

Package ‘affluenceIndex’

March 23, 2017

Type Package

Title Affluence Indices

Version 1.0

Date 2017-02-26

Author Alicja Wolny-Dominiak and Anna Saczewska-Piotrowska

Maintainer Alicja Wolny-Dominiak <alicya.wolny-dominiak@ue.katowice.pl>

Description Computes the statistical indices of affluence (richness) and constructs bootstrap confidence intervals for these indices. Also computes the Wolfson polarization index.

Depends stats

License GPL-2

Encoding latin2

NeedsCompilation no

Repository CRAN

Date/Publication 2017-03-23 13:02:42 UTC

R topics documented:

affluenceIndex-package	2
affluence	2
boot.r1	3
boot.r2	4
gap	5
polar.aff	6
r.cha	7
r.fgt	8
r.hc	9
r.is	10
Index	12

affluenceIndex-package

Affluence Indices

Description

Allows to compute the affluence (richness) indices (affluence gap, income share of the top p %, richness headcount ratio, concave and convex measures of affluence) and to construct the confidence intervals for affluence indices. The richness line is defined by the user as multiple of the income median. Additionally, this package allows also to compute the Wolfson polarization index.

Author(s)

Alicja Wolny-Dominiak, Anna Sączewska-Piotrowska
Maintainer: Alicja Wolny-Dominiak

References

1. Alich A., Kantenga K., Solé J. (2016) Income polarization in the United States. IMF Working Paper, WP/16/121.
2. Brzeziński M. (2010) Income affluence in Poland. *Social Indicators Research*, 99, pp. 285-299.
3. Medeiros M. (2006) The rich and the poor: the construction of an affluence line from the poverty line. *Social Indicators Research*, 78, pp. 1-18.
4. Peichl A., Schaefer T., Scheicher C. (2008) Measuring richness and poverty - A micro data application to Europe and Germany. IZA Discussion Paper No. 3790, Institute for the Study of Labor (IZA).
5. Sączewska-Piotrowska A. (2015) Identification of determinants of income richness using logistic regression model. *Zarządzanie i Finanse. Journal of Management and Finance*, 4, Part 2, pp. 241-259 (in Polish).
6. Wolfson M.C. (1994) When inequalities diverge, *The American Economic Review*, 84, pp. 353-358.

affluence

Equivalentised income

Description

The database contains information about equivalentised income of households

Usage

```
data("affluence")
```

Format

A data frame with 2000 observations on the following 4 variables.

income a numeric vector (equivalised income of households; equivalisation using modified OECD scale)

education a numeric vector (education of the household's head: 1=tertiary, 2=secondary, 3=basic vocational, 4=low)

age a numeric vector (age of the household's head: 1=less than 35, 2=35-44, 3=45-59, 4=60 and more)

sex a numeric vector (sex of the household's head: 0=male, 1=female)

Source

Based on Council for Social Monitoring (2016). Integrated database.<http://www.diagnoza.com> [11.09.2016]

Examples

```
data(affluence)
names(affluence)
```

boot.r1	<i>Bootstrap standard error 1</i>
---------	-----------------------------------

Description

Calculates the bootstrap standard errors.

Usage

```
boot.r1(x, k, nsim, boot.index = c("r.hc", "r.is"))
```

Arguments

x	income vector
k	multiple of the median income
nsim	the number of replications
boot.index	the index for which the error is estimated

Details

The function uses quantile method of calculating bootstrap confidence intervals.

Value

se.r	the bootstrap error
summary	bootstrap summary

Author(s)

Alicja Wolny-Dominiak

References

Brzeziński M. (2010) Income affluence in Poland. *Social Indicators Research*, 99, pp. 285-299.

Examples

```
data(affluence)
boot3 <-boot.r1(affluence$income[1:300], 0.9, 500, "r.is")
boot3$summary

boot4 <-boot.r1(affluence$income[1:300], 2, 500, "r.hc")
boot4$summary
```

boot.r2

Bootstrap standard error 2

Description

Calculates the bootstrap standard errors.

Usage

```
boot.r2(x, k, alpha, nsim, boot.index = c("r.cha", "r.fgt"))
```

Arguments

x	income vector
k	multiple of the median income
alpha	parameter of the index: $\alpha > 0$ for "r.cha", $\alpha > 1$ for "r.fgt"
nsim	the number of replications
boot.index	the index for which the error is estimated

Details

The function uses quantile method of calculating bootstrap confidence intervals.

Value

se.r	the bootstrap error
summary	bootstrap summary

Author(s)

Alicja Wolny-Dominiak

References

Brzeziński M. (2010) Income affluence in Poland. *Social Indicators Research*, 99, pp. 285-299.

Examples

```
data(affluence)
boot1 <-boot.r2(affluence$income[1:300], 2,2,500, "r.cha")
boot1$summary

boot2 <-boot.r2(affluence$income[1:300], 2,2,500, "r.fgt")
boot2$summary
```

gap	<i>Affluence gap</i>
-----	----------------------

Description

Computes the affluence gap.

Usage

```
gap(x, k)
```

Arguments

x	income vector
k	multiple of the median income

Details

Medeiros (2006) defined an affluence gap:

$$R^{Med}(\mathbf{x}) = \frac{1}{n} \sum_{i=1}^n (x_i - \rho)_+ = \frac{1}{n} \sum_{i=1}^n \max\{x_i - \rho, 0\},$$

where x_i is an income of individual i , n is the number of individuals, ρ is the richness line. Medeiros' index is not standardized and is an absolute measure of richness.

Value

the gap value

Author(s)

Alicja Wolny-Dominiak

References

Medeiros M. (2006) The rich and the poor: the construction of an affluence line from the poverty line. *Social Indicators Research*, 78, pp. 1-18.

Examples

```
data(affluence)
gap(affluence$income,2)
```

polar.aff	<i>Polarization index</i>
-----------	---------------------------

Description

Computes the Wolfson polarization index.

Usage

```
polar.aff(x)
```

Arguments

x the income vector

Details

Standard inequality measures do not give any information about polarization. A more polarized income distribution is one that has relatively fewer middle income class and more low- and/or high-income households (Alichi et al. 2016). Low income class is very often identified with poverty and high-income class with richness. One of the measures of polarization is the Wolfson polarization index given by (Wolfson 1994)

$$P = \left(T - \frac{G}{2} \right) \frac{\mu}{Me},$$

where T is the difference between 0.5 and the income share of bottom half of the population, G is the Gini coefficient, μ is the mean income, Me is the median income.

In order to have index from $\langle 0, 1 \rangle$ interval, Wolfson defined the scalar polarization index:

$$P^* = 2(2T - G) \frac{\mu}{Me}.$$

Value

gini	the Gini coefficient
p	the Wolfson polarization index
p.scalar	the Wolfson scalar polarization index
T	the difference between 0.5 and the income share of bottom half of the population

Author(s)

Alicja Wolny-Dominiak, Anna Sączewska-Piotrowska

References

1. Alich A., Kantenga K., Solé J. (2016) Income polarization in the United States. IMF Working Paper, WP/16/121.
2. Wolfson M.C. (1994) When inequalities diverge, *The American Economic Review*, 84, pp. 353-358.

Examples

```
data(affluence)
polar.aff(affluence$income)
```

r.cha

Concave measure of affluence

Description

Computes measure of affluence analogous to the poverty index of Chakravarty (1983).

Usage

```
r.cha(x, k, beta)
```

Arguments

x	the income vector
k	multiple of the median income
beta	parameter of the index: beta > 0

Details

Peichl et. al (2008) defined an affluence index

$$R_{\beta}^{Cha}(\mathbf{x}, \rho) = \frac{1}{n} \sum_{i=1}^n \left(1 - \left(\frac{\rho}{x_i} \right)_{+}^{\beta} \right), \beta > 0,$$

where x_i is an income of individual i , n is the number of individuals, ρ is the richness line. Index satisfies transfer axiom $T1$ (concave): a richness index should increase when a rank-preserving progressive transfer between two rich people takes place.

Value

r	elements of the sum in the index formula
r.cha	the value of index

Author(s)

Alicja Wolny-Dominiak

References

1. Chakravarty S.R. (1983) A new index of poverty. *Mathematical Social Sciences*, 6, pp. 307-313.
2. Peichl A., Schaefer T., Scheicher C. (2008) Measuring richness and poverty - A micro data application to Europe and Germany. IZA Discussion Paper No. 3790, Institute for the Study of Labor (IZA).

Examples

```
data(affluence)
r <-r.cha(affluence$income, 2, 2)
print(r)
```

r.fgt

Convex measure of affluence

Description

Computes measure of affluence analogous to the convex version of Foster, Greer and Thorbecke (1984) family of poverty indices.

Usage

```
r.fgt(x, k, alpha)
```

Arguments

x	the income vector
k	multiple of the median income
alpha	parameter of the index: alpha > 1

Details

Peichl et. al (2008) defined an affluence index

$$R_{\alpha}^{FGT,T2}(\mathbf{x}, \rho) = \frac{1}{n} \sum_{i=1}^n \left(\left(\frac{x_i - \rho}{\rho} \right)_+ \right)^{\alpha}, \alpha > 1,$$

where x_i is an income of individual i , n is the number of individuals, ρ is the richness line. Index satisfies transfer axiom $T2$ (convex): a richness index should decrease when a rank-preserving progressive transfer between two rich people takes place.

Value

r values of the sum in the index formula
 r.fgt the value of index

Author(s)

Alicja Wolny-Dominiak

References

1. Foster J.E., Greer J., Thorbecke E. (1984) A class of decomposable poverty measures. *Econometrica*, 52, pp. 761-766.
2. Peichl A., Schaefer T., Scheicher C. (2008) Measuring richness and poverty - A micro data application to Europe and Germany. IZA Discussion Paper No. 3790, Institute for the Study of Labor (IZA).

Examples

```
data(affluence)
r.fgt(affluence$income, 2, 1)$r.fgt
```

r.hc *Richness headcount ratio*

Description

Computes richness headcount ratio.

Usage

```
r.hc(x, k)
```

Arguments

x the income vector
 k multiple of the median income

Details

Richness headcount ratio is a proportion of the population with incomes above the affluence line

$$R^{HC}(\mathbf{x}, \rho) = \frac{1}{n} \sum_{i=1}^n \mathbf{1}_{x_i > \rho} = \frac{r}{n},$$

where x_i is an income of individual i , n is the number of individuals, ρ is the richness line, r is the number of rich.

Value

count.rich the number of the rich
 r.hc the value of index

Author(s)

Alicja Wolny-Dominiak, Anna Sączewska-Piotrowska

References

1. Brzeziński M. (2010) Income affluence in Poland. *Social Indicators Research*, 99, pp. 285-299.
2. Sączewska-Piotrowska A. (2015) Identification of determinants of income richness using logistic regression model. *Zarządzanie i Finanse. Journal of Management and Finance*, 4, Part 2, pp. 241-259 (in Polish).

Examples

```
data(affluence)
r <-r.hc(affluence$income,3)
print(r)
```

r.is

Income share of the top p %

Description

Computes income share of the top p %.

Usage

```
r.is(x, p)
```

Arguments

x the vector of income
 p the order of quantile. Must be in [0,1] as probability

Details

The most popular measure of richness which takes a form:

$$R^{IS}(\mathbf{x}, p) = \frac{\sum_{i=1}^n x_i \mathbf{1}_{x_i > q_{1-p}}}{\sum_{i=1}^n x_i},$$

where q_{1-p} is the $(1 - p)$ quantile of the population and $\mathbf{1}$ denotes the indicator function, which is equal to 1 when its argument is true and 0 otherwise. There is always p % of rich units in the population.

Value

the value of index

Author(s)

Alicja Wolny-Dominiak, Anna Sączewska-Piotrowska

References

Brzeziński M. (2010) Income affluence in Poland. *Social Indicators Research*, 99, pp. 285-299.

Examples

```
data(affluence)
r <-r.is(affluence$income,0.9)
print(r)
```

Index

*Topic **datasets**

affluence, [2](#)

*Topic **indboot**

boot.r1, [3](#)

boot.r2, [4](#)

*Topic **ind**

gap, [5](#)

r.cha, [7](#)

r.fgt, [8](#)

r.hc, [9](#)

r.is, [10](#)

*Topic **package**

affluenceIndex-package, [2](#)

*Topic **polar**

polar.aff, [6](#)

affluence, [2](#)

affluenceIndex

(affluenceIndex-package), [2](#)

affluenceIndex-package, [2](#)

boot.r1, [3](#)

boot.r2, [4](#)

gap, [5](#)

polar.aff, [6](#)

r.cha, [7](#)

r.fgt, [8](#)

r.hc, [9](#)

r.is, [10](#)