Package ‘qvcalc’

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Title Quasi variances for factor effects in statistical models

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URL http://www.warwick.ac.uk/go/qvcalc, http://www.warwick.ac.uk/go/dfirth

Description Functions to compute quasi variances and associated measures of approximation error

Suggests relimp

License GPL

Repository CRAN

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R topics documented:

indentPrint — *Print with Line Indentation*

Description

Same as `print`, but adds a specified amount of white space at the start of each printed line

Usage

```
indentPrint(object, indent=4, ...)
```

Arguments

`object`	any printable object
`indent`	a non-negative integer, the number of spaces to insert
`...`	other arguments to pass to `print`

Value

`object` is returned invisibly

Author(s)

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Examples

```
indentPrint("this indented by 10 spaces", indent=10)
```

plot.qv — *Plot method for objects of class qv*

Description

Provides visualization of estimated contrasts using intervals based on quasi standard errors.

Usage

```
## S3 method for class 'qv':
plot(x, intervalWidth = 2, ylab = "estimate", xlab = x$factorname, ylim = NULL, mai
```

Arguments

`x`	an object of class `"qv"`, typically the result of calling `qvcalc`
`intervalWidth`	the half-width, in quasi standard errors, of the plotted intervals
`ylab`	as for `plot.default`
`xlab`	as for `plot.default`
`ylim`	as for `plot.default`
`main`	as for `plot.default`
`levelNames`	labels to be used on the x axis for the levels of the factor whose effect is plotted
`...`	other arguments understood by `plot`

Details

If `levelNames` is unspecified, the row names of `x$qvframe` will be used.

Value

`invisible(x)`

Author(s)

David Firth, ⟨d.firth@warwick.ac.uk⟩

References

Easton, D. F, Peto, J. and Babiker, A. G. A. G. (1991) Floating absolute risk: an alternative to relative risk in survival and case-control analysis avoiding an arbitrary reference group. *Statistics in Medicine* **10**, 1025–1035.

Firth, D. (2000) Quasi-variances in Xlisp-Stat and on the web. *Journal of Statistical Software* **5.4**, 1–13. At `http://www.jstatsoft.org`

Firth, D. (2003) Overcoming the reference category problem in the presentation of statistical models. *Sociological Methodology* **33**, 1–18.

Firth, D. and Mezezes, R. X. de (2004) Quasi-variances. *Biometrika* **91**, 65–80.

McCullagh, P. and Nelder, J. A. (1989) *Generalized Linear Models*. London: Chapman and Hall.

Menezes, R. X. (1999) More useful standard errors for group and factor effects in generalized linear models. *D.Phil. Thesis*, Department of Statistics, University of Oxford.

See Also

`qvcalc`

Examples

```
##  Overdispersed Poisson loglinear model for ship damage data
##  from McCullagh and Nelder (1989), Sec 6.3.2
library(MASS)
data(ships)
ships$year <- as.factor(ships$year)
ships$period <- as.factor(ships$period)
shipmodel <- glm(formula = incidents ~ type + year + period,
    family = quasipoisson,
    data = ships, subset = (service > 0), offset = log(service))
shiptype.qvs <- qvcalc(shipmodel, "type")
summary(shiptype.qvs, digits=4)
plot(shiptype.qvs)
```

---

qvcalc *Quasi Variances for Model Coefficients*

Description

Computes a set of quasi variances (and corresponding quasi standard errors) for estimated model coefficients relating to the levels of a categorical (i.e., factor) explanatory variable. For details of the method see Firth (2000), Firth (2003) or Firth and Menezes (2004). Quasi variances generalize and improve the accuracy of "floating absolute risk" (Easton et al., 1991).

Usage

```
qvcalc(object, factorname=NULL, labels = NULL, dispersion = NULL,
      estimates=NULL,  modelcall=NULL)
```

Arguments

`object`	A model (of class lm, glm, etc.), or the covariance (sub)matrix for the estimates of interest
`factorname`	If `object` is a model, the name of the factor of interest
`labels`	An optional vector of row names for the `qvframe` component of the result (redundant if `object` is a model)
`dispersion`	an optional scalar multiplier for the covariance matrix, to cope with overdispersion for example
`estimates`	an optional vector of estimated coefficients (redundant if `object` is a model)
`modelcall`	optional, the call expression for the model of interest (redundant if `object` is a model)

Details

If `object` is a Bradley-Terry model of class `BTm`, of the standard, unstructured kind that is specified using the special `BTm` formula `~ ..`, the `factorname` argument can be omitted, in which case the `factorname` component of the resulting `qv` object will be `""`.

Ordinarily the quasi variances are positive and so their square roots (the quasi standard errors) exist and can be used in plots, etc.

Occasionally one (and only one) of the quasi variances is negative, and so the corresponding quasi standard error does not exist (it appears as `NaN`). This is fairly rare in applications, and when it occurs it is because the factor of interest is strongly correlated with one or more other predictors in the model. It is not an indication that quasi variances are inaccurate. An example is shown below using data from the `car` package: the quasi variance approximation is exact (since `type` has only 3 levels), and there is a negative quasi variance. The quasi variances remain perfectly valid (they can be used to obtain inference on any contrast), but it makes no sense to plot 'comparison intervals' in the usual way since one of the quasi standard errors is not a real number.

Value

A list of class `qv`, with components

`covmat`	the full variance-covariance matrix for the estimated coefficients corresponding to the factor of interest
`qvframe`	a data frame with variables `estimate`, `SE`, `quasiSE` and `quasiVar`, the last two being a quasi standard error and quasi-variance for each level of the factor of interest
`relerrs`	relative errors for approximating the standard errors of all simple contrasts
`factorname`	the factor name if given
`modelcall`	if `object` is a model, `object$call`; otherwise `NULL`

Author(s)

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References

Easton, D. F, Peto, J. and Babiker, A. G. A. G. (1991) Floating absolute risk: an alternative to relative risk in survival and case-control analysis avoiding an arbitrary reference group. *Statistics in Medicine* **10**, 1025–1035.

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See Also

worstErrors, plot.qv

Examples

```
##  Overdispersed Poisson loglinear model for ship damage data
##  from McCullagh and Nelder (1989), Sec 6.3.2
library(MASS)
data(ships)
ships$year <- as.factor(ships$year)
ships$period <- as.factor(ships$period)
shipmodel <- glm(formula = incidents ~ type + year + period,
    family = quasipoisson,
    data = ships, subset = (service > 0), offset = log(service))
shiptype.qvs <- qvcalc(shipmodel, "type")
summary(shiptype.qvs, digits=4)
plot(shiptype.qvs)
##  A Bradley-Terry model example
##  For details and references see help(BTm)
library(BradleyTerry)
##
##  Baseball data from Agresti (2002) p438
data(baseball)
##  Fit the Bradley-Terry model with home advantage effect
baseballModel <- BTm(baseball ~ .., order.effect = baseball$home.adv)
baseball.qv <- qvcalc(baseballModel, factorname = "team")
plot(baseball.qv, main = "Bradley-Terry analysis of baseball data")
## Not run:
##  Example of a negative quasi variance
##  Requires the "car" package
library(car)
data(Prestige)
attach(Prestige)
mymodel <- lm(prestige ~ type + education)
library(qvcalc)
type.qvs <- qvcalc(mymodel, "type")
##  Warning message:
##  NaNs produced in: sqrt(qv)
summary(type.qvs)
##  Model call:  lm(formula = prestige ~ type + education)
##  Factor name:  type
##          estimate       SE  quasiSE  quasiVar
##    bc    0.000000 0.000000 2.874361  8.261952
##    prof  6.142444 4.258961 3.142737  9.876793
##    wc   -5.458495 2.690667      NaN -1.022262
##  Worst relative errors in SEs of simple contrasts (%):  0 0
##  Worst relative errors over *all* contrasts (%):  0 0
plot(type.qvs)
##  Error in plot.qv(type.qvs) :  No comparison intervals available,
##  since one of the quasi variances is negative.  See ?qvcalc for more.
## End(Not run)
```

`worstErrors` *Accuracy of a Quasi-variance Approximation*

Description

Computes the worst relative error, among all contrasts, for the standard error as derived from a set of quasi variances. For details of the method see Menezes (1999) or Firth and Menezes (2004).

Usage

```
worstErrors(qv.object)
```

Arguments

`qv.object`	An object of class `qv`

Value

A numeric vector of length 2, the worst negative relative error and the worst positive relative error.

Author(s)

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References

Firth, D. and Mezezes, R. X. de (2004) Quasi-variances. *Biometrika* **91**, 69–80.

McCullagh, P. and Nelder, J. A. (1989) *Generalized Linear Models*. London: Chapman and Hall.

Menezes, R. X. (1999) More useful standard errors for group and factor effects in generalized linear models. *D.Phil. Thesis*, Department of Statistics, University of Oxford.

See Also

`qvcalc`

Examples

```
##  Overdispersed Poisson loglinear model for ship damage data
##  from McCullagh and Nelder (1989), Sec 6.3.2
library(MASS)
data(ships)
ships$year <- as.factor(ships$year)
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shipmodel <- glm(formula = incidents ~ type + year + period,
    family = quasipoisson,
    data = ships, subset = (service > 0), offset = log(service))
shiptype.qvs <- qvcalc(shipmodel, "type")
summary(shiptype.qvs, digits=4)
worstErrors(shiptype.qvs)
```

Index