

Pénzügyi modellek alkalmazásai: Pénzügyi matematika és R

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Pénzügyi csomagok

Könyvek, webes források

Néhány csomag, példák

fPortfolio

VaR, +

fBonds

fOptions

'Előzmények'

Jeszenszky Péter: R előadások, MAT Őszi Iskola, 2009
<http://www.inf.unideb.hu/~jeszy/R/index.html>

R project

<http://cran.at.r-project.org/>
CRAN Task Views

- ▶ Finance: Empirical Finance,
- ▶ Econometrics: Computational Econometrics,
- ▶ TimeSeries: Time Series Analysis,
- ▶ Multivariate: Multivariate Statistics,
- ▶ Distributions: Probability Distributions,
- ▶ Optimization: Optimization and Mathematical Programming.

Installálás

```
install.packages("ctv")  
library("ctv")  
install.views("Finance")  
update.views("Finance")
```

CRAN Task Views: Finance

- ▶ Finance (fOptions, fAsianOptions, fAssets, fBasics, fBonds, fExtremes, stb),
- ▶ Risk management (VaR, CreditMetrics),
- ▶ Standard regression models,
- ▶ Time series.

CRAN Task Views: Finance, csomagok

actuar, ArDec, backtest, bayesGARCH, BLCOP, CADFtest, car, ccgarch, ChainLadder, copula, CreditMetrics, data.table, dlm, dse, dyn, dynamo, dynlm, evd, evdbayes, evir, extRemes, fame, fArma, fAsianOptions, fAssets, fBasics, fBonds, fCopulae, fEcofin, fExoticOptions, fExtremes, fgac, fGarch, flmport, financial, fMultivar, fNonlinear, fOptions, forecasting, fPortfolio, fracdiff, FracSim, fractal, fRegression, fTrading, fUnitRoots, fUtilities, ghyp, gogarch, fBrokers, ismev, its, lmttest, longmemo, MSBVAR, MSVAR, mvtnorm, opentick, PerformanceAnalytics, portfolio, portfolioSim, POT, QRMLib, quantmod, RBloomberg, Rcmdr, realized, RQuantLib, rwt, sandwich, sde, strucchange, tawny, termstrc, timeDate, timeSeries, timsac, tis, tradeCosts, TSdbi, tsDyn, tseries, tseriesChaos, tsfa, TTR, urca, uroot, VaR, vars, vrtest, wavelets, waveslim, wavethresh, xts, Zelig, zoo

RMetrics

- ▶ <http://www.rmetrics.org/>
- ▶ Time Series Econometrics, Hypothesis Testing, GARCH Modelling and Volatility Forecasting, Extreme Value Theory & Copulae, Pricing of Derivatives, Portfolio Analysis, Design and Optimization.
- ▶ Diethelm Würtz, Yohan Chalabi, William Chen, Andrew Ellis: Portfolio Optimization with R/Rmetrics, Rmetrics eBooks 2009, Finance Online Publishing, Zurich

Webes források, I

Lei Jin: R Code and examples for David Ruppert 's book: Statistics and Finance: An Introduction,

<http://www.stat.tamu.edu/~ljin/Finance/stat689-R.htm>

Chapter 2: Probability and Statistical Models

Chapter 3: Returns

Chapter 4: Time Series

Chapter 5: Portfolio Theory

Chapter 7: The Capital Asset Pricing Model

Chapter 8: Option Pricing

Chapter 9: Fixed Income Securities

Chapter 10: Resampling

Chapter 12: GARCH Models

Webes források, II

- ▶ Jeszenszky, P (Debreceni Egyetem): jegyzetek, példák, linkek, stb, <http://www.inf.unideb.hu/~jeszy/R/index.html>,
- ▶ Solymosi, N.: <-...erre, erre...! (Bevezetés az R-nyelv és környezet használatába),
<http://cran.r-project.org/doc/contrib/Solymosi-Rjegyzet.pdf>,
- ▶ Münnich, Á, Nagy, Á és Abari, K (Debreceni Egyetem):
Többváltozós statisztika pszichológus hallgatók számára
<http://psycho.unideb.hu/statisztika/index2.html>,

Books on R by R Core Team members, I

- ▶ John M. Chambers (2008), *Software for Data Analysis: Programming with R*. Springer, New York, <http://stat.stanford.edu/~jmc4/Rbook/>.
- ▶ Peter Dalgaard (2008), *Introductory Statistics with R*, 2nd edition. Springer, <http://www.biostat.ku.dk/~pd/ISwR.html>.
- ▶ Robert Gentleman (2008), *R Programming for Bioinformatics*. Chapman & Hall/CRC, Boca Raton, FL, <http://www.bioconductor.org/pub/RBioinf/>.
- ▶ Stefano M. Iacus (2008), *Simulation and Inference for Stochastic Differential Equations: With R Examples*. Springer, New York.
- ▶ Deepayan Sarkar (2007), *Lattice: Multivariate Data Visualization with R*. Springer, New York.

Books on R by R Core Team members, II

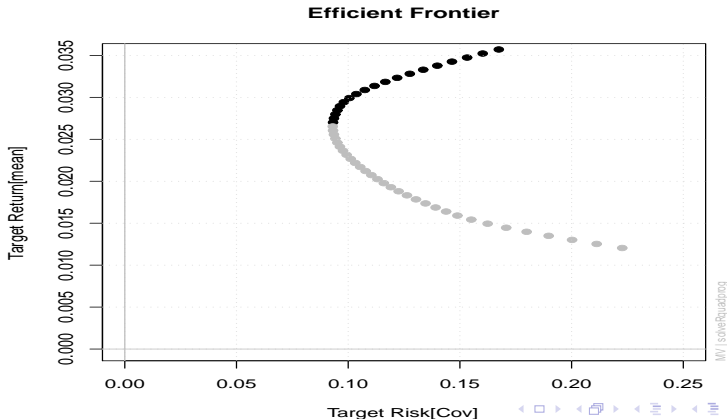
- ▶ W. John Braun and Duncan J. Murdoch (2007), A First Course in Statistical Programming with R. Cambridge University Press, Cambridge.
- ▶ P. Murrell (2005), R Graphics, Chapman & Hall/CRC, <http://www.stat.auckland.ac.nz/~paul/RGraphics/rgraphics.html>.
- ▶ William N. Venables and Brian D. Ripley (2002), Modern Applied Statistics with S (4th edition). Springer, <http://www.stats.ox.ac.uk/pub/MASS4/>.
- ▶ Jose C. Pinheiro and Douglas M. Bates (2000), Mixed-Effects Models in S and S-Plus. Springer.

fPortfolio

- ▶ mean-variance (Markowitz) elmélet,
- ▶ mean-VaR/CVaR portfeliók,
- ▶ egyéb változatok, feltételek.

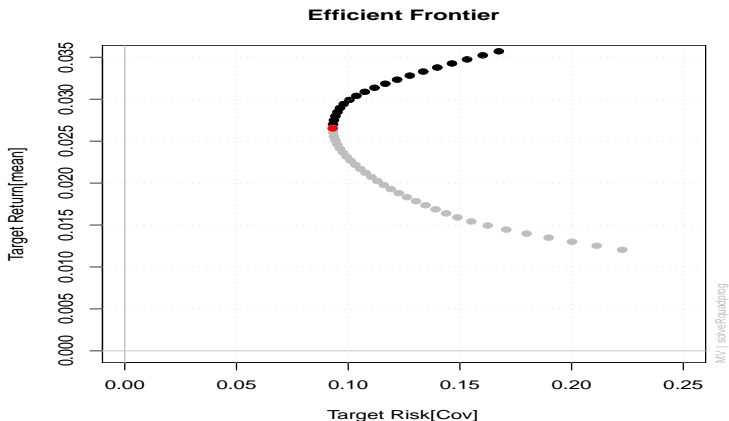
Példa: portfolio frontier 1

```
Frontier = portfolioFrontier(Data)  
frontierPlot(Frontier, ...)
```



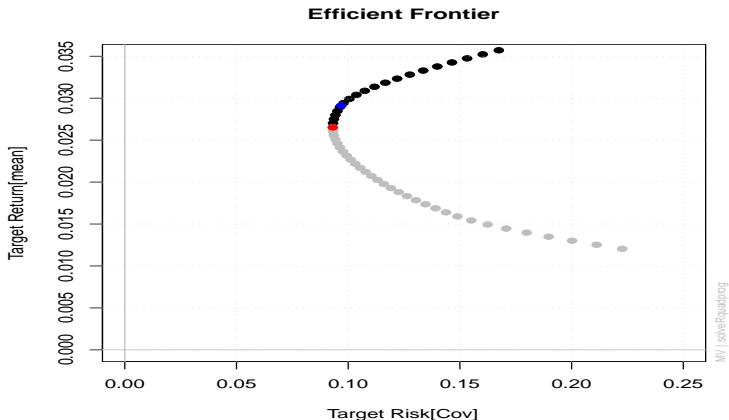
Példa: portfolio frontier 2

`minvariancePoints(Frontier, ...)`



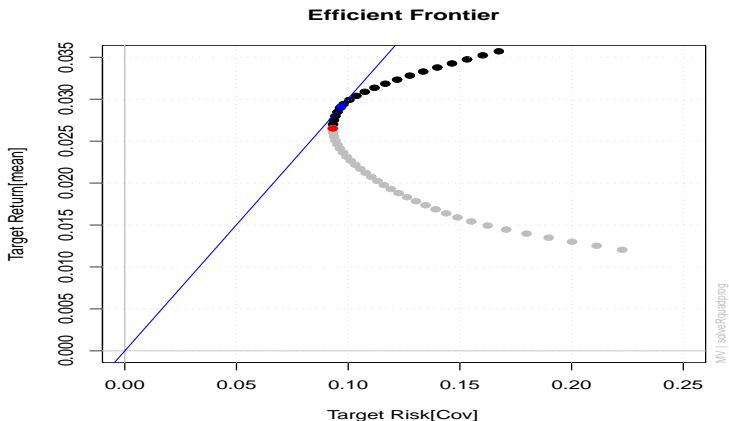
Példa: portfolio frontier 3

tangencyPoints(Frontier, ...)



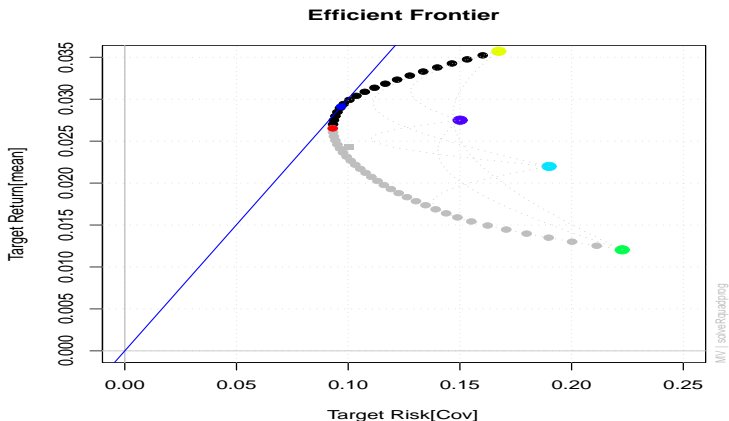
Példa: portfolio frontier 4

tangencyLines(Frontier, ...)



Példa: portfolio frontier 6

twoAssetsLines(Frontier, ...)



Megjegyzés: paraméterek

- ▶ `setWeights(spec)`, `setTargetReturn(spec)`,
`setTargetRisk(spec)`, `setRiskFreeRate(spec)`,
`setNFrontierPoints(spec)`, `setStatus(spec)`,
- ▶ `setSolver(spec)`, `setObjective(spec)`, `setTrace(spec)`
`setType(spec)`, `setOptimize(spec)`, `setEstimator(spec)`,
`setTailRisk(spec)`, `setParams(spec)`, `setAlpha(spec)`

VaR

- ▶ VaR.norm (VaR-ban): Value at Risk, lognormális közelítés,
- ▶ VaR.gpd (VaR-ban): Value at Risk, általánosított Pareto eloszlás (likelihood illesztés),
- ▶ továbbá ValueAtRisk: fExtremes-ben, szintén VaR és CVaR,
- ▶ és egyéb eloszlások, csomagok.

fBonds

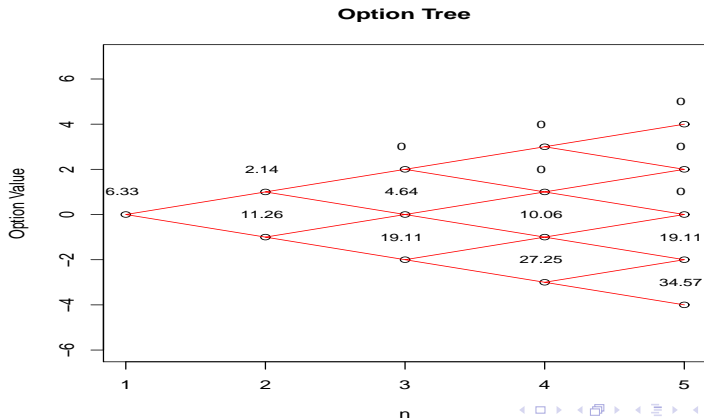
- ▶ TermStructure,
- ▶ NelsonSiegel,
- ▶ Svensson.

Opciók

- ▶ fOptions: bináris fák, Black-Scholes, Görögök.
- ▶ fAsianOptions, fExoticOptions: útfüggő opciók (barrier, binary, lookback, multiple asset, currency/translated,
- ▶ fAsianOptions: segédfv-ek.

Példa: Binomiális (CRR) modell, library(fOptions)

```
CRRTree=BinomialTreeOption(TypeFlag = "pa", ... )  
BinomialTreePlot(CRRTree, ... )
```



Példa: CRR konvergencia (Eu put)

