

This Quantitative finance codes list is partly what I have collected and published at my personal blog: <http://www.mathfinance.cn> during my financial engineering learning journey. Most of the entries were written when I was at university, apparently many codes can not be used directly for a certain purpose, we can, certainly, learn the way the coders applied.

Although I try best to check each file before recommendation, downloading and using are at your own risk. Should you are interested and would like to track my latest collection, please visit my blog listed above.

You can distribute this list as you want, the only wish from me is please 'do not change the sentences' and leave the original links when you want to post somewhere, thank you.

Writing program code is a good way of debugging your thinking  
- Bill Venables

All models are wrong but some are useful. - George Box

In theory there is little difference between theory and practice.  
In practice there is. - Yogi Berra

Give me four parameters and I can fit an elephant. Give me five and I can make it wave its trunk. - Bertrand

22/03/2009

# Today's Tabloid

PERSONAL NEWS FOR YOU

QUANTITATIVE FINANCE COLLECTOR

## Oxford MFE UCSD GARCH toolbox

19, 2009 07:20P.M.

The **Oxford MFE Toolbox** is the follow on to the UCSD GARCH toolbox. It has been widely used by students here at Oxford, and represents a substantial improvement in robustness over the original UCSD GARCH code, although in its current form it only contains univariate routines.

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Code and documentation are available at:  
[http://www.kevinsheppard.com/wiki/MFE\\_Toolbox](http://www.kevinsheppard.com/wiki/MFE_Toolbox)  
 Tags - garch


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- Black Scholes in Multiple Languages

- MatLab for Financial Engineers
- Matlab-GUI equity derivative calculator
- R-code for Vasicek estimation
- Bootstrapping interest rate curve 

## QUANTITATIVE FINANCE COLLECTOR

## Asymmetric copula analysis

12, 2009 06:58P.M.

<http://www.mathfinance.cn/Grouped-T-copula-simulation-estimation/> shared a sample code for grouped-t copula simulation, further, several copula estimation and simulation package can be found. But, most of the case we talk about an exchangeable copula due to its relatively easier to explain, however, it has limited applications especially in the area of credit risk, or derivative markets where asymmetric dependence plays a crucial role. For example, a desire to maintain the competitiveness of Japanese exports to the United States. with German exports to the United States. would lead the Bank of Japan to intervene to ensure a matching depreciation of the yen against the dollar whenever the Deutsche mark (DM) depreciated against the U.S. dollar. Such rebalancing behavior would also lead to greater dependence during depreciations of the DM and yen against the dollar than during appreciations. It is certainly natural to enquire whether there are extensions that are not rigidly exchangeable.

A scatter plot of the return of S&P 500 index and that of its implied volatility difference series is shown above, clearly the dependence is stronger in left-up corner than right-down corner.

Interested reader shall refer to the following papers and Matlab codes for detail:

Modelling Asymmetric Exchange Rate Dependence, 2006, International Economic Review, 47(2), 527-556.

Paper (PDF), Abstract (HTML), Slides June01 (PDF), Code (MATLAB)

— This paper was previously circulated as “Modelling Time-Varying Exchange Rate Dependence Using the Conditional Copula”, University of California, San Diego, Discussion Paper 01-09.

— The Joe-Clayton and symmetrised Joe-Clayton copula density functions can be found here (PDF). Matlab functions for these can be found here.

<http://www.economics.ox.ac.uk/members/andrew.patton/research.html>


Tags - copula , asymmetric

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## QUANTITATIVE FINANCE COLLECTOR

## Maximum likelihood estimation of CIR interest rate

09, 2009 06:02P.M.

## Quotation

The square root diffusion process is widely used for modeling interest rates behaviour. It is an underlying process of the well-known Cox-Ingersoll-Ross term structure model (1985). We investigate maximum likelihood estimation of the square root process (CIR process) for interest rate time series. The MATLAB implementation of the estimation routine is provided and tested on the PRIBOR 3M time series.

PDF file with Matlab codes included:

[http://dsp.vscht.cz/konference\\_matlab/MATLAB07/prispevky/kladivko\\_k/kladivko\\_k.pdf](http://dsp.vscht.cz/konference_matlab/MATLAB07/prispevky/kladivko_k/kladivko_k.pdf)

For those intested: a small re-organization of the blog has been undertaken, we moved all codes collection posts under category Quant code, which makes browse easier and more convenient (hopefully). In

addition, we added Quant newssection where selected news and resources, focusing on Asian Quant markets, will be published. Hope this change won't bring trouble to you, thanks.


Tags - cox ingersoll ross

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## Compound option pricing

08, 2009 10:09P.M.

A compound option is simply an option on an option. The exercise payoff of a compound option involves the value of another option. A compound option then has two expiration dates and two strike prices. Take the example of a European style call on a call. On the first expiration date  $T_1$ , the holder has the right to buy a new call using the strike price  $X_1$ . The new call has expiration date  $T_2$  and strike price  $X_2$ .

The pricing of many other derivative instruments can be modeled as compound options. By visualizing the underlying stock as an option on the firm value, an option on stock of a levered firm that expires earlier than the maturity date of the debt issued by the firm can be regarded as a compound option on the firm value (Geske, 1979). On the expiration of the option (the first expiration date of the compound option), the holder chooses to acquire the stock or otherwise. The decision depends on whether the stock as a call on the firm value is more valuable than the strike price.

Attached is a sample matlab code computing the value of a compound call option with the Black-Scholes pricing model using Geske's analytic formulas.

Click to download


Tags - compound , option

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## Managing MATLAB Projects

24, 2009 04:44P.M.

Whenever I opened my m files with Matlab, I was tired of looking for them one by one; the situation became worse for a big project with dozens of small m files. You might argue what we can do is to save all files of one project at a separated directory, well, that's what I did, but with the expanding of project, sub-projects are created and some files are inter-correlated among those sub-projects. It therefore becomes unrealistic to separate those files any more. Is there a project management tool like Visual C++ does for epp/hpp? mlProj is one good application I recently found.

mlProj is a tool for managing MATLAB projects. It considers

- all opened m-files,
- all figure windows,

- the MATLAB path, and
  - the MATLAB workspace,
- which are saved when a project is closed, and loaded when the project is opened. The projects are shown as a tree, which provides simple access to directories and files of the active project. The features include
- add a new project,
  - open, save and close projects,
  - open files in the MATLAB editor,
  - delete files, directories and projects,
  - rename files and directories,
  - reload the tree view, and
  - add user-defined items to the mlProj menu.


downloading link and userguide are  
 at:[http://mlproj.dohmke.de/Main\\_Page](http://mlproj.dohmke.de/Main_Page)  
 Tags - matlab

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# wavelet analysis

23, 2009 05:42P.M.

WaveLab is a collection of Matlab functions to implement a variety of algorithms related to **wavelet analysis**. A partial list of the techniques made available:

- orthogonal and biorthogonal wavelet transforms,
- translation-invariant wavelets,
- interpolating wavelet transforms,
- cosine packets,
- wavelet packets,
- matching pursuit,
- .....


downloading at [http://www-stat.stanford.edu/~wavelab/Wavelab\\_850/index\\_wavelab850.html](http://www-stat.stanford.edu/~wavelab/Wavelab_850/index_wavelab850.html)  
 Tags - wavelet

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## Historical Volatility Estimation

20, 2009 03:47P.M.

Dozens of ways to calculate historical volatility, let alone volatility (I mean, implied volatility, stochastic volatility, for instance.). Here is the MATLAB code that one could use to estimate historical volatility using different methods

**Historical Close-to-Close volatility****Historical High Low Parkinson Volatility****Historical Garman Klass Volatility****Historical Garman Klass Volatility modified by Yang and Zhang****Historical Roger and Satchell Volatility****Historical Yang and Zhang Volatility**

Average of all the historical volatilities calculated above

Enjoy. <http://tradingwithmatlab.blogspot.com/2008/06/estimate-historical-volatility.html>


Tags - volatility , stochastic

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## Several matlab packages

19, 2009 04:13P.M.

Several matlab packages to download, including:

Complexity - for estimating various temporal and spatial signal complexities

Denoising - for removing noise from signals

Kalman filter - for Kalman filter

Independent Components - for ICA based on `accelerated' covariant algorithm (natural gradient)

Gaussian mixture models - for analysis of Gaussian mixture models for data set clustering etc.

MinEnt clustering - for minimum-entropy (maximum certainty) partitioning

Extreme Value Theory - for detecting novelty using extreme value theory

Publications also are at:

<http://www.robots.ox.ac.uk/~sjrob/Outgoing/software.html>


Tags - filter , extreme

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# Generalized Linear Models in Matlab

17, 2009 06:03P.M.

glmlab is a free MATLAB toolbox for analysing generalized linear models. glmlab can fit all types of generalized linear models, including (among others):

**multiple regression;**  
**log-linear models;**  
**logistic regression; and**  
**weighted regression.**

glmlab includes the following error distributions:

normal (Gaussian);  
 gamma;  
 inverse Gaussian;  
 Poisson; and  
 binomial.

You can also specify your own error distributions with just a little bit of MATLAB programming.

<http://www.sci.usq.edu.au/staff/dunn/glmlab/glmlab.html>

Tags - regression

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# Pattern Recognition Package

13, 2009 04:46P.M.

Pattern recognition is a sub-topic of machine learning. It is “the act of taking in raw data and taking an action based on the category of the data”. Most research in pattern recognition is about methods for supervised learning and unsupervised learning. another black-box as neural network.

Pattern recognition aims to classify data (patterns) based either on a priori knowledge or on statistical information extracted from the patterns. The patterns to be classified are usually groups of measurements or observations, defining points in an appropriate multidimensional space. This is in contrast to pattern matching, where the pattern is rigidly specified.

PRTools supplies about 200 user routines for traditional statistical pattern recognition tasks. It includes procedures for data generation, training classifiers, combining classifiers, features selection, linear and non-linear feature extraction, density estimation, cluster analysis, evaluation and visualisation. It is intended to aid students and researchers in designing and evaluating new algorithms and in building prototypes.

Matlab package and manual are available at

<http://www.prtools.org/download.html>

Tags - pattern


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## QUANTITATIVE FINANCE COLLECTOR

## Feedforward neural networks package

11, 2009 06:08P.M.

Some call it “probably the best feedforward neural networks package”, I can't guarantee it, however, as I know almost nothing about neural network. Please help me write a review if you can, cheers.

The Netlab toolbox is designed to provide the central tools necessary for the simulation of theoretically well founded neural network algorithms and related models for use in teaching, research and applications development.

It consists of a toolbox of Matlab® functions and scripts based on the approach and techniques described in Neural Networks for Pattern Recognition by Christopher M. Bishop, (Oxford University Press, 1995)

Download, overview and example are at  
<http://www.ncrg.aston.ac.uk/netlab/index.php>.  
 Tags - neural-network

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## QUANTITATIVE FINANCE COLLECTOR

## Efficient maximum-likelihood estimation

10, 2009 06:41P.M.

```
% Fastfit Toolbox. Efficient maximum-likelihood estimation using
% generalized
% Newton iterations.
% Version 1.2 19-May-04
% By Thomas P. Minka
%
% Dirichlet
% dirichlet_sample - Sample from Dirichlet distribution.
% dirichlet_logprob - Evaluate a Dirichlet distribution.
% dirichlet_fit - Maximum-likelihood Dirichlet distribution.
% dirichlet_fit_simple - Maximum-likelihood Dirichlet distribution.
% dirichlet_fit_newton - Maximum-likelihood Dirichlet distribution.
% dirichlet_fit_m - Maximum-likelihood Dirichlet mean.
% dirichlet_fit_s - Maximum-likelihood Dirichlet precision.
%
% Polya, a.k.a. Dirichlet-multinomial
% polya_sample - Sample from Dirichlet-multinomial (Polya)
% distribution.
% polya_logprob - Evaluate a Dirichlet-multinomial (Polya)
% distribution.
% polya_fit - Maximum-likelihood Polya distribution.
% polya_fit_ms - Maximum-likelihood Polya distribution.
% polya_fit_simple - Maximum-likelihood Polya distribution.
% polya_fit_s - Maximum-likelihood Polya precision.
% polya_fit_m - Maximum-likelihood Polya mean.
%
% Other
% gamma_fit - Maximum-likelihood Gamma distribution.
% negbin_fit - Maximum-likelihood Negative Binomial.
% inv_digamma - Inverse of the digamma function.
%
% test_dirichlet_fit,... Test scripts for above routines.
```


<http://research.microsoft.com/en-us/um/people/minka/software/fastfit/>  
 Tags - mle

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QUANTITATIVE FINANCE COLLECTOR

## Extract Market Expectations from Financial Instruments

09, 2008 09:04P.M.

A Choosy review of recently techniques to extract information about market expectations from asset values for monetary policy uses. Traditionally, interest rates and forward exchange rates have been applied to extract expected returns of future interest rates, exchange rates and inflation. More lately, these ways have been polished to rely on implied forward interest rates, and then to extract expected future time-paths. Very recently, methods have been studied to extract not only the mean returns but the whole (risk neutral) probability distribution from a set of option prices.

Matlab files:

<http://home.datacomm.ch/paulsoderlind/Software/Software.html#MatLabScri>

Tags - distribution


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QUANTITATIVE FINANCE COLLECTOR

## Mean-variance portfolio optimization

04, 2008 09:52P.M.

Quotation

We seek to try out ga and patternsearch functions of the Genetic Algorithm and Direct Search Toolbox. We consider the unconstrained mean-variance portfolio optimization problem, handled by portopt and portalloc of the Financial Toolbox - note that in absence of constraints other than  $\sum(w) = 1$ , the problem admits a simple closed-form analytic solution - and see whether ga and patternsearch succeed at locating the optimal portfolio identified by portalloc.

<http://www.mathworks.com/matlabcentral/fileexchange/16884>

Tags - optimization , markowitz


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QUANTITATIVE FINANCE COLLECTOR

## Asymmetric Power Distribution

03, 2008 09:23P.M.

Asymmetric Power Distribution (APD) family of densities extends the Generalized Power Distribution to cases where the data exhibits asymmetry.

It contains the asymmetric Gaussian and Laplace densities as special cases.

In the paper entitled "Asymmetric Power Distribution: Theory and Applications to Risk Measurement", the author provide a detailed description of the properties of an APD random variable, such as its quantiles and expected shortfalls.

<http://econ.ucsd.edu/~ikomunje/code.htm> to download "Asymmetric Power Distribution: Theory and Applications to Risk Measurement" and Matlab code files.

Tags - distribution , asymmetric

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## Spatial Statistics Toolbox for Matlab

02, 2008 09:31P.M.

Historically, it has been difficult to apply spatial statistics to large datasets (e.g., more than 10,000 observations). This site contains public domain spatial software written in Matlab (Matlab Spatial Statistics Toolbox 2.0) capable of estimating very large spatial autoregressions (e.g., one example involves 1,000,000 observations). The spatial software uses sparse matrix methods to compute the matrix determinants employed in the maximum likelihood estimation of the spatial autoregressions. Specifically, the software can estimate simultaneous spatial autoregressions (SAR), conditional spatial autoregressions (CAR), mixed regressive spatially autoregressive (MRSAR) estimates as well as other lattice models which are the mainstay of spatial econometrics. Version 1.1 contained routines for specifying dependence via nearest neighbors or contiguity, exact log-determinant computations, and closed form maximum likelihood estimation of closest neighbor dependence.

Check <http://www.spatial-statistics.com/> for downloading.


Tags - matlab , statistics


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## QUANTITATIVE FINANCE COLLECTOR

## Generate random numbers of stable distribution

01, 2008 10:22P.M.

A deluging section of the research in financial markets is established on the presumption that financial markets are forced by a gaussian process. This presumption has been largely debated, and it has often been demonstrated than it's untrue for equity, forex, and commodities markets. Stable distributions have been advised as a better model instead.

Nevertheless, stable distributions are not applied much in the industry due to a lack of proper interpreting and usable software package. The lack of analytical formulas for the probability density and cumulative distribution functions is also a reason.

For Matlab codes and research results of stable distribution click

<http://www.hfri.org/stable-distributions.html>

Tags - stable , distribution

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## QUANTITATIVE FINANCE COLLECTOR

## A Simple Trick to Avoid Oscillation in Binomial Trees

27, 2008 09:45P.M.

Derivative price can be calculated either by analytic formula like Black Scholes model, or by numerical solution, for instance, solving paritial difference equation, Monte carlo simulation, binomial tree, etc. A lot of people are not aware of this simple trick to avoid oscillation in binomial trees. Oscillation might become dangerous when calculating Greeks via numerical differentiation. Here's the trick. E.g., for American options, just replace the last step in the binomial tree with the closed-form Black-Scholes formula.

<http://leippold.googlepages.com/matlab> for details.


Tags - tree

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## Kernel density estimation

26, 2008 07:53P.M.

One of widely applied non-parametric density estimation methods. Fast and accurate state-of-the-art bivariate kernel density estimator with diagonal bandwidth matrix. The kernel is assumed to be Gaussian. The two bandwidth parameters are chosen optimally without ever using/assuming a parametric model for the data or any "rules of thumb". Unlike many other procedures, this one is immune to accuracy failures in the estimation of multimodal densities with widely separated modes.

<http://www.mathworks.com/matlabcentral/fileexchange/17204>


Tags - kernel , density

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## Simulation of Heston model

24, 2008 08:39P.M.

Generates Heston stochastic volatility process at various frequencies,

```
% ds = mu dt + Vt^1/2 dW_1t
% dVt = b(a-Vt) dt + sig Vt^1/2 dW_2t
% Corr( dW_1t, dW_2t )=rho
% So is starting value of price proces
% NbD corresponds to numbers of days
```

[http://www.hec.unil.ch/matlabcodes/OptionPricing/second\\_order\\_simHest.m](http://www.hec.unil.ch/matlabcodes/OptionPricing/second_order_simHest.m)


Tags - heston

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QUANTITATIVE FINANCE COLLECTOR

## Estimation of parameters and eigenmodes of multivariate autoregressive models

19, 2008 09:50P.M.

ARfit is a collection of Matlab modules for

- \* estimating parameters of multivariate autoregressive (AR) models,
- \* diagnostic checking of fitted AR models, and
- \* analyzing eigenmodes of fitted AR models.

the package is based on the following two paper:

A. Neumaier and T. Schneider, 2001: Estimation of parameters and eigenmodes of multivariate autoregressive models. *ACM Trans. Math. Softw.*, 27, 27–57.

T. Schneider and A. Neumaier, 2001: Algorithm 808: ARfit - A Matlab package for the estimation of parameters and eigenmodes of multivariate autoregressive models. *ACM Trans. Math. Softw.*, 27, 58–65.

Paper and Package are at

<http://www.gps.caltech.edu/~tapio/arfit/#files>.


Tags - autoregressive

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QUANTITATIVE FINANCE COLLECTOR

## Extreme Value Analysis in Matlab

14, 2008 10:32P.M.

EVIM: A Software Package for Extreme Value Analysis in MATLAB

Quotation

From the practitioners' point of view, one of the most interesting questions that tail studies can answer is what are the extreme movements that can be expected in financial markets? Have we already seen the largest ones or are we going to experience even larger movements? Are there theoretical processes that can model the type of fat tails which come out of our empirical analysis? Answers to such questions are essential for sound risk management of financial exposures. It turns out that we can answer these questions within the framework of the extreme value theory. This paper provides a step-by-step guideline for extreme value analysis in the MATLAB environment with several examples.

paper and code can be downloaded at

<http://www.sfu.ca/~rgencay/evim.html>.

Tags - extreme


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## QUANTITATIVE FINANCE COLLECTOR

## Yield Curve Modelling

11, 2008 10:29P.M.

Exponentials, Polynomials, and Fourier Series: More Yield Curve Modelling at the Bank of Canada, where the authors used Cubic-spline, B-spline and MLES spline curve to model interest rate curve, including a penalty in the generalized least-squares objective function.

Interested ppl can refer to the PDF document and Matlab codes are at appendix. <http://www.bankofcanada.ca/en/res/wp/2002/wp02-29.html>


Tags - matlab , yield

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## QUANTITATIVE FINANCE COLLECTOR

## VaR and Expected shortfall under Generalized Student t

06, 2008 09:06P.M.

Value at risk (VaR) is the expected maximum loss an asset or a portfolio can incur over a target horizon within a given confidence level; Expected Shortfall (ES), also called Conditional tail expectation (CTE), is the expectation of the losses bigger (that is, worse) than VaR over a target horizon within a given confidence level. There are several methods in calculating VaR, including Historical simulation, Monte Carlo simulation, and parametric method, dozens of underlying distributions are ready for choice when using Monte Carlo simulation and Parametric method, among which Gaussian distribution is, undoubtedly the most popular one, t-distribution is also widely used due to its ability to capture fat-tail.

A sample Matlab code to construct the Generalized Student t over a given support then compute quantiles and numerical expected shortfall is <http://www.hec.unil.ch/matlabcodes/Econometrics/TestGTdens.m>.


Tags - var , es , t

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QUANTITATIVE FINANCE COLLECTOR

## Calibrating the Ornstein-Uhlenbeck model

31, 2008 09:42P.M.

Ornstein-Uhlenbeck model is widely used to model interest rate, two popular types are Vasicek and CIR, here the author describes two methods for calibrating the model parameters of an Ornstein-Uhlenbeck process to a given dataset.

- \* The least squares regression method
- \* maximum likelihood method

methodology applied and sample matlab code are at [http://www.sitmo.com/doc/Calibrating\\_the\\_Ornstein-Uhlenbeck\\_model](http://www.sitmo.com/doc/Calibrating_the_Ornstein-Uhlenbeck_model).


Tags - yield , calibration

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QUANTITATIVE FINANCE COLLECTOR

## Nearest correlation matrix

24, 2008 09:28P.M.

Correlation matrix exists almost everywhere for derivative pricing and risk management, especially when Monte Carlo simulation is applied, for instance, to simulate correlated random numbers via Cholesky decomposition of correlation matrix. However, one strong requirement of Cholesky decomposition on correlation matrix is positive semi-definite, in other words, eigenvalues must be positive. Another example of positive semi-definite correlation matrix requirement is for risk management measurement, otherwise the volatility calculated might be negative, which is non-acceptable.

In practice, sometimes we need to change correlation matrix to our forecasting values, even minor change might lead to invalid matrix, for this problem,

<http://www.maths.manchester.ac.uk/~nareports/narep369.pdf> details the way to overcome it, accompanying Matlab code can also be found at [http://www.maths.manchester.ac.uk/~clucas/near\\_cor.m](http://www.maths.manchester.ac.uk/~clucas/near_cor.m) and [http://www.maths.manchester.ac.uk/~clucas/eig\\_mex.c](http://www.maths.manchester.ac.uk/~clucas/eig_mex.c).


Tags - correlation , cholesky

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QUANTITATIVE FINANCE COLLECTOR

## MySQL and Matlab

23, 2008 09:40P.M.

The MySQL database server is very popular for its openness, robustness, and speed. Matlab is a wonderful commercial product for scientific and technical computing. Using them together is a great tool for quantitative data analysis. You can do this using the Matlab Database Toolbox, but it is more efficient to connect directly using the APIs for both products.

This code implements that connection, with a fairly rich framework for handling data conversion, especially dates and times.

<http://cims.nyu.edu/~almgren/mysql/>


Tags - matlab , sql

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QUANTITATIVE FINANCE COLLECTOR

## Heston model pricing and calibration

20, 2008 08:37P.M.

Quotation

The Heston Model is one of the most widely used stochastic volatility (SV) models today. Its attractiveness lies in the powerful duality of its tractability and robustness relative to other SV models.

This project initially begun as one that addressed the calibration problem of this model. Attempting to solve such a problem was an impossible task due to the lack of exposure to such 'advanced' models.

I, therefore, decided to take a slight digression into the world of Heston and stochastic volatility. Enroute I realised that fundamental information that one would require to gain an intuitive understanding of such a model was very disjoint and hence incomplete. This project, therefore, evolved into something that could fill this gap.

A practical approach has been adopted since the focus of calibration is quite practical itself. All the relevant tools are provided to facilitate this calibration process, including MATLAB code. This code has been confined to the appendix to keep the main body clutter free and 'quick-to-read'.

paper and code can be downloaded at

<http://web.wits.ac.za/NR/rdonlyres/98E22C37-FA41-4C5B-8F11-F44BED5FF4C7/o/nimalinmoodley.zip>

Tags - heston


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## QUANTITATIVE FINANCE COLLECTOR

## MATLAB routines for risk and portfolio management

17, 2008 09:40P.M.

These routines support the book "Risk and Asset Allocation" Springer Finance, by A. Meucci.

The routines include many new features:

- more uni-, multi- and matrix-variate distributions
- more copulas
- more graphical representations
- more analyses in terms of the location-dispersion ellipsoid.
- best replication / best factor selection
- FFT-based projection of a distribution to the investment horizon
- caveats about delta/gamma pricing
- step-by-step evaluation of a generic estimator
- non-parametric estimators
- multivariate elliptical maximum-likelihood estimators
- shrinkage estimators: Stein and Ledoit-Wolf, Bayesian classical equivalent
- robust estimators: Hubert M, high-breakdown minimum volume ellipsoid
- missing-data techniques: EM algorithm, uneven-series conditional estimation
- stochastic dominance
- extreme value theory for VaR
- Cornish-Fisher approximation for VaR
- kernel-based contribution to VaR and expected shortfall from different risk-factors
- mean-variance analysis and pitfalls (different horizons, compounded vs. linear returns, etc...)
- Bayesian estimation (multivariate analytical, Monte Carlo Markov Chains, priors for correlation matrices)
- estimation risk evaluation: opportunity cost of estimation-based allocations
- **Black Litterman allocation**
- robust optimization (calls SeDuMi to perform cone programming)
- robust Bayesian allocation
- more...

sample chapter and codes can be downloaded at

<http://www.symmys.com/AttilioMeucci/Book/Downloads/Downloads>


Tags - allocation

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## QUANTITATIVE FINANCE COLLECTOR

## Bayesian Copula Selection

15, 2008 08:36P.M.

Matlab implementation of a method to select the 'best' copula among a subset of copula families.

Based on theory published in : Huard, D., G. Évin, A.-C. Favre (2006), Bayesian Copula Selection, Computational Statistics and Data Analysis, COMSTA3137, vol. 51 (2), 809-822.

<http://code.google.com/p/copula/>

Tags - copula


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QUANTITATIVE FINANCE COLLECTOR

## Crank-Nicholson finite difference solution of American option

06, 2008 09:31P.M.

Crank-Nicolson for a European put was introduced before, to better master this technique, i share another sample code using Crank-Nicholson finite difference for American option.

BLSPRICEFDAM Black-Scholes put and call pricing for American Options using the Crank-Nicholson finite difference solution of Black-Scholes Partial differential equation. Note that this function returns an approximate solution unlike the analytical solution (BLSPRICE) SO is the current asset price, X is the exercise price, R is the risk-free interest rate, T is the time to maturity of the option in years, SIG is the standard deviation of the annualized continuously compounded rate of return of the asset (also known as volatility), and Q is the dividend rate of the asset. The default Q is 0. N denotes the number of discretization points in the stock price domain, and M denotes the number of discretization points in time domain used for the PDE solution. Try increasing either of M or N to achieve greater efficiency.


lecture notes can be downloaded at <http://www.cs.cornell.edu/Info/Courses/Spring-98/CS522/home.html> and matlab file <http://www.cs.cornell.edu/Info/Courses/Spring-98/CS522/content/blspricefdam.m>.  
Tags - american , pde

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QUANTITATIVE FINANCE COLLECTOR

## Up-and-out call option by Monte Carlo

03, 2008 03:01P.M.

Another sample code of the book An Introduction to Financial Option Valuation: Mathematics, Stochastics and Computation, read Crank-Nicolson for put. This sample calculates a up-and-out call barrier option via Monte Carlo simulation with antithetic variates.

An up and out call is a regular call option that ceases to exist if the asset price reaches a barrier level, H, that is higher than the current asset price, when H is less than or equal to K, the value of the up and out call is zero.

Code can be accessed here <http://www.maths.strath.ac.uk/~aas96106/ch21.m>.  
Tags - barrier


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QUANTITATIVE FINANCE COLLECTOR

## Variance swap hedging under Heston volatility

01, 2008 01:50P.M.

Calculate variance swap hedging portfolio under Heston vol model using MC simulation. The strategy is discussed in Gatheral p.136 and [http://www.ederman.com/new/docs/gs-volatility\\_swaps.pdf](http://www.ederman.com/new/docs/gs-volatility_swaps.pdf).

The strategy works by exploiting the difference between percentage differences and log differences. A percentage difference is expressed as  $(S' - S)/S$  or  $S'/S - 1$ . A log difference is  $\log(S') - \log(S)$  or  $\log(S'/S)$ . For more detail refer to <http://math.nyu.edu/~atm262/files/fallo6/casestudies/a7/hestonvarswap.m> and the above mentioned paper.  
Tags - heston

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## Solving PDE implicit / explicit methods

29, 2008 03:58P.M.

Basically there are two types of finite difference methods: explicit finite difference method and implicit finite difference method. Other types are just the derivation of these two types, for example, Crank-Nicolson method is an average of the explicit method and implicit method.

Two sample Matlab files to compare the performance of solving PDE via implicit and explicit method. <http://frontera.bu.edu/MathFn.html>

wiki(Finite difference method)  
Tags - pde

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## QUANTITATIVE FINANCE COLLECTOR

## Nearest Neighbour Algorithm to forecast Stock Prices

27, 2008 10:34P.M.

This is the algorithm involved on the use of the non-linear forecast of asset's prices based on the nearest neighbour method.

The basic idea of the NN algorithm is that the time series copies it's own past behavior, and such fact can be used for forecasting purposes. On the zip file there are two functions: one is the univariate version of NN (nn.m) and the other is the multivariate approach, also called simultaneous NN (snn.m).

### Quotation

The nearest neighbor method is defined as a non-parametric class of regression. Its main idea is that the series copies its own behavior along the time. In other words, past pieces of information on the series have symmetry with the last information available before the observation on  $t+1$ . Such way of capturing the pattern on the times series behavior is the main argument for the similarity between NN algorithm and the graphical part of technical analysis, charting.

The way the NN works is very different than the popular ARIMA model. The ARIMA modeling philosophy is to capture a statistical pattern between the locations of the observations in time. For the NN, such location is not important, since the objective of the algorithm is to locate similar pieces of information, independently of their location in time. Behind all the mathematical formality, the main idea of the NN approach is to capture a nonlinear dynamic of self-similarity on the series, which is similar to the fractal dynamic of a chaotic time series.

<http://www.mathworks.com/matlabcentral/fileexchange/loadFile.do?objectId=>

Tags - forecast


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## QUANTITATIVE FINANCE COLLECTOR

## FFT computation of option prices

26, 2008 12:22P.M.

The Black-Scholes formula, one of the major breakthroughs of modern finance, allows for an easy and fast computation of option prices. But some of its assumptions, like constant volatility or log-normal distribution of asset prices, do not find justification in the markets. More complex models, which take into account the empirical facts, often lead to more computations and this time burden can become a severe problem when computation of many option prices is required, e.g. in calibration of the implied volatility surface. To overcome this problem Carr and Madan (1999) developed a fast method to compute option prices for a whole range of strikes.

Fast Fourier transform (FFT) is applied for this purpose, the use of the FFT is motivated by two reasons. On the one hand, the algorithm offers a speed advantage. This effect is even boosted by the possibility of the pricing algorithm to calculate prices for a whole range of strikes. On the other hand, the cf of the log price is known and has a simple form for many models considered in literature, while the density is often not known in closed form.

Here is an sample Matlab file for FFT computation of option prices, <http://www.theponytail.net/CCFEA/lecto1/lecto1fftoptionnormal.m>.  
wiki(Fast Fourier transform)


Tags - fft

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QUANTITATIVE FINANCE COLLECTOR

## Rank reduction of correlation matrices by majorization

24, 2008 03:06P.M.

Rank reduction is useful for multi-factor derivative pricing and risk analysis, for instance, for a Bermudan swaption, Major, MajorW and MajorPower are MATLAB templates that may be used to find a low-rank correlation matrix locally nearest to a given correlation matrix, by means of majorization. Major implements equal weights on the entries of the correlation matrix. MajorW implements non-constant weights.

For an introductory of Rank reduction of correlation matrices by majorization paper can be downloaded at <http://www.pietersz.org/majorization.pdf>, with Matlab codes <http://www.pietersz.org/major.htm>

Tags - correlation

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# Today's Tabbloid

PERSONAL NEWS FOR YOU

QUANTITATIVE FINANCE COLLECTOR

## c++ for finance

11, 2009 07:03P.M.

A **c++ class list for finance**, specifically, a derivative calculator source code, is available, including:

american\_option\_approximation: uses the Black Scholes formulae for European options, to approximate the values of American options.

american\_option\_fudge: approximates the value of American Options as the value of the corresponding European option, plus the addition of a fudge factor

binomial\_option: typical binomial tree to price option value

Bisection\_Secant< functor, real > : This class is a child class of Bisection. The algorithm converges faster because it changes from the bisection to the secant algorithm /// on every other iteration

european\_option\_pair : Black Scholes option pricing formulae for puts and calls

...

Click for more and downloading

[http://acumenconsultinginc.net/TechNotes/public\\_options/html/annotated.htm](http://acumenconsultinginc.net/TechNotes/public_options/html/annotated.htm)  
Tags - option , c++


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QUANTITATIVE FINANCE COLLECTOR

## Matlab implementation of cointegration tests

16, 2009 06:26P.M.

Matlab of the paper "Implementing Pesaran-Shin-Smith"

This first year paper is based on Pesaran et al. (2000) who generalise the cointegration tests

introduced by Johansen to include exogenous I(1) variables in a VECM model. It reiterates

the proofs for their central test statistics and presents them in a less dense format: Following

Pesaran et al. (2000), this paper focuses on the derivation of the corresponding cointegrating rank

parameters and, finally, the test statistics and their asymptotic distributions. The final section

introduces tests on whether the required exogeneity restrictions hold. In addition, this paper is

concerned with implementing the mentioned test statistics in a Matlab routine.

Paper and Matlab code: <http://www.zeugner.eu/arbeiten/tafel.php>

Tags - cointegration


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## Newmat C++ matrix library

18, 2008 09:16P.M.

This C++ library is intended for scientists and engineers who need to manipulate a variety of types of matrices using standard matrix operations. Emphasis is on the kind of operations needed in statistical calculations such as least squares, linear equation solve and eigenvalues.

It supports matrix types: Matrix (rectangular matrix); UpperTriangularMatrix; LowerTriangularMatrix; DiagonalMatrix; SymmetricMatrix; BandMatrix; UpperBandMatrix; LowerBandMatrix; SymmetricBandMatrix; IdentityMatrix; RowVector; ColumnVector.

Only one element type (float or double) is supported.

The library includes the operations \*, +, -, \*=, +=, -=, Kronecker product, Schur product, concatenation, inverse, transpose, conversion between types, submatrix, determinant, Cholesky decomposition, QR triangularisation, singular value decomposition, eigenvalues of a symmetric matrix, sorting, fast Fourier and trig. transforms, printing and an interface with Numerical Recipes in C.

Introduction and package downloading:  
[http://www.robertnz.net/nm\\_intro.htm](http://www.robertnz.net/nm_intro.htm)  
<http://www.robertnz.net/download.html>  
 Tags - matrix , library

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- Simulation of Heston model

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## Feedforward Neural Networks and Lyapunov Exponents Estimation

20, 2008 08:35P.M.

This program, NETLE.EXE, estimates feedforward neural network models and computes Lyapunov exponents (LE). Neural networks are estimated by the method of nonlinear least squares (NLS) (Kuan and Liu (1995)); Lyapunov exponents are calculated from the derivative matrices of estimated network models (Gencay and Dechert (1992)). Note that a positive Lyapunov exponent indicates that the underlying series is chaotic.

REFERENCES:

Kuan, Chung-Ming and Tung Liu (1995). "Forecasting exchange rates using feedforward and recurrent networks", Journal of Applied Econometrics, forthcoming.

Gencay, Ramazan and W. D. Dechert (1992). "An algorithm for the n Lyapunov exponents of an n-dimensional unknown dynamical system", Physica D, 59, 142-157.

<http://www.sfu.ca/~rgencay/lyap.html>


Tags - neural-network

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QUANTITATIVE FINANCE COLLECTOR

## Levenberg-Marquardt nonlinear least squares algorithms

04, 2008 09:17P.M.

In mathematics and computing, the Levenberg–Marquardt algorithm (or LMA) provides a numerical solution to the problem of minimizing a function, generally nonlinear, over a space of parameters of the function. These minimization problems arise especially in least squares curve fitting and nonlinear programming.

The Levenberg-Marquardt algorithm has proved to be an effective and popular way to solve nonlinear least squares problems. MINPACK-1 contains Levenberg-Marquardt codes in which the Jacobian matrix may be either supplied by the user or calculated by using finite differences. IMSL , MATLAB , ODRPACK , and PROC NLP also contain Levenberg-Marquardt routines.

The algorithms in ODRPACK solve unconstrained nonlinear least squares problems and orthogonal distance regression problems, including those with implicit models and multiresponse data.

For detail about Levenberg-Marquardt nonlinear least squares algorithms introduction and code pls click


<http://www.ics.forth.gr/~lourakis/levmar/>  
Tags - levenberg-marquardt , optimization

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- MatLab for Financial Engineers
- Matlab-GUI equity derivative calculator
- R-code for Vasicek estimation
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QUANTITATIVE FINANCE COLLECTOR

## Singular Value Decomposition

21, 2008 09:53P.M.

In linear algebra, the singular value decomposition (SVD) is an important factorization of a rectangular real or complex matrix, with several applications in signal processing and statistics. Applications which employ the SVD include computing the pseudoinverse, least squares fitting of data, matrix approximation, and determining the rank, range and null space of a matrix.

Singular Value Decomposition to solve ill conditioned square matrices.

Excel, C++ Add-in and Demo Spreadsheet with application manual and on-line help are at [http://www.financial-risk-manager.com/risks/analytics/multivar/an\\_mv\\_t.html#svd](http://www.financial-risk-manager.com/risks/analytics/multivar/an_mv_t.html#svd)

wiki(Singular value decomposition)


Tags - svd , matrix

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Divonne is a further development of the CERNLIB routine D151. Divonne works by stratified sampling, where the partitioning of the integration region is aided by methods from numerical optimization. A number of improvements have been added to this algorithm, the most significant being the possibility to supply knowledge about the integrand. Narrow peaks in particular are difficult to find without sampling very many points, especially in high dimensions. Often the exact or approximate location of such peaks is known from analytic considerations, however, and with such hints the desired accuracy can be reached with far fewer points.

Cuhre employs a cubature rule for subregion estimation in a globally adaptive subdivision scheme. It is hence a deterministic, not a Monte Carlo method. In each iteration, the subregion with the largest error is halved along the axis where the integrand has the largest fourth difference. Cuhre is quite powerful in moderate dimensions, and is usually the only viable method to obtain high precision, say relative accuracies much below  $1e-3$ .

<http://www.feynarts.de/cuba/>


Tags - integration

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## QUANTITATIVE FINANCE COLLECTOR

## Multidimensional numerical integration

14, 2008 08:59P.M.

Most derivative pricing problems have finally come to solve integration numerically, by Simpson, Monte Carlo simulation, etc., however, multi-dimensional integration is time-consuming and prone to error, here I share a Cuba library which offers a choice of four independent routines for multidimensional numerical integration: Vegas, Suave, Divonne, and Cuhre.

## Quotation

Vegas is the simplest of the four. It uses importance sampling for variance reduction, but is only in some cases competitive in terms of the number of samples needed to reach a prescribed accuracy. Nevertheless, it has a few improvements over the original algorithm and comes in handy for cross-checking the results of other methods.

Suave is a new algorithm which combines the advantages of two popular methods: importance sampling as done by Vegas and subregion sampling in a manner similar to Miser. By dividing into subregions, Suave manages to a certain extent to get around Vegas' difficulty to adapt its weight function to structures not aligned with the coordinate axes.

QUANTITATIVE FINANCE COLLECTOR

## Trinomial tree class for short rate model

02, 2008 10:05P.M.

This page comprises the code and items of a C++ class that could be applied to construct a trinomial tree for the short rate. The tree matches to the yield curve but not to the volatility. curve.

The programming code is grounded on the book "Implementing Derivatives Models", page 260, Clewlow and Strickland, the code specifies a C++ implementation of a tree object. By input a set of parameters the class will form an array of nodes, each one corresponding to a node on the tree. Currently the tree is matched to the underlying interest rate curve, but not a vol. curve.


<http://www.phineas.pwp.blueyonder.co.uk/TreeClass.htm>  
Tags - yield

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QUANTITATIVE FINANCE COLLECTOR

## Numerical valuation of convertible bonds

18, 2008 02:16P.M.

A Convertible Bond (CB) is a hybrid derivative with complex embedded features, it allows the holder to convert the bond to a certain shares (conversion ratio) of stock issued by the same company at a prescribed stock price (conversion price), besides this feature, CB normally has embedded American call (put) option which allows the bond issuer (holder) to call (sell) back the CB from holder (to issuer) at a pre-decided call (put) price once the underlying stock price is above (below) strike price for a certain prescribed, consecutive time, hereafter called Parisian option; in Asian markets, CB also has a refix clause which allows the bond issuer to reset the conversion price, under several stock price scenarios; as a hybrid product with equity and fixed income characteristics, CB is under default risk, both stochastic interest rate and stochastic volatility play a role for its valuation; etc.,

The **convertible bond calculator** uses a binomial lattice with the stock price as the only state variable to analyse convertible bonds with call and put features. The software does not use the warrant valuation approach which requires the volatility of equity (stocks plus warrants). Instead, it ignores the dilution effect and uses stock price volatility which is more readily available.

download at <http://www.iimahd.ernet.in/~jrvarma/software/ecb.zip>  
online convertible bonds calculator  
<http://www.iimahd.ernet.in/~jrvarma/software/convertible.php>, more are at <http://www.iimahd.ernet.in/~jrvarma/software.php>.

Tags - convertible bond


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## QUANTITATIVE FINANCE COLLECTOR

## Spread option valuation

17, 2008 03:49P.M.

Spread option derives its value from the difference between the prices of two or more assets, it can be considered as a type of rainbow option in that it's payoff depends on 2 or 3 underlying assets. for instance, for a 2 underlying assets call spread option, the payoff is like  $\max(S_1 - S_2 - K, 0)$ , where K is the strike price betting on the spread (or difference) of these two stock prices. Spread option is widely used in energy industry, especially in oil industry.

In previous entry how to price spread option with Monte Carlo simulation was introduced, here is another valuation method of spread options following the article Low-Fat Spreads by K. Ravindran, RISK, Oct 1993.

for detail check <http://www.mathfinance.org/FF/cplib.php>.  
Tags - spread

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## QUANTITATIVE FINANCE COLLECTOR

## Cliquet option with Jump-Diffusion Bates Model

16, 2008 10:30P.M.

Cliquet option, also called ratchet option, is an extended roll-down option, with strikes set at the barriers, which never knock out completely. It is a series of at the money options, with periodic settlement, resetting the strike value at the then current price level, at which time, the option locks in the difference between the old and new strike and pays that out as the profit. The profit can be accumulated until final maturity, or paid out at each reset date.

The Bates Model is a type of Jump-Diffusion model that is able to improve calibration results for short term options. The Bates Model consists of Jumps processes built on top a Heston model.

<http://www.javaquant.net/finalgo/BatesModel.html> lists the C++ code to price Cliquet options using the Log-Jump variant of the Bates model with stochastic volatility.

wiki(Cliquet option)  
Tags - cliquet , heston

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## QUANTITATIVE FINANCE COLLECTOR

## Mixed Integer Linear Programming (MILP) solver

11, 2008 09:04A.M.

Are you fed up with “linprog” or “fmincon” command in Matlab? do you sometimes find the results violate your providing constraints while Matlab says “condition satisfied”, or sometimes you get a weird solution while Matlab tells you “convergence successful”, etc. (I am not saying bad words about Matlab, I AM a fan of it, but if there is a better solution for the given problem, why not at least try it?)

Optimization packages are widely spread, here is a site i introduced, optimization package. Several days ago a friend of mine sent me a link about lp-solver, which is a Mixed Integer Linear Programming (MILP) solver, convenient to use and highly efficient, cannot help sharing with you all. (please submit your favorite code site if you happen to find one and help others, thanx.)

The name itself tells you this package is for linear programming problem, What is Linear Programming then? A Linear Program (LP) is a problem that can be expressed as follows:

$$\begin{aligned} & \text{minimize } cx \\ & \text{subject to } Ax = b \\ & \quad x \geq 0 \end{aligned}$$

where  $x$  is the vector of variables to be solved for,  $A$  is a matrix of known coefficients, and  $c$  and  $b$  are vectors of known coefficients. The expression “ $cx$ ” is called the objective function, and the equations “ $Ax=b$ ” are called the constraints. LP is widely used for portfolio optimization, for instance, to mimic the performance of an index, to minimize tracking error of your portfolio, etc. Don't hesitate to try it yourself.

PS: lp-solver can be called as a library from different languages like C, VB, .NET, Delphi, Excel, Java, ...It can also be called from AMPL, MATLAB, O-Matrix, Scilab, Octave, R via a driver program. you will find a way.

Download at <http://lpsolve.sourceforge.net/5.5/>.

Tags - optimization


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## QUANTITATIVE FINANCE COLLECTOR

## Finite Element package

03, 2008 03:39P.M.

Recently I have been working on pricing a high dimensional (4 dimension, actually) derivative via partial differential equation (PDE), which can be solved numerically by Finite Element or Finite Difference method. Indeed Matlab has a PDE toolbox to use, however, as I know, this PDE toolbox can only calculate two dimensional problem, for instance, stock and time dimension as Black Scholes model does.

For your attention, I found an excellent Finite Element package named **Getfem++** written in C++, as its webpage says, “The Getfem++ project focuses on the development of a generic and efficient C++ library for finite element methods. The goal is to provide a library allowing the computation of any elementary matrix (even for mixed finite element methods) on the largest class of methods and elements, and for arbitrary dimension (i.e. not only 2D and 3D problems).” what's more interesting is this library can be linked easily to Matlab.

We know Finite Element method is an alternative to Finite Difference discretization of the BS and other equations in the price resp. the log-price space variable. The advantage of FE is that it gives convergent deterministic approximations of the option price under realistic, low smoothness assumptions on the payoff function, as e.g. for binary contracts and in particular allow a higher rate of convergence that that achievable with Monte Carlo simulations.

To get a deeper insight on and download open source **Getfem++** please be at [http://home.gna.org/getfem/wiki\(Finite element\)](http://home.gna.org/getfem/wiki(Finite%20element))


Tags - finite-element , pde

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## QUANTITATIVE FINANCE COLLECTOR

**Vasicek model in binomial tree**

02, 2008 05:28P.M.

At previous post I shared a site using R language for Vasicek estimation, as we know, Vasicek model is a term structure model describing the stochastic process of interest rates. It is a type of "one-factor model" with negative interest rate possible, despite this shortcoming, it is still applied for fixed income research and application due to its mean-reversion characteristics.

Here is another Vasicek application implemented with binomial tree in C++, the tree construction procedure is outlined in Tuckman famous book **Fixed Income Securities**. By providing input parameters like the initial short rate, speed of mean reversion, long-run average rate and volatility, interest rate following Vasicek evolution is constructed.

For detail check this page

<http://math.nyu.edu/~atm262/spring06/ircm/vasicek/>.


Tags - vasicek

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## QUANTITATIVE FINANCE COLLECTOR

**Libor Market Model: Theory and Implementation source code**

31, 2008 10:43A.M.

Libor Market Model is a term structure model applied to value and hedge exotic interest rate derivatives. The model is recognized and employed largely because of its consistency with the popular market model, Black's formula. This consistency makes the calibration process easy as the Black's market prices for vanilla interest rate Options can be instantly used as an input.

The purpose of this book -Libor Market Model: Theory and Implementation is to analyze the Libor Market Model in theory and implement it practically to the evaluation of normal caps, barriers, European swaptions and ratchets, etc. The dynamic of the Libor Market Model will be derived and the whole steps of its implementation applying Monte Carlo simulation will be introduced. Implementation is accomplished via several volatility and correlation formulation. Special attention should be given when it comes to calibrate the Libor Market Model and model the forward rate volatilities and correlations since they could impact prices of interest rate derivatives substantially.

you can download the free c course code by leaving your email at

[http://www.irina-goetsch.com/libor-market-model/app#order-wiki\(LIBOR Market Model\)](http://www.irina-goetsch.com/libor-market-model/app#order-wiki(LIBOR Market Model))


Tags - libor

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## PSOR for American option

24, 2008 04:11P.M.

We often have to price the American Option with Linear Complementarity Formulation when using finite difference method. One of methods for solving linear complementarity problem is Projected Successive Over Relaxation (PSOR), which is iterative and tries to solve the following formulation:

$$\begin{aligned} x'(Ax - b) &= 0 \\ x &\geq 0 \\ Ax - b &\geq 0 \end{aligned}$$

using the projected SOR algorithm. Here is a sample C++ code which can be called directly in Matlab.


Click to download  
[wiki\(Linear complementarity problem\)](#)  
 Tags - psor , american

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## Monte Carlo Pricer Black Derman Toy Model

30, 2008 08:44A.M.

Financial Quantitative Algorithms

below you will find the some sources of the sources in C++ and Java.T

Table with C++ sources

- Closed expressions and Approximate Models for various Financial Option on Equity
- Binary Tree method to Price Options on Equity
- Monte Carlo pricer of Exotics
- Monte Carlo Pricer of American Calls and Puts
- Monte Carlo Pricer of European Barrier, Knock in and out Options
- Monte Carlo Pricer European Spread Options
- Monte Carlo Pricer of Interest Rate Derivatives (One factor)
- Monte Carlo Pricer Ho Lee Model
- Monte Carlo Pricer Hull White Model
- Monte Carlo Pricer Black Derman Toy Model

Monte Carlo Pricer Brace Gatarek Musiela / Jamishidian Model  
 Monte Carlo pricer of exotics with constant Jump-Diffusion  
 Monte Carlo Pricer of Barrier, Knock in and out Options with Jump-Diffusion  
 Monte Carlo Pricer European Spread Options with Jump-Diffusion

Table with Java sources

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 Binary Tree method to Price Options on Equity  
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 Monte Carlo Pricer of American Calls and Puts  
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 Monte Carlo Pricer European Spread Options  
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 Monte Carlo Pricer European Spread Options with Jump-Diffusion

<http://www.javaquant.net/downloads.html>  
 wiki(Black Derman Toy)  
 Tags - bdt , monte carlo

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## CDO Pricing in Gaussian Copula

28, 2008 09:20A.M.

CDO prices with Monte Carlo simulation includes the creation of roads in the sample correlation preset times. This defect is sometimes used to calculate payments to fixed and floating legs and worth of each leg.

more at <http://math.nyu.edu/~atm262/spring06/ircm/cdo/index.html>


wiki(Collateralized debt obligations)  
 Tags - cdo , copula

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## Mersenne Twister random number generator

26, 2008 09:21A.M.

SFMT is a new variant of Mersenne Twister (MT) introduced by Mutsuo Saito and Makoto Matsumoto in 2006. The algorithm was reported at MCQMC 2006. The article will appear in the proceedings of MCQMC2006. (see Prof. Matsumoto's Papers on random number generation.) SFMT is a Linear Feedbacked Shift Register (LFSR) generator that generates a 128-bit pseudorandom integer at one step. SFMT is designed with recent parallelism of modern CPUs, such as multi-stage pipelining and SIMD (e.g. 128-bit integer) instructions. It supports 32-bit and 64-bit integers, as well as double precision floating point as output.


<http://www.math.sci.hiroshima-u.ac.jp/~m-mat/MT/SFMT/index.html>  
[wiki\(Mersenne Twister\)](#)  
[Tags - random](#)

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## Singular value decomposition

26, 2008 09:17A.M.

The singular value decomposition of  $M \times N$  matrix  $A$  is its representation as  $A = U W V^T$ , where  $U$  is an orthogonal  $M \times M$  matrix,  $V$  - orthogonal  $N \times N$  matrix. The diagonal elements of matrix  $W$  are non-negative numbers in descending order, all off-diagonal elements are zeros.

The matrix  $W$  consists mainly of zeros, so we only need the first  $\min(M,N)$  columns (three, in the example above) of matrix  $U$  to obtain matrix  $A$ . Similarly, only the first  $\min(M,N)$  rows of matrix  $V^T$  affect the product. These columns and rows are called left and right singular vectors.

<http://www.alglib.net/matrixops/general/svd.php>


[wiki\(Singular value decomposition\)](#)  
[Tags - matrix](#)

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QUANTITATIVE FINANCE COLLECTOR

## A lightweight C++ library for quantitative finance applications

25, 2008 06:41P.M.

What is Terreneuve? Simply: "A lightweight C++ library for quantitative finance applications."

In more detail, Terreneuve is our team name for the project in the Fall 2005 Computing in Finance course at NYU's Courant Institute Masters in Math Finance. Working from this specification we hope to design a useable C++ library for some important quantitative finance applications.

Our target audience (aside from our prof ;-)) is students in quantitative finance and those seeking a gentle introduction to financial computing. Obviously, we also intend to use the project as a learning opportunity. We refer those looking for a more comprehensive (and complex) library to the quantlib project.


<http://terreneuve.sourceforge.net/>

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QUANTITATIVE FINANCE COLLECTOR

## C++ Financial Algorithms (Financial Numerical Recipes)

25, 2008 06:40P.M.

In finance, there are areas where formulas tend to get involved. Sometimes it may be easier to follow an exact computer routine. I have made some C++ subroutines that implements common algorithms in finance. Typical examples are option/derivatives pricing, term structure calculations, mean variance analysis. These routines are presented together with a good deal of explanations and examples of use, but it is by no means a complete "book" with all the answers and explanations. I'm hoping to turn it into a book, but even in its incomplete state is should provide a good deal of useful algorithms for people working within the field of finance.


Book and Code are at [http://finance-old.bi.no/~bernt/gcc\\_prog/index.html](http://finance-old.bi.no/~bernt/gcc_prog/index.html)

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QUANTITATIVE FINANCE COLLECTOR

## Fast Greeks by Simulation in Forward Libor Models

25, 2008 09:21A.M.

Fast Greeks by Simulation in Forward Libor Models by Prof. Glasserman, paper and code can be downloaded at:

<http://www.gsb.columbia.edu/faculty/pglasserman/Other/grklibor.pdf>

[http://www.gsb.columbia.edu/faculty/pglasserman/Other/greeks\\_code.zip](http://www.gsb.columbia.edu/faculty/pglasserman/Other/greeks_code.zip)

wiki(libor)


Tags - greeks , libor

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## Design Patterns and Derivatives Pricing

25, 2008 09:17A.M.

Design patterns are the cutting-edge paradigm for programming in object-oriented languages. Here they are discussed, for the first time in a book, in the context of implementing financial models in C++. Assuming only a basic knowledge of C++ and mathematical finance, the reader is taught how to produce well-designed, structured, re-usable code via concrete examples. Each example is treated in depth, with the whys and wherefores of the chosen method of solution critically examined. Part of the book is devoted to designing re-usable components that are then put together to build a Monte Carlo pricer for path-dependent exotic options. Advanced topics treated include the factory pattern, the singleton pattern and the decorator pattern. Complete ANSI/ISO-compatible C++ source code is included on a CD for the reader to study and re-use and so develop the skills needed to implement financial models with object-oriented programs and become a working financial engineer.

a copy of the c++ code is available to download at

<http://www.markjoshi.com/design/>


Tags - derivative

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- Monte Carlo Pricer of Barrier, Knock in ...

Hot Views:

- Black Scholes in Multiple Languages
- MatLab for Financial Engineers
- Matlab-GUI equity derivative calculator
- R-code for Vasicek estimation
- Bootstrapping interest rate curve 

# Today's Tabloid

PERSONAL NEWS FOR YOU

QUANTITATIVE FINANCE COLLECTOR

## Java Quantlib

19, 2008 09:04A.M.

Many people know QuantLib, which is a free/open-source library for quantitative finance for modeling, trading, and risk management in real-life written in C++, for those people prefer Java language, they have to read & understand C++ codes and transfer them to Java code. JQuantLib is aiming at these Java-fans group,

### Quotation

JQuantLib is a free, open-source, comprehensive framework for quantitative finance, written in Java. It provides "quants" and Java application developers several mathematical and statistical tools needed for the valuation of financial instruments, among other features.

Is there MQuantLib for Matlab fans?

Tags - quantlib , java

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- CDO Pricing in Gaussian Copula
- State space model toolbox
- Valuing Warrants under dilution
- weighted covariance matrix
- Vasicek Model calibration and simulation

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## Monte Carlo Pricer Brace Gatarek Musiela / Jamishidian Model

28, 2008 09:06A.M.

Table with Java sources

- Closed expressions and Approximate Models for various Financial Option on Equity
- Binary Tree method to Price Options on Equity
- Monte Carlo pricer of Exotics
- Monte Carlo Pricer of American Calls and Puts
- Monte Carlo Pricer of European Barrier, Knock in and out Options
- Monte Carlo Pricer European Spread Options
- Monte Carlo Pricer of Interest Rate Derivatives (One factor)
- Monte Carlo Pricer Ho Lee Model
- Monte Carlo Pricer Hull White Model
- Monte Carlo Pricer Black Derman Toy Model
- Monte Carlo Pricer Brace Gatarek Musiela / Jamishidian Model
- Monte Carlo pricer of exotics with constant Jump-Diffusion
- Monte Carlo Pricer of Barrier, Knock in and out Options with Jump-Diffusion
- Monte Carlo Pricer European Spread Options with Jump-Diffusion

<http://www.javaquant.net/downloads.html>

wiki(LIBOR Market Model)

Tags - libor , bgm


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QUANTITATIVE FINANCE COLLECTOR

## Monte Carlo Pricer of Barrier, Knock in and out Options with Jump-Diffusion

28, 2008 09:03A.M.

how to price barrier options with jump-diffusion by monte carlo simulations, codes are in Java language.

<http://www.javaquant.net/downloads.html>

wiki(Barrier option)

Tags - barrier

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# Today's Tabloid

PERSONAL NEWS FOR YOU

QUANTITATIVE FINANCE COLLECTOR

## Free Mathematica Software for Stable Analysis

17, 2008 09:26P.M.

Stable densities in four different parameterizations:

$S(\alpha, \beta, \gamma, \delta; 0)$  parameterization (top left), the "standard"  $S(\alpha, \beta, \gamma, \delta; 1)$  parameterization (top right),  $S(\alpha, \beta, \gamma, \delta; 2)$  parameterization (bottom left),  $S(\alpha, \beta, \gamma, \delta; 3)$  parameterization (bottom right). The values of  $\alpha$  are indicated on the plots, skewness is indicated by color:  $\beta=0$  (black),  $\beta=0.25$  (red),  $\beta=0.5$  (green),  $\beta=0.75$  (yellow),  $\beta=1$  (blue). In all cases, scale  $\gamma=1$  and location  $\delta=0$ . Note the discontinuity in the standard 1-parameterization near  $\alpha=1$ .

download stable distribution software at

<http://www.mathestate.com/tools/Financial/sw/Software.html>


Tags - stable , distribution

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- Design Patterns and Derivatives Pricing
- CONVERTIBLE BOND PRICING MODEL
- VaR and Expected shortfall under General...
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## Primitive polynomials for Sobol sequences

13, 2008 09:16P.M.

Quasi monte carlo method is popular for derivative pricing, Sobol sequences is among the most widely-used low-discrepancy sequences, and most efficient one I have ever used. The biggest challenge for generating sobol sequences is to construct primitive polynomials, here is a Mathematic file showing the algorithm to construct primitive polynomials for multi-dimensional Sobol sequences , have fun.

<http://leippold.googlepages.com/matlab>


Tags - sobol , simulation

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## Unified Asian Option Pricing

28, 2008 02:36P.M.

Asian options are securities with payoff which depends on the average of the underlying stock price over certain time interval. Since no general analytical solution for the price of the Asian option is known, a variety of techniques have been developed to analyze arithmetic average Asian options.

A simple and numerically stable 2-term partial differential equation characterizing the price of any type of arithmetically averaged Asian option is given. The approach includes both continuously and discretely sampled options and it is easily extended to handle continuous or discrete dividend yields.

The paper "Unified Asian Pricing", Risk, Vol. 15, No. 6, 113-116 and its Mathematica nb file can be downloaded at

<http://www.stat.columbia.edu/~vecer/>.


Tags - asian

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## Combinatorica mathematica package

25, 2008 03:35P.M.

Oops, first post on Mathematica, simply because I dont use it for research, I simply love Matlab and C++, due to their popularity and easy-to-use. However, good news for Mathematica fans, here I found an excellent Mathematica package named "The Combinatorica Project", which is a package written in 1989 by Steve Skiena for exercising computational discrete mathematics.

here is the introductory page and downloading link, have fun and enjoy new week.

<http://www.cs.uiowa.edu/~sriram/Combinatorica/>


Tags - mathematica

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# Today's Tabbloid

PERSONAL NEWS FOR YOU

QUANTITATIVE FINANCE COLLECTOR

## Black Litterman Portfolio Allocation

29, 2008 09:57P.M.

Quotation

The **Black Litterman model** was first published by Fischer Black and Robert Litterman of Goldman Sachs in an internal Goldman Sachs Fixed Income document in 1990. This paper was then published in the Journal of Fixed Income in 1991. A longer and richer paper was published in 1992 in the Financial Analysts Journal (FAJ). The latter article was then republished by FAJ in the mid 1990's. Copies of the FAJ article are widely available on the Internet. It provides the rationale for the methodology, and some information on the derivation, but does not show all the formulas or a full derivation. It also includes a rather complex worked example, which is difficult to reproduce due to the number of assets and use of currency hedging.

The Black Litterman model makes two significant contributions to the problem of asset allocation. First, it provides an intuitive prior, the CAPM equilibrium market portfolio, as a starting point for estimation of asset returns. Previous similar work started either with the uninformative uniform prior distribution or with the global minimum variance portfolio. The latter method, described by Frost and Savarino (1986) and Jorion (1986), took a shrinkage approach to improve the final asset allocation. Neither of these methods has an intuitive connection back to the market. The idea that one could use 'reverse optimization' to generate a stable distribution of returns from the CAPM market portfolio as a starting point is a significant improvement to the process of return estimation.

Second, the BlackLitterman model provides a clear way to specify investors views and to blend the investors views with prior information. The investor's views are allowed to be partial or complete, and the views can span arbitrary and overlapping sets of assets. The model estimates expected excessreturns and covariances which can be used as input to an optimizer. Prior to their paper, nothing similar had been published. The mixing process had been studied, but nobody had applied it to the problem of estimating returns. No research linked the process of specifying views to the blending of the prior and the investors views. The BlackLitterman model provides a quantitative framework for specifying the investor's views, and a clear way to combine those investor's views with an intuitive prior to arrive at a new combined distribution.

For a collection of reference paper and an online application please see <http://www.blacklitterman.org/blapplet.html>


Tags - allocation , black-litterman

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## Fourier Space Time-stepping (FST) option calculator

27, 2008 10:03P.M.

Online Fourier Space Time-stepping (FST) option calculator where options class includes European, American, Barrier, Shout and Spread option; underlying stock process follows Black Scholes Merton, Merton Jump Diffusion, Kou Jump Diffusion, Variance Gamma, Normal Inverse Gaussian and CGMY.

For more information on the Fourier Space Time-stepping (FST)

method, stock price models and options refer to the papers below at the site <http://128.100.73.155/fst/>.

Papers:

- \* Option Pricing with Regime Switching Levy Processes Using Fourier Space Time-stepping
- \* Fourier Space Time-stepping for Option Pricing with Levy Models.


Related Matlab codes can also be downloaded at [http://www.cs.toronto.edu/~vsurkov/fst\\_matlab.html](http://www.cs.toronto.edu/~vsurkov/fst_matlab.html)  
Tags - calculator , derivative

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## Barrier Option Calculator

04, 2008 07:57A.M.

tran(This program can calculate values and greeks for plain vanilla options as well as single and double barrier options with or without rebate. Calculations are performed within the standard Black-Scholes model. For plain vanilla and single barrier options, the calculation is purely analytical. Double barrier options are approximated using a Fourier series approximation, unless volatility is low. For low volatility an alternative series expansion is used.)


<http://www.neumann.nl/~dimitri/pricing.html>  
wiki(barrier option)  
Tags - barrier , calculator

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QUANTITATIVE FINANCE COLLECTOR

## Online Option Calculator

26, 2008 09:08A.M.

Calculators

- \* Asian, fixed strike
- \* Asian, floating strike
- \* Barrier
- \* Barrier, double
- \* Binary, asset-or-nothing
- \* Binary, cash-or-nothing
- \* Binary, gap
- \* Double Binary
- \* Chooser, simple
- \* Chooser, complex
- \* Compound
- \* Correlation
- \* Exchange
- \* Extendible, holder

- \* Extendible, writer
- \* Forward start
- \* Lookback, fixed strike
- \* Lookback, floating strike
- \* Power
- \* Product
- \* Quanto
- \* Quotient
- \* Rainbow
- \* Range
- \* Spread
- \* StrikeReset
- \* TimeSwitch
- \* Vanilla


<http://www.sitmo.com/live/OptionVanilla.html>  
 Tags - calculator

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QUANTITATIVE FINANCE COLLECTOR

# Heston Stochastic Volatility

25, 2008 09:14A.M.

Online Closed form and Monte Carlo simulation for option under Heston Stochastic Volatility.

[http://www.math.nyu.edu/ms\\_students/lw429/calculator.htm](http://www.math.nyu.edu/ms_students/lw429/calculator.htm)


wiki(Heston model)  
 Tags - heston , volatility

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22 , 2009

# Today's Tabbloid

PERSONAL NEWS FOR YOU

QUANTITATIVE FINANCE COLLECTOR

## Credit card bailout

08, 2009 04:09P.M.

A review of credit card bailout.

It appears as if day-to-day at present that we hear about a government bought at bailout of additional major company. Numerous smaller commercial enterprise, as well as individual people, are left enquiring where is their bailout from the dishonest loaning practices of the depository financial institution and credit card corporations.

In recent years, consumers have been promoted to Apply Credit Card for daily purchases, including groceries, fast food meals, and even the morning cup of coffee en route to office. All of these purchases, in addition the interest and fees appended, have only ramped up a huge pile of debt for the ordinary cardholder.

This is not much unlike the debt built up by companies, who now bear their hand out, calling for help. And the government appears very amenable to offer that help, at the long-run expense of the American taxpayer.

There is nevertheless, a bailout of forms for personal credit card debt. This isn't a government platform, no more taxpayer bucks are ill-used, and you will not find out about it on the nightly news show. As a matter of fact, there is really no money needed in this bailout. Through debt elimination, a person can lawfully and entirely discharge 100% of their debts from credit cards and consumer loan\*. Totally without afresh loan, subsidy, or government takeover.


Tags - credit , bailout

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## CDS Standard Model

02, 2009 05:45P.M.

**JP. Morgan** has release its **CDS pricing and analysis model** code!

Quotation

The ISDA **CDS Standard Model**

The ISDA CDS Standard Model is a source code for CDS calculations and can be downloaded freely through this website. The source code is copyright of ISDA and available under an Open Source license.

Background

As the CDS market evolves to trade single name contracts with a fixed coupon and upfront payment, it is critical for CDS investors to match the upfront payment amounts and to be able to translate upfront quotations to spread quotations and vice versa in a standardized manner.

Implementing the ISDA CDS Standard Model and using the agreed standard input parameters will allow CDS market participants to tie out calculations and thus improve consistency and reduce operational differences downstream.

Besides the code for CDS, a Yield Curve Specifications PDF file about how the yield curve is constructed and calculated is also available at the webpage, enjoy!

<http://www.cdsmodel.com/>


Tags - cds , credit

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QUANTITATIVE FINANCE COLLECTOR

## Modelling the implied volatility surface

26, 2009 06:06P.M.

The volatility surface implied by option prices presents a structure that changes over time. The aim of this paper is to present a framework to model the implied volatility of the FTSE options in real time, and to present a prototype application that implements this framework. The authors adapt the parametric models presented in Dumas et al (1998) to estimate the surfaces across moneyness instead of across strikes, they discuss how this framework can be used in applications of option pricing and risk management.

Paper and attached matlab/VB/mathematica codes:

[http://www.amadeo.name/working\\_papers/volatility\\_surface\\_may04.pdf](http://www.amadeo.name/working_papers/volatility_surface_may04.pdf)


Tags - volatility , surface , smile

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QUANTITATIVE FINANCE COLLECTOR

## Automatic Code Testing

25, 2009 05:37P.M.

Everyday you write your quantitative finance code, test the code, crash; then modify it, test it, maybe crash again, and so on. Is there an automatic testing tool doing these boring, repetitive procedures for you? YES. Automatic Testing is a great tool to increase productivity and save time. It helps you catch bugs early by allowing frequent retesting of your code as you develop. This prevents code "regressing" in the sense of reintroducing previously identified and fixed bugs in later updates to your code.

Automatic Testing is made simple and quick through the use of unit testing frameworks, the most popular amongst these is xUnit which has implementations in most modern programming languages. For Matlab we have a version of mUnit available for your use. In python, pyUnit is part of the standard library and is available as a standard package unittest. For R there is RUnit.

Main Benefits:

much less time spent chasing bugs and debugging;  
higher quality of code and software;

provides documentation of which functionality has been tested; greater confidence to make changes to existing code since unit tests will catch incompatibilities early.

Sounds nice? Downloading packages at:  
[http://mlunit.dohmke.de/Main\\_Page](http://mlunit.dohmke.de/Main_Page) for Matlab  
<http://docs.python.org/library/unittest.html> for Python  
<http://cran.r-project.org/web/packages/RUnit/index.html> for R.


Tags - code , test

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QUANTITATIVE FINANCE COLLECTOR

## Merry Christmas

25, 2008 10:07A.M.

Merry Christmas to you all and happy 2009 new year.

Blog will take several days off.


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QUANTITATIVE FINANCE COLLECTOR

## Grouped T copula simulation and estimation

08, 2008 08:24P.M.

Copula is widely applied to model the dependence of multivariate variable, two popula implicit copulas are Gaussian copula and T copula, however, tail dependence under Gaussian copula is asymptotically equal to zero, which is unrealistic and under-estimate the co-movement of variables, especially in extreme market situation nowadays; T copula, on the other hand, has a global degree of freedom to decide largely the dependence structure, which is over-simple, for instance, risk manager might want to define different degree of freedom for different markets due to their special risk profile. Grouped-T copula was created to overcome this problem, where seperated degree of freedom can be set for each subgroup. sample code is here:

[http://economia.unipv.it/pagp/pagine\\_personali/dean/programs/gruped\\_t\\_copula](http://economia.unipv.it/pagp/pagine_personali/dean/programs/gruped_t_copula)  
 Tags - copula


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QUANTITATIVE FINANCE COLLECTOR

## OptionCity Calculator

25, 2008 09:39P.M.

Key Benefits of the OptionCity Calculator

- \* Flexible models with stochastic volatility and stock price jumps
- \* Option prices with Greeks (sensitivity to parameters)
- \* Realistic Smile charts
- \* Fast evaluations
- \* Self-validating results. (You validate calculations by selecting a different numerical method: Lattice, Series, or Monte Carlo)

The program is a downloadable executable for MS Windows systems:  
<http://www.optioncity.net/calculator.htm>

Tags - calculator

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QUANTITATIVE FINANCE COLLECTOR

## Uniform Random Number Generator

21, 2008 08:14P.M.

Uniform Random number is crucial for Monte Carlo simulation, some famous uniform random number generators are Halton sequence and Sobol sequence. Normal random number can be simulated then by inverse normal cumulative function, for instance, Peter J Acklam inverse normal cumulative distribution or Beasley-Springer-Moro inverse normal.

UNIFORM is a Mathematica library which return a sequence of uniformly distributed pseudorandom numbers.

The fundamental underlying random number generator in UNIFORM is based on a simple, old, and limited linear congruential random number generator originally used in the IBM System 360.

For detail and several language version pls click  
[http://people.scs.fsu.edu/~burkardt/math\\_src/uniform/uniform.html](http://people.scs.fsu.edu/~burkardt/math_src/uniform/uniform.html).  
 Tags - simulation , monte carlo


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QUANTITATIVE FINANCE COLLECTOR

## Online derivative calculator

10, 2008 09:55P.M.

An online derivative calculator covers:

Bond Price Volatility: duration(s), convexity, immunization;

Term Structure: yield curve, spot rate, forward rate, term structure theories

Option Pricing: Black-Scholes, binomial, European, American

Numerical Greeks (& Some Latin): delta, gamma, vega, theta

Option Applications & Exotic Options: Corporate securities, barrier, Asian, lookback, **Parisian option**, compound, exchange, etc.

futures, forward, futures option, swap

Monte Carlo & Quasi-random: variance reduction, Brownian bridge, Halton-, Sobel-, Faure-sequences

GARCH option pricing model:multinomial tree, Monte Carlo

Interest Rate Models: lognormal, Vasicek, CIR, BDT, Hull-White, HJM

Mortgage-backed Securities: prepayment, PSA, CPR, SMM, pass-through, CMO, stripped MBS, ARM, prepayment model, seq. CMO,

PO/IO, PAC, option-adjusted spread, cash flow, duration

convertible bond, callable & put bond, option-adjusted spread

...

<http://www.csie.ntu.edu.tw/~lyuu/Capitals/capitals.htm>

Tags - calculator , derivative

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QUANTITATIVE FINANCE COLLECTOR

## Newey and West Covariance Matrix Estimator

03, 2008 08:24P.M.

Covariance matrix is vital for pricing and risk analysis, before I shares a Matlab code on weighted covariance matrix computation, here is another method named Newey & West covariance matrix, which calculates the covariance matrix with a non-parametrical method. Choices of kernels include Bartlett, Truncated and Quadratic Spectral. An example program also demonstrates how to use of these procedures. For detail please refer to <http://kafuwong.econ.hku.hk/research/gausscode/cov1.htm>.


Tags - covariance

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## Code search portal

16, 2008 08:35P.M.

Share two code search portal today, one is search Quant code, where people can search code relative to quantitative finance, for instance, Code Search example: Black Scholes matlab; the other one is R-project search engine, specifically for R language programming users. Enjoy.

<http://www.finmath.cn/>


<http://www.rseek.org/>

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- Black Scholes in Multiple Languages
- Econometric tools for performance and ri...
- halton and sobol sequences
- Nelson Siegel interest rate model calibr...

Hot Views:

- Black Scholes in Multiple Languages
- MatLab for Financial Engineers
- Matlab-GUI equity derivative calculator
- R-code for Vasicek estimation
- Bootstrapping interest rate curve 

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## Career change

05, 2008 06:46P.M.

Arrived in London today, new job will start from tomorrow, the first few weeks will be busy as i need to get used to the new life here.

I will try to update new code link as possible as i can. thx for your support.


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## Arithmetic Game

15, 2008 03:16P.M.

One of my friends sent me an interesting site: Arithmetic game, (please help us develop by submitting a site in your favorites), The Arithmetic Game is a speed drill where you are given two minutes to solve as many arithmetic problems as you can, problems including addition, subtraction, multiplication, and division, for each problem answered correctly you will get score, test how many scores you can achieve. The highest score so far is 137, amazing...

<http://zetamac.com/arithmetic/>

This game helps me recall the exam I took for a quantitative trader position several months ago, i failed

Tags - game


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## Perl Option Pricing Project

16, 2008 09:00A.M.

Derivatives can be valued applying a mixture of statistical models. A former version of the Perl module was utilized to produce market analysis software package. The code comprises of a Perl module incorporating routines to do option pricing and related computations.

Software documentation

For a fantabulous reference on derivative pricing, confer with Espen Gaarder Haug (1998) Option Pricing Formulas, McGraw-Hill. The routines were all deduced from the pseudocode there.

<http://www.kmri.com/software/popp.html>


Tags - perl

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## SAS for Financial Engineers

24, 2008 05:23P.M.

SAS for Financial Engineers:

- 1 – Introduction
- 2 – Data Management
- 3 – Financial Modeling(Important PROCs and Advanced PROCs: IML, SQL)
- 4 – Advanced Techniques (SAS Macro and other programming techniques)

<http://faculty.haas.berkeley.edu/peliu/computing/>

Tags - sas

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-

# Today's Tabbloid

PERSONAL NEWS FOR YOU

QUANTITATIVE FINANCE COLLECTOR

## Maximum likelihood estimation in R

18, 2009 05:58P.M.

Maximum likelihood estimation can be implemented like Quasi-maximum likelihood in Matlab, You can also write an R function which computes out the likelihood function. As always in R, this can be done in several different ways.

One issue is that of restrictions upon parameters. When the search algorithm is running, it may stumble upon nonsensical values - such as a sigma below 0 - and you do need to think about this. One traditional way to deal with this is to "transform the parameter space". As an example, for all positive values of sigma,  $\log(\sigma)$  ranges from  $-\infty$  to  $+\infty$ . So it's safe to do an unconstrained search using  $\log(\sigma)$  as the free parameter.

For detail about methodology and sample codes see  
<http://www.mayin.org/ajayshah/KB/R/documents/mle/mle.html>.  
Tags - mle

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## Extra moments measure

16, 2008 09:57P.M.

The following functions are intended to replicate calculations for taking higher moments of hedge fund returns into account in analyzing particular investments. Most of the formulae are taken from various EDHEC research papers.

# All returns are assumed to be on a monthly scale!

functions including:

```
# moment.third
# moment.fourth
# CoSkewness
# CoKurtosis
# BetaCoVariance
# BetaCoV (wrapper for BetaCoVariance)
# SystematicBeta (wrapper for BetaCoVariance)
# BetaCoSkewness
# BetaCoS (wrapper for BetaCoSkewness)
# SystematicSkewness (wrapper for BetaCoSkewness)
# BetaCoKurtosis
# BetaCoK (wrapper for BetaCoKurtosis)
# SystematicKurtosis (wrapper for BetaCoKurtosis)
# VaR
# VaR.Beyond
# VaR.column
# VaR.CornishFisher
# VaR.Marginal
# modifiedVaR (wrapper for VaR.CornishFisher)
```

[http://braverock.com/brian/R/extra\\_moments.R](http://braverock.com/brian/R/extra_moments.R)

Tags - moment , portfolio


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## Functions for portfolio analysis

11, 2008 03:07P.M.

Functions include:

1. `efficient.portfolio` compute minimum variance portfolio subject to target return
2. `globalMin.portfolio` compute global minimum variance portfolio
3. `tangency.portfolio` compute tangency portfolio
4. `efficient.frontier` computer Markowitz bullet

<http://faculty.washington.edu/ezivot/econ483/portfolio.ssc>


Tags - markowitz , splus

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## Convert Splus to R

10, 2008 06:57P.M.

Suppose you have got used to Splus and want to switch to R software (why bother to change? R is free while Splus is not, fair enough?), what can you do? since there are many functions in S-PLUS that are missing in R, one way is to understand the functions and write your owns, working N hours without sleep (N>?). however, you can avoid doing like that if you are as headache as me whenever you think of this solution. There is a package named Splus2R, which is to facilitate the conversion of S-PLUS packages to R packages, this package provides some missing S-PLUS functionality in R.

I have not tested the package, though, will update later. Here is downloading link: <http://cran.r-project.org/web/packages/splus2R/index.html>.  
Tags - splus , r


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## Multivariate dependence with copulas

17, 2008 08:03P.M.

Classes (S4) of commonly used copulas including elliptical (normal and t), Archimedean (Clayton, Gumbel, Frank, and Ali-Mikhail-Haq), extreme value (Husler-Reiss and Galambos), and other families (Plackett and Farlie-Gumbel-Morgenstern). Methods for density, distribution, random number generation, bivariate dependence measures, perspective and contour plots. Functions for fitting copula models. Independence tests among random variables and random vectors. Serial independence tests for univariate and multivariate continuous time series. Goodness-of-fit tests for copulas based on multipliers and on the parametric bootstrap.


R package can be downloaded at <http://cran.r-project.org/web/packages/copula/index.html>  
Tags - copula

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## Modeling Financial Time Series with S-PLUS

12, 2008 09:36P.M.

Although S-plus is the most terrible language I have ever used in terms of debugging (I have to say that, no offense to S-plus fans, as my colleagues said, it is hard to understand it is still existed in 21 century), I found the S-plus scripts accompanying the book **Modeling Financial Time Series with S-PLUS**, covering:

Time Series Manipulation, Time Series Concepts, Unit Root Tests, Modeling Extreme Values, Time Series Regression, Univariate GARCH, Long Memory, Rolling Analysis, Systems of Regression Equations, VAR Models, Cointegration, Factor Models, Term Structure, Copulas, Generalized Method of Moments, etc.


For detail please download at <http://faculty.washington.edu/ezivot/MFTS2ndEditionScripts.htm>  
Tags - s-plus

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## Quantitative Risk Management R package

05, 2008 08:43P.M.

I shared an Econometric tools for performance and risk analysis package in R, today I introduce another **Quantitative Risk Management** R package, which is accompanying the book *Quantitative Risk Management: Concepts, Techniques and Tools* by Alexander J. McNeil, Rudiger Frey and Paul Embrechts, a nice book written by one of my professors. In this book special care is given to Copula analysis, Extreme value theory, credit risk analysis, etc. Given the fact it was ranked by one of the top 10 most technical books of the year 2007, i bet you will learn a lot from it.


R-language version can be downloaded at <http://cran.r-project.org/web/packages/QRMLib/index.html> and S-PLUS library to accompany book is at <http://www.ma.hw.ac.uk/~mcneil/book/index.html>.  
Tags - risk

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## Rmetrics - Basics of Option Valuation

22, 2008 08:14P.M.

Open Source Software for Financial Engineering and Computational Finance

Rmetrics is the premier open source solution for teaching financial market analysis and valuation of financial instruments. With hundreds of functions built on modern methods Rmetrics combines explorative data analysis, statistical modeling and rapid model prototyping. The Rmetrics Packages are embedded in R building an environment which creates for students a first class system for applications in statistics and finance.


Download at <http://cran.cnr.berkeley.edu/web/packages/fOptions/index.html>  
Tags - r

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# Econometric tools for performance and risk analysis

13, 2008 08:31P.M.

## Quotation

Library of econometric functions for performance and risk analysis of financial portfolios. This library aims to aid practitioners and researchers in using the latest research in analysis of both normal and non-normal return streams.

We created this library to include functionality that has been appearing in the academic literature on performance analysis and risk over the past several years, but had no functional equivalent in R. In doing so, we also found it valuable to have wrapper functions for functionality easily replicated in R, so that we could access that functionality using a function with defaults and naming consistent with common usage in the finance literature. The following sections cover Performance Analysis, Risk Analysis (with a separate treatment of VaR), Summary Tables of related statistics, Charts and Graphs, a variety of Wrappers and Utility functions, and some thoughts on work yet to be done.

<http://braverock.com/brian/R/PerformanceAnalytics/html/PerformanceAnalyticsPackage.html>

Tags - econometrics , performance , r

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# evolutionary algorithm optimization

04, 2008 04:27P.M.

In the post Optimization packages dozens of optimization routines can be downloaded, here I am going to share a special optimization method: evolutionary algorithm.

Evolutionary algorithms (EAs) are search methods that take their inspiration from natural selection and survival of the fittest in the biological world. EAs differ from more traditional optimization techniques in that they involve a search from a "population" of solutions, not from a single point. Each iteration of an EA involves a competitive selection that weeds out poor solutions. The solutions with high "fitness" are "recombined" with other solutions by swapping parts of a solution with another. Solutions are also "mutated" by making a small change to a single element of the solution. Recombination and mutation are used to generate new solutions that are biased towards regions of the space for which good solutions have already been seen.

This R package provides the DEoptim function which performs Differential Evolution Optimization (evolutionary algorithm), for detail check <http://cran.r-project.org/web/packages/DEoptim/index.html>.  
wiki(Evolutionary algorithm)

Tags - optimization


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## Visualize Copulas

20, 2008 03:09P.M.

In those Copula codes you can get a rough idea what copula is, how to estimate and simulate it, how to test its performance, etc., to help you visualize what on earth the copula should look like, below R code draws plots of some widely used copulas.

PS: I just finished my Copulas exam one hour ago, performance...um.... Fighting...

<http://www.fam.tuwien.ac.at/~mkeller/R-progs/copula.R>


Tags - copula

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## Process Simulation in R

12, 2008 08:50A.M.

Simple demonstration codes for process simulation in R, including Brownian motion simulation, Poisson process simulatio, Euler scheme simulation for Geometric Brownian motion, the mean-reverting process, and the process with two 'attractors', etc.


[http://www.math.ku.dk/~rolf/teaching/mfe04/MiscInfo.html#CodeTags - simulation](http://www.math.ku.dk/~rolf/teaching/mfe04/MiscInfo.html#CodeTags-simulation)

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## R-code for Vasicek estimation

08, 2008 07:51A.M.

A short-rate model is usually calibrated to some initial structures in the market, typically the initial yield curve, the caps volatility surface, the swaptions volatility surface, and possibly other products, thus determining the model parameters. Vasicek, Cox Ingersoll Ross (CIR), Dothan, for instance, are among the frequently-used short-rate models. The strength of Vasicek model is analytical bond prices and analytical option prices can be obtained and easily calculatied, however, negative short rates are also possible with positive probability.

R code can be downloaded at  
<http://www.math.ku.dk/~rolf/teaching/mfe04/MiscInfo.html#Code>


wiki(Vasicek model)  
 Tags - vasicek , cox ingersoll ross

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## download option price data from Yahoo

29, 2008 08:57A.M.

This R program can be used to download option price data from Yahoo to a data frame and to plot the corresponding implied-volatility smiles.

<http://www.fam.tuwien.ac.at/~mkeller/>


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## Quantile Regression

29, 2008 08:48A.M.

Quantile regression is a statistical technique intended to estimate, and conduct inference about, conditional quantile functions. Just as classical linear regression methods based on minimizing sums of squared residuals enable one to estimate models for conditional mean functions, quantile regression methods offer a mechanism for estimating models for the conditional median function, and the full range of other conditional quantile functions. By supplementing the estimation of conditional mean functions with techniques for estimating an entire family of conditional quantile functions, quantile regression is capable of providing a more complete statistical analysis of the stochastic relationships among random variables.

<http://www.econ.uiuc.edu/~roger/research/rq/rq.html>  
 wiki(Quantile regression)  
 Tags - regression


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