Package 'foretell'

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Type Package

Title Projecting Customer Retention Based on Fader and Hardie
Probability Models

Version 0.2.0

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Description
Project Customer Retention based on Beta Geometric, Beta Discrete Weibull and Latent Class
Discrete Weibull Models.This package is based on Fader and Hardie (2007)
<doi:10.1002/dir.20074> and Fader and Hardie et al. (2018) <doi:10.1016/j.intmar.2018.01.002>.

Depends R (>= 3.0.1)

License GPL-3

Encoding UTF-8

LazyData true

Imports stats,nloptr

RoxygenNote 6.1.1

NeedsCompilation no

Repository CRAN

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R topics documented:

| BdW | *Beta discrete Weibull (BdW) Model for Projecting Customer Retention.* |

Description

BdW is a beta discrete weibull model implemented based on `Fader` and `Hardie` probability based projection methedology. The survivor function for BdW is

$$Beta(a, b + t^c)/Beta(a, b)$$

Usage

```
BdW(surv_value, h, lower = c(0.001, 0.001, 0.001), upper = c(10000,
  10000, 10000))
```

Arguments

surv_value	a numeric vector of historical customer retention percentage should start at 100 and non-starting values should be between 0 and less than 100
h	forecasting horizon
lower	lower limit used in R `optim` rotuine. Default is `c(1e-3,1e-3)`.
upper	upper limit used in R `optim` rotuine. Default is `c(10000,10000,10000)`.

Value

`fitted:`	Fitted values based on historical data
`projected:`	Projected h values based on historical data
`max.likelihood:`	
	Maximum Likelihood of Beta discrete Weibull
`params - a, b and c:`	
	Returns a and b paramters from maximum likelihood estimation for beta distribution and c

References

Fader P, Hardie B. How to project customer retention. Journal of Interactive Marketing. 2007;21(1):76-90.

Fader P, Hardie B, Liu Y, Davin J, Steenburgh T. "How to Project Customer Retention" Revisited: The Role of Duration Dependence. Journal of Interactive Marketing. 2018;43:1-16.

Examples

```
surv_value <- c(100,86.9,74.3,65.3,59.3)
h <- 6
BdW(surv_value,h)
```

BG | *Beta Geometric (BG) Model for Projecting Customer Retention.*

Description

BG is a beta geometric model implemented based on `Fader` and `Hardie` probability based projection methedology. The survivor function for BG is

$$Beta(a, b + t)/Beta(a, b)$$

Usage

```
BG(surv_value, h, lower = c(0.001, 0.001))
```

Arguments

surv_value	a numeric vector of historical customer retention percentage should start at 100 and non-starting values should be between 0 and less than 100
h	forecasting horizon
lower	lower limit used in R `optim` rotuine. Default is `c(1e-3,1e-3)`.

Value

`fitted:`	Fitted values based on historical data
`projected:`	Projected h values based on historical data
`max.likelihood:`	Maximum Likelihood of Beta Geometric
`params - a, b:`	Returns a and b paramters from maximum likelihood estimation for beta distribution

References

Fader P, Hardie B. How to project customer retention. Journal of Interactive Marketing. 2007;21(1):76-90.

Examples

```
surv_value <- c(100,86.9,74.3,65.3,59.3)
h <- 6
BG(surv_value,h)
```

| customer_retention | *Observed % Customers Surviving at Least 0-12 Years* |

Description

A dataset containing customer retention.

Usage

```
data(customer_retention)
```

Format

A data frame 13 observations and 3 variables.

Details

year Time in years

regular % of regular customers surviving

high_end % of high_end customers surviving

References

Fader P, Hardie B. How to project customer retention. Journal of Interactive Marketing. 2007;21(1):76-90.

| exltrend | *Excel based trendlines for projecting customer retention.* |

Description

exltrend generates Microsoft(r) Excel(r) based linear, logarthmic, exponential, polynomial of order 2, power trends.

Usage

```
exltrend(surv_value, h)
```

Arguments

surv_value	a numeric vector of historical customer retention percentage should start at 100 and non-starting values should be between 0 and less than 100
h	forecasting horizon

Value

`fitted:`	A data frame of fitted Values based on historical data for linear (lin.p), exponential (exp.p), logarthmic (log.p), polynomial (poly.p) of order 2 and power (pow.p) trends.
`projected:`	A data frame of projected h values based on historical data for linear (lin.p), exponential (exp.p), logarthmic (log.p), polynomial (poly.p) of order 2 and power (pow.p) trends.

Examples

```
surv_value <- c(100,86.9,74.3,65.3,59.3)
h <- 6
exltrend(surv_value,h)
```

LCW	*Latent Class Weibull (LCW) Model for Projecting Customer Retention*

Description

`LCW` is a latent class weibull model implementation based on `Fader` and `Hardie` probability based projection methedology. The survivor function for `LCW` is

$$wS(t|t1, c1) + (1 - w)S(t|t2, c2), 0 < w < 1$$

Usage

```
LCW(surv_value, h, lower = c(0.001, 0.001, 0.001, 0.001, 0.001),
  upper = c(0.99999, 10000, 0.999999, 10000, 0.99999))
```

Arguments

`surv_value`	a numeric vector of historical customer retention percentage should start at 100 and non-starting values should be between 0 and less than 100
`h`	forecasting horizon
`lower`	lower limit used in R `optim` rotuine. Default is `c(0.001,0.001,0.001,0.001,0.001)`.
`upper`	upper limit used in R `optim` rotuine. Default is `c(0.99999,10000,0.999999,10000,0.99999)`.

Value

`fitted:`	Fitted Values based on historical data
`projected:`	Projected h values based on historical data
`max.likelihood:`	
	Maximum Likelihood of LCW
`params` – `t1,t2,c1,c2,w:`	
	Returns t1,c1,t2,c2,w paramters from maximum likelihood estimation

References

Fader P, Hardie B. How to project customer retention. Journal of Interactive Marketing. 2007;21(1):76-90.

Fader P, Hardie B, Liu Y, Davin J, Steenburgh T. "How to Project Customer Retention" Revisited: The Role of Duration Dependence. Journal of Interactive Marketing. 2018;43:1-16.

Examples

```
surv_value <- c(100,86.9,74.3,65.3,59.3,55.1,51.7,49.1,46.8,44.5,42.7,40.9,39.4)
h <- 6
LCW(surv_value,h)
```

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persistency_data   *Drug persistency (retention) rates by different therapeutic class.*

Description

A dataset containing drug persistency of patients in different therapeutic classes.

Usage

```
data(persistency_data)
```

Format

A data frame 334 observatios and 3 variables:

therapy Type of therapy. Unique values include: "Hypertension" "Occular Hypertension" "Statin" "Insulin" "Epilepsy" "RA" "Osteoporosis" "Alzheimer""ADHD" "Atrial Fibrillation". See references below. Data was extracted using https://automeris.io/WebPlotDigitizer/ and discretized using akima package.

time_period Time Period

value % Patients retained

References

Hypertension: Solomon M, Goldman D, Joyce G, Escarce J. Cost Sharing and the Initiation of Drug Therapy for the Chronically Ill.Archives of Internal Medicine. 2009;169(8):740-748.

Occular Hypertension: Campbell J, Schwartz G, LaBounty B, Kowalski J, Patel. Patient adherence and persistence with topical ocular hypotensive therapy in real-world practice: a comparison of bimatoprost 0.01% and travoprost Z 0.004% ophthalmic solutions. Clinical Ophthalmology. 2014;8:927-935.

Statin: Kiss Z, Nagy L, Reiber I, Paragh G, Molnar M, Rokszin G et al. Persistence with statin therapy in Hungary. Archives of Medical Science. 2013;9(3):409-417.

`Insulin`: Roussel R, Charbonnel B, Behar M, Gourmelen J, Emery C, Detournay B. Persistence with Insulin Therapy in Patients with Type 2 Diabetes in France: An Insurance Claims Study. Diabetes Therapy. 2016;7(3):537-549.

`Epilepsy`: Lai E, Hsieh C, Su C, Yang Y, Huang C, Lin S et al. Comparative persistence of antiepileptic drugs in patients with epilepsy: A STROBE-compliant retrospective cohort study. Medicine. 2016;95(35):e4481.

`RA`: Neovius M, Arkema E, Olsson H, Eriksson J, Kristensen L, Simard J et al. Drug survival on TNF inhibitors in patients with rheumatoid arthritis comparison of adalimumab, etanercept and infliximab. Annals of the Rheumatic Diseases. 2013;74(2):354-360.

`Osteoporosis`: Kishimoto H, Maehara M. Compliance and persistence with daily, weekly, and monthly bisphosphonates for osteoporosis in Japan: analysis of data from the CISA. Archives of Osteoporosis. 2015;10(27):1-6.

`Alzheimer`: Suh D, Thomas S, Valiyeva E, Arcona S, Vo L. Drug persistency of two cholinesterase inhibitors: rivastigmine versus donepezil in elderly patients with Alzheimer's disease. Drugs & Aging. 2005;22(8):695-707.

`ADHD`: Beau-Lejdstrom R, Douglas I, Evans S, Smeeth L. Latest trends in ADHD drug prescribing patterns in children in the UK: prevalence, incidence and persistence. BMJ Open. 2016;6(6):1-8.

`Atrial Fibrillation`: Gomes T, Mamdani M, Holbrook A, Paterson J, Juurlink D. Persistence With Therapy Among Patients Treated With Warfarin for Atrial Fibrillation. Archives of Internal Medicine. 2012;172(21):1687-1689.

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