Package ‘foretell’

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Author Srihari Jaganathan
Maintainer Srihari Jaganathan <sriharitn@gmail.com>
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**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 methodology. The survivor function for BdW is

\[
\frac{\text{Beta}(a, b + t^c)}{\text{Beta}(a, b)}
\]

**Usage**

\[
\text{BdW(surv_value, h, lower = c(0.001, 0.001, 0.001), upper = c(10000, 10000, 10000))}
\]

**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 `optim` routine. Default is `c(1e-3, 1e-3)`. 
- `upper`: upper limit used in `optim` routine. 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 parameters from maximum likelihood estimation for beta distribution and c

**References**


**Examples**

```r
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 methodology. The survivor function for BG is

\[ \frac{\text{Beta}(a, b + t)}{\text{Beta}(a, b)} \]

**Usage**

\[ \text{BG(surv_value, h, lower = c(0.001, 0.001))} \]

**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` routine. Default is \( 1 \times 10^{-3} \).

**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 \( b \) parameters from maximum likelihood estimation for beta distribution

**References**


**Examples**

\[ \text{surv_value} \leftarrow \text{c(100, 86.9, 74.3, 65.3, 59.3)} \]
\[ h \leftarrow 6 \]
\[ \text{BG(surv_value, h)} \]
customer_retention  

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

**Description**

A dataset containing customer retention.

**Usage**

`data(customer_retention)`

**Format**

A data frame with 13 observations and 3 variables.

**Details**

- **year**  Time in years
- **regular**  % of regular customers surviving
- **high_end**  % of high_end customers surviving

**References**


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**exltrend**  

*Excel based trendlines for projecting customer retention.*

**Description**

exltrend generates Microsoft(r) Excel(r) based linear, logarithmic, 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), logarithmic (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), logarithmic (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
extrend(surv_value, h)

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 methodology. The survivor function for LCW is

\[ w S(t|t1, c1) + (1 - w) S(t|t2, c2), 0 < w < 1 \]

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 routine. Default is c(0.001, 0.001, 0.001, 0.001, 0.001).
upper upper limit used in R optim routine. 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


Examples

```r
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)
```

persitency_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 observations 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/](https://automeris.io/WebPlotDigitizer/) and discretized using akima package.
- **time_period** Time Period
- **value** % Patients retained

References


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.


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