Package ‘gtop’

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Type Package

Title Game-Theoretically OPtimal (GTOP) Reconciliation Method

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Description In hierarchical time series (HTS) forecasting, the hierarchical relation between multiple time series is exploited to make better forecasts. This hierarchical relation implies one or more aggregate consistency constraints that the series are known to satisfy. Many existing approaches, like for example bottom-up or top-down forecasting, therefore attempt to achieve this goal in a way that guarantees that the forecasts will also be aggregate consistent. This package provides with an implementation of the Game-Theoretically OPtimal (GTOP) reconciliation method proposed in van Erven and Cugliari (2015), which is guaranteed to only improve any given set of forecasts. This opens up new possibilities for constructing the forecasts. For example, it is not necessary to assume that bottom-level forecasts are unbiased, and aggregate forecasts may be constructed by regressing both on bottom-level forecasts and on other covariates that may only be available at the aggregate level.

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Depends hts, quadprog, lassoshooting

NeedsCompilation no

Repository CRAN

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Reconciliate individual predictions using GTOP

Description

Uses a Game Theory approach to reconcile hierarchical time series predictions.

Usage

gtop(preds_indiv, pred_total, weights_indiv, weight_total, bounds_indiv, solver = "quad")

Arguments

- preds_indiv: vector contains the individual predictions
- pred_total: prediction for the sum of individuals
- weights_indiv: vector, contains the weights of the individuals
- weight_total: weight of the total
- bounds_indiv: vector, contains the bounds of the individuals
- solver: string, use quadratic programming (quad) or Lasso-like solvers (lasso)

Details

In hierarchical time series forecasts, one predicts individuals quantities and a global quantity. There exists a constraint that matches the sum of the individual quantities to the global quantity. However, forecasting models don’t take into account this constraint. With GTOP you can reconcile the individual and global quantities in order to match the aggregate consistency constraint.

Value

A list with

- pred_indiv: the reconciliated predictions for the individuals and the total,
- solution: the solution to the associate minimisation problem.

Examples

```r
K <- 5
indiv <- rep(0, K)
total <- 1
gtop(preds_indiv = indiv, 
      pred_total = total, 
      weights_indiv = rep(1, K), 
      weight_total = 2, 
      bounds_indiv = rep(1 / K, K))```
hts  

Prediction conciliation by ...n.

Description

Uses a simple L2 projection to reconcile hierarchical time series forecasts.

Usage

hts(preds_indiv, pred_total)

Arguments

preds_indiv : K-length vector with predictions \( y_{\text{bar}_1}, \ldots, y_{\text{bar}_K} \) for individual regions
pred_total  : number with prediction \( y_{\text{bar}_{*}} \) for the total consumption

Value

A vector with the reconciliated predictions for the individuals and the total.

References

Hyndman et al. (2011)

Examples

```r
K <- 5
hts(preds_indiv = rep(0, K), 1)
```

proj  

Prediction conciliation by projection.

Description

Uses a simple L2 projection to reconcile hierarchical time series forecasts.

Usage

proj(preds_indiv, pred_total, weights_indiv, weight_total)

Arguments

preds_indiv : K-length vector with predictions \( y_{\text{bar}_1}, \ldots, y_{\text{bar}_K} \) for individual regions
pred_total  : number with prediction \( y_{\text{bar}_{*}} \) for the total consumption
weights_indiv : K-length vector with weights \( a_1, \ldots, a_K \) for individual regions
weight_total : number with weight \( a_{*} \) for the total consumption
Value

A vector with the reconciliated predictions for the individuals and the total.

Examples

```r
K <- 5
proj(preds_indiv = rep(0, K), 1,
     weights_indiv = rep(1, K),
     weight_total = 2)
```
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