Package ‘moin’

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Title Modelling Interactions in R

Description This package provides functions to calculate simple location and interaction models. It is based on the gravity and entropy maximization approaches. These can be defined within the deterrence (or cost) functions. Two functions are implmented, covered singly- as well as doubly-constrained models.

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Encoding UTF-8

RoxygenNote 6.0.1

Suggests knitr,
rmarkdown,
testthat

VignetteBuilder knitr

R topics documented:

`dc` *Doubly constrained location model*

Description

A gravity like approach

Usage

```
dc(Oi, Dj, beta = 1, cij, iterations = 1000, detfun = "power")
```

Arguments

`Oi`	population/workers
`Dj`	settlement size/jobs
`beta`	distance decay factor, default = 1
`cij`	distance/cost etc. matrix
`iterations`	used to stop calculation after n-iterations when no convergence is achieved
`detfun`	deterrence function (always negative); default is "power beta"; further option is "exp" for an expontential function; ..

Value

a list with the elements:

- iteration: when was convergence achieved
- beta: beta (repeated for convenience)
- Oi: a data.frame showing input and calculated values of summed rows, i.e. sum over j
- Dj: a data.frame showing input and calculated values of summed columns, i.e. sum over i
- Ratio: ratio of the difference between targeted and calculated values
- error: globar error
- Ai: the last five results for balancing factor Ai; the last value is chosen to calculate Tij
- Bj: the last five results for balancing factor Bj; the last value is chosen to calculate Tij
- Tij: the resulting flow matrix
- sumTij: the overall sum of the flow matrix

References

Wilson, A.G., Kirkby, M.J., 1980. Mathematics for geographers and planners, 2nd ed, Contemporary problems in geography. Clarendon Pr., Oxford. Thomas, R.W., Huggett, R.J., 1980. Modelling in Geography: A Mathematical Approach. Rowman & Littlefield. Ortúzar S., J. de D., Willumsen, L.G., 2011. Modelling Transport, Fourth edition. ed. John Wiley & Sons, Chichester, West Sussex, United Kingdom.

Examples

```
## From Thomas & Huggett 1980, 150
## ------------------------------------------------
Oi <- c(4,6,2)
Dj <- c(3,8,1)
cij <- matrix(data = c(1,2,2,
                       2,1,2,
                       2,2,1
                       ),
               nr = 3,
               nc = 3
               )
beta <- 1
```

```
dc(Oi = Oi, Dj = Dj, cij = cij, iterations = 5)

## From Ortúzar & Willumsen 2011, 184-189
## -------------------------------------------------
cost_mat <- matrix(data = c(3, 12, 15.5, 24,
                            11, 3, 13, 18,
                            18, 12, 5, 8,
                            22, 19, 7, 5
                            ),
                   nrow = 4,
                   ncol = 4
                   )
Oi_target <- c(400, 460, 400, 702)
Dj_target <- c(260, 400, 500, 802)

dc(Oi_target, Dj_target, cij = cost_mat, beta = .1, detfun = "exp")
```

`dc2` *Doubly constrained location model (Furness method version)*

Description

A gravity like approach; the code should be much faster than the dc version; it is based on the Furness method as presented in Ortúzar & Willumsen 2011 184–189

Usage

```
dc2(Oi, Dj, cij, beta = 1, iterations = 100, detfun = "exp")
```

Arguments

`Oi`	population/workers
`Dj`	settlement size/jobs
`cij`	distance/cost etc. matrix
`beta`	distance decay factor, default = 1
`iterations`	used to stop calculation after n-iterations when no convergence is achieved
`detfun`	deterrence function (always negative); default is "power beta"; further option is "exp" for an expontential function; ..

Value

a list with the elements:

- iteration: when was convergence achieved
- beta: beta (repeated for convenience)
- Oi: a data.frame showing input and calculated values of summed rows, i.e. sum over j

- Dj: a data.frame showing input and calculated values of summed columns, i.e. sum over i
- Ratio: ratio of the difference between targeted and calculated values
- error: globar error
- Tij: the resulting flow matrix
- sumTij: the overall sum of the flow matrix

References

Wilson, A.G., Kirkby, M.J., 1980. Mathematics for geographers and planners, 2nd ed, Contemporary problems in geography. Clarendon Pr., Oxford. Ortúzar S., J. de D., Willumsen, L.G., 2011. Modelling Transport, Fourth edition. ed. John Wiley & Sons, Chichester, West Sussex, United Kingdom. Thomas, R.W., Huggett, R.J., 1980. Modelling in Geography: A Mathematical Approach. Rowman & Littlefield.

Examples

```
## From Thomas & Huggett 1980, 150
## --------------------------------------------------
Oi <- c(4,6,2)
Dj <- c(3,8,1)
cij <- matrix(data = c(1,2,2,
                       2,1,2,
                       2,2,1
                       ),
               nr = 3,
               nc = 3
               )
beta <- 1

dc2(Oi = Oi, Dj = Dj, cij = cij, iterations = 5)

## From Ortúzar & Willumsen 2011, 184-189
## --------------------------------------------------
cost_mat <- matrix(data = c(3, 12, 15.5, 24,
                           11, 3, 13, 18,
                           18, 12, 5, 8,
                           22, 19, 7, 5
                           ),
                  nrow = 4,
                  ncol = 4
                  )
Oi_target <- c(400, 460, 400, 702)
Dj_target <- c(260, 400, 500, 802)

dc2(Oi_target, Dj_target, cij = cost_mat, beta = 0.1, detfun = "exp")
```

sc *Singly constrained location model*

Description

A gravity like approach

Usage

```
sc(Oi, Dj, cij, alpha = 1, beta = 1, detfun = "power")
```

Arguments

Oi	origin values, e.g. measured as purchasing power, money, etc. of location i
Dj	destination values, e.g. measured as attractiveness of location j
cij	distance/cost etc. matrix
alpha	default = 1; scaling factor for the attractiveness
beta	distance decay factor, default = 1
detfun	deterrence function (always negative); default is "power beta"; further option is "exp" for an expontential function (–> entropy maximizing approach; NOTE: beta is overwritten by the estimate 1/mean(cij); this will be changed as soon as the beta estimating function is implemented.); ..

Value

a list with the elements:

- flows showing the flows from i to j,
- si are the sum of the rows, i.e. the sum of i along columns j; this is the factor that can be used to predict, e.g. shopping sales, subject to the constraint of purchasing power/population, etc. (Oi)
- sj are the constraints

Examples

```
## From Wilson & Kirkby 1980, 100f.
ei <- c(2,1,1)
Pi <- c(50, 1000, 500)
Wj <- c(10, 100, 20)
cij <- matrix(data = c(1, 5, 5,
                      5, 2.585, 5,
                      5, 5, 2),
              nr = 3,
              nc = 3
)
```

```
sc(Oi = ei * Pi, Dj = Wj, cij = cij, detfun = "power")

## ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
# from: Chan, Y., 2011. Location Theory and Decision
# Analysis. Springer Berlin Heidelberg, Berlin, Heidelberg.
# p. 128f.
cij <- matrix(data = c(8,5,10,
                       3,10,5),
              nrow = 2,
              byrow = TRUE)
Vi <- c(1000, 1400)
Vj <- c(1300, 300, 800)

sc(Oi = Vi, Dj = Vj, cij = cij, beta = 2)
```

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