

# Package ‘promotionImpact’

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**Type** Package

**Title** Analysis & Measurement of Promotion Effectiveness

**Version** 0.1.4

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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 (>= 0.6.1)

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**URL** <https://github.com/ncsoft/promotionImpact>

**LazyData** true

**RoxygenNote** 7.0.2

**Encoding** UTF-8

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compareModels	<i>compare several models</i>
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### Description

compareModels

### Usage

```
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.pro
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

### Details

compareModels compares several models under user-defined conditions and suggests the best options.

### Examples

```
comparison <- compareModels(data = sim.data, promotion = sim.promotion.sales,
                             fix = list(logged = TRUE, differencing = TRUE, smooth.origin='all',
                                         trend = FALSE, period = NULL),
                             time.field = 'dt', target.field = 'simulated_sales',
                             trend.param = 0.02, period.param = 2)
```

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detectOutliers	<i>detect some outliers</i>
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### Description

detectOutliers

### Usage

```
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**

```

pri1 <- 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)
out <- detectOutliers(model = pri1,
                      threshold = list(cooks.distance=1, dfbetas=1, dffits=2), option = 1)

```

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promotionImpact	<i>estimate effectiveness of promotions</i>
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**Description**

promotionImpact

**Usage**

```

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,

```

```

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 prespecified or estimated control variables.

### Examples

```
pri1 <- 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	<i>Daily Total Sales</i>
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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

```
sim.data
```

### Format

A dataset containing 958 observations of 2 variables.

### Source

NCsoft AnalysisModeling Team <gimmesilver@ncsoft.com> <windy0126@ncsoft.com> <nhkim1302@ncsoft.com>

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sim.promotion	<i>Promotion Schedule</i>
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**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	<i>Daily Promotion Sales with Promotion information</i>
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**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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