Master thesis (RW/CSE, INFK, MSc in QF)

Supervisor: Prof. Ch. Schwab

Parallel implementation of a multidimensional FFT method for pricing options on baskets

Project description:
The Fast Fourier Transform (FFT) is a widely used algorithm in computational finance for pricing plain vanilla options with a specific view on the calibration of the parameters of the market models. Challenging *de facto* Monte Carlo methods, this approach may be extended to price multi-asset contingent claims, e.g. options on baskets of assets, which gives rise to high dimensional partial (integro-)differential equations (PIDEs) and therefore significantly increases the computational requirements.

This project will show the implementability of such an approach on a parallel hardware (cluster, or preferably GPUs) to solve $d \leq 3$ dimensional problems. Extensions to address higher dimensional problems or to calibration issues will be contemplated if reasonable progress is made.

To this end, a `C++` or `FORTRAN` code is to be written with either MPI (cluster) or OpenCL (GPUs) on ETH machines and should handle classically encountered contracts (basket, min/max, quanto, power payoffs). Efficient parallel algorithms have to be worked out and implemented in order to yield satisfactory speedups.

Prerequisites: Computational Methods for Quantitative Finance II
Introduction to Parallel Computing
`C/C++` or `FORTRAN` fluency
MPI/OpenCL an asset but not mandatory

Contact: Prof. Christoph Schwab
Seminar for Applied Mathematics, ETH HG G 57.1
ETH Zurich, CH-8092 Zurich
Tel. +41 44 632 3595, FAX +41 44 632 1104
http://www.sam.math.ethz.ch/∼schwab