

Scientific Seminar for ECP 2008-2009

Arbitrage of Futures on Volatility and Pricing of Options on Volatility

X and Y, promo 2009,
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Abstract

A new asset class within the world of financial derivatives has recently emerged a decade ago: volatility itself [1] as well as options on volatility[2]. Pricing such esoteric instruments requires a knowledge of the kurtosis of the distribution curve, which is a difficult information to obtain. It also requires the advent of models which take into account jumps in the distribution of asset prices such as variance-gamma or Heston models.

This project is a difficult one. It is proposed to students of ECP and tries to solve one of the latest enigma of quant finance: how to price the fourth order of the distribution curve, how to price options on volatility ?

Keywords: derivatives pricing, futures on volatility, options on volatility, Heston model, stochastic volatility, kurtosis, Monte Carlo simulation, jump diffusion process, variance swaps.

1 Research Steps

The goal is to find a relevant way to price options on volatility [3]. The preliminary research will require an in-depth study of the dynamics of volatility and the understanding of the way the VIX index (the index on volatility) is computed. Talks with staff from the CBOE in Chicago (Chicago Board of Options Exchange) will be a must.

Then, first pricing models will be run with Monte Carlo and C++. A research will be done to see which pricing model would be the most suitable for our purposes.

Eventually, calibration with real market data will be done.

If the study is successful, a final step would be to find relevant trading strategies that exploit potential market inefficiencies.

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 european and US markets will be readily available for number crunching.

3 What you will gain from this experience

You will gain a massive expertise in C++ and in quantitative finance that will be useful for your career as future Traders or Quants. Your knowledge and understanding of derivatives will be extremely high. 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 if you need and 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>.

References

- [1] Demeterfi, Derman, Kamal, Zou, 1999, More Than You Ever Wanted To Know About Volatility Swaps
Goldman Sachs Equity Derivatives Research, 1999
- [2] Chicago Board of Options Exchange
<http://www.cboe.com/VIX/>
- [3] Peter Carr: Realised volatility and variance: options via swaps
Risk.net.