Scientific Seminar for ECP 2008-2009
Alternative Hedging Strategies for Derivatives: Hedging Multi Fractional Brownians Across Different Time Scales

X and Y, promo 2009,
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September 9, 2008

Abstract

Hedging of derivatives is supposed to be in continuous time [1]. In reality, continuous hedging is impossible because prices are not continuous and because transaction costs would render a quasi-continuous hedging strategy prohibitively expensive. Quants and Traders have tried to tackle this issue by introducing utilities functions, by using "no transaction" banana-shape functions around the theoretical optimal delta hedge or by defining a "no delta hedge" zone within a certain price variation [2]. However, hedging in discontinuous time has one major drawback: the increase of the variance of the replication portfolio [3].

This project, proposed to students of ECP, is our pursuit of the holy grail of optimal hedging in a real world. We propose to investigate alternative hedging policies derived from specific behaviour of underlying prices.

Keywords: derivatives pricing, hedging, continuous time, multi fractional brownian movement, forward on volatility, autocorrelation, Monte Carlo simulation.

1 Research Steps

The goal is to find an optimal way of hedging a gamma position [5] by trying to find the right hedging frequency. A more frequent rehedge policy would reduce the variance of the replicated P&L but would cost more in terms of transaction fees. Conversely, a less frequent rehedge policy would have the disadvantage of increasing the residual delta risk taken while reducing the impact of transaction costs. The in-depth study of dynamics of multi-fractional brownian movements and the implication on option pricing models will be required with Monte Carlo and C++.

Model calibration with real market data could be done by getting some inspiration from the work done by Cont [4]. A final step would be to find and backtest relevant trading strategies that exploit this potential market inefficiency.

2 Tools Given by Arbitragis

Selected students will need to be fairly proficient in C++ and for Monte Carlo simulations, will be provided with the same computing power as Meteo France. They will benefit from our internal tools that will help them generate tangible results quickly. Market data across all stock markets will be readily available for number crunching.

3 What you will gain from this experience

You will gain an expertise in C++ and in quantitative finance that will be useful for your career as future Traders or Quants. We will help you study and develop calibration methodologies in order to try and design real-life trading strategies. You will benefit from a very competent staff which will help you so that you spend as much time as possible doing research rather than be stuck in pure IT issues.

Eventually, you will benefit from our trading methodologies, know-how and vision.

4 Example of previous work with ECP academics and students

Arbitragis has already cooperated with ECP on numerous subjects related to computational finance and derivatives pricing. Here is a non-exhaustive list:

4.0.1 Teaching of *Computational Finance with Graphics Processing Units*, Applied Mathematics class, January 2009 with Ioane Muni Toke

Click here for the schedule and the agenda.

4.0.2 Study of Earthquake Predictions Applied to Financial Crashes. Michael Martos, ECP 2008

4.0.3 Lookback Options Pricing and Trend Following Strategies. Francois Bouscarle & Fabien Charbonnel, ECP 2008

4.0.4 Levy Laws used in Derivatives Pricing, Geoffrey Gascq, ECP 2008

4.0.5 Classification Algorithms and Market Predictions, Otakar Frank, ECP 2008

4.0.6 Massively Parallel Quasi Monte Carlo, Grégoire Jauvion, ECP 2009

4.0.7 Visualization of High Frequency Market Data, Raphael Megzari & Hugo Delaborde, ECP 2010

5 How to apply ?

Please send a resume in pdf form to tuan.nguyen@arbitragis.com. This document can also be found on http://www.arbitragis-research.com.

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