Package ‘promotionImpact’

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Type   Package
Title   Analysis & Measurement of Promotion Effectiveness
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Description Analysis and measurement of promotion effectiveness on a given target variable (e.g. daily sales). After converting promotion schedule into dummy or smoothed predictor variables, the package estimates the effects of these variables controlled for trend/periodicity/structural change using prophet by Taylor and Letham (2017) <doi:10.7287/peerj.preprints.3190v2> and some prespecified variables (e.g. start of a month).

Depends R (>= 3.5.0), Rcpp (>= 0.12.17), dplyr (>= 0.7.6), ggplot2 (>= 3.0.0), scales (>= 1.0.0)
Imports KernSmooth (>= 2.23.15), data.table (>= 1.11.4), ggpubr (>= 0.1.8), reshape2 (>= 1.4.3), stringr (>= 1.3.1), strucchange (>= 1.5.1), lmtest (>= 0.9), crayon (>= 1.3.4), prophet (>= 0.3.0.1)

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URL https://github.com/ncsoft/promotionImpact

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**Description**

`compareModels`

**Usage**

```r
compareModels(
  data,
  promotion,
  fix = list(logged = TRUE, differencing = TRUE),
  time.field = "dt",
  target.field = "sales",
  dummy.field = NULL,
  trend.param = 0.05,
  period.param = 3,
  var.type = "smooth",
  smooth.except.date = NULL,
  smooth.bandwidth = 2,
  smooth.var.sum = TRUE,
  allow.missing = TRUE
)
```

**Arguments**

- **data**  
  Dataframe containing date, target variable, and some additional time dummies that the researcher wants to account for.

- **promotion**  
  Dataframe containing promotion ID, start date, end date, promotion tag(type). Might include daily payments associated with the promotion.

- **fix**  
  A List of constraints to find the best model. Constraints can only be in following list: 'period', 'trend', 'logged', 'synergy.var', 'differencing', 'smooth.origin', 'structural.change', 'synergy.promotion'

- **time.field**  
  Specify the date field of 'data'.

- **target.field**  
  Specify the target field of 'data'.

- **dummy.field**  
  Specify the additional time dummies of 'data'.

trend.param  Flexibility of trend component. Default is 0.05, and as this value becomes larger, the trend component will be more flexible.

period.param  Flexibility of period component. Default is 3, and as this value becomes larger, the period component will be more flexible.

var.type  'smooth' to use smoothed promotion variables, 'dummy' to use dummy promotion variables

smooth.except.date  Date value that will be excluded from the smoothing process. eg) '01' to exclude every start day of a month

smooth.bandwidth  Bandwidth of local polynomial regression used in the smoothing process. Default value is 2.

smooth.var.sum  If TRUE, the smoothing values for times when multiple promotions in a single tag overlap will be the values from the latest promotion. Otherwise, the values will be added(default).

allow.missing  TRUE to allow missing data in promotion sales during the promotion period

detectOutliers  detect some outliers

detectOutliers(model, threshold = list(cooks.distance = 1, dfbetas = 1, dffits = 2), option = 2)
Arguments

- **model**: Execution result object: `promotionImpact`
- **threshold**: List of threshold values to be determined as outliers if greater than the written values
- **option**: The number of indicators that must be greater than the threshold values to be outliers.

Details

detectOutliers extracts outliers which affect the average effects of promotions.

Examples

```r
pri1 <- promotionImpact(data=sim.data, promotion=sim.promotion,
                         time.field = 'date', target.field = 'simulated_sales',
                         trend = FALSE, period = NULL, structural.change = FALSE,
                         logged = TRUE, differencing = TRUE, synergy.promotion = FALSE,
                         synergy.var = NULL, allow.missing = TRUE)
out <- detectOutliers(model = pri1,
                       threshold = list(cooks.distance=1, dfbetas=1, dffits=2), option = 1)
```

**Description**

`promotionImpact` estimates the effectiveness of promotions.

**Usage**

```r
promotionImpact(
  data, promotion,
  time.field = "date", target.field = "value",
  dummy.field = NULL,
  trend = TRUE,
  period = "auto",
  structural.change = FALSE,
  trend.param = 0.05,
  period.param = 3,
  var.type = "smooth",
  smooth.except.date = NULL,
  smooth.bandwidth = 2,
  
  
  ...)```

```r
```
smooth.origin = "all",
smooth.var.sum = TRUE,
logged = TRUE,
differencing = TRUE,
synergy.promotion = FALSE,
synergy.var = NULL,
allow.missing = TRUE
)

Arguments

data: Dataframe containing date, target variable, and some additional time dummies that the researcher wants to account for.
promotion: Dataframe containing promotion ID, start date, end date, promotion tag(type). Might include daily payments associated with the promotion.
time.field: Specify the date field of 'data'.
target.field: Specify the target field of 'data'.
dummy.field: Specify the additional time dummies of 'data'.
trend: TRUE to incorporate trend component, FALSE to exclude the trend component.
period: NULL to exclude any periodicity from the model, 'auto' to automatically determine the period, certain numeric value(e.g. '30.5' for month) to manually specify the period
structural.change: TRUE to incorporate structural changes in the intercept(baseline)
trend.param: Flexibility of trend component. Default is 0.05, and as this value becomes larger, the trend component will be more flexible.
period.param: Flexibility of period component. Default is 3, and as this value becomes larger, the period component will be more flexible.
var.type: 'smooth' to use smoothed promotion variables, 'dummy' to use dummy promotion variables
smooth.except.date: Date value that will be excluded from the smoothing process. eg) '01' to exclude every start day of a month
smooth.bandwidth: Bandwidth of local polynomial regression used in the smoothing process. Default value is 2.
smooth.origin: 'all' to estimate a global smoothing function for all promotions. 'tag' to estimate different smoothing functions for different promotion types(tags).
smooth.var.sum: If TRUE, the smoothing values for times when multiple promotions in a single tag overlap will be the values from the latest promotion. Otherwise, the values will be added(default).
logged: TRUE to take logs to the target variable and the trend/period component
differencing: TRUE to first difference the target variable, smoothed regressors, and the trend/period component values
synergy.promotion
TRUE to incorporate synergy between promotion tags.

synergy.var
Specify the synergy variables. 'names of fields' between each promotion tag and other variables. eg) c('month_start') to incorporate synergy between each promotion tag and 'month_start'.

allow.missing
TRUE to allow missing data in promotion sales during the promotion period

Details

promotionImpact is for analysis & measurement of the effectiveness of promotions, controlling for some specified or estimated control variables.

Examples

```r
pr1 <- promotionImpact(data=sim.data, promotion=sim.promotion,
time.field = 'dt', target.field = 'simulated_sales',
trend = FALSE, period = NULL, structural.change = FALSE,
logged = TRUE, differencing = TRUE, synergy.promotion = FALSE,
synergy.var = NULL, allow.missing = TRUE)
```

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### sim.data

**Daily Total Sales**

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**Description**

This data set is simulated daily total sales data containing 958 observations of 2 variables. ‘dt’: date with Date format. ‘simulated_sales’: simulated daily sales with numeric format.

**Usage**

```r
sim.data
```

**Format**

A dataset containing 958 observations of 2 variables.

**Source**

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**sim.promotion**  

**Promotion Schedule**

**Description**
This data set is promotion schedule data including promotion tag information.  
- `pro_id`: promotion ID  
- `start_dt`: start date of each promotion  
- `end_dt`: end date of each promotion  
- `tag_info`: promotion tag information (promotion type).

**Usage**

sim.promotion

**Format**
A dataset containing 50 observations of 4 variables.

**Source**
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**sim.promotion.sales**  

**Daily Promotion Sales with Promotion information**

**Description**
This data set is simulated daily promotion sales data with promotion information.  
- `pro_id`: promotion ID  
- `start_dt`: start date of each promotion  
- `end_dt`: end date of each promotion  
- `tag_info`: promotion tag information (promotion type)  
- `dt`: date  
- `payment`: simulated daily promotion sales

**Usage**

sim.promotion.sales

**Format**
A dataset containing 1486 observations of 6 variables.

**Source**
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