

September 23<sup>rd</sup>, 2019  
KAP 414  
2:00 P.M. – 3:00 P.M.

**Professor Andrew Lyasoff**  
(Boston University)

**“Incomplete-Market Equilibria with a Large Number of Heterogeneous Agents and BSDEs”**

**Abstract:** Incomplete-market equilibrium models with a very large number of heterogeneous agents do parallel models of mean field games and control, but also involve interactions that cannot be placed in the standard mean field framework. Specifically, while the cross-sectional distribution of the agents' wealth must be accounted for, the agents must still coordinate their individual choices of the control variables because: (a) they must agree on the (endogenous) asset prices, and (b) their choices must clear the market. In fact, as the prices are endogenous, the individual control problems are not meaningful until all agents agree on those prices, i.e., the individual control problems are only meaningful if treated all together. Nevertheless, by using the technique introduced by Dumas and Lyasoff (JF, 67:5) it becomes possible to solve some common equilibrium models of incomplete markets with a large number of heterogeneous agents (so to speak, to solve mean fields with "orchestrated" controls). This technique is based on a special decoupling of the first order conditions, organized in such a way that at every step one solves simultaneously for certain control variables attached to the current period and other control variables attached to the next period. There is a very close connection between these steps and the principle of maximum formulated in terms of BSDEs. The main difference in relation to (JF, 67:5), which assumes a small number of agents, is in the need to account for the cross-sectional distribution of agents (whence the parallel with the mean field terminology and methodology). It will be shown how the same approach can be applied to classical mean field control problems in discrete time, potentially leading to new approximation methods. The talk will conclude with concrete examples of Bewley-Aiyagari models taken from classical macroeconomic texts, and will discuss the difference between the answers obtained by the proposed new approach and those obtained via the common solution methods.