Latest Innovations in Financial Time Series and Mathematical Optimization

NAG City Event in partnership with the CQF Institute & Fitch Learning

London
Wed. 8th Feb. 2017

John Holden
Agenda

- Dr Rebecca Killick, University of Lancaster
  Financial Time Series: Changepoints, structural breaks, segmentations and other stories

- Jan Fiala & Benjamin Marteau
  What’s new in Mathematical Optimization from NAG

- John Holden
  Latest releases and news from NAG
Latest releases and news

- Recent NAG Library releases
- Algorithmic Differentiation tools and services
- HPC, Hadoop & Apache SPARK
- Recent Technical Reports
The NAG Library Contents

- Root Finding
- Summation of Series
- Quadrature
- Ordinary Differential Equations
- Partial Differential Equations
- Numerical Differentiation
- Integral Equations
- Mesh Generation
- Interpolation
- Curve and Surface Fitting
- Optimization
- Approximations of Special Functions

- Dense Linear Algebra
- Sparse Linear Algebra
- Correlation & Regression Analysis
- Multivariate Methods
- Analysis of Variance
- Random Number Generators
- Univariate Estimation
- Nonparametric Statistics
- Smoothing in Statistics
- Contingency Table Analysis
- Survival Analysis
- Time Series Analysis
- Operations Research
NAG Library - Ease of integration

- Supporting Wide Range of Operating systems...
  - Windows, Linux, Mac, ...

- ...and a number of interfaces
  - C, C++,
  - Fortran,
  - VB, Excel & VBA,
  - C#, F#, VB.NET,
  - CUDA, OpenCL,
  - Java,
  - Python,
  - Julia,
  - ...
Mark 26 NAG Library

- **Highlights**
  - NAG Modelling Optimization Suite*
  - Interior point method for large-scale nonlinear optimization *(NLP)*
  - Semidefinite optimization (SDP)*
  - New quadrature functionality
  - Improvements to ODE RK routines – with reverse communications
  - New “nearest correlation matrix” functionality*
  - Update to LAPACK functions
  - Quick-access Keyword search from HTML documentation

*Short papers on NAG website
Mark 25 NAG Library

Mixed Integer Nonlinear Programming (MINLP)*
Quadratic Eigenvalues*
Sparse Grids
Sparse Symmetric Eigensolver
Gauss Hypergeometric Function*
Barycentric interpolation
Kalman Filter*

Travelling Salesman Problem, simulated annealing
Change Point*
Lars/Lasso*
Matrix Ops*
Dickey-Fuller
NCM*
OpenMP(X06)
Wavelets

*Short papers on NAG website
Growing number of major Investment Banks using the NAG’s AD tools and consulting services

- Within their main quant libraries
- Within CVA/XVA applications
- NAG’s AD tools support not just x86, but also accelerators such as GPUs & CUDA

We also deliver

- Adjoint versions of client codes as well as NAG Library functions
  - Fast, efficient implementations - handwritten and tool based solutions
HPC, Hadoop & Apache SPARK

- **NAG HPC training and consulting partner**
  - Providing Mathematical Optimization Consultancy
  - Delivering F2F and webinar training - code tuning for Intel Xeon Phi
  - Delivering tools and code for Adjoint Numerical Methods on GPU (NVIDIA)
  - NAG has joined STAC to assist with code benchmarking
    - STAC-A2 benchmark – pricing and risk management analytics reference code

- **Increasing use of the NAG Library in Hadoop Environment**
  - NAG is Cloudera Certified (example codes on NAG website)
  - Growing number of clients using NAG Library with Apache SPARK through Python, Java and Scala
    - where performance really matters with MPI and C++ as well!
  - NAG is BigData Finance partner – [www.bigdatafinance.eu](http://www.bigdatafinance.eu)
“Must read” technical reports from NAG:

- A Finite Volume - Alternating Direction Implicit Approach for the Calibration of Stochastic Local Volatility models
- Index-tracking Portfolio Optimization Model
- Pricing Bermudan Swaptions on the LIBOR Market Model using the Stochastic Grid Bundling Method
- Adjoint Algorithmic Differentiation Tool Support for Typical Numerical Patterns in Computational Finance

All at http://www.nag.com/technical-report-repository
Finally....

- Thank you and....

  KEEP TELLING US WHAT YOU WANT

Do join us at future events

- The Role of Matrix Functions, 9th March 2017
  - [http://www.nag.co.uk/content/matrix-functions-webinar](http://www.nag.co.uk/content/matrix-functions-webinar)

- Archive of previous technical webinars
  - Incl. Nearest Correlation Matrix, Algorithmic Differentiation,....
  - [http://www.nag.co.uk/content/webinars-presentations](http://www.nag.co.uk/content/webinars-presentations)
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