

Package ‘IC2’

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 IC2-package

Inequality and Concentration Index and Curves

Description

The package **IC2** implements the computation of some indices of inequality and concentration. For each index, it provides decomposition between subgroups. Plotting of Lorenz and concentration curves are also available.

Details

Three family of inequality indices are available: extended Gini, Atkinson and Generalized Entropy. Except for GEI, two different forms of decomposition are available. Ordinary as well as generalized Lorenz curves can be drawn. Sampling weights can be used.

Author(s)

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 calcAtkinson

Atkinson Index of Inequality

Description

Computes an Atkinson measure of inequality within a vector.

Usage

```
calcAtkinson(x, w = NULL, epsilon = 1)
```

Arguments

| | |
|---------|--|
| x | Numeric vector with non-negative values (strictly positive when epsilon=1) |
| w | Numeric vector of sampling weights (optional) |
| epsilon | Parameter of the Atkinson index (must be strictly positive) |

Value

A list of class "ICI" with components:

| | |
|------|---|
| ineq | a list with components <code>Atk</code> (value of inequality index) and <code>epsilon</code> (value of parameter) |
| nas | a list with NA counts, including components <code>xNA</code> , <code>wNA</code> and <code>totalNA</code> |

References

Atkinson A.B. (1970) On the Measurement of Inequality. *Journal of Economic Theory*, 2, pp. 244-263.

See Also

[decompAtkinson](#)

Examples

```
data(hhbudgets)

calcAtkinson(hhbudgets[, "ingreso"], epsilon=3)
summary(hhbudgets[, "transporte"])
calcAtkinson(hhbudgets[, "transporte"], w=hhbudgets[, "factor"])
```

| | |
|---------|----------------------------------|
| calcGEI | <i>Generalized Entropy Index</i> |
|---------|----------------------------------|

Description

Computes a generalized entropy inequality measure within a vector.

Usage

```
calcGEI(x, w = NULL, alpha = 1)
```

Arguments

| | |
|-------|--|
| x | Numeric vector with non-negative values (strictly positive when alpha=0 or alpha=1) |
| w | Numeric vector of sampling weights (optional) |
| alpha | Parameter of the generalized entropy index. Theil index (T_T) is calculated for alpha=1, the mean log deviation (T_L) for alpha=0. |

Value

A list of class "ICI" with components:

| | |
|------|---|
| ineq | a list with components GEI (value of inequality index) and alpha (value of parameter) |
| nas | a list with NA counts, including components xNA, wNA and totalNA |

References

Cowell F.A. (2000) Measurement of Inequality. In Atkinson A.B., Bourguignon F. (Eds.) *Handbook of Income Distribution*. Amsterdam, Elsevier, Vol. 1, pp. 87-166.

See Also[decompAtkinson](#)**Examples**

```
data(hhbudgets)

summary(hhbudgets[, "transporte"])
calcGEI(hhbudgets[, "transporte"], alpha=3)
summary(calcGEI(hhbudgets[, "ingreso"], w=hhbudgets[, "factor"]))
```

calcSConc

*Concentration Index***Description**

Computes the concentration index for a vector, ranked by another vector.

Usage

```
calcSConc(x, y, w = NULL, param = 2)
```

Arguments

| | |
|-------|---|
| x | Numeric vector with non-negative values. |
| y | Numeric vector used for the ranking of vector x. |
| w | Numeric vector of sampling weights (optional). |
| param | Parameter specifying the concentration index (must be strictly positive). |

Value

A list of class "ICI" with components:

| | |
|------|---|
| ineq | a list with components SConc (value of concentration index) and param (value of parameter). |
| nas | a list with NA counts, including components xNA, yNA, wNA and totalNA. |

References

Kakwani N.C. (1977) Measurement of Tax Progressivity: An International Comparison. *The Economic Journal*, 87(345), pp. 71-80.

O'Donnell O., van Doorslaer E., Wagstaff A., Lindelow M. (2008) *Analyzing Health Equity Using Household Survey Data*. World Bank, 220 p.

See Also[curveConcent](#)

Examples

```

data(hhbudgets)

calcSConc(hhbudgets[, "transporte"], hhbudgets[, "ingreso"], param=0.5)
summary(hhbudgets[, "mantenimiento"])
calcSConc(hhbudgets[, "mantenimiento"], hhbudgets[, "ingreso"], w=hhbudgets[, "factor"])

```

calcSGini

Extended Gini Coefficient

Description

Computes the Extended Gini coefficient for a vector.

Usage

```
calcSGini(x, w = NULL, param = 2)
```

Arguments

x Numeric vector with non-negative values.
w Numeric vector of sampling weights (optional).
param Parameter specifying the extended Gini index (must be strictly positive).

Value

A list of class "ICI" with components:

ineq a list with components SGini (value of inequality index) and param (value of parameter).
nas a list with NA counts, including components xNA, wNA and totalNA.

References

Cowell F.A. (2000) Measurement of Inequality. In Atkinson A.B., Bourguignon F. (Eds.) *Handbook of Income Distribution*. Amsterdam, Elsevier, Vol. 1, pp. 87-166.

Schechtman E., Yitzhaki S. (2008) Calculating the Extended Gini Coefficient from Grouped Data: A Covariance Presentation. *Bulletin of Statistics & Economics*, 2(S08), pp. 64-69.

See Also

[decompSGini](#), [curveLorenz](#)

Examples

```
data(hhbudgets)

calcSGini(hhbudgets[, "ingreso"], param=0.5)
summary(hhbudgets[, "mantenimiento"])
calcSGini(hhbudgets[, "mantenimiento"], w=hhbudgets[, "factor"])
```

curveConcent

Concentration Curve

Description

Plots a concentration curve.

Usage

```
curveConcent(x, y, w = NULL, xlab = NA, ylab = NA, add = FALSE, grid = 0, ...)
```

Arguments

| | |
|------|--|
| x | Numeric vector with non-negative values. |
| y | Numeric vector used for the ranking of vector x. |
| w | Numeric vector of sampling weights (optional). |
| xlab | Title for the x-axis. |
| ylab | Title for the y-axis. |
| add | If add is TRUE, only the curve is drawn. The device must contain a high-level plot. |
| grid | If grid > 0, a grid is drawn, with spacing equal to 1/grid. |
| ... | Further arguments to be used for drawing the concentration curve (see lines). |

References

O'Donnell O., van Doorslaer E., Wagstaff A., Lindelow M. (2008) *Analyzing Health Equity Using Household Survey Data*. World Bank, 220 p.

See Also

[calcSConc](#)

Examples

```
data(hhbudgets)

curveConcent(x=hhbudgets[, "transporte"], y=hhbudgets[, "ingreso"], w=hhbudgets[, "factor"], col="red", xlab="Ran
curveConcent(x=hhbudgets[, "mantenimiento"], y=hhbudgets[, "ingreso"], w=hhbudgets[, "factor"], col="blue", add=T
curveConcent(x=hhbudgets[, "publico"], y=hhbudgets[, "ingreso"], w=hhbudgets[, "factor"], col="green", add=TRUE)
title(main="Transport expenditures")
legend("topleft", legend = c("All transport", "Private: Maintenance and repair", "Public transport"), col=c("red"
```

`curveLorenz`*Lorenz Curve*

Description

Plots an ordinary or generalized Lorenz curve.

Usage

```
curveLorenz(x, w = NULL, gener = FALSE, xlab = NA, ylab = NA, add = FALSE, grid = 0, ...)
```

Arguments

| | |
|--------------------|---|
| <code>x</code> | Numeric vector with non-negative values. |
| <code>w</code> | Numeric vector of sampling weights (optional). |
| <code>gener</code> | If <code>gener</code> is TRUE, the generalized curve is plotted. Else, the ordinary curve is plotted. |
| <code>xlab</code> | Title for the x-axis. |
| <code>ylab</code> | Title for the y-axis. |
| <code>add</code> | If <code>add</code> is TRUE, only the curve is drawn. The device must contain a high-level plot. |
| <code>grid</code> | If <code>grid > 0</code> , a grid is drawn, with spacing equal to $1/\text{grid}$. |
| <code>...</code> | Further arguments to be used for drawing the Lorenz curve (see lines). |

References

Cowell F.A. (2000) Measurement of Inequality. In Atkinson A.B., Bourguignon F. (Eds.) *Handbook of Income Distribution*. Amsterdam, Elsevier, Vol. 1, pp. 87-166.

See Also

[calcSGini](#)

Examples

```
data(hhbudgets)

curveLorenz(x=hhbudgets[, "transporte"], w =hhbudgets[,"factor"])
curveLorenz(x=hhbudgets[, "transporte"], w =hhbudgets[,"factor"], gener=TRUE, col="red")
```

decompAtkinson *Decomposition by Groups for Atkinson Index*

Description

Decomposes by population subgroups an Atkinson measure of inequality within a vector.

Usage

```
decompAtkinson(x, z, w = NULL, epsilon = 1, decomp = "BDA", ELMO = TRUE)
```

Arguments

| | |
|---------|---|
| x | Numeric vector with non-negative values (strictly positive when epsilon=1). |
| z | Factor who determines the subgroups. |
| w | Numeric vector of sampling weights (optional). |
| epsilon | Parameter of the Atkinson index (must be strictly positive). |
| decomp | Character string specifying the decomposition. It must be one of "BDA" for the Blackorby and alii (1985) decomposition or "DP" for the Das and Parikh (1982) decomposition. |
| ELMO | When ELMO is TRUE, a "maximum" between-group inequality index is estimated using the Elbers and alii method (2005). |

Value

A list of class "ICI" with components:

| | |
|--------|---|
| ineq | a list with components Atk (value of inequality index) and epsilon (value of parameter). |
| decomp | a list with components within (value of within-group inequality), between (value of between-group inequality), residual (value of residual inequality) and, if ELMO is TRUE, betweenELMO (value of maximum between-group inequality). |
| intra | a list with component AtkGroups (the subgroup values of inequality index). |
| ws | a list with components wIntra (the subgroup weights) and sIntra (the subgroup shares of x). |
| nas | a list with NA counts, including components xNA, zNA, wNA and totalNA. |

References

Atkinson A.B. (1970) On the Measurement of Inequality. *Journal of Economic Theory*, 2, pp. 244-263.

Blackorby C., Donaldson D., Auersperg M. (1981) A new procedure for the measurement of inequality within and among population subgroups. *Canadian Journal of Economics*, 14, pp. 665-685.

Das T., Parikh A. (1982) Decomposition of Inequality Measures and a Comparative Analysis. *Empirical Economics*, 7(1-2), pp. 23-48.

Elbers C., Lanjouw P., Mistiaen J.A., Ozler B. (2005) *Re-Interpreting Sub-Group Inequality Decompositions*. World Bank, World Bank Policy Research Working Paper 3687, 42 p.

See Also

[calcAtkinson](#)

Examples

```
data(hhbudgets)
```

```
decompAtkinson(hhbudgets[, "ingreso"], hhbudgets[, "estructura"], epsilon=3)
```

```
summary(hhbudgets[, "tenencia"]) # 35 NA's
```

```
summary(decompAtkinson(x=hhbudgets[, "transporte"], z=hhbudgets[, "tenencia"], w=hhbudgets[, "factor"], decomp="DF"))
```

```
summary(decompAtkinson(x=hhbudgets[, "transporte"], z=hhbudgets[, "tenencia"], w=hhbudgets[, "factor"], decomp="DF"))
```

decompGEI

Decomposition by Groups for GEI

Description

Decomposes by population subgroups a generalized entropy inequality measure within a vector.

Usage

```
decompGEI(x, z, w = NULL, alpha = 1, ELMO = TRUE)
```

Arguments

| | |
|-------|--|
| x | Numeric vector with non-negative values (strictly positive when alpha=0 or alpha=1). |
| z | Factor who determines the subgroups. |
| w | Numeric vector of sampling weights (optional). |
| alpha | Parameter of the generalized entropy index. Theil index (T_T) is calculated for alpha=1, the mean log deviation (T_L) for alpha=0. |
| ELMO | When ELMO is TRUE, a "maximum" between-group inequality index is estimated using the Elbers and alii method (2005). |

Value

A list of class "ICI" with components:

| | |
|--------|--|
| ineq | a list with components GEI (value of inequality index) and alpha (value of parameter). |
| decomp | a list with components within (value of within-group inequality), between (value of between-group inequality) and, if ELMO is TRUE, betweenELMO (value of maximum between-group inequality). |
| intra | a list with components GEIGroups (the subgroup values of inequality index) and contribGEIGroups (the contribution of each subgroup to the total within-groups inequality). |
| ws | a list with components wIntra (the subgroup weights) and sIntra (the subgroup shares of x). |
| nas | a list with NA counts, including components xNA, zNA, wNA and totalNA. |

References

Cowell F.A. (2000) Measurement of Inequality. In Atkinson A.B., Bourguignon F. (Eds.) *Handbook of Income Distribution*. Elsevier, Vol. 1, pp. 87-166.

Elbers C., Lanjouw P., Mistiaen J.A., Ozler B. (2005) *Re-Interpreting Sub-Group Inequality Decompositions*. World Bank, World Bank Policy Research Working Paper 3687, 42 p.

See Also

[calcGEI](#)

Examples

```
data(hhbudgets)

decompGEI(hhbudgets[, "ingreso"], hhbudgets[, "estructura"], alpha=4)
summary(hhbudgets[, "tenencia"]) #35 NA's
decompGEI(x=hhbudgets[, "transporte"], z=hhbudgets[, "tenencia"], w=hhbudgets[, "factor"], ELMO=FALSE)
summary(decompGEI(x=hhbudgets[, "transporte"], z=hhbudgets[, "tenencia"], w=hhbudgets[, "factor"], alpha=1.5))
```

decompSGini

Decomposition by Groups for Extended Gini Coefficient

Description

Decomposes by population subgroups the extended Gini coefficient of inequality within a vector.

Usage

```
decompSGini(x, z, w = NULL, param = 2, decomp = "BM", ELMO = TRUE)
```

Arguments

| | |
|--------|---|
| x | Numeric vector with non-negative values. |
| z | Factor who determines the subgroups. |
| w | Numeric vector of sampling weights (optional). |
| param | Parameter specifying the extended Gini index (must be strictly positive). |
| decomp | Character string specifying the decomposition. This must be one of "BM" for the Bhattacharya and Mahalanobis (1967) decomposition or "YL" for the Yitzhaki and Lerman (1991) decomposition. |
| ELMO | When ELMO is TRUE, a "maximum" between-group inequality index is estimated using the Elbers and alii method (2005). |

Value

A list of class "ICI" with components:

| | |
|---------|--|
| ineq | a list with components SGini (value of inequality index) and param (value of parameter). |
| decomp | a list with components within (value of within-group inequality), between (value of between-group inequality), overlap (value of residual inequality) when decomp = "BM" or stratif (value of residual inequality) when decomp = "YL" and, if ELMO is TRUE, betweenELMO (value of maximum between-group inequality). |
| intra | a list with components SGiniGroups (the subgroup values of inequality index) and contribSGiniGroups (the contribution of each subgroup to the total within-group inequality). |
| stratif | only if decomp = "YL", a list with components stratifGroups (the index of stratification for each subgroup) and contribStratifGroups (the contribution of each subgroup to the total stratification). |
| ws | a list with components wIntra (the subgroup weights) and sIntra (the subgroup shares of x). |
| nas | a list with NA counts, including components xNA, zNA, wNA and totalNA. |

References

- Bhattacharya N., Mahalanobis B. (1967) Regional disparities in household consumption in India. *Journal of the American Statistical Association*, 62 (317), pp. 143-161.
- Cowell F.A. (2000) Measurement of Inequality. In Atkinson A.B., Bourguignon F. (Eds.) *Handbook of Income Distribution*. Amsterdam, Elsevier, Vol. 1, pp. 87-166.
- Elbers C., Lanjouw P., Mistiaen J.A., Ozler B. (2005) *Re-Interpreting Sub-Group Inequality Decompositions*. World Bank, World Bank Policy Research Working Paper 3687, 42 p.
- Schechtman E., Yitzhaki S. (2008) Calculating the Extended Gini Coefficient from Grouped Data: A Covariance Presentation. *Bulletin of Statistics & Economics*, 2(S08), pp. 64-69.
- Yitzhaki S., Lerman R. (1991) Income Stratification and Income Inequality. *Review of Income and Wealth*, 37(3), pp. 313-29.

See Also[calcSGini](#)**Examples**

```
data(hhbudgets)
```

```
decompSGini(x=hhbudgets[, "ingreso"], z=hhbudgets[, "estructura"], param=4)
```

```
decompSGini(x=hhbudgets[, "transporte"], z=hhbudgets[, "estructura"], w=hhbudgets[, "factor"], decomp="YL", ELMO=F)
```

```
summary(decompSGini(x=hhbudgets[, "transporte"], z=hhbudgets[, "tenencia"], w=hhbudgets[, "factor"], param=1.5))
```

hhbudgets

Mexican Households Budgets

Description

Household income and expenditure metadata extracted from the 2008 Mexican ENIGH (Household Income and Expenditure Survey).

Usage

```
data(hhbudgets)
```

Format

A data frame with 2542 observations and 7 variables.

factor Population inflating weights.

tenencia Home tenancy, factor with levels rentada (rented), prestada (lent), propia_pagando (owned, paying back), propia (owned), litigio (disputed), otra (other).

estructura Household structure, factor with levels unipersonal (single), nuclear (nuclear), ampliado (extended), compuesto (nuclear or extended with unrelated persons), coresidente (share housing).

ingreso Total household income.

transporte Total transport (private and public) expenditure.

publico Public transport expenditure.

mantenimiento Total expenditure for vehicle maintenance and repair.

Details

The data set is a small excerpt of the original data set. More information and the whole data set are available at <http://www.inegi.org.mx/sistemas/microdatos2/encuestas.aspx?c=26182&s=est>.

Source

INEGI, Mexico.

References

INEGI (2009) *Encuesta Nacional de Ingresos y Gastos de los Hogares 2008. Conociendo la base de datos*. Mexico, 98 p.

Examples

```
data(hhbudgets)
names(hhbudgets)
```

summary.ICI

Summarize a ICI Object

Description

Print the main characteristics of an ICI object.

Usage

```
## S3 method for class 'ICI'
summary(object, ...)
```

Arguments

| | |
|--------|--|
| object | An ICI object. |
| ... | Number of significant digits to be used in the result. |

Details

Values of the index and the parameter are systematically printed. If x is the result of a subgroup decomposition, the function also prints the type of decomposition (when necessary), the values of the between-group, within-group and residual (when necessary) inequality indices and, if calculated, the maximum between-group inequality index.

Examples

```
data(hhbudgets)

summary(calcAtkinson(hhbudgets[, "ingreso"], epsilon=3), digits=3)
summary(decompGEI(hhbudgets[, "ingreso"], hhbudgets[, "estructura"], alpha=1.1))
```

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