Rmetrics – Reference Card

An Environment for Teaching
Financial Engineering and Computational Finance
with R Rmetrics Built 200.10058

fBasics

IMPORT FROM INTERNET: [A2]

```
yahooImport                Yahoo
keystatsImport      KeyStatistics
economagicImport       Economagic
fredImport           St Louis FED
```

BASIC STATISTICS: [A3]
COLUMN STATISTICS

```
skewness                 Skewness
kurtosis                 Kurtosis

colStats        Column Statistics
  colAvgs                Averages
  colVars               Variances
  colStdevs         Standard Devs
  colSkewness            Skewness
  colKurtosis            Kurtosis
  colCumsums              Cumsums
```

SOME UTILITY FUNCTIONS: [A4]
BASIC PLOTS

```
splusLikePlot      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 DIST: [B1]

```
dhyp           Hyperbolic Density
  phyp                 Probability
  qhyp                   Quantiles
  rhyp            Random Variates
```

```
dnig      Normal Inverse Gaussian
  pnig                 Probability
  qnig                   Quantiles
  rnig            Random Variates
```

STABLE DISTRIBUTION: [B2]
SYMMETRIC AND SKEWED DENSITIES

```
dsymstb          Symmetric Density
  psymstb              Probability
  qsymstb                Quantiles
  rsymstb         Random Variates

dstable             Skewed Density
  pstable              Probability
  qstable                Quantiles
  rstable         Random Variates
```

MLE ESTIMATES: [B3]
OF DISTRIBUTIONAL PARAMETERS

```
tFit                      Student-t
hypFit                   Hyperbolic
nigFit       Normal Inverse Gauss
```

CLASSICAL STATISTICAL TESTS: [B4]
DISTRIBUTIONAL AND INEPENDENCE

```
Normal Tests:
  shapiroTest                Shapiro
  adTest           Anderson-Darling
  cvmTest          Cramer von Mises
  lillieTest        Lilliefors Test
  pearsonTest          Pearson Test
..sfTest            Shapiro Francia
  dagoTest          D'Agostino Test
..normalTest             S-Plus like
  gofnorm                Test Suite
  ksTest         Kolmogorof-Smirnov

More Tests ...
  bartlettTest          Diff in Var
  ansariTest          Diff in Scale
  corTest       Pair Associations
  flignerTest           Diff in Var
  moodTest            Diff in Scale
  varTest               Diff in Var

Independence:
  runsTest                Runs Test
```

STYLIZED FACTS: [B5]
OF FINANCIAL TIME SERIES

```
acfPlot             Autocorrelation
pacfPlot                Partial ACF
ccfPlot           Cross Correlation
lmacfPlot           Long Memory ACF
teffectPlot           Taylor Effect
xacfPlot                 Excess ACF
```

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

```
RulesFinCenter             DST Rule
ListFinCenter          List Centers
S4: timeDate-class
  timeDate         Date/Time Object
  timeCalendar      Calender Atoms
  timeSequence            Sequence
  Sys.timeDate         System Time

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

is.timeDate                    Test
print.timeDate                Print
summary.timeDate            Summary
format.timeDate              Format
```

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

```
S3 Methods:
  [.TimeDate                Subsets
  +.timeDate                    Add
  -.timeDate               Subtract
  Ops.timeDate             Math Ops
  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              .
```

HOLIDAY CALENDARS: [C4]
MANAGEMENT OF CALENDAR DATES

```
easter                    Easter
holiday                 Holidays
holiday.NYSE        NYSE Holidays
              Conditioned N-Days
on.or.after             Get Date
on.or.before            Get Date
nth.of.nday             Get Date
last.of.nday            Get Date

        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
```

SPLUS LIKE DATE AND TIME: [C5]
MANAGEMENT OF CALENDAR DATES

```
fjulian          Formatted Dates
julian            Julian Counter
month.day.year    Calendar Atoms
leap.year              Leap Year
day.of.week      Day of the Week
```

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

```
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       Devolatilization
  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

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

Bootstrapped Statistics:
  bootMean     Bootstrapped Mean

Data Import:
  csvImport       from CSV files
  forecastsImport   forcasts.org

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
```

fSeries

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

```
S4: fARMA                  Class
armaSim                Simulation
armaFit                Estimation
S3-Methods:
  predict.fARMA          Forecast
  print.fARMA            Printing
  plot.fARIMA                Plot
  summary.fARMA            Report
  print.summary.fARMA
  fitted.vales.fARMA       Fitted
  residuals.fARMA      Residuals

True ARMA Process:
armaTrueacf              True ACF
armaRoots     Characteristic Pol
```

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

```
garchSim               Simulation
garchFit               Estimation

S3-Methods:
  predict.fGARCH         Forecast
  print.fGARCH           Printing
  summary.fGARCH           Report
  print.summary.fGARCH
  plot.fGARCH                Plot
  fitted.vales.fGARCH      Fitted
  residuals.fGARCH     Residuals
```

RANDOM INNOVATION: [A3]
PORTABLE RANDOM GENERATOR

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

TIME SERIES TESTS: [A4]
NONLINEARITY, STATIONARITY, UNIT ROOTS, COINTEGRATION

```
bdsTest              Independence
jbTest                  Normality
wnnTest              Nonlinearity
tnnTest              Nonlinearity
```

UNIT ROOT DISTRIBUTION: [A5]

```
punitroot             Probability
qunitroot               Quantiles
```

UNIT ROOT AND COINTEGRATION TESTS: [A6[

```
S4: fURTEST                Class
  print.fURTEST          Printing
  summary.fURTEST          Report
  unitrootTest      ADF/McKinnon
  adfTest                ADF Test

Tests from "tseries":
  tsadfTest              ADF Test
..tsppTest        Philipps-Perron
..tskpssTest    KPSS Stationarity
..tspoTest      Philipps-Ouliaris

Tests from "urca":
  urersTest Elliott-Rothbg-Stock
  urkpssTest   KPSS Stationarity
  urppTest       Philipps-Perron
  urspTest      Schmidt-Philipps
  urzaTest         Zivot-Andrews
```

REGRESSION MODELLING: [B1[
EASY TO USE FUNCTION WRAPPERS

```
S4: fREG                   Class
regFit             Fit Parameters

Included Models:
  LM             Linear Modelling
  GLM              Generalized LM
  PPR     Projection Pursuit Reg
  MARS   Multiv Adap Reg Splines
  POLYMARS    Polytochomous MARS
  NNET    Feedforward Neural Net

S3 Methods:
  Print.fREG                 Print
  plot.fREG                   Plot
  summary.fREG             Summary
  predict.fREG             Predict
  fitted.values.fREG Fitted Vals
  residuals.fREG       Residuals
```

LINEAR REGRESSION TESTS: [B2]

```
Tests from "lm":
  bgTest          Breusch-Godfrey
  bpTest            Breusch-Pagan
  dwTest            Durbin-Watson
  gqTest            GoldfelQuandt
```

```
  harvTest        Harvey-Collier
  hmcTest        Harrison-McCabe
  rainbowTest       Rainbow Test
  resetTest         Ramsey-Reset
```

EQUATIONS MODELLING: [B3]

```
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

Methods:
  print. fEQNS          S3 Print
  plot. fEQNS            S3 Plot
  summary.fEQNS       S3 Summary
  predict.fEQNS      S3 Forecast

More S3 Methods:
  coef.fEQNS        Coefficients
  fitted.fEQNS     Fitted Values
  residuals.fEQNS      Residuals
  vcov.fEQNS    Var-Covar Matrix

S-Plus Like:
  SUR               SUR Wrapper
```

LONG MEMOR MODELLING: [C1]

```
fgSim    Fractial Gaussian Noise
                Durbin's Method
                 Paxon's Method
                 Beran's Method
```

TECHNICAL ANALYSIS: [D1]
TRADING 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: [D2]

```
getReturns               Returns
ohlcPlot        OpenHighLowClose
sharpeRatio         Sharpe Ratio
sterling Ratio    Sterling Ratio
maxDrawDown     Maximum Drawdown
```

ROLLING ANALYSIS: [D3]

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

MATRIX ADDON: [G1]

```
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
  norm                      norm
  rk                        rank
  tr                       trace
  t                    transposed
  %*%                     product
  %x%|kron     Kronecker product

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
```

HEAVISIDE
AND RELATED FUNCTIONS: [G2]

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

SKEW NORMAL DISTRIBUTION: [H1]

```
dsnorm                   Density
psnorm               Probability
qsnorm                 Quantiles
rsnorm           Random Deviates
```

SKEW STUDENT DISTRIBUTION: [H2]

```
Normalized Sudent-t:
  dst                    Density
  pst                Probability
  qst                  Quantiles
  rst            Random Deviates

Skew Normalized Sudent-t:
  dsst                   Density
  psst               Probability
  qsst                 Quantiles
  rsst           Random Deviates
```

SKEW GENERALISED ERROR
DISTRIBUTION: [H3]

```
GED:
  dged                   Density
  pged               Probability
  qged                 Quantiles
  rged           Random Deviates

Skew GED:
  Dsged                  Density
  psged              Probability
  qsged                Quantiles
  rsged          Random Deviates
```

GARCH DISTRIBUTION FITS: [H3]

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

ADDITIONAL FUNCTIONS
PART OF THE DEMO SECTION:

```
APARCH Simulation:
  .aparchSim     another Sim Fun

Chaotic Time Series Maps:
  henonMap             Henon Map
  ikedaSim             Ikeda Map
  logisticSim       Logistic Map
  lorentzSim         Lorentz Map
  roessler          Roessler Map

Distributional Statistics:
  absMoments    absolute Moments
```

```
GARCH OX Interface:
  garchOxFit       Parameter Fit
  print.garchOX  S3 Print Method
  plot.garchOx    S3 Plot method

Manipulate Missing Data:
  removeNA            Remove NAs
  substituteNA    Substitute NAs
  interpNA       Interpolate NAs
  knnNA           knn Impute Nas

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

Additional Trading Indicators:
  accelTA           Acceleration
  adiTA              AD Indicator
  adoscillatorTA   AD Oscillator
  bollingerTA    Bollinger Bands
  chaikinoT   Chaikin Oscillator
  chaikinv    Chaikin Volatility
  garmanKlass  Garman-Klass Vola
  macdTA          MACD Indicator
  medpriceTA        Median Price
  momentumTA            Momentum
  nvi        Negative Volume Idx
  obvTA        On Balance Volume
  pv         Positive Volume Idx
  pvtrend     Price-Volume Trend
  rocTA             RateOfChange
  rsiTA    Relative Strength Idx
  stochasticTA    Stochastic Osc
  typicalPrice     Typical Price
  wcloseTA        Weighted Close
  williamsadTA       Williams AD
  williamsrTA        Williams R%
```

fExtremes

EXPLORATIVE DATA
ANALYSIS: [A1]

```
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]

```
findThreshold   Threshold Values
blockMaxima         Block Maxima
deCluster          Declusters PP
```

FLUCTUATIONS OF MAXIMA: [B1]
GENERALIZED EXTREME VALUE DIST

```
dgev            GEV Distribution
  pgev               Probability
  qgev                 Quantiles
  rgev          Random Variates
```

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
```

ALLOWING FOR GLM [ISMEV] [B3]

```
gevglmFit               adds GLM

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
  gpdsfallPlot  Expect Shortfall
  gpdriskmeasures      Quantiles
```

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

```
gpdglmFit               adds GLM

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

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)
```

fOptions

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

```
Distribution Functions:
  NDF         Normal Distribution
  CND           Cumulative Normal
  CBND           Bivariate Normal
GBSOption           Black-Scholes
  GBSGreeks                Greeks
  GBSCharacteristics       Report
  GBSOption3DPlot            Plot
  GBSGreeks3DPlot            Plot
BlackScholesOption       Synonyme

S3-Methods:
  print.option               Print
  summary.otion            Summary

Options on Futures
  Black76Option           Black76
  MiltersenSchwartzOption
```

AMERICAN OPTION BASICS: [A2]

```
RollGeskeWhaleyOption
BAWAmericanApproxOption
             Barone-Adesi/Whaley
BSAmericanApproxOption
             Bjerksund-Stensland
```

BINOMIAL TREE OPTION: [A3]

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

EXOTIC OPTIONS: [B1]
MULTIPLE EXERCISES OPTIONS

```
ExecutiveStockOption          .
ForwardStartOption            .
RatchetOption                 .
TimeSwitchOption              .
SimpleChooserOption           .
ComplexChooserOption          .
OptionOnOption                .
HolderExtendibleOption        .
WriterExtendibleOption        .
```

EXOTIC OPTIONS: [B2]
MULTIPLE ASSETS OPTIONS

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

EXOTIC OPTIONS: [B3]
LOOKBACK OPTIONS

```
FloatingStrikeLookbackOption  .
FixedStrikeLookbackOption     .
PTFloatingStrikeLookbackOption .
PTFixedStrikeLookbackOption   .
ExtremeSpreadOption           .
```

EXOTIC OPTIONS: [B4]
BARRIER OPTIONS

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

EXOTIC OPTIONS: [B5]
BINARY OPTIONS

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

EXOTIC OPTIONS: [B6]
ASIAN OPTIONS

```
GeometricAverageAsianOption   .
TurnbullWakemanAsianApproxOption
LevyAsianApproxOption         .
```

EXOTIC OPTIONS: [B7]
FX TRANSLATED OPTIONS

```
FEInDomesticCurrencyOption    .
QuantoOption                  .
EquityLinkedFXOption          .
TakeoverFXOption              .
```

HESTON-NANDI OPTION PRICING: [C1]
GARCH TIME SERIES ANALYSIS

```
hngarchSim             Simulates
hngarchFit          Fit Process
hngarchStats       True Moments

S3-Methods:
  print.hngarch            Print

  summary.hngarch        Summary
```

HESTON-NANDI OPTION PRICING: [C2]
VALUATION OF OPTIONS

```
HNGOption          Option price
HNGGreeks                Greeks
HNGCharacteristics       Summary
```

MONTE CARLO OPTION VALUATION: [D1]
LOW DISCREPANCY SEQUENCES

```
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]

```
MonteCarloOption              .
  sobolInnovations            .
  wienerPath                  .
  plainVanillaPayoff          .
  arithmeticAsianPayoff       .

Included Methods:             .
  antithetic valuation        .
```

EXPONENTIAL
BROWNIAN MOTION: [D2]

```
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    1st/2nd Derivative
```

ERROR, GAMMA AND
RELATED\FUNCTIONS

```
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

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

ADDITIONAL FUNCTIONS
PART OF THE DEMO SECTION:

```
Trinomial Tree Model:
.. TrinomialTreeOption
```

fPortfolio

```
... coming soon
```

*functions are part of R's base installation.

www.rmetrics.org - October 2004
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