

R and Rmetrics – Reference Card



An Environment for Teaching Financial Engineering and Computational Finance with R Rmetrics Built 221.10065

R

An (uncomplete) summary of functions from R's base installation.

GETTING HELP:

<i>help</i>	<i>documentation</i>
<i>?</i>	<i>help topic</i>
<i>help.search</i>	<i>search system</i>
<i>str</i>	<i>object structure</i>
<i>args</i>	<i>display arguments</i>
<i>summary</i>	<i>object summary</i>
<i>mode</i>	<i>mode of an object</i>
<i>type</i>	<i>type of an object</i>
<i>attributes</i>	<i>attribute list</i>
<i>dim</i>	<i>dimension of an object</i>
<i>ls</i>	<i>list path</i>
<i>dir</i>	<i>show files</i>
<i>methods</i>	<i>show S3 methods</i>

DATA INPUT AND OUTPUT:

<i>library</i>	<i>load package</i>
<i>require</i>	<i>load package</i>
<i>data</i>	<i>load data set</i>
<i>scan</i>	<i>read data values</i>
<i>write</i>	<i>write to a file</i>
<i>read.table</i>	<i>read from file</i>
<i>write.table</i>	<i>write to file</i>
<i>read.csv</i>	<i>read csv data</i>
<i>cat</i>	<i>print coerced characters</i>
<i>print</i>	<i>generic print method</i>
<i>sprintf</i>	<i>C style printing</i>

DATA CREATION:

<i>c</i>	<i>combine data</i>
<i>from:to</i>	<i>create sequence</i>
<i>seq</i>	<i>generate sequence</i>
<i>rep</i>	<i>replicate data</i>
<i>matrix</i>	<i>create matrix</i>
<i>array</i>	<i>create array</i>
<i>list</i>	<i>create list</i>
<i>data.frame</i>	<i>create data.frame</i>

<i>factor</i>	<i>encode as factor</i>
<i>cbind</i>	<i>combine by columns</i>
<i>rbind</i>	<i>combine by rows</i>
<i>unlist</i>	<i>flatten lists</i>
<i>as.character</i>	<i>convert</i>
<i>as.integer</i>	<i>convert</i>
<i>as.numeric</i>	<i>convert</i>

DATA SELECTION & MANIPULATIONS:

<i>which.max</i>	<i>index of the largest</i>
<i>which.min</i>	<i>of the smallest</i>
<i>rev</i>	<i>revert elements</i>
<i>sort</i>	<i>sort elements</i>
<i>cut</i>	<i>devide into intervals</i>
<i>which</i>	<i>return indices</i>
<i>choose</i>	<i>compute combinations</i>
<i>na.omit</i>	<i>omit missing values</i>
<i>na.fail</i>	<i>return fail message</i>
<i>unique</i>	<i>remove duplicates</i>
<i>table</i>	<i>build contingency table</i>
<i>subset</i>	<i>return subsets</i>
<i>sample</i>	<i>resample randomly</i>

ADVANCED DATA PROCESSING:

<i>apply</i>	<i>apply function to margins</i>
<i>lapply</i>	<i>to elements of a list</i>
<i>tapply</i>	<i>to cells of ragged array</i>
<i>merge</i>	<i>merge two data frames</i>
<i>aggregate</i>	<i>split into subsets</i>

DATE CLASS: Date

Represents dates as the number of days since 1970-01-01, with negative values for earlier dates. They are always printed following the rules of the current Gregorian calendar.

<i>Date</i>	<i>Class</i>
<i>as.Date</i>	<i>convert</i>
<i>Sys.Date</i>	<i>current date</i>
<i>Sys.timezone</i>	<i>time zone setting</i>

<i>S3 Methods:</i>	
<i>print</i>	<i>print</i>
<i>summary</i>	<i>summary</i>

<i>date + number</i>	<i>add</i>
<i>date - number</i>	<i>subtract</i>
<i>date1 lop date2</i>	<i>logical op</i>
<i>weekdays</i>	<i>extract weekdays</i>
<i>months</i>	<i>extract months</i>
<i>quarters</i>	<i>quarters Q1 to Q4</i>
<i>julian</i>	<i>get days since origin</i>
<i>seq</i>	<i>regular sequence</i>
<i>cut</i>	<i>convert to factor</i>
<i>round</i>	<i>round date</i>
<i>trunc</i>	<i>truncate Date</i>

Conversion Function:
format.Date *string conversion*

DATE TIME CLASSES: POSIXt, POSIXct, POSIXlt

Represent calendar dates and times to the nearest second.

<i>POSIXt</i>	<i>Classes</i>
<i>POSIXct</i>	<i>number representation</i>
<i>POSIXlt</i>	<i>list representation</i>
<i>as.POSIX[cl]t</i>	<i>convert</i>
<i>Sys.time</i>	<i>system time</i>

S3 methods:

<i>print</i>	<i>print</i>
<i>summary</i>	<i>summary</i>
<i>time + number</i>	<i>add</i>
<i>time - number</i>	<i>subtract</i>
<i>time1 lop time2</i>	<i>logical op</i>
<i>weekdays</i>	<i>extract weekdays</i>
<i>months</i>	<i>extract months</i>
<i>quarters</i>	<i>quarters Q1 to Q4</i>
<i>julian</i>	<i>get days since origin</i>
<i>seq</i>	<i>regular sequence</i>
<i>cut</i>	<i>convert to factor</i>
<i>round</i>	<i>round date</i>
<i>trunc</i>	<i>truncate date</i>

Conversion Functions:

<i>strptime</i>	<i>convert</i>
<i>format</i>	<i>format string</i>
<i>strftime</i>	<i>format alias</i>
<i>ISOdatetime</i>	<i>return POSIXct</i>
<i>ISOdate</i>	<i>return POSIXct</i>

NOTE: Rmetrics has its own S4 'timeDate' and 'timeSeries' classes

MATHEMATICAL FUNCTIONS:

Arithmetic and Relational Operators:

+ - * / ^ %% %/%..
< > <= >= ==..!=..

Mathematical Functions:

sqrt abs sign
sin cos tan
asin acos atan atan2
sinh cosh tanh
asinh acosh atanh
exp log log10 log2

Distributions:

rnorm rexp rgamma rpois
rweibull rcauchy rbeta
rt rf rchisq rbinom rgeom
rhyper rlogis rlnorm
rnbinom runif rwilcox

Statistical Functions:

min max range sum diff prod
mean median sd var cor
scale round trunc
pmin pmax
cumsum cumprod cummin cummax
union intersect

Complex Arithmetic:

complex Re Im Mod Adj Conj

STRING MANIPULATIONS:

paste concatenate and convert
substr extract substring
strsplit split in substrings
grep search for matches
gsub substitute matches
tolower convert to lower case
toupper to upper case
match positons of matches
pmatch partial matches
nchar number of characters

GRAPHS AND PLOTS:

General Plots:

plot generic plot function
hist histogram plot
densityplot density plot
barplot bar plot
piechart pie chart
boxplot box plot
coplot bivariate plot
pairs bivariate plots
symbols draw symbols

Time Series Plots:

plot.ts time series plot
ts.plot allow different dates

Quantile Plots:

qqnorm normal quantile plot
qqplot quantile-quantile plot

Two Dimensional Plots:

contour contour plot
image image plot

persp perspective plot
heatmap heat map

Low Level Plot Functions:

points add points
lines add lines
text add text to plot
mtext add text in the margin
abline draw a line
rect draw a rectangle
polygon draw a polygon
legend add legend to plot
title add title/subtitle
locator return coordinates

Graphical Parameters:

par set parameters
adj control justification
bg background color
box control box type
cex size of text/symbbols
col select color
font select font type
lty line type
lwd line width
mfc col column partitions
mfrow row partitions
pchar symbol type

OPTIMIZATION AND MODELLING:

uniroot search for zero
optimize search for optimum
optim general purpose optimizer
nlm non-linear minimizatoion
nls non-linear least squares

approx interpolation function
smooth.spline spline fit
loess local polynomial fit
lowess scatterplot smoothing

lm linear model fit

Rmetrics

1 fBasics

IMPORT DATA FROM INTERNET: [A1]

Functions to import financial and economic market data from the Internet.

download.file WWW download

yahooImport Yahoo
keystatsImport KeyStatistics
economagicImport Economagic
fredImport St Louis FED

BASIC STATISTICS: [A2] INCLUDING ROW/COLUMN STATISTICS

Functions which compute basic statistical properties. Missing functions in R to calculate skewness and kurtosis are added, a function which creates a summary statistics, and functions to calculate column and statistics.

mean Mean
median Median
std Standard Deviation
var Variance

skewness Skewness
kurtosis Kurtosis
basicStats Basic Statistics

rowStats Row Statistics
rowMeans Means
rowAvg Averages
rowVars Variances
rowStdevs Standard Devs
rowSkewness Skewness
rowKurtosis Kurtosis
rowCumsums Cumsums

colStats Column Statistics
colMeans Means
colAvg Averages
colVars Variances
colStdevs Standard Devs
colSkewness Skewness
colKurtosis Kurtosis
colCumsums Cumsums

SOME UTILITY FUNCTIONS: [A3] BASIC PLOTS AND TABLES

Plotting functions and utilities for the explorative data analysis of financial and economic market data using S4 time series objects from Rmetrics. Included are also utility functions displaying tables for characters, plot symbols, and colors.

spplusLikePlot Set Parameters

tsPlot Time Series
histPlot Histogram
densityPlot Density

logpdfPlot Log Density
qqgaussPlot Normal Quantiles
scalinglawPlot Scaling Law
circlesPlot 3D Circles
perspPlot Perspective

characterTable Characters
plotcharacterTable Plot Chars
colorTable Show Colors

GENERALISED-HYPERBOLIC DISTRIBUTION: [B1]

Functions to compute density, distribution function, quantile function and to generate

random variates for two special cases of the generalized hyperbolic distribution: the hyperbolic distribution and the normal inverse Gaussian distribution.

Generalized Hyperbolic Distribution:

dgh	GH Density
pgh	Probability
qgh	Quantiles
rg	Random Variates

Hyperbolic:

dhyp	Hyperbolic Density
phyp	Probability
qhyp	Quantiles
rhyp	Random Variates
*hyp2	Second Parameterization
*hyp3	Third Parameterization
*hyp3	Fourth Parameterization

Normal Inverse Gaussian:

dnig	NIG Density
pnig	Probability
qnig	Quantiles
rnig	Random Variates

STABLE DISTRIBUTION: [B2]

Functions to compute density, distribution function, quantile function and to generate random variates from the stable distribution. Two different algorithms are used for the symmetric and skewed distribution.

dsymstb	Symmetric Density
psymstb	Probability
qsymstb	Quantiles
rsymstb	Random Variates

dstable	Skewed Density
pstable	Probability
qstable	Quantiles
rstable	Random Variates
Parameterizations: 0, 1, 2	
stableMode	Stable Mode

MLE ESTIMATES: [B3] OF DISTRIBUTIONAL PARAMETERS

Maximum likelihood estimators to fit the parameters of a distribution. Included are estimators for the Student-t, the hyperbolic and the normal inverse Gaussian distributions.

tFit	Student-t
ghFit	Generalized Hyperbolic
hypFit	Hyperbolic
nigFit	Normal Inverse Gauss

TEST CLASS : [B4]

Class representation and methods for objects of class fHTEST.

Class Representation:	
fHTEST	S4 class

@call	call
@data	list
@test	list
@title	character
@description	character

Methods:	
show.fHTEST	S4 print method

ONE SAMPLE TESTS: [B5]

Functions of one sample tests mostly for testing normality of observations.

Normal Tests:	
normalTest	test suite
ksnormTest	Kolmogorof-Smirnov
shapiroTest	Shapiro
jarqueberaTest	Jarque-Bera
dagoTest	D'Agostino Test

Functions from the nortest Package:	
adTest	Anderson-Darling
cvmTest	Cramer von Mises
lillieTest	Lilliefors Test
pchiTest	Pearson Test
sftest	Shapiro Francia

Independence Test:	
runsTest	Runs Test

TWO SAMPLE TEST: [B6]

Functions for two sample statistical tests.

Distributional Equivalence:	
s2Test	Kolmogorov Smirnov

Difference in Locations:	
tTest	t Test
kw2test	Kruskal-Wallis

Difference in Variances:	
varfTest	variance f Test

Difference in Scales:	
ansariTest	Ansari-Bradley
bartlett2Test	Bartlett
fligner2Test	Fligner-Killeen

Correlations:	
PearsonTest	Pearson's coeff
KendallTest	Kendall's tau
SpearmanTest	spearman's rho

Distributions:	
[dpq]ansariw	Ansari W Statistic

STYLIZED FACTS: [B7]

Functions to plot several stylized facts of financial and economic time series. This includes fat tails, autocorrelations, cross-correlations, long memory behavior, and the Taylor effect.

LogpdfPlot	logarithmic PDF
qqgausPlot	Normal Quantiles

scalinglawPlot	Scaling Law
acfPlot	Autocorrelation
pacfPlot	Partial ACF
ccfPlot	Cross Correlation
lmacfPlot	Long Memory ACF
teffectPlot	Taylor Effect

ADDITIONAL FUNCTIONS PART OF THE DEMO SECTION:

Spline Smoothed Density:	
dssd	Density
pssd	Probability
qssd	Quantiles
rssd	Random Deviates

Bootstrapped Statistics:	
bootMean	Bootstrapped Mean

Data Import:	
csvImport	from CSV files
forecastsImport	forecasts.org

2 fCalendar

TIME-DATE CLASS: [C1] MANAGING DATES AND TIME

Functions for managing date and time around the globe for any financial center. The concept allows for dealing with time zones, daylight saving time and holiday calendars independent of the date and time specifications of the operating system implemented on your computer. This is an important issue especially for R running under Microsoft's Windows operating system.

RulesFinCenter	DST Rule
ListFinCenter	List Centers

Class Representation:	
timeDate	S4 Class
@Data	POSIXlt date/time Slot
@Dim	length Slot
@format	format specification
@FinCenter	financial center

timeCalendar	calendar atoms
timeSequence	sequence
Sys.timeDate	system date/time

Special Time Date Objects:	
TimeLastDayInMonth	.
TimeNdayOnOrAfter	.
TimeNdayOnOrBefore	.
TimeNthNdayInMonth	.
TimeLastNdayInMonth	.

S3 Methods:	
is.timeDate	test
print	print
summary	summary
format	format

**TIME-DATE CLASS - METHODS: [C2]
METHODS FOR TIME-DATE OBJECTS**

Methods for objects of class 'timeDate'. Included are S3 methods for mathematical operations and for transformations between different representations of date/time objects.

S3 Methods:	
[.timeDate	subset
+.timeDate	add
-.timeDate	subtract
Ops.timeDate	math operations
diff.timeDate	difference
difftimeDate	another diff
c.timeDate	concatenate
rep.timeDate	repeat
round.timeDate	round
trunc.timeDate	truncate
start.timeDate	first
end.timeDate	last
sort.timeDate	sort
rev.timeDate	revert

Transformations:	
as.character.timeDate	.
as.data.frame.timeDate	.
as.POSIXct.timeDate	.
as.POSIXlt.timeDate	.
julian.POSIXt	.
julian.timeDate	.
atoms.timeDate	.
months.timeDate	.

DAYLIGHT SAVING TIME RULES: [C3]

Functions for about 100 cities and regions, which return the daylight saving time tables. The functions are:

Adelaide	Algiers	Amsterdam
Anchorage	Andorra	Athens
Auckland		
Bahrain	Bangkok	Beirut
Belfast	Belgrade	Berlin
Bogota	Bratislava	Brisbane
Brussels	Bucharest	Budapest
BuenosAires		
Cairo	Calcutta	Caracas
Casablanca	Cayman	Chicago
Copenhagen		
Darwin	Denver	Detroit
Dubai	Dublin	Eastern
Edmonton	Frankfurt	Helsinki
HongKong	Honolulu	
Indianapolis	Istanbul	
Jakarta	Jerusalem	
Johannesburg		
Kiev	KualaLumpur	Kuwait
Lagos	Lisbon	Ljubljana
London	LosAngeles	Luxembourg
Madrid	Manila	Melbourne
MexicoCity	Monaco	Montreal
Moscow		
Nairobi	Nassau	NewYork
Nicosia	Oslo	
Pacific	Paris	Perth
Prague	Riga	Riyadh
Rome		

Seoul	Shanghai	Singapore	Sofia
Stockholm	Sydney		
Taipei	Tallinn	Tehran	Tokyo
Tunis			
Vaduz	Vancouver	Vienna	Vilnius
Warsaw	Winnipeg		
Zagreb	Zurich		

TIME SERIES CLASS: [C4]

Functions and methods dealing with regular and irregular 'timeSeries' objects. Dates and times are implemented as 'timeDate' objects. Included are functions and methods for the generation and representation of 'timeSeries' objects, and for mathematical operations.

Class Representation:	
timeSeries	S4 Class
@Data	matrix slot
@positions	character
@format	character
@FinCenter	character
@units	character
@title	character
@documentation	character
seriesData	get data
seriesPositions	get positions
read.timeSeries	Spreadsheet

S3 Methods:	
as.timeSeries	convert
is.timeSeries	check
print	print
plot	plot
lines	lines
Ops	math operations
[	indexing
head	head of data
tail	tail of data
start	first date
end	last date

Format Conversions:	
as.vector	convert
as.matrix	convert
as.data.frame	convert

Math Operations:	
applySeries	apply
cutSeries	cut
diffSeries	difference
lagSeries	lagged
mergeSeries	merge
returnSeries	returns
revSeries	revert

**HOLIDAY CALENDARS: [C5]
MANAGEMENT OF CALENDAR DATES**

easter	Easter
holiday	holidays
holiday.NYSE	NYSE holidays
Conditioned N-Days Dates:	
on.or.after	get date
on.or.before	get date
nth.of.nday	get date

last.of.nday	get date
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ISO-8601 CCYYMMDD Format:	
sjulian	Julian day counter
sdate	Gregorian date
sday.of.week	day of the week
sleap.year	leap year
print.sdate	print method

HOLIDAY DATES: [C6]

Functions and methods dealing with holiday calendars.

Septuagesima	Quinquagesima
AshWednesday	PalmSunday
GoodFriday	Easter
EasterSunday	EasterMonday
RogationSunday	Ascension
Pentecost	PentecostMonday
TrinitySunday	CorpusChristi
ChristTheKing	Advent1st
Advent2nd	Advent3rd
Advent4th	
ChristmasEve	ChristmasDay
BoxingDay	NewYearsDay
SolemnityOfMary	Epiphany
PresentationOfLord	
Annunciation	
TransfigurationOfLord	
AssumptionOfMary	
BirthOfVirginMary	
CelebrationOfHolyCross	
MassOfArchangels	AllSaints
AllSouls	LaborDay

Switzerland:	
CHBerchtoldsDay	
CHSechselaeuten	
CHAscension	
CHConfederationDay	
CHKnabenschiesen	

Great Britain:	
GBMayDay	
GBBankHoliday	
GBSummerBankHoliday	
GBMilleniumDay	

Germany:	
DEAscension	
DECorpusChristi	
DEGermanUnity	
DEChristmasEve	
DENewYearsEve	

France:	
FRFetDeLaVictoire1945	
FRAscension	
FRBastilleDay	
FRAssumptionVirginMary	
FRAllSaints	
FRArmisticeDay	

Italy:	
ITEpiphany	
ITLiberationDay	
ITAssumptionOfVirginMary	
ITAllSaints	
ITStAmrose	
ITImmaculateConception	

United States:
 USDecorationMemorialDay
 USPresidentsDay
 USNewYearsDay
 USInaugurationDay
 USMLKingsBirthday
 USLincolnsBirthday
 USWashingtonsBirthday
 USMemorialDay
 USIndependenceDay
 USLaborDay
 USColumbusDay
 USElectionDay
 USVeteransDay
 USThanksgivingDay
 USChristmasDay
 USCPulaskisBirthday
 USGoodFriday

Canada:
 CAVictoriaDay
 CACanadaDay
 CACivicProvincialHoliday
 CALabourDay
 CAThanksgivingDay
 CaRemembranceDay

Japan:
 JPNewYearsDay
 JPGantan
 JPBankHolidayJan2
 JPBankHolidayJan3
 JPComingOfAgeDay
 JPSeijinNoHi
 JPNatFoundationDay
 JPKenkokuKinenNoHi
 JPGreeneryDay JPMidoriNoHi
 JPConstitutionDay
 JPKenpouKinenBi
 JPNationHoliday
 JPKokuminNoKyujitu
 JPChildrensDay
 JPKodomoNoHi
 JPMarineDay
 JPUmiNoHi
 JPRespectForTheAgedDay
 JPKeirouNoHi
 JPAutumnalEquinox
 JPShuubunNoHi
 JPHealthandSportsDay
 JPTaiikuNoHi
 JPNationalCultureDay
 JPBunkaNoHi
 JPThanksgivingDay
 JPKinrouKanshaNoHi
 JPEmperorsBirthday
 JPTennouTanjyouBi
 JPBankHolidayDec31

FX HIGH FREQUENCY DATA / [D1] FILTERING / BUSINESS TIME SCALES ISO-8601 CCYYMMDDhhmm:

Functions for the management of high frequency financial market time series, especially for FX series collected from a Reuters data feed. The collection includes functions for the management of dates and times formatted in the ISO-8601 string CCYYMMDDhhmm, functions for filter and

outlier detection of high frequency FX data records as collected from a Reuters data feed, and functions which can be used to calculate log-prices, log-returns, to extract subsamples, to interpolate in time, to build business time scales, and to de-seasonalize and de-volatilize high frequency financial market data.

xjulian	Julian timer
xdate	Gregorian Date/Time
xday.of.week	day of the week
xleap.year	leap year
fxdata.	FX Data
fxdata.parser	parser
fxdata.filter	filter
fxdata.varmin	var min format

xts.log	take log
xts.diff	difference
xts.cut	cut
xts.interp	interpolate
xts.map	time map
xts.upsilon	Upsilon time
xts.dvs	de-volatilization
xts.dwh	day/week histograms

ADDITIONAL FUNCTIONS PART OF THE DEMO SECTION:

S3 chron Methods:	
print.chron	print patch
print.dates	print patch
seq.chron	sequence method

Time/Date Functions:	
is.weekday	check for weekdays
is.weekend	for weekend days
is.bizday	for business days
holidayZurich	Holiday Cal
summary.timeSeries	S3 Method

3 fSeries

LINEAR TIME SERIES MODELLING: [A1] AR-ARMA-ARIMA-FRACDIFF MODELS

Functions to model univariate autoregressive moving average time series processes, including time series simulation, parameter estimation, diagnostic analysis of the fit, and predictions of future values.

Class Representation:	
fARMA	S4 Class
@call	call
@formula	formula
@method	character
@parameter	list
@data	data.frame
@fit	list
@residuals	numeric

@fitted.values	numeric
@title	character
@description	character

Simulation and Estimation:	
armaSim	Simulation
armaFit	Estimation

fARMA S3-Methods:	
predict	forecast
print	print
plot	plot
summary	summary
print.summary	
fitted.values	fitted values
residuals	residuals

True ARMA Process:	
armaTrueacf	True ACF
armaRoots	Characteristic Pol

HETEROSKEDASTIC TS MODELING : [A2] GARCH-APARCH MODELS :

Functions to simulate artificial ARCH time series processes, to fit the parameters of univariate time series to ARCH models, to perform a diagnostic analysis of the fit, and to predict future values of the time series.

Class Representation:	
fGARCH	S3 Class

Simulation and Estimation:	
garchSim	GARCH Simulation
garchFit	GARCH Estimation
aparchSim	APARCH Simulation
aparchFit	APARCH Estimation

fGARCH S3-Methods:	
predict	forecast
print	print
summary	summary

LONG MEMORY MODELLING: [A3]

Functions to investigate the long memory behavior time series processes. Included are functions to simulate fractional Gaussian noise and fractional ARIMA processes, functions to model true autocorrelations and spectrum of these processes, and functions to compute the Hurst exponent by several different methods.

Fractional Gaussian Noise:	
FbmSim	Simulation
	from Stochastic Integral
	from Choleski Decomposition
	using Levinson's Method
	using Wood-chan's Method
	using Wavelet Sybthesis

Fractional Gaussian Noise:	
fgnSim	Simulation
	Durbin's Method
	Paxon's Method
	Beran's Method

True ACF and Spectrum:

ckFGN0	True FGN covariance
gkFGN0	True FGARIMA spectrum
ckFAIRMA0	True FGN covariance
gkFARIMA0	True FARIMA spectrum

Estimation of the Hurst Exponent:

aggvarFit	Aggregated Var
diffvarFit	Differenced Var
absvalFit	Absolute Moments
higuchiFit	Higuchi's Method
pengFit	Peng's Mmethod
rsFit	R/S Statistic Method
perFit	Periodogram Method
boxperFit	Boxed Periodogram
whittleFit	Whittle Estimator

Wavelet Synthesis:

WaveletFit	Wavelet Estimator
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CHAOTIC TIME SERIES: [A4]

Functions to investigate the chaotic behavior of time series processes.

henonSim	Henon Map
ikedasim	Ikeda Map
logisticSim	Logistic Map
lorentzSim	Lorentz Attractor
roesslerSim	Roessler Attractor

RANDOM INNOVATION: [A5] PORTABLE RANDOM GENERATOR

Functions to generate portable random innovations. The functions run under R and SPlus and generates the same sequence of random numbers. Supported are uniform, normal and Student-t distributed random numbers.

set.lcgseed	Set Seed
get.lcgseed	Get Seed
runif.lcg	Uniform
rnorm.lcg	Normal
rt.lcg	Student-t

TIME SERIES TESTS: [B1]

Functions for testing various aspects of time series, including independence, and neglected nonlinearities.

Tests from 'tseries' Package:

bdsTest	BrockDechertScheinkman
tnnTest	Teraesvirta NN test
wnnTest	White NN test

UNIT ROOT DISTRIBUTION: [B2]

Functions to compute distribution function and quantile function for the unit root test statistics.

punitroot	Probability
qunitroot	Quantiles

UNIT ROOT TESTS: [B3]

Functions for unit root testing. The family of tests includes ADF tests based on Banerjee's et al. tables and on J.G. McKinnons' numerical distribution functions. In addition we have included functions from the 'urca' packages.

unitrootTest	ADF/McKinnon
adfTest	ADF Test

Tests from 'urca' Package:

urersTest	Elliott-Rothbg-Stock
urkpssTest	KPSS Stationarity
urppTest	Philipps-Perron
urspTest	Schmidt-Philipps
urzaTest	Zivot-Andrews

HEAVISIDE AND RELATED FUNCTIONS: [C1]

Functions which compute the Heaviside and related functions, the sign function, the delta function, the boxcar function, and the ramp function.

H	Unit Step Function
Sign	Another Signum
Delta	Delta Function
Boxcar	Boxcar Function
Ramp	Ramp Function

GARCH DISTRIBUTIONS [C2]

SkewNormal Distribution:

Functions to compute density, distribution function, quantile function and to generate random variates for the skew normal distribution.

dsnrm	Density
psnrm	Probability
qsnrm	Quantiles
rsnrm	Random Deviates

Skew Student Distribution:

Functions to compute density, distribution function, quantile function and to generate random variates for the symmetric and skew Student-t distribution with unit variance.

Normalized Student-t:

dst	Density
pst	Probability
qst	Quantiles
rst	Random Deviates

Skew Normalized Student-t:

dsst	Density
psst	Probability
qsst	Quantiles
rsst	Random Deviates

Skew Generalized Error Distribution:

Functions to compute density, distribution

function, quantile function and to generate random variates for the symmetric and skew generalized error distribution.

GED:	
dged	Density
pged	Probability
qged	Quantiles
rged	Random Deviates

Skew GED:	
ssged	Density
psged	Probability
qsged	Quantiles
rsged	Random Deviates

GARCH DISTRIBUTION FITS: [C3]

Maximum likelihood estimators to fit the parameters of a distribution and to compute basic statistical properties. Included are estimators for the symmetric and skew normal, the Student-t, and the generalized error distributions.

normFit	Normal Fit
snormFit	Skew Normal Fit
gedFit	GED Fit
sged	Skew GED Fit
stdFit	Student-t Fit
sstdFit	Skew Student-t Fit

ADDITIONAL FUNCTIONS PART OF THE DEMO SECTION:

APARCH Simulation:

.aparchSim	another Sim Fun
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Distributional Statistics:

absMoments	absolute Moments
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GARCH OX Interface:

garchOxFit	Parameter Fit
print.garchOX	S3 Print Method
plot.garchOX	S3 Plot method

OLS Regression Analysis:

OLS	Parameter Fit
print.OLS	S3 Print Method
plot.OLS	S3 Plot Method
summary.OLS	S3 Summary Method

Moving Averages:

SMA	Simple Moving Average
EWMA	Exponentially Weighted

Time Series Filter:

hpFilter	Hodrick-Prescott
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Additional Trading Indicators:

accelTA	Acceleration
adiTA	AD Indicator
adoscillatorTA	AD Oscillator
bollingerTA	Bollinger Bands
chaikinoTA	Chaikin Oscillator
chaikinVTA	Chaikin Volatility
garmanKlassTA	Garman-Klass Volatility
macdTA	MACD Indicator
medpriceTA	Median Price

momentumTA	Momentum
nvTA	Negative Volume Idx
obvTA	On Balance Volume
pvTA	Positive Volume Idx
pvTrendTA	Price-Volume Trend
rocTA	RateOfChange
rsiTA	Relative Strength Idx
stochasticTA	Stochastic Osc
typicalPrice	Typical Price
wcloseTA	Weighted Close
williamsadTA	Williams AD
williamsrTA	Williams R%

Tests from 'lm' package:

bgTest	Breusch-Godfrey
bpTest	Breusch-Pagan
dwTest	Durbin-Watson
gqTest	Goldfeld-Quandt
harvTest	Harvey-Collier
hmcTest	Harrison-McCabe
rainbowTest	Rainbow Test
resetTest	Ramsey-Reset

norm	norm
rk	rank
tr	trace
t	transposed
%**	product
%x% kron	Kronecker product
mexp	matrix exponentiation

More Linear Algebra:

chol	Cholesky factor
eigen	eigenvalues/vectors
svd	singular values
kappa	condition number
q	QR decomposition
solve	system of LE
backsolve	for upper Triang
forwardsolve	lower triang

4 fMultivar

REGRESSION MODELLING: [A1] EASY TO USE FUNCTION WRAPPERS

A collection and description of easy to use functions to perform a univariate regression analysis from several methods, to analyse and summarize the fit, and to predict for new data records. This wrapper was mainly build for multivariate financial time series analysis.

Class Representation:

fREG	S4 Class
@call	call
@formula	formula
@family	character
@data	data.frame
@method	character
@fit	list
@title	character
@description	characte

Estimation:

regFit	Fit Parameters
LM	Linear Modelling
GLM	Generalized LM
PPR	Projection Pursuit Reg
MARS	Multiv Adap Reg Splines
POLYMARS	Polytochomous MARS
NNET	Feedforward Neural Net

fREG S3 Methods:

print	print
plot.	plot
summary	summary
predict	predict
fitted.values	fitted values
residuals	residuals

LINEAR REGRESSION TESTS: [A2]

Functions to test linear regression models, including tests for higher serial correlations, for heteroskedasticity, for autocorrelations of disturbances, for linearity, and functional relations.

EQUATIONS MODELLING: [A3]

Based on "systemfit":

S4: fEQNS	Class
eqnsFit	Fit Parameters
OLS	Ordinary Least Squares
WLS	Weighted Least Squares
SUR	Seemingly Unrelated Reg
2SLS	Two-Stage Least Squares
W2SLS	Weighted Two Stage LS
3SLS	Three-Stage LS
W3SLS	Weighted Three-Stage LS

S3 Methods:

print	print
plot	plot
summary	summary
predict	predict
coef.	coefficients
fitted	fitted values
residuals	residuals
vcov	var-covar matrix

S-Plus Like:

SUR	SUR Wrapper
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MATRIX ADDON: [B1]

Functions for matrix arithmetics and linear algebra. These functions are often useful for the manipulation of multivariate time series data.

Matrix Generation:

matrix	create matrix
diag	diagonal matrix
triang	lower tridiagonal
Triang	upper tridiagonal
pascal	pascal matrix
colVec	column vector
rowVec	row vector
as.matrix	convert to matrix
is.matrix	test for matrix
dimname	dimension names
colnames rowname	names
colIds rowId	names

Matrix Subsets:

dim	matrix dimension
ncol nrow	col/row numbers
length	number of elements
"[" "][" "	matrix subsets
(Arith)	Arithmetic
(Lops)	logical Ops
cbind rbind	augment

Linear Algebra:

det	determinant
inv chol2inv	inverse

MISSING VALUES: [B1] MANIPULATING NA's

removeNA	Remove NAs
substituteNA	Substitute NAs
interpNA	Interpolate NAs
knnNA	knn Impute NAs

TECHNICAL ANALYSIS: [C1] TRADING INDICATORS

Functions for the technical analysis of stock markets. The collection provides a set of the most common technical indicators.

Utility Functions:

emaTA	Exp Moving Average
biasTA	EMA-Bias
medpriceTA	Median Price
typicalpriceTA	Typical Price
wcloseTA	Weighted Close
rocTA	Rate of Change
oscTA	EMA-Oscillator

Oscillators:

momTA	Momentum
macdTA	MACD Indicator
cdsTA	MACD Signal Line
cdoTA	MACD Oscillator
vohlTA	High/Low Volatility

Stochastic Indicators:

fpkTA	Fast %K
fpdTA	Fast %D
spdTA	Slow %D
apdTA	Averaged %D
wprTA	Williams %R
rsiTA	Relative Strength

BENCHMARK ANALYSIS: [C2]

Utility and benchmark functions for the analysis of financial markets. The collection provides a set of functions for the computation of returns, for the display of price charts, and for benchmark measurements.

getReturns	Returns
ohlPlot	OpenHighLowClose
sharpeRatio	Sharpe Ratio

sterlingRatio	Sterling Ratio
maxDrawDown	Maximum Drawdown

qgev	Quantiles
rgev	Random Variates

gpdsfallPlot	Expect Shortfall
gpdriskmeasures	Quantiles

ROLLING ANALYSIS: [C3]

Functions to perform a rolling analysis. A rolling analysis is often required in building trading models.

rollFun	Rolling Function
rollMean	Rolling Mean
rollVar	Rolling Variance
rollMin	Rolling Minimum
rollMax	Rolling Maximum

FLUCTUATIONS OF MAXIMA: [B2] GEV/GUMBEL | MLE/PWM [EVIR]

gevSim	Simulates GEV
gevFit	Fits GEV

Included Models/Methods:	
GEV/MLE	ML Estimator
GUMBEL/MLE	ML Estimator
GEV/PWM	Probability
GUMBEL/PWM	Weighted Moments

S3-Methods:	
print.gev	Print
plot.gev	Plot
summary.gev	Summary

Plots:	
gevrlevelPlot	Return Levels

5 fExtremes

EXPLORATIVE DATA ANALYSIS: [A1]

Functions for explorative data analysis of extreme values. The tools include plot functions for empirical distributions, quantile plots, graphs exploring the properties of exceedences over a threshold, plots for mean/sum ratio and for the development of records.

emdPlot	Empirical Distribution
qqPlot	Quantile-Quantile
qqbayesPlot	with Conf Levels
qPlot	exploratory
mePlot	Mean Excess
mxfPlot	Mean Excess
mrlPlot	Mean Residual Life
recordsPlot	Records
ssrecordsPlot	Subsamples
msratioPlot	Max/Sum Ratio
xacfPlot	Exceedences

PREPROCESSING EXTREME DATA: [A2]

Functions for preprocessing data for extreme value analysis. Included are tools to separate data beyond a threshold value, to compute blockwise data like block maxima, and to decluster point process data.

findThreshold	Threshold Values
blockMaxima	Block Maxima
deCluster	Declusters PP

FLUCTUATIONS OF MAXIMA: [B1] GENERALIZED EXTREME VALUE DIST

Distribution functions used in extreme value theory. The functions compute density, distribution function, quantile function and generate random deviates for the Generalized Ex-treme Value Distribution, GEV, for the Frechet, Gumbel, and Weibull distributions.

dgev	GEV Distribution
pgev	Probability

ALLOWING FOR GLM [ISMEV] [B3]

gevglmFit	adds GLM
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S3-Methods:	
print.gevglm	Print
plot.gevglm	Plot
summary.gevglm	Summary

Plots:	
gevglmprofPlot	Profile LLH
gevglmprofxiPlot	xi Profile

HILL ESTIMATOR AND [B4] SHAPE PARAMETER PLOTS

hillPlot	Hill's Estimator
shaparmPlot	Shape Parameters

Included Methods:	
Pickands	MDA Estimator
Hill	MDA Estimator
Decker-Einmahl-deHaan	MDA

POINT PROCESSES: [C1] GENERALIZED PARETO DISTRIBUTION

gpdSim	Simulates GPD
gpdFit	Fits GPD

Included Models/Methods:	
ML Estimator	.
Probability Weighted Moments	.

S3-Methods:	
print.gpd	print
plot.gpd	plot
summary.gpd	summary

Plots:	
gpdPlot	Tail Estimate
gpdtailPlot	Tail Estimate
gpdquantPlot	High Quantiles
gpdshapePlot	Shape Parameter
gpdqPlot	Quantile Estimates

ALLOWING FOR GLM [ISMEV]: [C2] GENERALIZED PARETO DISTRIBUTION

gpdglmFit	adds GLM
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S3-Methods:	
print.gpdglm	Print
plot.gpdglm	Plot
summary.gpdglm	Summary

Plots:	
gpdglmprofPlot	Profile LLH
gpdglmprofxiPlot	xi Profile

PEAKS OVER THRESHOLD: [C3] POT MODEL [EVIR]

potSim	simulates POT
potFit	fits POT

S3-Methods:	
print.pot	print
summary.pot	summary

POINT PROCESSES: [C4] PP MODEL [ISMEV]

ppFit	Fits Point Process
S3-Methods:	
print.pp	print
summary.pp	summary

Plot	
ppFitrange	fits for range

R-LARGEST PEAKS: [C5] ORDER STATISTICS MODEL [ISMEV]

rlargFit	Fits Order Stats
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S3-Methods:	
print.rlarg	Print
summary.rlarg	Summary

EXTREMAL INDEX: [D1] BLOCKS, RMC, AND RUNS METHOD

exindexesPlot	Theta(1,2,3)
exindexPlot	Theta(1,2)

6 fCopulae / 7 fTickdata

8 fOptions

BASICS OF OPTION PRICING: [A1] ACCORDING TO E. G. HAUG

Functions to value plain vanilla options.

Included are functions for the Generalized Block-Scholes option pricing model, for options on futures, some utility functions, and print and summary methods for options.

Distribution Functions:

NDF	Normal Distribution
CND	Cumulative Normal
CBND	Bivariate Normal

Generalized Black-Scholes Option:

GBSOption	Black-Scholes
GBSGreeks	Greeks
GBSCharacteristics	Report
GBSOption3DPlot	Plot
GBSGreeks3DPlot	Plot
BlackScholesOption	Synonyme

S3-Methods:

print.option	Print
summary.option	Summary

Options on Futures:

Black76Option	Black76
MiltersenSchwartzOption	

AMERICAN OPTION BASICS: [A2]

Functions to value basic American options. Approximative formulas for American calls are given for the Roll, Geske and Whaley Approximation, for the Barone-Adesi and Whaley Approximation, and for the Bjerksund and Stensland Approximation.

RollGeskeWhaleyOption	
BAWAmericanApproxOption	
	Barone-Adesi/Whaley
BSAmericanApproxOption	
	Bjerksund-Stensland

BINOMIAL TREE OPTION: [A3]

Functions to value options in the framework of the Binomial tree option approach.

CRRBinomialTreeOption	
	Cox-Ross-Rubinstein
JRBinomialTreeOption	
	Jarrod-Rudd Modification
TIANBinomialTreeOption	
	Tian Modification
BinomialTreeOption	
	with Cost of Carry Term
BinomialTreePlot	Plot

EXOTIC OPTIONS: [B1]

MULTIPLE EXERCISES OPTIONS

Functions to value multiple exercise options. Multiple exercises options, as the name implies, are options whose payoff is based on multiple exercise dates.

ExecutiveStockOption	.
ForwardStartOption	.

RatchetOption	.
TimeSwitchOption	.
SimpleChooserOption	.
ComplexChooserOption	.
OptionOnOption	.
HolderExtendibleOption	.
WriterExtendibleOption	.

EXOTIC OPTIONS: [B2]

MULTIPLE ASSETS OPTIONS

Functions to value multiple asset options. Multiple asset options, as the name implies, are options whose payoff is based on two (or more) assets

TwoAssetCorrelationOption	.
ExchangeOneForAnotherOption	.
ExchangeOnExchangeOption	.
EuropeanExchangeOption	.
AmericanExchangeOption	.
TwoRiskyAssetsOption	.
SpreadApproxOption	.
LookbackOptions.R	.

EXOTIC OPTIONS: [B3]

LOOKBACK OPTIONS

Functions to value lookback options. The payoff from a pathdependent lookback call (put) depends on the exercise price being set to the minimum (maximum) asset price achieved during the life of the option.

FloatingStrikeLookbackOption	.
FixedStrikeLookbackOption	.
PTFloatingStrikeLookbackOption	.
PTFixedStrikeLookbackOption	.
ExtremeSpreadOption	.

EXOTIC OPTIONS: [B4]

BARRIER OPTIONS

Functions to value barrier options. Barrier options are path-dependent options, with payoffs that depend on the price of the underlying asset at expiration and whether or not the asset price crosses a barrier during the life of the option.

StandardBarrierOption	.
DoubleBarrierOption	.
PTSingleAssetBarrierOption	.
TwoAssetBarrierOption	.
PTTwoAssetBarrierOption	.
LookBarrierOption	.
DiscreteBarrierOption	.
SoftBarrierOption	.

EXOTIC OPTIONS: [B5]

BINARY OPTIONS

Functions to value binary options. Binary options, also known as digital options, have discontinuous payoffs. They can be used as building blocks to develop options with more complicated payoffs

GapOption	.
CashOrNothingOption	.
TwoAssetCashOrNothingOption	.
AssetOrNothingOption	.
SuperShareOption	.
BinaryBarrierOption	.

EXOTIC OPTIONS: [B6]

ASIAN OPTIONS

Functions to value Asian options. Asian options are path-dependent options, with payoffs that depend on the average price of the underlying asset or the average exercise price.

GeometricAverageAsianOption	.
TurnbullWakemanAsianApproxOption	.
LevyAsianApproxOption	.

EXOTIC OPTIONS: [B7]

FX TRANSLATED OPTIONS

Functions to value currency translated options. Currency translated options are options on foreign assets where the payoff is exchanged into domestic currency at expiration.

FEInDomesticCurrencyOption	.
QuantoOption	.
EquityLinkedFXOption	.
TakeoverFXOption	.

HESTON-NANDI OPTION PRICING: [C1]

GARCH TIME SERIES ANALYSIS

Functions to model the GARCH(1,1) price paths which underly Heston and Nandi's option pricing model.

hngarchSim	Simulates
hngarchFit	Fit Process
hngarchStats	True Moments

S3-Methods:

print.hngarch	Print
summary.hngarch	Summary

HESTON-NANDI OPTION PRICING: [C2]

VALUATION OF OPTIONS

Functions to value Heston-Nandi options. Included are functions to compute the option price and the delta and gamma sensitivities for call and put options.

HNGOption	Option price
HNGGreeks	Greeks
HNGCharacteristics	Summary

MONTE CARLO OPTION VALUATION: [D1]

LOW DISCREPANCY SEQUENCES

Functions to compute Halton's and Sobol's low discrepancy sequences, distributed in form of a uniform or normal distribution.

runif.pseudo	Uniform Pseudo
rnorm.pseudo	Normal Pseudo
runif.halton	Uniform Halton
rnorm.halton	Normal Halton
runif.sobol	Uniform Sobol
rnorm.sobol	Normal Sobol

MONTE CARLO OPTION VALUATION: [D2]

Functions to value options by Monte Carlo methods. The functions include beside the main Monte Carlo Simulator, example functions to generate Monte Carlo price paths and to compute Monte Carlo price payoffs.

MonteCarloOption	.
sobolInnovations	.
wienerPath	.
plainVanillaPayoff	.
arithmeticAsianPayoff	.

Included Methods:	.
antithetic valuation	.

EXPONENTIAL BROWNIAN MOTION: [E1]

Distributions and related functions which are useful in the theory of exponential Brownian motion and Asian option valuation. The functions compute densities and probabilities for several distributions. In addition a function is available to compute numerically first and second derivatives of a given function.

Distributions:	
dlognorm	log-Normal Density
plognorm	Probability
dgam	Gamma Density
pgam	Probability
drgam	Reciprocal-Gamma
prgam	Probability
djohnson	Johnson Type I
pjohnson	Probability

Moments:	
mnorm	Normal Density
mlognorm	log-Normal
mrgam	Reciprocal-Gamma
masian	Asian Option Density

Numerical Derivatives:	
derivativ	1 st /2nd Derivative

ERROR, GAMMA AND RELATED FUNCTIONS: [E2]

Special mathematical functions including the error function, the Psi function, the incomplete Gamma function, the Gamma function for complex argument, and the Pochhammer symbol. Furthermore, the Gamma function the logarithm of the

Gamma function, their first four derivatives, and the Beta function and the logarithm of

the Beta. These functions are required to value Asian Options based on the theory of exponential Brownian motion.

erf	Error Function
gamma*	Gamma Function
lgamma*	Log-Gamma Function
digamma*	1st Deriv of LogGamma
trigamma*	2nd Derivative
tetragamma*	3rd Derivative
pentagamma*	4th Derivative
beta*	Beta Function
lbeta*	Log-Beta Function
Psi	Digamma Function
igamma	Incomplete Gamma Fct
cgamma	Complex Gamma Fct
Pochhammer	Pochhammer Symbol

CONFLUENT HYPERGEOMETRIC AND RELATED FUNCTIONS: [E3]

Special mathematical functions which compute the confluent hypergeometric and related functions. For example, these functions are required to value Asian Options based on the theory of exponential Brownian motion

kummerM	CHF of the 1st Kind
kummerU	2nd Kind
whittakerM	Whittaker's M Fct
whittakerW	Whittaker's W Fct
hermiteH	Hermite Polynomial

MODIFIED BESSEL FUNCTIONS : [E4]

Special mathematical functions which compute the modified Bessel functions of integer order of the first and second kind as well as their derivatives.

BesselI	of the 1st kind
BesselDI	its derivative
BesselK	of the 3rd Kind
BesselDK	its derivative

ADDITIONAL FUNCTIONS PART OF THE DEMO SECTION:

Trinomial Tree Model:

TrinomialTreeOption

9 fBonds

10 fPortfolio

MULTIVARIATE DISTRIBUTION: [A1]

Functions to compute multivariate densities and probabilities from skew normal and skew

Student-t distribution functions. Furthermore, multivariate random variates can be generated, and for multivariate data, the parameters of the underlying distribution can be estimated by the maximum log-likelihood estimation.

Multivariate Skew Normal Distribution:	
dmvsnorm	Normal Density
pmvsnorm	Probability
rmvsnorm	Random Variates

Multivariate Skew Student-t Distribution:	
dmvst	Normal Density
pmvst	Probability
rmvst	Random Variates

Parameter Fit:	
fmv	S4 Class
mvFit	Parameter Fit
print.fmv	S3 Print Method
plot.fmv	S3 Plot Method
summary.fmv	S3 Summary Method

ASSETS MODELLING: [A2]

Functions which generate multivariate artificial data sets of assets, which fit the parameters to a multivariate normal, skew normal, or (skew) Student-t distribution and which compute some benchmark statistics. In addition a function is provided which allows for the selection and clustering of individual assets from portfolios using hierarchical and k-means clustering approaches.

assetsSim	Simulation
assetsSelect	Selection by
..hclust	hierarchical Clusters
..kmeans	k-means Cluster
fASSETS	S4 Class
assetsFits	Fitting
norm	Normal Assets
..snorm	Skew Normal Assets
..st	Skew Student-t Assets
assetsStats	Statistics
print.fASSETS	Print Method
plot.fASSETS	Plot Method
summary.fASSETS	Summary Method

DRAWDOWN STATISTICS: [A3]

Functions which compute drawdown statistics. Included are density, distribution function, and random generation for the maximum-drawdown distribution. In addition the expectation of drawdowns for Brownian motion can be computed.

Maximum Drawdown Statistics:	
maxddStats	Statistics

Maximum Drawdown Distribution:	
dmaxdd	Density
pmaxdd	Probability
rmaxdd	Random Variates

VALUE-AT-RISK MODELLING: [B1]

Functions to compute Value-at-Risk and related risk measures for a portfolio of assets. In addition utility functions are available to compute the maximum loss, to calculate the total return, and to plot a histogram of the total return.

Value-at-Risk Functions:

VaR	Portfolio VaR
CVaRplus	Conditional VaR Plus
CVaR	Conditional VaR
lambdaCVaR	Atomic Split Value

Portfolio Functions:

pfolioMaxLoss	Maximum Loss
pfolioReturn	Return Series
pfolioTargetReturn	Target Ret
pfolioTargetRisk	Target Risk
pfolioHist	Histogram

MARKOWITZ PORTFOLIO: [B2]

Functions to investigate the efficient frontier for a Markowitz portfolio from a given return series in the mean-variance sense when short selling is forbidden. Tangency, equal weights, and Monte Carlo portfolios can also be evaluated.

fPFOLIO	S4 Class
portfolioMarkowitz	Markowitz
frontierPortfolio	Eff.Frontier
montecarloMarkowitz	MC Sim

print.fPFOLIO	Print Method
plot.fPFOLIO	Plot Method
summary.fPFOLIO	Summary Method

TWO ASSETS PORTFOLIO: [B3]

MARKOWITZ AND CVAR PORTFOLIOS:

Functions to investigate the efficient frontier for a two assets portfolio from a given return series in the mean-variance and CVaR sense when short selling is forbidden.

FrontierTwoAssetsMarkowitz
FrontierTwoAssetsCVaR

11 fActuar

12 fAgents

*functions are part of R's base installation.