Market Microstructure in Practice: Why and how to trade optimally in a fragmented market

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Purpose of these Lectures

It is not the presentation of a recent research, but a mix of my former experience as the Global Head of Quant Research of the Equity Brokerage and Derivative Dept. of a large Investment Bank (Crédit Agricole CIB), with a specific focus on trading since I started at CACIB as Head of Quant Research of its brokerage arm (CA Cheuvreux), my current one as Senior Research Advisor in an hedge fund (CFM), and the questions I have or had to answer to the French regulator (AMF), the European one (ESMA), and other entities I have positions into.

Nevertheless I only talk on my behalf, all that is written or said is only my opinion and not theirs.

My three lectures are split across:

- **The Emergence of Continuous Trading** . In this part I will deal with microstructural topics in the *classical sense*, but with a specific angle: the one of the role of the financial system. We will talk about intermediation, fragmentation, regulation, market making, etc.
- **What to model and what for?** is the question I will address during the second part. Of course it is linked with the user of the model. The role of market participants, their needs in modelling (observed market dynamics and/or the nature of their interactions with markets) will be discussed. From an empirical or a theoretical viewpoint.
- **Optimal trading? In what sense?** During the last part I will simply focus on the principal — agent problem in optimal trading (we will have a lot of talks about optimal trading techniques this week), and open the topics to big data with the issue of monitoring hundreds of trading algorithms in realtime.

More Details About the Talks

The Emergence of Continuous Trading .

- The role of financial markets in the financial system
- Recent evolutions of microstructure
- Fragmentation(s)

What to model and what for?

- Market participants
- Observing short term dynamics: simple descriptions
- Short term dynamics: towards orderbook modelling
- Modelling interactions with markets: Market Impact

Optimal trading? In what sense?

- Optimal trading in the Principal-Agent problem
- Monitoring trading algorithms: a machine learning viewpoint

Main Supporting Papers and Books I

Optimal Trading.

1. Bruno Bouchard, Ngoc-Minh Dang, and Charles-Albert Lehalle. Optimal control of trading algorithms: a general impulse control approach. *SIAM J. Financial Mathematics*, 2(1):404–438, 2011.
2. O. Guéant, Charles-Albert Lehalle, and J. Fernandez-Tapia. Optimal Portfolio Liquidation with Limit Orders. *SIAM Journal on Financial Mathematics*, 13(1):740–764, 2012.
3. Olivier Guéant and Charles-Albert Lehalle. General intensity shapes in optimal liquidation. *Mathematical Finance*, page n/a, October 2013.
4. Olivier Guéant, Charles-Albert Lehalle, and Joaquin Fernandez-Tapia. Dealing with the inventory risk: a solution to the market making problem. *Mathematics and Financial Economics*, 4(7):477–507, September 2013.
5. Mauricio Labadie and Charles-Albert Lehalle. Optimal starting times, stopping times and risk measures for algorithmic trading. *The Journal of Investment Strategies*, 3(2), March 2014.
6. Charles-Albert Lehalle. Market Microstructure knowledge needed to control an intra-day trading process. In Jean-Pierre Fouque and Joseph Langsam, editors, *Handbook on Systemic Risk*. Cambridge University Press, May 2013.

Market Microstructure.

7. Lehalle, C.-A., Laruelle, S., Burgot, R., Pelin, S., and Lasnier, M. (2013). *Market Microstructure in Practice*. World Scientific publishing.

Main Supporting Papers and Books II

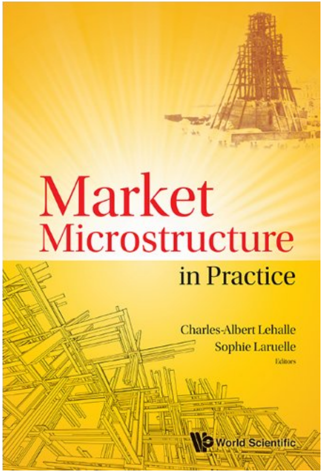
8. Frédéric Abergel, Jean-Philippe Bouchaud, Thierry Foucault, Charles-Albert Lehalle, and Mathieu Rosenbaum, editors. *Market Microstructure Confronting Many Viewpoints*. Wiley, 2012.
9. Emmanuel Bacry, Adrian Iuga, Matthieu Lasnier, and Charles-Albert Lehalle. Market Impacts and the Life Cycle of Investors Orders. *Social Science Research Network Working Paper Series*, December 2014.
10. Paul Besson and Charles-Albert Lehalle. The Deal/Book Split Analysis: A New Method to Disentangle the Contribution to Market and Limit Orders in Any Price Change. *Social Science Research Network Working Paper Series*, January 2014.
11. Weibing Huang, Charles-Albert Lehalle, and Mathieu Rosenbaum. Simulating and analyzing order book data: The queue-reactive model, December 2013.
12. Aimé Lachapelle, Jean-Michel Lasry, Charles-Albert Lehalle, and Pierre-Louis Lions. Efficiency of the Price Formation Process in Presence of High Frequency Participants: a Mean Field Game analysis, May 2013.
13. Charles-Albert Lehalle, Matthieu Lasnier, Paul Besson, Hamza Harti, Weibing Huang, Nicolas Joseph, and Lionel Massoulard. What does the saw-tooth pattern on US markets on 19 July 2012 tell us about the price formation process. Technical report, Crédit Agricole Cheuvreux Quant Note, August 2012.
14. Charles-Albert Lehalle, Olivier Guéant, and Julien Razafinimanana. High Frequency Simulations of an Order Book: a Two-Scales Approach. In F. Abergel, B. K. Chakrabarti, A. Chakraborti, and M. Mitra, editors, *Econophysics of Order-Driven Markets*, New Economic Windows. Springer, 2010.

Main Supporting Papers and Books III

Stochastic Algorithms for trading.

15. Gilles Pagès, Sophie Laruelle, and Charles-Albert Lehalle. Optimal split of orders across liquidity pools: a stochastic algorithm approach. *SIAM Journal on Financial Mathematics*, 2:1042–1076, 2011.
16. Sophie Laruelle, Charles-Albert Lehalle, and Gilles Pagès. Optimal posting price of limit orders: learning by trading. *Mathematics and Financial Economics*, 7(3):359–403, June 2013.
17. Robert Azencott, Arjun Beri, Yutheeka Gadhyan, Nicolas Joseph, Charles-Albert Lehalle, and Matthew Rowley. Realtime market microstructure analysis: online Transaction Cost Analysis. *Quantitative Finance*, pages 0–19, March 2014.

And more...



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The aim of the journal is to become the leading forum on market microstructure related issues (in a very broad sense) such as market design, regulation, high frequency trading, statistics of high frequency data, order books dynamics and liquidity effects at every time scale, intraday derivatives hedging and portfolio management.
One of the main goals of Market Microstructure and Liquidity is to bridge the gap between academia and industry on these topics. Hence, the editorial board of the journal consists of top academic researchers from at least five different communities (economics, financial mathematics, econometrics, statistics and econophysics), together with an industry advisory board, which includes practitioners from some of the most important investment banks, hedge funds and exchanges, and regulators from international agencies. We believe the role of an industry advisory board is crucial in identifying important and challenging research topics.
We encourage authors to submit their work on these topics to Market Microstructure and Liquidity. Papers can be theoretical, empirical, or both. Our goal is to provide them fair reviews without following any community standards.
To be accepted for publication, a paper should simply meet at least one of the two following criteria:
- Improve our knowledge on market microstructure significantly;
- Provide relevant and innovative new tools for market practitioners.
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