Istituto Metodi Quantitativi - Università L. Bocconi
Viale Isonzo, 25 - 20135 Milano
Tel. 02-58365632 - Fax 02-58365630

SEMINARIO

"Simpson's paradox for the Cox model"

Marco Scarsini
(Dipartimento di Scienze Economiche e Aziendali – LUISS)

Lunedì, 28 Maggio 2007 – ore 14.00
Aula 137 – Viale Isonzo 25 - 20135 Milano

Abstract:

In the context of survival analysis, we define a covariate X as protective (detrimental) for the failure time T if the conditional distribution of [T |X = x] is stochastically increasing (decreasing) as a function of x. In the presence of another covariate Y, there exist situations where [T |X = x, Y = y] is stochastically decreasing in x for each fixed y, but [T |X = x] is stochastically increasing. When studying causal effects and influence of covariates on a failure time, this state of affairs appears paradoxical and raises the question of whether X should be considered protective or detrimental. In a biomedical framework, for instance when X is a treatment dose, such a question has obvious practical importance. Situations of this kind may be seen as a version of Simpson's paradox. In this paper we study this phenomenon in terms of the well-known Cox model of survival analysis. The introduction of a time variable makes the paradox more interesting and intricate: it may hold conditionally on a certain survival time, that is, on an event of the type {T > t} for some but not all t, and it may hold only for some range of survival times. We analyze these times, as well as conditions on the parameters of the model and the type of dependence between X and Y required for the paradox to hold. Among other things, we show that the paradox may hold for residual failure times conditioned on T > t even when the covariates X and Y are independent. This is due to the fact that independent covariates may become dependent when conditioned on the failure time being larger than t.

(Joint work with Clelia Di Serio and Yosef Rinott)