

Package ‘wqs’

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Type Package

Title Weighted Quantile Sum Regression

Version 0.0.1

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Author Jenna Czarnota, David Wheeler

Maintainer Jenna Czarnota <jennaczarnota@gmail.com>

Description Fits weighted quantile sum regression models, calculates weighted quantile sum index and estimated component weights.

Depends R (>= 3.2.1)

Imports Rsolnp, glm2

License GPL (>= 2)

LazyLoad yes

NeedsCompilation no

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R topics documented:

wqs-package	2
wqs.est	3
WQSdata	4
Index	6

wqs-package

Weighted Quantile Sum Regression

Description

Fits weighted quantile sum regression models, calculates weighted quantile sum index and estimated component weights.

Details

The DESCRIPTION file:

```

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```

Index of help topics:

WQSdata	Simulated data to test WQS
wqs-package	Weighted Quantile Sum Regression
wqs.est	Weighted Quantile Sum Regression

This package performs weighted quantile sum (WQS) regression, by fitting a WQS regression model for a continuous outcome variable. The components (e.g. chemicals) to be combined into an index are scored into quantiles and then used in the estimation of empirically derived weights and a final WQS index through bootstrap sampling. The weights are constrained to sum to 1 and be between 0 and 1, and can be used to identify important (highly weighted) components and those with no association with outcome (components receiving zero or negligible weight). Inference is constrained in a single direction and the index is interpretable as a measure of the mixture effect.

Author(s)

Jenna Czarnota, David Wheeler

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References

Carrico C, Gennings C, Wheeler D, Factor-Litvak P. Characterization of a weighted quantile sum regression for highly correlated data in a risk analysis setting. *J Biol Agricul Environ Stat.* 2014;1-21. ISSN: 1085-7117. DOI: 10.1007/s13253-014-0180-3. <http://dx.doi.org/10.1007/s13253-014-0180-3>.

Czarnota J, Gennings C, Colt JS, De Roos AJ, Cerhan JR, Severson RK, Hartge P, Ward MH, Wheeler D. 2015. Analysis of environmental chemical mixtures and non-Hodgkin lymphoma risk in the NCI-SEER NHL study. *Environmental Health Perspectives*, DOI:10.1289/ehp.1408630.

Czarnota J, Gennings C, Wheeler D. 2015. Assessment of weighted quantile sum regression for modeling chemical mixtures and cancer risk. *Cancer Informatics*, 2015:14(S2) 159-171 DOI: 10.4137/CIN.S17295

Examples

```
data(WQSdata)
y.train <- WQSdata[, 'y']
x.train <- WQSdata[, -10]
output <- wqs.est(y.train, x.train, B = 10)
```

wqs.est

Weighted Quantile Sum Regression

Description

This function fits a weighted quantile sum regression model.

Usage

```
wqs.est(y.train, x.train, z.train = NULL, y.valid = y.train, x.valid = x.train,
z.valid = z.train, n.quantiles = 4, B = 100, b1.pos = TRUE)
```

Arguments

y.train	vector of the continuous explanatory variable from training data
x.train	matrix of explanatory variables (to be combined into an index) from training data
z.train	vector or matrix of covariates from training data
y.valid	vector of the continuous explanatory variable from validation data
x.valid	matrix of explanatory variables (to be combined into an index) from validation data
z.valid	vector or matrix of covariates from validation data
n.quantiles	number of quantiles to be used (needs to be between 2 and 10)
B	number of bootstrap samples to be used in estimation (needs to be greater than 1)
b1.pos	TRUE if the index is expected to be positively related to the outcome

Value

A list with the following items:

<code>q.train</code>	matrix of quantiles for training data
<code>q.valid</code>	matrix of quantiles for validation data
<code>wts.matrix</code>	matrix of estimated weights; each row corresponds to a bootstrap sample
<code>weights</code>	final estimated weights used in calculating the WQS index
<code>WQS</code>	weighted quantile sum estimate based on calculated weights
<code>fit</code>	WQS model fit to validation data

Author(s)

Jenna Czarnota, David Wheeler

References

Carrico C, Gennings C, Wheeler D, Factor-Litvak P. Characterization of a weighted quantile sum regression for highly correlated data in a risk analysis setting. *J Biol Agricul Environ Stat.* 2014;1-21. ISSN: 1085-7117. DOI: 10.1007/ s13253-014-0180-3. <http://dx.doi.org/10.1007/s13253-014-0180-3>.

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Examples

```
data(WQSdata)
y.train <- WQSdata[, 'y']
x.train <- WQSdata[, -10]
output <- wqs.est(y.train, x.train, B = 10)
```

WQSdata

Simulated data to test WQS

Description

Correlation and concentration patterns were loosely based on NHL data.

Usage

```
data("WQSdata")
```

Format

A data frame with 1000 observations on the following 10 variables.

X1 a numeric vector

X2 a numeric vector

X3 a numeric vector

X4 a numeric vector

X5 a numeric vector

X6 a numeric vector

X7 a numeric vector

X8 a numeric vector

X9 a numeric vector

y a numeric vector; the outcome variable

Details

Correlation and concentration patterns were loosely based on NHL data.

References

Carrico C, Gennings C, Wheeler D, Factor-Litvak P. Characterization of a weighted quantile sum regression for highly correlated data in a risk analysis setting. *J Biol Agricul Environ Stat.* 2014;1-21. ISSN: 1085-7117. DOI: 10.1007/s13253-014-0180-3. <http://dx.doi.org/10.1007/s13253-014-0180-3>.

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Examples

```
data(WQSdata)
```

Index

- * **datasets**

- WQSdata, [4](#)

- * **package**

- wqs-package, [2](#)

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

wqs-package, [2](#)

wqs.est, [3](#)

WQSdata, [4](#)