Nonparametric Estimation in Random Coefficients Binary Choice Models

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Resumen We consider the estimation of the joint density of the random coefficients in a random coefficient model $Y = \mathbf{1}\{X'b > 0\}$ where $\mathbf{1}$ denotes the indicator function and X is a d-vector of covariates such that the first element is 1. The first element of b in this formulation absorbs the usual scalar stochastic shock term as well as a constant in standard binary choice with non-random coefficients. X and b correspond respectively to observed and unobserved heterogeneity across agents. This is an ill-posed inverse problem. The operator that relates the density of the random coefficient with the choice probability is called the hemispherical transform. It corresponds to a convolution on the $d-1$ dimensional sphere. Fourier- Laplace series allow to have a clear insight on the identification problem and what useful restrictions allow to have identification. We propose a general procedure to estimate the density of the random coefficient. Characterizing the degree of ill-posedness in the Sobolev spaces based on L^2 we are able to relate the rate of convergence of an estimate of the density with that of an estimate of the choice probability. Finally, given a particular estimate of the choice probability relying on a plug-in of an estimate of the density of the design and smoothed othogonal projection kernels, the estimate of the density of the random coefficient takes a simple closed form which is easy to implement in empirical applications and for which we obtain rates of consistency in all L^p spaces and prove asymptotic normality. If time will permit, extensions including estimation of marginals, treatment of nonrandom coefficients and models with endogeneity could be presented.