

Scientific Seminar for ECP 2009-2010

Designing a Trading Robot that Trades on Futures on Volatility

Student X and Student Y,
Ecole Centrale Paris
Tuan Nguyen
Arbitragis Trading, Paris, France

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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 challenging and fascinating one: ECP students will try and create a robot that will trade and arbitrage the futures on volatility market.

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 trade futures on volatility [3]. The preliminary research will be based on the understanding on our in-house research on futures on volatility and will require an in-depth study of the dynamics of volatility, as well an understanding of the way the VIX index (the index on volatility) is computed.

You will try and detect inefficiencies in the VIX futures and implement a trading strategy with our in-house proprietary softwares.

2 Tools Given by Arbitragis

Selected students will need to be very proficient in C++ and quantitative finance. They will leverage on 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. The subject has a strong finance / trading bias, but requires a very good knowledge of C++ : students need ideally to be familiar with inheritance, multithreading, parallel computing, polymorphism.

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. Your work will be the continuation of the work previously done by Cyril Neyme and Kevin Maurice (ECP 2009).

Eventually, you will benefit from our trading methodologies, know-how, and vision. During your spare time, you will be allowed to trade on X-Trader, on our in-house simulated market platform.

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:

- Teaching of *Computational Finance with Graphics Processing Units*, Applied Mathematics class, January 2010 with Ioane Muni Toke [Click here for the schedule and the agenda.](#)
- Study of Earthquake Predictions Applied to Financial Crashes. Michael Martos, ECP 2008
- Lookback Options Pricing and Trend Following Strategies. Francois Bouscarle & Fabien Charbonnel, ECP 2008
- Levy Laws used in Derivatives Pricing, Geoffrey Gascq, ECP 2008
- Statistics and Market Predictions, Otakar Frank, ECP 2008
- Massively Parallel Quasi Monte Carlo, Grégoire Jauvion, ECP 2009
- Visualization of High Frequency Market Data, Raphael Megzari & Hugo Delaborde, ECP 2010
- Pricing of Futures on Volatility, Cyril Neyme, Kevin Maurice-Vallerey, ECP 2009
- Hedge Fund Strategies Analysis, Jean-Romain Derote, Rémi Quilliet, ECP 2009
- Algorithmic Music derived from Stock Market Prices, Nicolas Thomas, Romain Davroux, Emmanuel Losada, ECP 2011
- Creation of a World-Class Computing Go game, Kevin Trouilleux, Pierre-Jean Stalter, Mikhail Gorodilin, Florent, ECP 2011

5 How to apply ?

Please send a resume in pdf form to stages@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.