The Hong Kong Polytechnic University
Department of Applied Mathematics

Colloquium

Endogenous Formation of Limit Order Books: Dynamics Between Trades

by

Prof. Sergey Nadtochiy

Department of Mathematics, University of Michigan, U.S.A.

Abstract

In this talk, I will present a continuous time modeling framework in which the shape and dynamics of a Limit Order Book (LOB) arise endogenously from an equilibrium between multiple market participants (agents). Using a framework based on a continuum-player game (proposed in our previous work), I will model the shape and dynamics of LOB between two consecutive trades. In this model, the LOB arises as an outcome of an equilibrium between the agents, who have different beliefs about the future demand for the asset. These beliefs may change according to the information observed by the agents, and represented by a relevant stochastic factor, implying a change in the shape of the LOB. This model is consistent with the empirical observation that most of the changes in the LOB are not due to trades. More importantly, it allows one to see how changing the relevant stochastic factor (which is not specified in our approach, and can be chosen arbitrarily) will affect the LOB. The latter is important, for example, for modeling the price impact – if the relevant factor is chosen as a function of the LOB itself. On the mathematical side, we formulate the problem as a mixed control-stopping game, which we manage to split into two parts: a two-dimensional system of Reflected Backward Stochastic Differential Equations and an additional fixed-point problem. Although both problems present certain mathematical challenges, we manage to prove existence of their solutions and show how they can be computed in a simple example.

Date :   22 August, 2016 (Monday)
Time :   11a.m. – 12noon
Venue : TU801, The Hong Kong Polytechnic University

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