Package ‘wec’

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Author Rense Nieuwenhuis, Manfred te Grotenhuis, Ben Pelzer, Alexander Schmidt, Ruben Konig, Rob Eisinga
Maintainer Rense Nieuwenhuis <rense.nieuwenhuis@sofi.su.se>
Description Provides functions to create factor variables with contrasts based on weighted effect coding, and their interactions. In weighted effect coding the estimates from a first order regression model show the deviations per group from the sample mean. This is especially useful when a researcher has no directional hypotheses and uses a sample from a population in which the number of observation per group is different.
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Data on BMI of Dutch citizens

Description

The BMI data contains information on Dutch individuals’ BMI, in addition to select socio-demographic variables.

Format

A data frame with 3323 observations on the following 6 variables.

- **sex** a factor with levels male and female
- **education** a factor with levels lowest, middle, and highest
- **year** a factor with levels 2000, 2005, and 2011
- **BMI** interval variable representing respondents’ Body Mass Index (BMI)
- **childless** a factor with levels no and yes
- **log_age** interval variable representing the natural log of respondents’ age
- **age_categorical** a factor with levels Young (18-30), Middle (31-59) and Older (60-70)

Source

These data are a subset from three waves of the ‘Socio-Cultural Developments in the Netherlands’ (SOCON) datasets, collected at the Radboud University in the Netherlands (see references for original codebooks).

References


Examples

```r
data(BMI)

# Without Controls
model.dummy <- lm(BMI ~ education, data=BMI)
```
summary(model.dummy)

# With Controls
model.dummy.controls <- lm(BMI ~ education + sex + log_age + childless + year, data=BMI)
summary(model.dummy.controls)

contr.wec

Function calculates contrasts for a factor variable based on weighted effect coding.

Description
This function calculates contrasts for a factor variable based on weighted effect coding. In weighted effect coding the estimates from a first order regression model show the deviations per group from the sample mean. This is especially useful when a researcher has no directional hypotheses and uses a sample from a population in which the number of observations per group is different.

Usage
contr.wec(x, omitted)

Arguments
x          Factor variable
omitted    Label of the factor label that should be taken as the omitted category

Value
Returns a contrast matrix based on weighted effect coding.

Author(s)
Rense Nieuwenhuis, Manfred te Grotenhuis, Ben Pelzer, Alexander Schmidt, Ruben Konig, Rob Eisinga

References
See Also

wec.interact

Examples

data(BMI)

# Without controls
BMI$educ.wec.lowest <- BMI$educ.wec.highest <- BMI$educ
contrasts(BMI$educ.wec.lowest) <- contr.wec(BMI$education, omitted="lowest")
contrasts(BMI$educ.wec.highest) <- contr.wec(BMI$education, omitted="highest")

model.wec.lowest <- lm(BMI ~ educ.wec.lowest, data=BMI)
model.wec.highest <- lm(BMI ~ educ.wec.highest, data=BMI)
summary(model.wec.lowest)
summary(model.wec.highest)

# With Controls
BMI$sex.wec.female <- BMI$sex.wec.male <- BMI$sex
contrasts(BMI$sex.wec.female) <- contr.wec(BMI$sex, omitted="female")
contrasts(BMI$sex.wec.male) <- contr.wec(BMI$sex, omitted="male")

BMI$year.wec.2000 <- BMI$year.wec.2011 <- BMI$year
contrasts(BMI$year.wec.2000) <- contr.wec(BMI$year, omitted="2000")
contrasts(BMI$year.wec.2011) <- contr.wec(BMI$year, omitted="2011")

model.wec.lowest.controls <- lm(BMI ~ educ.wec.lowest +
                                sex.wec.female + log_age + year.wec.2000,
                                data=BMI)
model.wec.highest.controls <- lm(BMI ~ educ.wec.highest +
                                sex.wec.male + log_age + year.wec.2011,
                                data=BMI)
summary(model.wec.lowest.controls)
summary(model.wec.highest.controls)

PUMS

Public Use Microdata Sample files (PUMS) 2013

Description

The ACS Public Use Microdata Sample files (PUMS) are a sample of the actual responses to the American Community Survey and include most population and housing characteristics.

Format

A data frame with 10000 observations on the following 4 variables.
wage annual wages (binned to 1000s, top-coded, in US dollar)
race a factor with levels Hispanic, Black, Asian, and White
education.int level of education
education.cat a factor variable with levels High School, and Degree

Source
These data are a random subset of 10000 observations from working individuals aged over 25 in the 2013 ACS Public Use Microdata Sample files (PUMS).

Examples
data(PUMS)

PUMS$race.wec <- factor(PUMS$race)
contrasts(PUMS$race.wec) <- contr.wec(PUMS$race.wec, "White")
contrasts(PUMS$race.wec)

m.wec <- lm(wage ~ race.wec, data=PUMS)
summary(m.wec)

PUMS$race.educint <- wec.interact(PUMS$race.wec, PUMS$education.int)
m.wec.educ <- lm(wage ~ race.wec + education.int + race.educint, data=PUMS)
summary(m.wec.educ)

wec.interact Function to create an interaction between two variables based on weighted effect coding.

Description
This function facilitates the estimation of an interaction between two factor variables that are based on weighted effect coding. To that end, it creates a third variable that, together with the two original factor variables, forms the complete interaction. In interaction models, weighted effect coding displays the extra effect on top of the main effects found in a model without the interaction effect(s).

Usage
wec.interact(x1, x2, output.contrasts)

Arguments
x1 Factor variable (with contrasts based on weighted effect coding)
x2 Factor variable (with contrasts based on weighted effect coding) or interval or ratio variable.
output.contrasts

Specifies whether the contrast matrix of the interaction should be returned. Defaults to FALSE, returning the model matrix. Option currently only implemented for interactions between one weighted effect coded and one interval or ratio variable.

Value

Returns a model matrix or contrast matrix for the interaction terms of (a.) two weighted effect coded variables, or (b.) one weighted effect coded and one interval or ratio variable.

Note

It should be noted that the procedure of applying weighted effect coding with interactions differs from the conventional way to apply contrasts in R. This is because the contrast matrix of the interaction differs from the multiplication of the contrast matrix/matrices of the interacted variables.

Author(s)

Rense Nieuwenhuis, Manfred te Grotenhuis, Ben Pelzer, Alexander Schmidt, Ruben Konig, Rob Eisinga

References


See Also

contr.wec

Examples

data(BMI)

# Interaction two weighted effect coded categorical variables
BMI$childless.wec.yes <- BMI$childless.wec.no <- BMI$childless
contrasts(BMI$childless.wec.yes) <- contr.wec(BMI$childless, omitted="yes")
contrasts(BMI$childless.wec.no) <- contr.wec(BMI$childless, omitted="no")

BMI$age.wec.young <- BMI$age.wec.older <- BMI$age
```r
contrasts(BMI$age.wec.young) <- contr.wec(BMI$age_categorical, omitted="Young (18-30)")
contrasts(BMI$age.wec.older) <- contr.wec(BMI$age_categorical, omitted="Older (60-70)"

model3a <- lm(BMI ~ childless.wec.yes + age.wec.young, data=BMI)
model3b <- lm(BMI ~ childless.wec.no + age.wec.older, data=BMI)
summary(model3a)
summary(model3b)

# Interaction
BMI$interact_c <- wec.interact(BMI$childless.wec.yes, BMI$age.wec.young)
BMI$interact_d <- wec.interact(BMI$childless.wec.yes, BMI$age.wec.older)
BMI$interact_e <- wec.interact(BMI$childless.wec.no, BMI$age.wec.young)
BMI$interact_f <- wec.interact(BMI$childless.wec.no, BMI$age.wec.older)

model3c <- lm(BMI ~ childless.wec.yes + age.wec.young + interact_c, data=BMI)
model3d <- lm(BMI ~ childless.wec.yes + age.wec.older + interact_d, data=BMI)
model3e <- lm(BMI ~ childless.wec.no + age.wec.young + interact_e, data=BMI)
model3f <- lm(BMI ~ childless.wec.no + age.wec.older + interact_f, data=BMI)

summary(model3c)
summary(model3d)
summary(model3e)
summary(model3f)

# Interaction weighted effect coded categorical variable and ratio/interval variable

data(PUMS)

PUMS$race.wec <- factor(PUMS$race)
contrasts(PUMS$race.wec) <- contr.wec(PUMS$race.wec, "White")
contrasts(PUMS$race.wec)

m.wec <- lm(wage ~ race.wec, data=PUMS)
summary(m.wec)

PUMS$race.educint <- wec.interact(PUMS$race.wec, PUMS$education.int)
m.wec.educ <- lm(wage ~ race.wec + education.int + race.educint, data=PUMS)
summary(m.wec.educ)
```
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