Package 'riskR'

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Type Package

Title Risk Management

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Description Computes risk measures from data, as well as performs risk management procedures.

License GPL-2

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`riskR-package` *Risk Management*

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Computes risk measures from data, as well as performs risk management procedures.

Details

The DESCRIPTION file:

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Title:	Risk Management
Version:	1.1
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Author(s)

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References

Righi, M. (2015). Loss-Deviation risk measures. Working Paper. Available in: http://arxiv.org/abs/1511.06943

`returns` *Real market data for examples*

Description

Daily log-returns for Standard and Poor's 500 (SP500), Apple (AAPL), Bank of America (BAC), The DOW Chemical Company (DOW), Sun Edison (SUNE).

Usage

```
data("returns")
```

Format

A data frame with 503 observations on the following 6 variables.

`Date` a vector of dates

`SP500` a numeric vector

`AAPL` a numeric vector

`BAC` a numeric vector

`DOW` a numeric vector

`SUNE` a numeric vector

Examples

```
data(returns)
head(returns)
```

---

risk *Computes risk measures*

Description

Computes risk measures (Standard Deviation (StD), Value at Risk (VaR), Expected Loss (EL), Expected Loss Deviation (ELD), Expected Shortfall (ES), Shortfall Deviation Risk (SDR), Expectile Value at Risk (EVaR), Deviation Expectile Value at Risk (DEVaR), Entropic (ENT), Deviation Entropic (DENT), Maximum Loss (ML)) from empirical data.

Usage

```
risk(x, alpha = c(0.05), beta = 1, p = 2)
```

Arguments

`x`	a vector of observations.
`alpha`	a vector of probabilities for significance level.
`beta`	a positive risk aversion parameter.
`p`	a positive value for the power of deviation terms.

Value

A matrix with values for each risk measure at all probabilities of interest.

Examples

```
# computes risk measures for the SP500

data(returns)
s <- returns[, 2]
risk(s, c(0.01, 0.05))
```

risk.decision *Decides the best alternative based on risk measures*

Description

Decides the best alternative based on risk measures (StD, VaR, EL, ELD, ES, SDR, EVaR, DEVaR, ENT, DENT, ML) by choosing that with maximum ratio between mean and risk.

Usage

```
risk.decision(x, alpha = c(0.05), beta = 1, p = 2)
```

Arguments

x	a matrix of observations with each column representing an investment alternative.
alpha	a vector of probabilities for significance level.
beta	a positive risk aversion parameter.
p	a positive value for the power of deviation terms.

Value

A matrix with a numeric indicating which is column that represents the best investment alternative for each risk measure at all probabilities of interest.

Examples

```
## Decides which is the best investment alternative among AAPL, BAC, DOW and SUNE.

data(returns)
s <- returns[, 3:6]
risk.decision(s, c(0.01, 0.05))
```

risk.hedge *Computes optimal hedging ratios based on risk measures*

Description

Determines optimal hedging ratios based on risk measures (StD, VaR, EL, ELD, ES, SDR, EVaR, DEVaR, ENT, DENT, ML) by minimization of position risk.

Usage

```
risk.hedge(x, y, alpha = c(0.05), beta = 1, p = 2)
```

Arguments

x	a vector of observations.
y	a vector of observations of the asset used for hedging.
alpha	a vector of probabilities for significance level.
beta	a positive risk aversion parameter.
p	a positive value for the power of deviation terms.

Value

A matrix with values of optimal hedging ratios for each risk measure at all probabilities of interest.

Examples

```
## computes optimal hedging ratios between AAPL and SP500.

data(returns)
s <- returns[, 3]
h <- returns[, 2]
risk.hedge(s, h, c(0.01, 0.05))
```

---

risk.port *Computes optimal weights of portfolio based on risk measures*

Description

Computes optimal weights of portfolio strategy based on risk measures (StD, VaR, EL, ELD, ES, SDR, EVaR, DEVaR, ENT, DENT, ML) by minimization of the composed position risk. Weights are restricted to be non-negative and with unit sum.

Usage

```
risk.port(x, alpha = c(0.05), beta = 1, p = 2)
```

Arguments

x	a matrix of observations with each column representing an asset.
alpha	a vector of probabilities for significance level.
beta	a positive risk aversion parameter.
p	a positive value for the power of deviation terms.

Value

An array with optimal weight for each risk measure at all probabilities of interest for every asset in the portfolio.

Examples

```
## Computes optimal weights of a portfolio strategy composed by AAPL, BAC, DOW and SUNE.

data(returns)
s <- returns[1:100, 3:6]
risk.port(s, 0.05)
```

`risk.port2` *Computes optimal weights of portfolio based on risk measures*

Description

Computes optimal weights of portfolio strategy based on risk measures (StD, VaR, EL, ELD, ES, SDR, EVaR, DEVaR, ENT, DENT, ML) by maximization of the ratio between composed position return and risk. Weights are restricted to be non-negative and with unit sum.

Usage

```
risk.port2(x, alpha = c(0.05), beta = 1, p = 2)
```

Arguments

`x`	a matrix of observations with each column representing an asset.
`alpha`	a vector of probabilities for significance level.
`beta`	a positive risk aversion parameter.
`p`	a positive value for the power of deviation terms.

Value

An array with optimal weight for each risk measure at all probabilities of interest for every asset in the portfolio.

Examples

```
## Computes optimal weights of a portfolio strategy composed by AAPL, BAC, DOW and SUNE.

data(returns)
s <- returns[1:100, 3:6]
risk.port2(s, 0.05)
```

risk.req *Computes capital requirements based on risk measures*

Description

Determines capital requirements based on risk measures (StD, VaR, EL, ELD, ES, SDR, EVaR, DEVaR, ENT, DENT, ML) given initial capital and time period.

Usage

```
risk.req(x, M = 10^6, T = 1, alpha = c(0.05), beta = 1, p = 2)
```

Arguments

x	a vector of observations.
M	a numeric representing initial capital.
T	a numeric representing the period capital is required.
alpha	a vector of probabilities for significance level.
beta	a positive risk aversion parameter.
p	a positive value for the power of deviation terms.

Value

A matrix with values of required capital for each risk measure at all probabilities of interest.

Examples

```
## computes capital requirement for a position of U$ 1,000 on SP500 for five days

data(returns)
s <- returns[, 2]
risk.req(s, 1000, 5, c(0.01, 0.05))
```

risk.roll *Computes risk measures through rolling scheme*

Description

Computes risk measures (StD, VaR, EL, ELD, ES, SDR, EVaR, DEVaR, ENT, DENT, ML) from empirical data using a rolling estimation window.

Usage

```
risk.roll(x, N = length(x) - 1, alpha = c(0.05), beta = 1, p = 2)
```

Arguments

x	a vector of observations.
N	an integer representing estimation window size. Very small values are not recommended.
alpha	a vector of probabilities for significance level.
beta	a positive risk aversion parameter.
p	a positive value for the power of deviation terms.

Value

An array with values for each risk measure at all probabilities of interest for every point of the rolling scheme.

Examples

```
## computes risk measures for SP500 using one year of daily data.

data(returns)
s <- returns[, 2]
risk.roll(s, 250, c(0.01, 0.05))
```

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