

# Package ‘crrcbv’

May 8, 2026

**Title** Bias-Corrected Variance for Competing Risks Regression with Clustered Data

**Version** 1.0

**Description** A user friendly function 'crrcbv' to compute bias-corrected variances for competing risks regression models using proportional subdistribution hazards with small-sample clustered data. Four types of bias correction are included: the MD-type bias correction by Mancl and DeRouen (2001) <doi:10.1111/j.0006-341X.2001.00126.x>, the KC-type bias correction by Kauermann and Carroll (2001) <doi:10.1198/016214501753382309>, the FG-type bias correction by Fay and Graubard (2001) <doi:10.1111/j.0006-341X.2001.01198.x>, and the MBN-type bias correction by Morel, Bokossa, and Neerchal (2003) <doi:10.1002/bimj.200390021>.

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**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.1.2

**Depends** R (>= 3.5.0), crrSC, abind, pracma, survival, stats

**NeedsCompilation** no

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`cls`*Clustered competing risks simulated data*

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**Description**

sample of 20 clusters with an average cluster size of 20

**Usage**

```
data(cls)
```

**Format**

A data frame containing 20 clusters with an average cluster size of 20 and the following five variables. Simulation is detailed in the paper Finite-sample adjustments in variance estimators for clustered competing risks regression. Chen, Li. 2022. Under Review. Statistics in Medicine.

I id of clusters

X\_1 a cluster-level covariate generated from the standard normal distribution

X\_2 an individual-level covariate generated from the standard normal distribution

eps event type. 0=censored, 1, 2

T\_obs observed event time

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**References**

Chen X, Li F. (2022). Finite-sample adjustments in variance estimators for clustered competing risks regression. Statistics in Medicine. 00(Under Review): 1-24.

**Examples**

```
data(cls)
```

crrcbcv

*Bias-Corrected Variance for Competing Risks Regression with Clustered Data***Description**

Small-sample bias-corrected variance for regression modeling using proportional subdistribution hazards with clustered right censored data. (Zhou et al., 2012) Failure times within the same cluster are dependent.

Four types of bias correction are included: the MD-type correction by Mancl and DeRouen (2001), the KC-type correction by Kauermann and Carroll (2001), the FG-type correction by Fay and Graubard (2001), and the MBN-type correction by Morel, Bokossa, and Neerchal (2003).

**Usage**

```
crrcbcv(
  beta,
  ftime,
  fstatus,
  cov1,
  cov2,
  tf,
  cluster,
  failcode = 1,
  cencode = 0,
  subset,
  na.action = na.omit,
  var.type = "MD"
)
```

**Arguments**

|         |  |
|---------|--|
| beta    | the estimated regression coefficients from <code>crrc</code>   |
| ftime   | vector of failure/censoring times  |
| fstatus | vector with a unique code for each failure type and a separate code for censored observations  |
| cov1    | matrix (nobs x ncovs) of fixed covariates (either cov1, cov2, or both are required)  |
| cov2    | matrix of covariates that will be multiplied by functions of time; if used, often these covariates would also appear in cov1 to give a prop hazards effect plus a time interaction   |
| tf      | functions of time. A function that takes a vector of times as an argument and returns a matrix whose jth column is the value of the time function corresponding to the jth column of cov2 evaluated at the input time vector. At time tk, the model includes the term $\text{cov2}[, j] * \text{tf}(tk)[, j]$ as a covariate |
| cluster | clustering indicator   |

|                        |  |
|------------------------|--|
| <code>failcode</code>  | code of <code>fstatus</code> that denotes the failure type of interest   |
| <code>cencode</code>   | code of <code>fstatus</code> that denotes censored observations  |
| <code>subset</code>    | a logical vector specifying a subset of cases to include in the analysis   |
| <code>na.action</code> | a function specifying the action to take for any cases missing any of <code>ftime</code> , <code>fstatus</code> , <code>cov1</code> , <code>cov2</code> , <code>cengroup</code> , or <code>subset</code> |
| <code>var.type</code>  | a string or a vector of strings with value(s) selected from {"MD", "KC", "FG", "MBN"}  |

### Value

Returns a list of class `crr`, with components corresponding to `var.type`

`$MD` the MD-type bias-corrected variance covariance matrix for beta

`$KC` the KC-type bias-corrected variance covariance matrix for beta

`$FG` the FG-type bias-corrected variance covariance matrix for beta

`$MBN` the MBN-type bias-corrected variance covariance matrix for beta

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### References

Chen X, Li F. (2022). Finite-sample adjustments in variance estimators for clustered competing risks regression. *Statistics in Medicine*. 00(Under Review): 1-24.

Zhou B, Fine J, Latouche A, Labopin M. (2012). Competing risks regression for clustered Data. *Biostatistics*. 13(3): 371-383.

### See Also

`crrSC`

### Examples

```
library(crrcbcv)
data(cls)
mod.est = crrc(ftime=cls$T_obs, fstatus=cls$eps, cov1=cls[,c('X_1','X_2')], cluster=cls$I)
crrcbcv(beta=mod.est$coef, ftime=cls$T_obs, fstatus=cls$eps, cov1=cls[,c('X_1','X_2')],
cluster=cls$I, var.type=c('MD','KC','FG','MBN'))
```

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