Barcelona School of Economics

COURSE SYLLABUS **16F026**

Market Liquidity and High Frequency Trading

3 ECTS **TERM 2** **ELECTIVE COURSE**

Professor

Professor: Roberto Pascual

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Prerequisites to enroll

The target audience for this course is economics and finance graduate students. The course is mostly self-contained, but it presumes some exposure to undergraduate finance, economics, statistics, and econometrics. The grade will be based on weekly empirical exercises with real data and a final exam.

Overview and objectives

This course provides both theoretical and (primarily) empirical background on Market Microstructure, an area of Financial Economics that studies the organization and regulation of markets and its impact on market quality. The course central topics are liquidity of security markets, price discovery at high frequencies, and high-frequency trading (HFT).

Regarding liquidity and price discovery, these are some of the questions we will address in the course are: What is liquidity? Why do we care about liquidity? How can we measure it? Why liquidity matters in asset pricing? What is the limit order book? What are the risks and costs liquidity providers run?

How can they manage those risks? Is the liquidity of different stocks connected somehow? Why do prices change at high frequencies? What are trading frictions and what do they have to do with liquidity and price discovery? Does trading activity contribute to price discovery? Does the presence of informed traders in the market impair liquidity? Can we measure the likelihood of trading with informed traders?

Regarding HFT, these are some of the topics we will cover: What is algorithmic trading? What is HFT? What strategies do high-frequency traders (HFTs) implement? Do HFTs contribute to liquidity supply? Do they contribute to price discovery? What are the main concerns about HFT?

Objectives:

- Understand the foundations of market microstructure research
- Understand why liquidity matters
- Understand how securities markets work and how are they organized
- Learn how various market imperfections affect price formation, liquidity, and the speed of price discovery
- Understand the interplay between order flow and price discovery
- Understand why HFTs have changed the way markets work

Course outline

The course will combine basic conceptual background, seminar theoretical models (only a bit), and overview of academic empirical studies and methods. The students will learn about some of the issues involved in the course by working themselves with high-frequency data.

Part I: General background: Electronic markets and HFT

Part II: Order flow and price discovery

Part III: HFT: Strategies and Impact (I)

Part IV: HFT: Strategies and Impact (II)

Detailed description:

Session	Day	Time	Title, contents, material
1	Th.	17h	Liquidity supply in electronic markets
2	Fr.	11h	HFT: Need for speed
3	Th.	17h	Order flow and price discovery (I)
4	Fr.	11h	Order flow and price discovery (II)
5	Th.	17h	The diversity of HFTs
6	Fr.	11h	HFT and liquidity
7	Th.	17h	HFT and price discovery / HFT: Concerns
8	Fr.	11h	Fragmentation

Required activities

Evaluation is based on homework assignments and a final exam.

Evaluation

Final exam: 60% and Bi-weekly homework exercises: 40%

Competencies

☐ Construct a global vision of the situation of the problem based on knowledge of the synergies between advanced statistical methods, computing and business analysis to generate added value.

☐ Modeling and predicting high-dimensional data with advanced statistical methods in the field of data science in order to improve strategic decision making.

☐ Solve the real problems that arise in the fields of study through the accurate analysis of the data.

☐ Communicate with conviction in English the results and implications of the required analytical study using a language related to the receiver.

☐ Work in a heterogeneous team of researchers in the field of the economic analyst using specific group techniques.

☐ Own and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.

☐ That students know how to apply the acquired knowledge and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.

☐ That the students be able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, include reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.

☐ That the students know to communicate their conclusions and the knowledge and last reasons that sustain them to specialized and non-specialized publics in a clear and unambiguous way.

☐ That students have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.

Learning outcomes

☐ Make decisions based on the fundamentals of the markets and the behavior of public agents.

☐ Apply optimization algorithms in business and marketing problems.

☐ Associate the role of public policies in the economic framework.

☐ Apply mathematical and statistical analysis using economic theory in complex problems with high-dimensional data.

☐ Apply mathematical theory and statistics on data sets from disparate disciplines.

By the end of the course, the students will be able to use the machinery of Itô calculus, and be capable to evaluate the price of current financial derivatives and construct the hedging portfolio. Practitioners from banks will be invited to give seminars to students.

Bibliography

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Foucault, T., M. Pagano, and A. Roëll (2013). Market Liquidity: Theory, Evidence and Policy. Oxford University Press (Basic).

Harris L. (2003). Trading and Exchanges. Oxford University Press.
Hasbrouck, J. (2007). Empirical Market Microstructure: The Institutions, Economics, and Econometrics of Securities Trading. Oxford University Press. (Basic)
O'Hara, M. (1995). Market Microstructure Theory. Blackwell Publishers Inc.

Professor's Biography

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EDUCATION
Ph.D. in Economics
Universidad Carlos III de Madrid

AREAS OF INTEREST
Market microstructure
Financial Econometrics

RECENT SELECTED PUBLICATIONS IN ENGLISH

Chakrabarty, B., and R. Pascual "Stock liquidity and algorithmic market making during the COVID-19 crisis" *Journal of Banking and Finance*, forthcoming.

Abad, D., M. Massot, and R. Pascual, 2018. "Evaluating VPIN as a trigger for single-stock circuit breakers." *Journal of Banking and Finance* 86, 21-36.

Chakrabarty, B., Pamela C. Moulton, and R. Pascual, 2017. "Trading System Upgrades and Short-Sale Bans: Uncoupling the Effects of Technology and Regulation." *Journal of Empirical Finance* 43, 74-90.

Chakrabarty, B., R. Pascual, and A. Shkilko, 2015. "Evaluating trade classification algorithms: bulk volume classification versus the tick rule and the Lee-Ready algorithm." *Journal of Financial Markets* 25, 52-79.

Pascual, R., and B. Pascual-Fuster, 2014, "The relative contribution of ask and bid quotes to price discovery." *Journal of Financial Markets* 20, 129-150.