Package ‘diffusion’

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Author Oliver Schaer [aut, cre], Nikolaos Kourentzes [aut]
Maintainer Oliver Schaer <info@oliverschaer.ch>
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difcurve

Calculates the values for various diffusion curves, given some parameters.

Description

This function calculates the values of diffusion curves that can be of "bass", "gompertz" or "gsgompertz" type, given some parameters.

Usage

difcurve(n, w = c(0.01, 0.1, 10), type = c("bass", "gompertz", "gsgompertz"), curve = NULL)

Arguments

- **n**: number of periods to calculate values for.
- **w**: vector of curve parameters (see note). If argument curve is used, this is ignored.
- **type**: diffusion curve to use. This can be "bass", "gompertz" and "gsgompertz". If argument curve is used, this is ignored.
- **curve**: if provided, **w** and **type** are taken from an object of class diffusion, the output of **diffusion**.

Value

Returns a matrix of values with each row being a period.

Note

**w** needs to be provided for the Bass curve in the order of "p", "q", "m", where "p" is the coefficient of innovation, "q" is the coefficient of imitation and "m" is the market size coefficient.

For the Gompertz curve, vector **w** needs to be in the form of ("a", "b", "m"). Where "a" is the x-axis displacement coefficient, "b" determines the growth rate and "m" sets, similarly to Bass model, the market potential (saturation point).

For the Shifted-Gompertz curve, vector **w** needs to be in the form of ("a", "b", "c", "m"). Where "a" is the x-axis displacement coefficient, "b" determines the growth rate, "c" is the shifting parameter and "m" sets, similarly to Bass model, the market potential (saturation point).
diffusion

Author(s)
Oliver Schaer, <info@oliverschaer.ch>,
Nikoloas Kourentzes, <nikoloas@kourentzes.com>

See Also
diffusion for fitting a diffusion curve.

Examples
difcurve(w=c(0.01,0.1,10),20)

diffusion

Fit various diffusion curves.

Description
This function fits diffusion curves that can be of "bass", "gompertz" or "gsgompertz" type.

Usage
diffusion(x, w = NULL, cleanlead = c(TRUE, FALSE), prew = NULL, l = 2,
cumulative = c(TRUE, FALSE), pvalreps = 0, eliminate = c(FALSE, TRUE),
sig = 0.05, verbose = c(FALSE, TRUE), type = c("bass", "gompertz",
"gsgompertz"), optim = c("nm", "hj"), maxiter = Inf, opttol = 1e-06)

Arguments

x          vector with adoption per period
w          vector of curve parameters (see note). If provided no estimation is done.
cleanlead  removes leading zeros for fitting purposes (default == TRUE)
prew       Experimental. Ignore!
l          the l-norm (1 is absolute errors, 2 is squared errors).
cumulative If TRUE optimisation is done on cumulative adoption.
pvalreps   Experimental. Ignore!
eliminate  Experimental. Ignore!
sig        Experimental. Ignore!
verbose    if TRUE console output is provided during estimation (default == FALSE)
type       diffusion curve to use. This can be "bass", "gompertz" and "gsgompertz"
optim      optimization method to use. This can be "nm" for Nelder-Mead or "hj" for
            Hooke-Jeeves.
maxiter    number of iterations the optimser takes (default == 10000 for "nm" and Inf for
            "hj")
opttol     Tolerance for convergence (default == 1.e-06)
Value

Returns an object of class `diffusion`, which contains:

- type diffusion curve type used
- call calls function fitted
- `w` named vector of fitted parameters
- `x` actuals
- fit fitted values of model
- `frc` forecasts for future periods. This is NULL until `predict.diffusion` is called.
- `mse` in-sample Mean Squared Error
- `p ew` the `w` of the previous generation
- `p val` p-values for `w`

Bass curve

The optimisation of the Bass curve is initialised by the linear approximation suggested in Bass (1969).

Gompertz curve

The initialisation of the Gompertz curve uses the approach suggested by Jukic et al. (2004), but is adapted to allow for the non-exponential version of Gompertz curve. This makes the market potential parameter equivalent to the Bass curve's and the market potential from Bass curve is used for initialisation.

Gamma/Shifted Gompertz

The curve is initialised by assuming the shift operator to be 1 and becomes equivalent to the Bass curve, as shown in Bemmaor (1994). A Bass curve is therefore used as an estimator for the remaining initial parameters.

Note

Vector `w` needs to be provided for the Bass curve in the order of "p", "q", "m", where "p" is the coefficient of innovation, "q" is the coefficient of imitation and "m" is the market size coefficient.

For the Gompertz curve, vector `w` needs to be in the form of ("a", "b", "m"). Where "a" is the x-axis displacement coefficient, "b" determines the growth rate and "m" sets, similarly to Bass model, the market potential (saturation point).

For the Shifted-Gompertz curve, vector `w` needs to be in the form of ("a", "b", "c", "m"). Where "a" is the x-axis displacement coefficient, "b" determines the growth rate, "c" is the shifting parameter and "m" sets, similarly to Bass model, the market potential (saturation point).

Parameters are estimated by minimising the Mean Squared Error with a Subplex algorithm from the nloptr package.
Author(s)

Oliver Schaer, <info@oliverschaer.ch>,
Nikoloas Kourentzes, <nikoloas@kourentzes.com>

References


See Also

predict.diffusion, plot.diffusion and print.diffusion.

Examples

```r
fitbass <- diffusion(tscChicken[,2], type = "bass")
fitgomp <- diffusion(tscChicken[,2], type = "gompertz")
fitgsg <- diffusion(tscChicken[,2], type = "gsgompertz")

# Produce some plots
plot(fitbass)
plot(fitgomp)
plot(fitgsg)
```

Description

Produces a plot of a fitted diffusion curve.

Usage

```r
## S3 method for class 'diffusion'
plot(x, cumulative = c(FALSE, TRUE), ...)
```
Arguments

- `x`: diffusion object, produced using `diffusion`.
- `cumulative`: If TRUE plot cumulative adoption.
- `...`: Unused argument.

Value

None. Function produces a plot.

Author(s)

Oliver Schaer, <info@oliverschaer.ch>,
Nikoloas Kourentzes, <nikoloas@kourentzes.com>

See Also

diffusion.

Examples

```r
fit <- diffusion(tschicken[, 2])
plot(fit)
```

---

**predict.diffusion**

*Predict future periods of a fitted diffusion curve.*

Description

Calculates the values for h future periods of a fitted diffusion curve.

Usage

```r
## S3 method for class 'diffusion'
predict(object, h = 10, ...)
```

Arguments

- `h`: Forecast horizon.
- `...`: Unused argument.
Value

Returns an object of class diffusion, which contains:

- **type** diffusion curve type used
- **call** calls function fitted
- **w** named vector of fitted parameters
- **x** actuals
- **fit** fitted values of model
- **frc** forecasts for future periods.
- **mse** insample Mean Squared Error
- **prew** the \(w\) of the previous generation
- **pval** p-values for \(w\)

Note

This function populates the matrix \text{frc} of the \text{diffusion} object used as input.

Author(s)

Oliver Schaefer, \texttt{<info@oliverschaer.ch>},
Nikoloas Kourentzes, \texttt{<nikoloas@kourentzes.com>}

See Also

diffusion.

Examples

```r
fit <- diffusion(tsChicken[, 2])
fti <- predict(fit, 20)
plot(fit)
```

---

**Description**

Outputs the result of a fitted diffusion curve.

**Usage**

```r
## S3 method for class 'diffusion'
print(x, ...)
```
Arguments

- **x**
  - diffusion object, produced using `diffusion`.

- **...**
  - Unused argument.

Value

None. Console output only.

Author(s)

Oliver Schaer, <info@oliverschaer.ch>,
Nikoloas Kourentzes, <nikoloas@kourentzes.com>

See Also

diffusion.

Examples

```r
fit <- diffusion(tsChicken[, 2])
print(fit)
```

---

**tsAc**

*Time series: Assassins Creeds*

Description

A dataset containing the weekly sales of Assassins Creeds game.

Format

A matrix with 380 observations and 8 variables

- **ac1** Assassins Creed 1
- **ac2** Assassins Creed 2
- **ac3** Assassins Creed 3
- **ac4** Assassins Creed 4
- **ac5** Assassins Creed 5
- **ac6** Assassins Creed 6
- **ac7** Assassins Creed 7
- **ac8** Assassins Creed 8

References

VGChartz
tsBroadband

Description

A dataset containing the broadcast subscribers to UK market 4Q 2011 to 2Q 2016.

Format

A data frame with 51 observations and 4 variables

Time  Quarters
DSL  Adoption of DSL subscribers
Cablemodem  Adoption of CableModem users
FTTPb  Adoption of FTTPb sales

References

Telecoms Market Matrix

tsCarstock

Description

A dataset containing the yearly stock of cars in the Netherlands (1965-1989).

Format

A data frame with 25 observations and 3 variables

year  Year
raw  Raw stock numbers
smoothed  Smoothed stock numbers as described by Franses (1994)

References

**tsChicken**  
*Time series: Chicken weight*

### Description
A dataset containing the average weekly female chicken weight.

### Format
A data frame with 13 observations and 2 variables
- **time** Weeks since birth
- **weight** Weight of the female chicken in Kg

### References

**tsIbm**  
*Time series: Sales of IBM Computers*

### Description
A dataset containing the first four generations of yearly IBM general-purpose computers installations in the USA.

### Format
A data frame with 24 observations and 4 variables
- **SIU1** 1st generation
- **SIU2** 2nd generation (starts 6 years after first generation)
- **SIU3** 3rd generation (starts 11 years after first generation)
- **SIU4** 4th generation (starts 16 years after first generation)

### Source
https://goo.gl/VSEkgM

### References
tsSafari  

**Time series: Safari Browser market share**

**Description**

A dataset containing the monthly market share of Safari browser generations from Safari 4.0 to Safari 10.

**Format**

A data frame with 98 observations and 13 variables

- **Date**  Log file date
- **Safari10.0**  Usage of Windows 10
- **Safari9.1**  Market share of Safari browser v 10.0
- **Safari9.0**  Market share of Safari browser v 9.1
- **Safari8.0**  Market share of Safari browser v 9.0
- **Safari7.1**  Market share of Safari browser v 8.0
- **Safari7.0**  Market share of Safari browser v 7.1
- **Safari6.1**  Market share of Safari browser v 6.1
- **Safari6.0**  Market share of Safari browser v 6.0
- **Safari5.1**  Market share of Safari browser v 5.1
- **Safari5.0**  Market share of Safari browser v 5.0
- **Safari4.1**  Market share of Safari browser v 4.1
- **Safari4.0**  Market share of Safari browser v 4.0

**Source**


---

**tsWindows**  

**Time series: Windows OS Platform Statistics**

**Description**

A dataset containing the 3WSchools monthly log files of Windows operating system usage from March 2003 until February 2017.
Format

A data frame with 168 observations and 9 variables

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date</strong></td>
<td>Log file date</td>
</tr>
<tr>
<td><strong>Win10</strong></td>
<td>Usage of Windows 10</td>
</tr>
<tr>
<td><strong>Win8</strong></td>
<td>Usage of Windows 8</td>
</tr>
<tr>
<td><strong>Win7</strong></td>
<td>Usage of Windows 7</td>
</tr>
<tr>
<td><strong>Vista</strong></td>
<td>Usage of Windows Vista</td>
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<tr>
<td><strong>WinXP</strong></td>
<td>Usage of Windows XP</td>
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<tr>
<td><strong>Win2000</strong></td>
<td>Usage of Windows 2000</td>
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<tr>
<td><strong>Win98</strong></td>
<td>Usage of Windows 98</td>
</tr>
<tr>
<td><strong>Win95</strong></td>
<td>Usage of Windows 95</td>
</tr>
</tbody>
</table>

Note

From March 2003 until January 2008 log file is only available bi-monthly. To retain monthly consistency, values have been linearly interpolated.

Source

https://www.w3schools.com/browsers/browsers_os.asp
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