

# Package ‘poissonMT’

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**Type** Package

**Title** Robust M-Estimators Based on Transformations for Poisson Model

**LazyLoad** yes

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## Description

R functions for the computation of Least Square based on transformation (L2T) and robust M-estimators based on transformations (MT-estimators) for Poisson regression models.

**Depends** MASS, robustbase, robcbi, checkmate

**License** GPL (>= 2)

**NeedsCompilation** yes

**Repository** CRAN

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glmrobMT	<i>Robust Fitting of Poisson Generalized Linear Models using MT robust method</i>
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### Description

glmrobMT is used to fit generalized linear models by robust MT method. The model is specified by the  $x$  and  $y$  components and a description of the error distribution. Currently, only implemented for `family=poisson`.

### Usage

```
glmrobMT(x, y, weights=NULL, start=NULL, offset=NULL,
         family=poisson(), weights.on.x="none",
         control=glmrobMT.control(), intercept=TRUE, trace.lev=1,
         include.cubinf=TRUE, m.approx=NULL, mprime.approx=NULL, ...)
```

### Arguments

<code>x</code>	design matrix of dimension $n \times p$ .
<code>y</code>	vector of observations of length $n$ .
<code>weights</code>	an optional vector of weights to be used in the fitting process (in addition to the robustness weights computed in the fitting process).
<code>start</code>	starting values for the parameters in the linear predictor. Note that specifying <code>start</code> skips the computation of the initial estimates, but needs to be <i>robust</i> itself.
<code>offset</code>	this can be used to specify an <i>a priori</i> known component to be included in the linear predictor during fitting. At the moment it is not used.
<code>family</code>	a description of the error distribution and link function to be used in the model. This can be a character string naming a family function, a family <a href="#">function</a> or the result of a call to a family function. See <a href="#">family</a> for details of family functions. At the moment only <code>poisson</code> is available.
<code>weights.on.x</code>	<p>a character string (can be abbreviated), a <a href="#">function</a> or <a href="#">list</a> (see below), or a numeric vector of length <math>n</math>, specifying how points (potential outliers) in <math>x</math>-space are downweighted. If "hat", weights on the design of the form <math>\sqrt{1 - h_{ii}}</math> are used, where <math>h_{ii}</math> are the diagonal elements of the hat matrix. If "robCov", weights based on the robust Mahalanobis distance of the design matrix (intercept excluded) are used where the covariance matrix and the centre is estimated by <a href="#">cov.rob</a> from the package <b>MASS</b>. Similarly, if "covMcd", robust weights are computed using <a href="#">covMcd</a>. The default is "none".</p> <p>If <code>weights.on.x</code> is a <a href="#">function</a>, it is called with arguments <math>(X, \text{intercept})</math> and must return an <math>n</math>-vector of non-negative weights.</p> <p>If it is a <a href="#">list</a>, it must be of length one, and as element contain a function much like <a href="#">covMcd()</a> or <a href="#">cov.rob()</a> (package <b>MASS</b>), which computes multivariate location and "scatter" of a data matrix <math>X</math>.</p>

control	a list of parameters for controlling the fitting process. See the documentation for <a href="#">glmrobMT.control</a> for details.
intercept	logical indicating if an intercept at the first column of $x$ is present. This information is only used when <code>weights.on.x</code> is not set to <code>none</code> .
trace.lev	logical (or integer) indicating if intermediate results should be printed; defaults to $\emptyset$ (the same as <code>FALSE</code> ).
include.cubinf	logical, if <code>TRUE</code> the <code>cubinf</code> is also used as possible starting value.
m.approx	a function that return the value, for each linear predictor, that makes the estimating equation Fisher consistent. If <code>NULL</code> the default internal function is used.
mprime.approx	a function that return the value, for each linear predictor, corresponding to the first derivative of <code>m.approx</code> . If <code>NULL</code> the default internal function is used.
...	At the moment it is not used.

### Value

A list with the following components:

coefficients	a named vector of coefficients.
initial	Initial vector of coefficients.
family	the <code>family</code> object used.
residuals	weighted Pearson residuals.
fitted.values	the fitted mean values, obtained by transforming the linear predictors by the inverse of the link function.
linear.predictors	the linear fit on link scale.
cov	the estimated asymptotic covariance matrix of the estimated coefficients.
converged	logical. Was the IWLS algorithm judged to have converged?
iter	the number of iterations used by the influence algorithm.
cw	the tuning constant $c$ in Tukey's bisquare $\psi$ -function.
weights.on.x	how the weights on the design matrix $x$ were evaluated.
w.x	weights used to down-weight observations based on the position of the observation in the design space.
w.r	robustness weights for each observations.

### Author(s)

Claudio Agostinelli, Marina Valdora and Victor J. Yohai

### References

- C. Agostinelli, M. Valdora and V.J Yohai (2018) Initial Robust Estimation in Generalized Linear Models with a Large Number of Covariates. Submitted.
- M. Valdora and V.J. Yohai (2014) Robust estimators for generalized linear models. *Journal of Statistical Planning and Inference*, 146, 31-48.

**See Also**

[poissonMT](#), [glmrob](#) and [cubinf](#)

**Examples**

```
data(epilepsy)
Efit1 <- glm(Ysum ~ Age10 + Base4*Trt, family=poisson, data=epilepsy)

x <- model.matrix(~ Age10 + Base4*Trt, data=epilepsy)
poissonMTsetwd(tempdir())
Efit2 <- glmrobMT(x=x, y=epilepsy$Ysum)
```

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poissonL2T	<i>Fitting of Poisson Generalized Linear Models using MT method with L2 rho function</i>
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**Description**

poissonL2T is used to fit generalized linear models by MT method with L2 rho function. The model is specified by the x and y components. Since the L2 rho function is used the method is not robust.

**Usage**

```
poissonL2T(x, y, start = NULL, tol = 1e-08, maxit = 100,
m.approx = NULL, mprime.approx = NULL, na.to.zero = TRUE)
```

**Arguments**

x	design matrix of dimension $n \times p$ .
y	vector of observations of length n.
start	starting values for the parameters in the linear predictor.
tol	convergence tolerance for the parameter vector.
maxit	integer specifying the maximum number of IRWLS iterations.
m.approx	a function that return the value, for each linear predictor, that makes the estimating equation Fisher consistent. If NULL the default internal function is used.
mprime.approx	a function that return the value, for each linear predictor, corresponding to the first derivative of m.approx. If NULL the default internal function is used.
na.to.zero	logical, should the eventual NA in the coefficients be replaced by 0?

**Value**

A vector with the estimated coefficients.

**Author(s)**

Claudio Agostinelli, Marina Valdora and Victor J. Yohai

**References**

C. Agostinelli, M. Valdora and V.J Yohai (2018) Initial Robust Estimation in Generalized Linear Models with a Large Number of Covariates. Submitted.

M. Valdora and V.J. Yohai (2014) Robust estimators for generalized linear models. *Journal of Statistical Planning and Inference*, 146, 31-48.

**See Also**

[poissonMT](#)

**Examples**

```
data(epilepsy)
x <- model.matrix( ~ Age10 + Base4*Trt, data=epilepsy)
poissonMTsetwd(tempdir())
Efit4 <- poissonL2T(x=x, y=epilepsy$Ysum)
```

---

poissonMT

*Robust Fitting of Poisson Generalized Linear Models using MT robust method*

---

**Description**

poissonMT is used to fit generalized linear models by robust MT method. The model is specified by the x and y components.

**Usage**

```
poissonMT(x, y, start, weights = NULL, tol = 1e-08, maxit = 100,
m.approx = NULL, mprime.approx = NULL, psi = "bisquare",
cc = 2.3, na.to.zero = TRUE)
```

**Arguments**

x	design matrix of dimension $n \times p$ .
y	vector of observations of length n.
start	starting values for the parameters in the linear predictor.
weights	an optional vector of weights to be used in the fitting process (in addition to the robustness weights computed in the fitting process).
tol	convergence tolerance for the parameter vector.
maxit	integer specifying the maximum number of IRWLS iterations.

<code>m.approx</code>	a function that return the value, for each linear predictor, that makes the estimating equation Fisher consistent. If NULL the default internal function is used.
<code>mprime.approx</code>	a function that return the value, for each linear predictor, corresponding to the first derivative of <code>m.approx</code> . If NULL the default internal function is used.
<code>psi</code>	the name of the psi function. At the moment only the bisquare is available.
<code>cc</code>	tuning constant $c$ for Tukey's bisquare psi-function.
<code>na.to.zero</code>	logical, should the eventual NA in the coefficients be replaced by $\emptyset$ ?

### Value

A list with the following components

<code>coefficients</code>	a vector of coefficients.
<code>fitted.values</code>	the fitted mean values, obtained by transforming the linear predictors by the inverse of the link function.
<code>linear.predictors</code>	the linear fit on link scale.
<code>residuals</code>	residuals on the transformed scale.
<code>weights</code>	the <i>working</i> weights, that is the weights in the final iteration of the IWLS fit.
<code>w.r</code>	robustness weights for each observations.
<code>prior.weights</code>	the weights initially supplied, a vector of 1s if none were.
<code>converged</code>	logical. Was the IWLS algorithm judged to have converged?
<code>iter</code>	the number of iterations used by the influence algorithm.
<code>obj</code>	value of the MT objective function at coefficients.

### Author(s)

Claudio Agostinelli, Marina Valdora and Victor J. Yohai

### References

- C. Agostinelli, M. Valdora and V.J Yohai (2018) Initial Robust Estimation in Generalized Linear Models with a Large Number of Covariates. Submitted.
- M. Valdora and V.J. Yohai (2014) Robust estimators for Generalized Linear Models. *Journal of Statistical Planning and Inference*, 146, 31-48.

### See Also

[glmrobMT](#), [glmrob](#) and [cubinf](#)

### Examples

```
data(epilepsy)
x <- model.matrix(~ Age10 + Base4*Trt, data=epilepsy)
poissonMTsetwd(tempdir())
start <- poissonMTinitial(x=x, y=epilepsy$Ysum)$coefficients
Efit3 <- poissonMT(x=x, y=epilepsy$Ysum, start=start)
```

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poissonMTinitial	<i>Initial Robust Estimates based on MT robust method for fitting of Poisson Generalized Linear Models</i>
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### Description

poissonMTinitial is used to provides a robust initial estimate for fit generalized linear models. The model is specified by the x and y components.

### Usage

```
poissonMTinitial(x, y, stage2 = TRUE, alpha = c(0.025, 0.025),
  tol = 1e-04, cc = 2.3, psi = "bisquare", maxit = 20,
  zero = sqrt(.Machine$double.eps), replace.small = 0.5, start = NULL,
  na.to.zero = TRUE)
```

### Arguments

x	design matrix of dimension $n \times p$ .
y	vector of observations of length n.
stage2	logical, the second stage should be performed?
alpha	quantile orders used in the second stage.
tol	convergence tolerance for the parameter vector.
cc	tuning constant c for Tukey's bisquare psi-function.
psi	the name of the psi function. At the moment only the bisquare is available.
maxit	integer specifying the maximum number of IRWLS iterations.
zero	eigenvalues smaller than zero will be considered exactly equal to 0.
replace.small	all the observations y smaller than replace.small are replaced by replace.small value.
start	eventual starting values, as a reference, for the parameters in the linear predictor.
na.to.zero	logical, should the eventual NA in the coefficients be replaced by 0?

### Value

A list with the following components

coefficients1	initial value proposed at the end of the first stage.
obj1	value of the MT objective function at coefficients1.
coefficients2a	initial value proposed at the end of the first part od the second stage.
obj2a	value of the MT objective function at coefficients2a.
coefficients2b	initial value proposed at the end of the second part od the second stage.
obj2b	value of the MT objective function at coefficients2b.
coefficients	initial value proposed.
obj	value of the MT objective function at coefficients.

**Author(s)**

Claudio Agostinelli, Marina Valdora and Victor J. Yohai

**References**

C. Agostinelli, M. Valdora and V.J Yohai (2018) Initial Robust Estimation in Generalized Linear Models with a Large Number of Covariates. Submitted.

M. Valdora and V.J. Yohai (2014) Robust estimators for generalized linear models. *Journal of Statistical Planning and Inference*, 146, 31-48.

**See Also**

[poissonMT](#) and [poissonL2T](#)

**Examples**

```
data(epilepsy)
x <- model.matrix(~ Age10 + Base4*Trt, data=epilepsy)
poissonMTsetwd(tempdir())
start <- poissonMTinitial(x=x, y=epilepsy$Ysum)$coefficients
start
```

---

poissonMTinitialParallel

*Initial Robust Estimates based on MT robust method for fitting of Poisson Generalized Linear Models*

---

**Description**

poissonMTinitialParallel is used to provides a robust initial estimate for fit generalized linear models. This is the parallel computing version. The model is specified by the x and y components.

**Usage**

```
poissonMTinitialParallel(x, y, stage2 = TRUE, alpha = c(0.025, 0.025),
  tol = 1e-04, cc = 2.3, psi = "bisquare", maxit = 20,
  zero = sqrt(.Machine$double.eps), replace.small = 0.5, start = NULL,
  na.to.zero = TRUE, parallel = c("no", "multicore", "snow"),
  ncpus = 1, cl = NULL)
```

**Arguments**

x	design matrix of dimension $n \times p$ .
y	vector of observations of length n.
stage2	logical, the second stage should be performed?
alpha	quantile orders used in the second stage.



tol	convergence tolerance for the parameter vector.
cc	tuning constant $c$ for Tukey's bisquare psi-function.
psi	the name of the psi function. At the moment only the bisquare is available.
maxit	integer specifying the maximum number of IRWLS iterations.
zero	eigenvalues smaller than zero will be considered exactly equal to 0.
replace.small	all the observations $y$ smaller than <code>replace.small</code> are replaced by <code>replace.small</code> value.
start	eventual starting values, as a reference, for the parameters in the linear predictor.
na.to.zero	logical, should the eventual NA in the coefficients be replaced by $\emptyset$ ?
parallel	The type of parallel operation to be used. By default (none) no parallel is used.
ncpus	integer: number of processes to be used in parallel operation. Typically one would chose this to the number of available CPUs.
cl	An optional parallel or snow cluster for use if <code>parallel = "snow"</code> . If not supplied, a cluster on the local machine is created for the duration of the <code>poissonMTinitialParallel</code> call.

### Details

This function is the same as function `poissonMTinitial`, however it can takes advantage of parallel computing.

### Value

A list with the following components

coefficients1	initial value proposed at the end of the first stage.
obj1	value of the MT objective function at <code>coefficients1</code> .
coefficients2a	initial value proposed at the end of the first part od the second stage.
obj2a	value of the MT objective function at <code>coefficients2a</code> .
coefficients2b	initial value proposed at the end of the second part od the second stage.
obj2b	value of the MT objective function at <code>coefficients2b</code> .
coefficients	initial value proposed.
obj	value of the MT objective function at <code>coefficients</code> .

### Author(s)

Claudio Agostinelli, Marina Valdora and Victor J. Yohai

### References

- C. Agostinelli, M. Valdora and V.J Yohai (2018) Initial Robust Estimation in Generalized Linear Models with a Large Number of Covariates. Submitted.
- M. Valdora and V.J. Yohai (2014) Robust estimators for generalized linear models. *Journal of Statistical Planning and Inference*, 146, 31-48.

**See Also**

[poissonMTinitial](#), [poissonMT](#) and [poissonL2T](#)

**Examples**

```
data(epilepsy)
x <- model.matrix( ~ Age10 + Base4*Trt, data=epilepsy)
poissonMTsetwd(tempdir())
start <- poissonMTinitialParallel(x=x, y=epilepsy$Ysum)$coefficients
start
```

---

poissonMTwd

*Set and get working directory for the package.*

---

**Description**

Set and get working directory for the package. This working directory is used to store some objects needed during the estimation process.

**Usage**

```
poissonMTsetwd(path)
```

```
poissonMTgetwd()
```

**Arguments**

path            A valid path name for your OS where you have write/read permission.

**Details**

poissonMTsetwd is just a wrapper for `options("poissonMT:wd" = path)` while `poissonMTsetwd` is just a wrapper for `getOption("poissonMT:wd", NULL)`.

**Value**

`poissonMTsetwd` does not return any object, `poissonMTsetwd` return a path or NULL.

**Author(s)**

Claudio Agostinelli, Marina Valdora and Victor J. Yohai

**See Also**

[glmrobMT](#), [glmrob](#) and [cubinf](#)

**Examples**

```
poissonMTsetwd(tempdir())
poissonMTgetwd()
```

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poissonSSinitial	<i>Initial Robust Estimates based on SubSampling method for fitting of Poisson Generalized Linear Models</i>
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### Description

poissonSSinitial is used to provides a robust initial estimate for fit generalized linear models. The model is specified by the x and y components.

### Usage

```
poissonSSinitial(x, y, nsubm, size = ncol(x), cc = 2.3,
  psi = "bisquare", na.to.zero = TRUE, trace.lev = 0)
```

### Arguments

x	design matrix of dimension $n \times p$ .
y	vector of observations of length n.
nsubm	the number of subsamples to take for finding an initial estimate.
size	size of the subsamples.
cc	tuning constant c for Tukey's bisquare psi-function.
psi	the name of the psi function. At the moment only the bisquare is available.
na.to.zero	logical, should the eventual NA in the coefficients be replaced by 0?
trace.lev	logical (or integer) indicating if intermediate results should be printed; defaults to 0 (the same as FALSE).

### Value

A list with the following components

coefficients	initial value proposed.
obj	value of the MT objective function at coefficients.
n0ksamples	number of subsamples without errors.

### Author(s)

Claudio Agostinelli, Marina Valdora and Victor J. Yohai

### References

C. Agostinelli, M. Valdora and V.J Yohai (2018) Initial Robust Estimation in Generalized Linear Models with a Large Number of Covariates. Submitted.

M. Valdora and V.J. Yohai (2014) Robust estimators for generalized linear models. Journal of Statistical Planning and Inference, 146, 31-48.

**See Also**[poissonMTinitial](#)**Examples**

```
data(epilepsy)
x <- model.matrix( ~ Age10 + Base4*Trt, data=epilepsy)
start <- poissonSSinitial(x=x, y=epilepsy$Ysum, nsubm=100)$coefficients
start
```

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