GF04 (Mathematics and Statistics of Algorithmic Trading)

Year:	2014–2015
Code:	MATHGF04
Value:	15 UCL credits
Term:	2
Structure:	3 hour lectures per week
Assessment:	100% examination. Student must achieve at least 50% to pass this course.
Normal Pre-requisites:	MATHGM21 Quantitative & Computational Finance
Lecturer:	Dr A Cartea

Course Description and Objectives

The objective of this course is to introduce mathematical concepts and tools used in the finance industry for algorithmic and high frequency trading.

Some of the techniques taught in this course are standard in the finance industry and other material is cutting edge research that is currently being applied by proprietary trading desks. The student will be familiar with industry-standard methods and will be able to set-up and solve stochastic control problems that deal with the most up-to-date requirements of the industry; market making, optimal liquidation and optimal acquisition.

On successful completion of the course, a student should have a good understanding of how electronic markets function and what are the problems faced by stakeholders when buying and selling assets. Students will have a good understanding of market making activities - designated traders, specialists, and high frequency traders. Moreover, the student will be familiar with some of the classical microstructure theory of market making and will be able to work with ultra-high frequency data (millisecond stamped).

Recommended Texts

Huyen Pham, *Continuous-time Stochastic Control and Optimization with Finance Applications: Stochastic Modelling and Applied Probability*, Springer, 2009.

Fwu-Ranq Chang, *Stochastic Optimization in Continuous Time*, Cambridge University press, 2009.

Detailed Syllabus

Stochastic Optimal Control. High and low frequency market making. Optimal liquidation. Optimal acquisition. Different types of orders sent to exchanges (e.i. limit order, market order, fill-or-kill, immediate-or-cancel, hidden orders, etc.), dynamics of the Limit Order Book.