Package 'DescriptiveRepresentationCalculator'

June 11, 2025

Title Characterizing Observed and Expected Representation

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| Version 1.1.0 |
|---|
| Description A system for analyzing descriptive representation, especially for comparing the composition of a political body to the population it represents. Users can compute the expected degree of representation for a body under a random sampling model, the expected degree of representation variability, as well as representation scores from observed political bodies. The package is based on Gerring, Jerzak, and Oncel (2024) <doi:10.1017 s0003055423000680="">.</doi:10.1017> |
| <pre>URL https://github.com/cjerzak/DescriptiveRepresentationCalculator-software/</pre> |
| <pre>BugReports https: //github.com/cjerzak/DescriptiveRepresentationCalculator-software/issues</pre> |
| Depends R (>= $3.3.3$) |
| License GPL-3 |
| Encoding UTF-8 |
| LazyData false |
| Imports stats |
| Suggests knitr, testthat (>= 3.0.0) |
| VignetteBuilder knitr |
| RoxygenNote 7.3.2 |
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ExpectedRepresentation

Compute the expected degree of representation for any group in a political body

Description

Finds the degree of expected representation for any group in a political body under a random sampling model as described in Gerring, Jerzak and Oncel (2024).

Usage

```
ExpectedRepresentation(PopShares, BodyN, a = -0.5, b = 1)
```

Arguments

PopShares A numeric vector containing the group-level population proportions.

BodyN A positive integer denoting the size of the political body in question.

a, b The a and b parameters control the affine transformation for how the represen-

tation measure is summarized. That is, a and b control how the expected L1 deviation of the population shares from the body shares is re-weighted. The expected L1 deviation is the average value of the absolute deviation of the population from body shares under a random sampling model. This expected L1 deviation is multiplied by a; b is as an additive re-scaling term: a*E[L1]+b. By default, a=-0.5 and b=1 so that the expected Rose Index of Proportionality is

returned.

Value

The expected degree of representation (a scalar).

References

• John Gerring, Connor T. Jerzak, Erzen Oncel. (2024), The Composition of Descriptive Representation, *American Political Science Review*, 118(2): 784-801. doi:10.1017/S0003055423000680

See Also

- ObservedRepresentation for calculating representation scores from observed data.
- SDRepresentation for calculating representation unexplained under the random sampling model.

Examples

ObservedRepresentation

Compute the observed degree of representation for any group in a political body

Description

Finds the degree of observed representation for any group in a political body.

Usage

ObservedRepresentation(BodyMemberCharacteristics, PopShares, BodyShares, a = -0.5, b = 1)

Arguments

BodyMemberCharacteristics

A vector specifying the characteristics for members of a political body.

PopShares A numeric vector specifying population shares of identities specified in the

body-member characteristics input. The names of the entries in PopShares should correspond to identities in that body-member characteristics input (see

Example).

BodyShares (optional) A numeric vector with same structure as PopShares specifying group

population shares of a given body. If supplied with names, they are matched to PopShares; otherwise, the order is assumed to correspond to that of PopShares.

a, b Parameters controlling the affine transformation for how the representation mea-

sure is summarized. That is, a and b control how the L1 deviation of the population shares from the body shares is re-weighted. This expected L1 deviation is multiplied by a; b is as an additive re-scaling term: a*L1+b. By default, a=-0.5

and b=1 so that the Rose Index of Proportionality is returned.

Value

The observed degree of representation (a scalar). By default, this quantity is the Rose Index of Proportionality.

See Also

- ExpectedRepresentation for calculating expected representation scores under random sampling.
- SDRepresentation for calculating representation unexplained under the random sampling model.

Examples

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RelativeRepresentation

Compute relative representation compared to random sampling

Description

Calculates the difference between observed and expected representation. Optionally standardizes this difference using the standard deviation of representation under the random sampling model.

Usage

Arguments

BodyMemberCharacteristics

A vector specifying characteristics for each member of a political body.

PopShares A numeric vector of population group proportions. Names must correspond to

identities in BodyMemberCharacteristics.

a b Parameters controlling the affine transformation of the representation index,

 $passed \ to \ Observed Representation \ and \ Expected Representation.$

standardize Logical. If TRUE, the difference between observed and expected representation

is divided by the standard deviation of representation under random sampling.

nMonte A positive integer denoting number of Monte Carlo iterations used for estimat-

ing the standard deviation when standardize = TRUE.

Value

A scalar giving the difference between observed and expected representation. If standardize = TRUE, the difference is divided by the standard deviation under the random sampling model.

See Also

ObservedRepresentation, ExpectedRepresentation, SDRepresentation

| SDRepresentation Compute the amount of representation left unexplained sampling model. | by a random |
|--|-------------|
|--|-------------|

Description

Finds the residual standard deviation when using the expected representation for any group in a political body to predict observed representation as described in Gerring, Jerzak and Oncel (2024).

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Usage

```
SDRepresentation(PopShares, BodyN, a = -0.5, b = 1, nMonte = 10000)
```

Arguments

a, b

PopShares A numeric vector containing the group-level population proportions.

BodyN A positive integer denoting the size of the political body in question.

Parameters controlling the affine transformation for how the representation measure is summarized. That is, a and b control how the expected L1 deviation of the population shares from the body shares is re-weighted. The expected L1 deviation is the average value of the absolute deviation of the population from body shares under a random sampling model. This expected L1 deviation is multiplied by a; b is as an additive re-scaling term: a*E[L1]+b. By default, a=-0.5 and b=1 so that the expected Rose Index of Proportionality is used in

the calculation.

nMonte A positive integer denoting number of Monte Carlo iterations used to approxi-

mate the variance of representation under a random sampling model.

Value

A scalar summary of the amount of representation not explained by a random sampling model. More precisely, this function returns the the residual standard deviation when using the expected degree of representation to predict observed representation under a random sampling model.

References

• John Gerring, Connor T. Jerzak, Erzen Oncel. (2024), The Composition of Descriptive Representation, *American Political Science Review*, 118(2): 784-801. doi:10.1017/S0003055423000680

See Also

- ExpectedRepresentation for calculating expected representation scores under random sampling.
- ObservedRepresentation for calculating representation scores from observed data.

Examples

```
SDRep <- SDRepresentation(PopShares = c(1/4, 2/4, 1/4), BodyN = 50) 
print( SDRep )
```

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