5432	33.5395
ScoreOptE	33.9896	33.9906	34.1231	34.0147
ScoreOptEIn	44.0465	43.6139	45.8893	44.5371
ScoreOptV	33.9687	34.3669	34.3377	34.0837
ScoreOptVIn	33.9717	34.3321	35.1315	33.9232
WLS	34.1330	34.1405	34.1314	34.1330

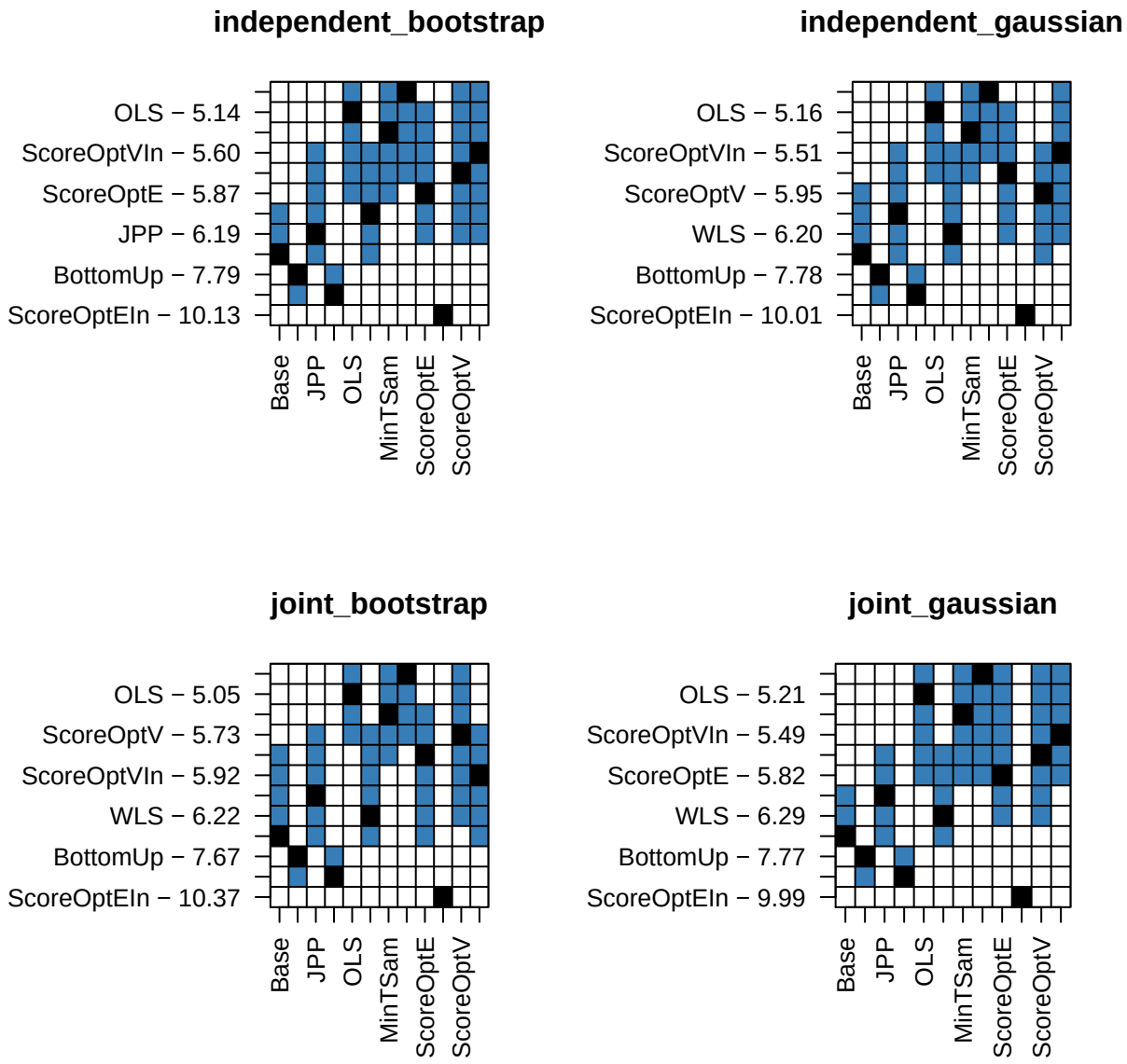

Figure 2: Nemenyi matrix for arima modelling with a nongaussian nonstationary DGP using variogram score