

Internship Research Subject 2009-2010

Microstructure Noise in Financial Markets

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Abstract

A new field in quantitative finance is emerging : high-frequency trading. This area of derivatives trading is very different from traditional trading (say volatility trading or convert arbitrage) because of the massive amount of data that needs to be processed and because of a relative lack of academic work that has been done on the subject. One big issue that modern finance has not managed to solve yet, is the impact of microstructure noise. Indeed, a stock price tends to bounce between the bid and the ask price and this move, invisible at the daily level, becomes a problem at high frequency. This noise at the tick level pollutes traditional computations of volatility or correlation. In addition, the fact that data under the 2-minute interval may be sparse and unevenly spaced in time makes traditional statistical analysis obsolete: at a high-frequency level, we are dealing with what we call *stochastic time*.

We propose an internship research subject that aims at understanding how to handle microstructure noise.

Keywords: microstructure noise, stochastic time, tick data, high-frequency finance, jump diffusion process.

1 Research Steps

You will try and understand how microstructure noise can be analyzed with stochastic calculus. Inspiration may come from the thesis report from Rosenbaum and from Farmer models. We will then try to see how microstructure noise can affect trading and risk measures. Adjustments to regular statistics will be researched in order to compute more relevant statistics such as volatility and correlation. You will do a thorough documentary research relying partly on our internal scientific library and on academic papers. A calibration of relevant models will be done in order to try and measure the impact of microstructure noise.

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

A computing power similar to the computing power as Meteo France will be provided to students. 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. You will benefit from the expertise of a competent and available staff that will help you whenever you need. Our development methodologies based on agile programming and our expertise in financial markets will allow you to create trading robots within an extremely short period of time. We also teach computational finance in Ecole Centrale Paris, and you will also take advantage of our research and vision.

4 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>.

5 Who should apply ?

Selected students will need to be extremely proficient in C++ and for Monte Carlo simulations, and ideally with market microstructure theory.

Students from Polytechnique, Telecom Paris, Mines de Paris, and Centrale Paris. DEA from P6 and P7 may also apply if they graduated from one of the previous schools.

6 Internship dates

Dates are flexible, starting from January 2010 or later, for total length of 4-6 months.

References

- [1] Olsen, 2001, An Introduction to High Frequency Finance
Academic Press
- [2] Smith, Farmer, Gillemot, Krishnamurthy, 2003, Statistical Theory of the continuous double auction
Quantitative Finance