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Italians love wine differently: A latent class hedonic price model

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Abstract

Introduction - The hedonic pricing model assumes that goods consist of a bundle of characteristics valued by their utility-generating properties. Market price reflects the composition of the attributes that, on the contrary, have no explicit price. To this extent, it is possible to value the attributes that compose the final good by analysing the systematic variation in the price (Rosen, 1974). In what follows we propose an econometric technique that contributes to the growing literature seeking to incorporate unexplained heterogeneity in the estimation of hedonic price functions.

Data - Our empirical specification is built on the full set of wines marketed for domestic consumption in the year 2016 in Italy. More than 166,000 purchases of wine made by around 8,000 households, statistically representative of the Italian population, were recorded (HomeScan) by A.C Nielsen (a leading market research organization operating worldwide

Methodology

A cluster-wise regression analysis, capable to identify observations exhibiting similar behaviour, is based on a mixture model (Melnykov and Martra, 2010). Unlike traditional approaches, there is no prior assumptions about the number of clusters. Indeed, this method allows to design the groups according to consumers characteristics and their sensitivity to economic variables. The definition of the clusters is simultaneous with the estimation of the model parameters and the estimation procedure is based on the Expectation-Maximization (EM) algorithm (Dempster et al., 1977). Other approaches

instead compute in a first stage the clusters and then estimate the regression coefficients within each class.

Consider the price of wine yi as function f (xi[?][?]) of a set of explanatory variables comprising both consumers characteristics, xi1, and product features, xi2, in a sample of size n. The maximum likelihood objective function, which provides the maximization step, is given by $\prod n\pi if(yi|xi,zi$ =1), (1) where [?]i is the probability of an observation to belong to a given group, and zi is a non-observable latent variable determining for each observation its involvement in one group or another. For each observation the probability of inclusion in a

group,?i, is function of zi, with zi =g (xi1, δ) which assumes values 0 and 1 to define the exclusion or the inclusion of an observation in a specific group

The idea is that each group of consumers has its own distribution $f_k(x_{i2}???)$), and each observation has its own probability of belonging to a group. The EM algorithm breaks in two steps the objective function in (1): it iterates between the estimated expected probability of belonging to a specific group πi and the estimates of the regression coefficients for each group. This estimation approach allows to model bimodal/multimodal distributions and more generally finite mixtures of distributions. The bimodality/multimodality of the y distribution allows to model the presence of two/many distinct groups of consumers.

Results - A multi-class hedonic model for wine, yields the identification of four distinct wine classes based on implicit prices of product attributes. The procedure identifies cohorts of sample observations exhibiting similar economic structural behaviour meanwhile computing the coefficients of the model. This allows to compute class-specific implicit prices without any prior knowledge or assumption on the clustering. The analysis in four classes turns out to be more efficient than the model estimated without clustering.

Keywords: Hedonic pricing, **finite mixture, wine**

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