Department of Decision Sciences

Endogeneity in Dynamic Models

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Abstract

We consider models where an explained variable Y is a function of an explanatory variable Z and an unobservable noise U. The variable Z is exogenous if Z and U satisfy some independence condition which characterizes the relation between Y and (Z,U). The variable Z is endogenous if such an independence does not hold and is replaced by an independence condition between U and some other random elements W called instrumental variables. The relation between Y and (Z,U) is then characterized by the independence between W and U which takes the form of an integrated equation and the function to be estimated is the solution of an ill-posed inverse problem.
The object of this seminar is to extend this analysis to cases where all the random elements of this problem become stochastic processes.
In a first step we define an instrumental variable decomposition of semi-martingales where the process Yt, is decomposed into a predictable process with respect to the explanatory process Zt and an error Ut which satisfies a martingale property with respect to the instrumental processes. This analysis cover in particular the case of diffusions where the drift only depends on endogenous variables. In a second step we consider models where the endogenous elements changes through a sequence of stopping times which transform the process Yt into a process Ut of given distribution and independent of the instruments. Particular examples of this second case are counting processes and general diffusion processes.

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