

Package ‘miscFuncs’

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Title Miscellaneous Useful Functions Including LaTeX Tables, Kalman Filtering, QQplots with Simulation-Based Confidence Intervals, Linear Regression Diagnostics and Development Tools

Type Package

LazyLoad yes

Description Implementing various things including functions for LaTeX tables, the Kalman filter, QQ-plots with simulation-based confidence intervals, linear regression diagnostics, web scraping, development tools, relative risk and odds rati, GARCH(1,1) Forecasting.

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<i>.onAttach</i>	<i>.onAttach function</i>
------------------	---------------------------

Description

A function to print a welcome message on loading package

Usage

.onAttach(libname, pkgname)

Arguments

libname libname argument
pkgname pkgname argument

Value

...

bin	<i>bin function</i>
-----	---------------------

Description

A function to convert decimal to binary

Usage

bin(n)

Arguments

n a non-negative integer

Value

the binary representation stored in a vector.

colour_legend	<i>colour_legend function</i>
---------------	-------------------------------

Description

A function to

Usage

colour_legend(palette, suffix = "", dir = ".")

Arguments

palette	X
suffix	X
dir	X

Value

...

cor_taylor	<i>cor_taylor function</i>
------------	----------------------------

Description

A function to compute Taylor’s correlation coefficient ;-)

Usage

cor_taylor(X)

Arguments

X a numeric matrix with number of rows bigger than the number of columns

Value

Taylor’s correlation coefficient, a number between 0 and 1 expressing the amount of dependence between multiple variables.

cospulse	<i>cospulse function</i>
----------	--------------------------

Description

A function to

Usage

cospulse(x, tau = pi)

Arguments

x	X
tau	pulse duration

Value

...

cosrsaw	<i>cosrsaw function</i>
---------	-------------------------

Description

A function to

Usage

cosrsaw(x)

Arguments

x X

Value

...

cossaw	<i>cossaw function</i>
--------	------------------------

Description

A function to

Usage

cossaw(x)

Arguments

x X

Value

...

costri	<i>costri function</i>
--------	------------------------

Description

A function to

Usage

costri(x)

Arguments

x X

Value

...

daynames	<i>daynames function</i>
----------	--------------------------

Description

A function to

Usage

daynames()

Value

...

dplot	<i>dplot function</i>
-------	-----------------------

Description

Generic function for model diagnostics.

Usage

```
dplot(mod, ...)
```

Arguments

mod	an object
...	additional arguments

Value

method dplot

dplot.lm	<i>dplot.lm function</i>
----------	--------------------------

Description

Function for producing diagnostic plots for linear models. Points are identified as being outliers, of high leverage and high influence. The QQ plot has a confidence band. A plot of leverage vs fitted is given. The plot of Studentised residuals versus leverage includes along with standard thresholds (at Cook's distance 0.5 and 1) an additional band highlighting influential observations, whose Cook's distance exceed $8/(n-2p)$, where n is the number of observations and p is the number of parameters. The respective threshold for outliers are set, by default, as those observations whose standardised residuals exceed 2. Observations are declared as having high leverage if their value exceeds $2p/n$.

Usage

```
## S3 method for class 'lm'
dplot(
  mod,
  pch = 19,
  outlier.threshold = 2,
  leverage_threshold = function(n, p) {
    return(2 * p/n)
  },
  influence_threshold = function(n, p) {
    return(8/(n - 2 * p))
  }
)
```

```

    },
    ibands = c(0.5, 1),
    ...
)

```

Arguments

<code>mod</code>	an object of class 'lm'
<code>pch</code>	the type of point to use, passed to 'plot', the default being 19
<code>outlier.threshold</code>	threshold on standardised residuals to declare an outlier, default is 2
<code>leverage_threshold</code>	threshold on leverage to be classed as "high leverage", a function of (n,p), the default being $2p/n$
<code>influence_threshold</code>	threshold on influence to be classed as "high influence", a function (n,p), the default being $2p/n$
<code>ibands</code>	specifying thresholds at which to display Cook's distance on the Studentised residuals vs leverage plot. Default is at 0.5 and 1
<code>...</code>	additional arguments, not used as yet

Value

...

EKFadvance

EKFadvance function

Description

A function to perform one iteration of the EKF. Currently UNDER DEVELOPMENT.

Usage

```

EKFadvance(
  obs,
  oldmean,
  oldvar,
  phi,
  phi.arglist,
  psi,
  psi.arglist,
  W,
  V,
  loglik = FALSE,
  na.rm = FALSE
)

```


Arguments

obs	observations
oldmean	old mean
oldvar	old variance
phi	Function computing a Taylor Series approximation of the system equation. Can include higher (ie 2nd order and above) terms.
phi.arglist	arguments for function phi
psi	Function computing a Taylor Series approximation of the observation equation. Can include higher (ie 2nd order and above) terms.
psi.arglist	arguments for function psi
W	system noise matrix
V	observation noise matrix
loglik	whether or not to compute the pseudo-likelihood
na.rm	logical, whether or not to handle NAs. Default is FALSE. Set to TRUE if there are any missing values in the observed data.

Value

list containing the new mean and variance, and if specified, the likelihood

fcastGARCH	<i>fcastGARCH function</i>
------------	----------------------------

Description

A function to forecast forwards using MCMC samples from the bayesGARCH function from the bayesGARCH package.

Usage

```
fcastGARCH(y, parmat, l)
```

Arguments

y	vector of log-returns used in fitting the model via bayesGARCH
parmat	a matrix of MCMC samples from the bayesGARCH function e.g. "out\$chain1" where "out" is the output of the fitted model and "chain1" is the desired chain
l	number of lags to forecast forward

Details

Suggest thinning MCMC samples to get, say 1000, posterior samples (this can be done post-hoc)

See also the function `lr2fact` for converting log-returns to a factor. Apply this to the output of `fcastGARCH` in order to undertake forecasting on the scale of the original series (i.e. not the log returns). Quantiles may be computed across the MCMC iterations and then all one needs to do is to multiply the result by the last observed value in the original series (again, not the log returns)

Value

forecast log returns and also forecast y

generic

generic function

Description

A function to generate roxygen templates for generic funtions and associated methods.

Usage

```
generic(gen, methods = NULL, sp = 3, oname = "obj")
```

Arguments

<code>gen</code>	character string giving the name of an S3 generic.
<code>methods</code>	character vector: a list of methods for which to provide templates
<code>sp</code>	the amont of space to put in between functions
<code>oname</code>	name of the generic object

Value

roxygen text printed to the console.

genharmonic	<i>genharmonic function</i>
-------------	-----------------------------

Description

A function to create harmonic terms ready for a harmonic regression model to be fitted.

Usage

```
genharmonic(
  df,
  tname,
  base,
  num,
  sinfun = sin,
  cosfun = cos,
  sname = "s",
  cname = "c",
  power = FALSE
)
```

Arguments

df	a data frame
tname	a character string, the name of the time variable. Note this variable will be converted using the function <code>as.numeric</code>
base	the period of the first harmonic e.g. for harmonics at the sub-weekly level, one might set <code>base=7</code> if time is measured in days
num	the number of harmonic terms to return
sinfun	function to compute sin-like components in model. Default is <code>sin</code> , but alternatives include <code>sintri</code> , or any other periodic function defined on $[0, 2\pi]$
cosfun	function to compute sin-like components in model. Default is <code>cos</code> , but alternatives include <code>costri</code> , or any other periodic function defined on $[0, 2\pi]$ offset to <code>sinfun</code> by $\pi/2$
sname	the prefix of the sin terms, default 's' returns variables 's1', 's2', 's3' etc.
cname	the prefix of the cos terms, default 's' returns variables 's1', 's2', 's3' etc.
power	logical, if <code>FALSE</code> (the default) it will return the standard Fourier series with sub-harmonics at 1, 1/2, 1/3, 1/4 of the base periodicity. If <code>TRUE</code> , a power series will be used instead, with harmonics 1, 1/2, 1/4, 1/8 etc. of the base frequency.

Value

a data frame with the time variable in numeric form and the harmonic components

genIntegratedharmonic *genIntegratedharmonic function*

Description

A function to generate basis vectors for integrated Fourier series.

Usage

```
genIntegratedharmonic(
  df,
  t1name,
  t2name,
  base,
  num,
  sname = "bcoef",
  cname = "acoef",
  power = FALSE
)
```

Arguments

df	a data frame containing a numeric time variable of interest
t1name	a character string, the name of the variable in df containing the start time of the intervals
t2name	a character string, the name of the variable in df containing the end time of the intervals
base	the fundamental period of the signal, e.g. if it repeats over 24 hours and time is measured in hours, then put 'base = 24'; if the period is 24 hours but time is measured in days, then use 'base = 1/7'
num	number of sin and cosine terms to compute
sname	character string, name for cosine terms in Fourier series (not integrated)
cname	character string, name for sine terms in Fourier series (not integrated)
power	legacy functionality, not used here

Details

If the non-integrated Fourier series is:

$$f(t) = \sum_k a_k \sin(2 \pi k t / P) + b_k \cos(2 \pi k t / P)$$

then

$$\int_{t_1}^{t_2} f(s) ds = \sum_k a_k (base/(2 \pi k)) * (\cos(2 \pi k t_1 / P) - \cos(2 \pi k t_2 / P)) + b_k (base/(2 \pi k)) * (\sin(2 \pi k t_2 / P) - \sin(2 \pi k t_1 / P))$$

where P is the fundamental period, or 'base', as referred to in the function arguments

Value

a data frame containing the start and end time vectors, together with the sin and cosine terms

getstrbetween	<i>getstrbetween function</i>
---------------	-------------------------------

Description

A function used in web scraping. Used to simplify the searching of HTML strings for information.

Usage

```
getstrbetween(linedata, start, startmark, endmark, include = FALSE)
```

Arguments

linedata	a string
start	integer, where to start looking in linedata
startmark	character string. a pattern identifying the start mark
endmark	character string. a pattern identifying the end mark
include	include the start and end marks?

Value

the first string after start and between the start and end marks

getwikicoords	<i>getwikicoords function</i>
---------------	-------------------------------

Description

A function to return the lat/lon coordinates of towns in the UK from Wikipedia. Does not always work. Sometimes the county has to be specified too.

Usage

```
getwikicoords(place, county = NULL, rmslash = TRUE)
```

Arguments

place	character, the name of the town
county	character, the county it is in
rmslash	remove slash from place name. Not normally used.

Value

The lat/lon coordinates from Wikipedia

hCreate	<i>hCreate function</i>
---------	-------------------------

Description

A function used in the forecasting of GARCH(1,1) models

Usage

```
hCreate(pars, y, T = length(y))
```

Arguments

pars	parameters for the GARCH model, these would come from an MCMC run
y	vector of log returns
T	this is the length of y; allow this to be pre-computed

Value

vector of h's

KFadvance	<i>KFadvance function</i>
-----------	---------------------------

Description

A function to compute one step of the Kalman filter. Embed in a loop to run the filter on a set of data.

Usage

```
KFadvance(
  obs,
  oldmean,
  oldvar,
  A,
  B,
  C,
  D,
  E,
  F,
  W,
  V,
  marglik = FALSE,
  log = TRUE,
  na.rm = FALSE
)
```

Arguments

obs	$Y(t)$
oldmean	$\mu(t-1)$
oldvar	$\Sigma(t-1)$
A	matrix A
B	column vector B
C	matrix C
D	matrix D
E	column vector E
F	matrix F
W	state noise covariance
V	observation noise covariance
marglik	logical, whether to return the marginal likelihood contribution from this observation
log	whether or not to return the log of the likelihood contribution.
na.rm	na.rm logical, whether or not to handle NAs. Default is FALSE. Set to TRUE if there are any missing values in the observed data.

Details

The model is: (note that Y and θ are COLUMN VECTORS)

$\theta(t) = A*\theta(t-1) + B + C*W$ (state equation)

$Y(t) = D*\theta(t) + E + F*V$ (observation equation)

W and V are the covariance matrices of the state and observation noise. Prior is normal,

$N(\mu(t-1), \Sigma(t-1))$

Result is the posterior, $N(\mu(t), \Sigma(t))$, together with the likelihood contribution $\text{Prob}(Y(t)|Y(t-1))$

Value

list containing the new mean and variance, and if specified, the likelihood

KFadvanceAR2	<i>KFadvanceAR2 function</i>
--------------	------------------------------

Description

A function to compute one step of the Kalman filter with second order AR state evolution. Embed in a loop to run the filter on a set of data.

Usage

```
KFadvanceAR2(  
  obs,  
  oldmean,  
  oldermean,  
  oldvar,  
  oldervar,  
  A,  
  A1,  
  B,  
  C,  
  D,  
  E,  
  F,  
  W,  
  V,  
  marglik = FALSE,  
  log = TRUE,  
  na.rm = FALSE  
)
```

Arguments

obs	Y(t)
oldmean	mu(t-1)
oldermean	mu(t-2)
oldvar	Sigma(t-1)
oldervar	Sigma(t-2)
A	A matrix A
A1	A matrix A1
B	column vector B
C	matrix C
D	matrix D
E	column vector E
F	matrix F

<code>W</code>	state noise covariance
<code>V</code>	observation noise covariance
<code>marglik</code>	logical, whether to return the marginal likelihood contribution from this observation
<code>log</code>	whether or not to return the log of the likelihood contribution.
<code>na.rm</code>	na.rm logical, whether or not to handle NAs. Default is FALSE. Set to TRUE if there are any missing values in the observed data.

Details

The model is: (note that Y and θ are COLUMN VECTORS)

$\theta(t) = A \cdot \theta(t-1) + A1 \cdot \theta(t-2) + B + C \cdot W$ (state equation)

$Y(t) = D \cdot \theta(t) + E + F \cdot V$ (observation equation)

W and V are the covariance matrices of the state and observation noise. Priors are normal,

$N(\mu(t-1), \Sigma(t-1))$ and $N(\mu(t-2), \Sigma(t-2))$

Result is the posterior, $N(\mu(t), \Sigma(t))$, together with the likelihood contribution $\text{Prob}(Y(t)|Y(t-1))$

Value

list containing the new mean and variance, and if specified, the likelihood

KFtemplates	<i>KFtemplates function</i>
-------------	-----------------------------

Description

A function to print KFfit and KFparest templates to the console. See vignette("miscFuncs") for more information

Usage

```
KFtemplates()
```

Value

Tust prints to the console. This can be copied and pasted into a text editor for further manipulation.

latexformat	<i>latexformat function</i>
-------------	-----------------------------

Description

A function to format text or numeric variables using scientific notation for LaTeX documents.

Usage

```
latexformat(x, digits = 3, scientific = -3, ...)
```

Arguments

x	a numeric, or character
digits	see ?format
scientific	see ?format
...	other arguments to pass to the function format

Value

...

latexable	<i>latexable function</i>
-----------	---------------------------

Description

A very useful function to create a LaTeX table from a matrix. Rounds numeric entries and also replaces small numbers with standard index form equivalents.

Usage

```
latexable(
  x,
  digits = 3,
  scientific = -3,
  colnames = NULL,
  rownames = NULL,
  caption = NULL,
  narep = " ",
  laststr = "",
  intable = TRUE,
  manualalign = NULL,
  file = "",
  ...
)
```

Arguments

<code>x</code>	a matrix, or object that can be coerced to a matrix. <code>x</code> can include mixed character and numeric entries.
<code>digits</code>	see help file for format
<code>scientific</code>	see help file for format
<code>colnames</code>	optional column names set to NULL (default) to automatically use column names of <code>x</code> . NOTE! if <code>rownames</code> is not NULL present, <code>colnames</code> must include an entry for the <code>rownames</code> i.e. it should be a vector of length the number of columns of <code>x</code> plus 1.
<code>rownames</code>	optional row names set to NULL (default) to automatically use row names of <code>x</code>
<code>caption</code>	optional caption, not normally used
<code>narep</code>	string giving replacement for NA entries in the matrix
<code>laststr</code>	string to write at end, eg note the double backslash!!
<code>intable</code>	output in a table environment?
<code>manualalign</code>	manual align string e.g. 'ccc' or 'llccc'
<code>file</code>	connection to write to, default is "" which writes to the console; see ?write for further details
<code>...</code>	additional arguments passed to format

Details

To get a backslash to appear, use a double backslash

Just copy and paste the results into your LaTeX document.

Value

prints the LaTeX table to screen, so it can be copied into reports

Examples

```
latextable(as.data.frame(matrix(1:4,2,2)))
```

lr2fact

lr2fact function

Description

Apply this to the output of fcastGARCH in order to undertake forecasting on the scale of the original series (i.e. not the log returns). Quantiles may be computed across the MCMC iterations and then all one needs to do is to multiply the result by the last observed value in the original series (again, not the log returns)

Usage

```
lr2fact(mod)
```

Arguments

mod the output of fcastGARCH

Value

the multiplicative factors.

method	<i>method function</i>
--------	------------------------

Description

A function to generate a roxygen template for a method of a generic S3 function. Normally, this would be called from the function generic, see ?generic

Usage

```
method(meth, gen, oname = "obj")
```

Arguments

meth character, the name of the method
gen character the associated generic method
oname name of object

Value

a roxygen template for the method.

monthnames	<i>monthnames function</i>
------------	----------------------------

Description

A function to

Usage

```
monthnames()
```

Value

...

print22	<i>print22 function</i>
---------	-------------------------

Description

A function to print details of the 2 by 2 table for use with the function twotwoinfo.

Usage

```
print22()
```

Value

prints the names of the arguments of twotwofunction info to screen in their correct place in the 2 by 2 table

See Also

[twotwoinfo](#)

qqci	<i>qqci function</i>
------	----------------------

Description

A function to compare quantiles of a given vector against quantiles of a specified distribution. The function outputs simulation-based confidence intervals too. The option of zero-ing the plot (rather than visualising a diagonal line (which can be difficult to interpret) and also standardising (so that varying uncertainty around each quantile appears equal to the eye) are also given.

Usage

```
qqci(  
  x,  
  rfun = NULL,  
  y = NULL,  
  ns = 100,  
  zero = FALSE,  
  standardise = FALSE,  
  qts = c(0.025, 0.975),  
  llwd = 2,  
  lcol = "red",  
  xlab = "Theoretical",  
  ylab = "Sample",  
  alpha = 0.02,  
  cicol = "black",
```

```

        cilwd = 1,
        ...
    )

```

Arguments

<code>x</code>	a vector of values to compare
<code>rfun</code>	a function accepting a single argument to generate samples from the comparison distribution, the default is <code>rnorm</code>
<code>y</code>	an optional vector of samples to compare the quantiles against. In the case this is non-null, the function <code>rfun</code> will be automatically chosen as bootstrapping <code>y</code> with replacement and sample size the same as the length of <code>x</code> . You must specify exactly one of <code>rfun</code> or <code>y</code> .
<code>ns</code>	the number of simulations to generate: the more simulations, the more accurate the confidence bands. Default is 100
<code>zero</code>	logical, whether to zero the plot across the x-axis. Default is FALSE
<code>standardise</code>	logical, whether to standardise so that the variance around each quantile is made constant (this can help in situations where the confidence bands appear very tight in places)
<code>qts</code>	vector of probabilities giving which sample-based empirical quantiles to add to the plot. Default is <code>c(0.025,0.975)</code>
<code>llwd</code>	positive numeric, the width of line to plot, default is 2
<code>lcol</code>	colour of line to plot, default is red
<code>xlab</code>	character, the label for the x-axis
<code>ylab</code>	character, the label for the y-axis
<code>alpha</code>	controls transparency of samples (coloured blue)
<code>cicol</code>	colour of confidence band lines, default is black
<code>cilwd</code>	width of confidence band lines, default is 1
<code>...</code>	additional arguments to pass to <code>matplot</code>

Value

Produces a QQ-plot with simulation-based confidence bands

Examples

```

qqci(rnorm(1000))
qqci(rnorm(1000),zero=TRUE)
qqci(rnorm(1000),zero=TRUE,standardise=TRUE)

```

roxbc	<i>roxbc function</i>
-------	-----------------------

Description

A function to build and check packages where documentation has been compiled with roxygen. Probably only works in Linux.

Usage

```
roxbc(name, checkflags = "--as-cran")
```

Arguments

name	package name
checkflags	string giving optional check flags to R CMD check, default is --as-cran

Value

builds and checks the package

roxbuild	<i>roxbuild function</i>
----------	--------------------------

Description

A function to build packages where documentation has been compiled with roxygen. Probably only works in Linux.

Usage

```
roxbuild(name)
```

Arguments

name	package name
------	--------------

Value

builds and checks the package

roxtext	<i>roxtext function</i>
---------	-------------------------

Description

A function to generate roxygen documentation templates for functions for example,

Usage

```
roxtext(fname)
```

Arguments

fname	the name of a function as a character string or as a direct reference to the function
-------	---

Details

would generate a template for this function. Note that functions with default arguments that include quotes will throw up an error at the moment, just delete these bits from the string, and if should work.

Value

minimal roxygen template

sinpulse	<i>sinpulse function</i>
----------	--------------------------

Description

A function to

Usage

```
sinpulse(x, tau = pi)
```

Arguments

x	X
tau	pulse duration

Value

...

sinrsaw	<i>sinrsaw function</i>
---------	-------------------------

Description

A function to

Usage

sinrsaw(x)

Arguments

x X

Value

...

sinsaw	<i>sinsaw function</i>
--------	------------------------

Description

A function to

Usage

sinsaw(x)

Arguments

x X

Value

...

sintri	<i>sintri function</i>
--------	------------------------

Description

A function to

Usage

sintri(x)

Arguments

x X

Value

...

timeop	<i>timeop function</i>
--------	------------------------

Description

A function to time an operation in R

Usage

timeop(expr)

Arguments

expr an expression to evaluate

Value

The time it took to evaluate the expression in seconds

twotwoinfo

*twotwoinfo function***Description**

A function to compute and display information about 2 by 2 tables for copying into LaTeX documents. Computes odds ratios and relative risks together with confidence intervals for 2 by 2 table and prints to screen in LaTeX format. The function will try to fill in any missing values from the 2 by 2 table. Type `print22()` at the console to see what each argument refers to.

Usage

```
twotwoinfo(
  e1 = NA,
  u1 = NA,
  o1t = NA,
  e2 = NA,
  u2 = NA,
  o2t = NA,
  et = NA,
  ut = NA,
  T = NA,
  lev = 0.95,
  LaTeX = TRUE,
  digits = 3,
  scientific = -3,
  ...
)
```

Arguments

<code>e1</code>	type <code>print22()</code> at the console
<code>u1</code>	type <code>print22()</code> at the console
<code>o1t</code>	type <code>print22()</code> at the console
<code>e2</code>	type <code>print22()</code> at the console
<code>u2</code>	type <code>print22()</code> at the console
<code>o2t</code>	type <code>print22()</code> at the console
<code>et</code>	type <code>print22()</code> at the console
<code>ut</code>	type <code>print22()</code> at the console
<code>T</code>	type <code>print22()</code> at the console
<code>lev</code>	significance level for confidence intervals. Default is 0.95
<code>LaTeX</code>	whether to print the 2 by 2 information as LaTeX text to the screen, including the table, odds ratio, relative risk and confidence intervals
<code>digits</code>	see <code>?format</code>

scientific see ?format
... other arguments passed to function format

Value

Computes odds ratios and relative risks together with confidence intervals for 2 by 2 table and prints to screen in LaTeX format.

See Also

[print22](#)

vdc	<i>vdc function</i>
-----	---------------------

Description

A function to generate a Van der Corput sequence of numbers.

Usage

vdc(n)

Arguments

n the length of the sequence

Value

Van der Corput sequence of length n

vif	<i>vif function</i>
-----	---------------------

Description

Function to calculate the variance inflation factor for each variable in a linear regression model.

Usage

vif(mod)

Arguments

mod an object of class 'lm'

Value

...

`yhIterate`*yhIterate function*

Description

A function to perform forecasting of the series, used by fcastGARCH

Usage

```
yhIterate(i, current, pars, eps, omega)
```

Arguments

<code>i</code>	the index of the forward lags
<code>current</code>	current matrix of (y,h)
<code>pars</code>	parameters for the GARCH model, these would come from an MCMC run
<code>eps</code>	matrix of Gaussian noise, dimension equal to number of MCMC iterations by the number of forecast lags
<code>omega</code>	matrix of Inverse Gamma noise, dimension equal to number of MCMC iterations by the number of forecast lags

Value

two column matrix containing forecast y (1st column) and updated h (2nd column)

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