

Abstract

The Basel II framework strictly defines the conditions under which financial institutes are authorized to accept real estate as collateral in order to decrease their credit risk. The value of a residential house, for example, has to be assessed every three years, in volatile markets even more frequently. The use of statistical methods for this valuation process is explicitly allowed.

A widely used concept is the hedonic valuation approach. It assumes, that a property can be characterized by a bundle of attributes that involves both structural covariates (the floor space area, the age of the building, etc.) and locational covariates (the proximity to places of work, the buying power index in the respective region, etc.). Each of these attributes can be assigned an implicit price, summing up to the value of the entire property.

With respect to value-at-risk concepts financial institutes are often not only interested in the expected value but in different quantiles of the distribution of real estate prices. There are basically two approaches to estimate a certain quantile: The more popular one is to first determine the conditional mean and then deduce the respective quantile by assuming a normal distribution of house prices. However, the marginal effects of a certain covariate then are identical for all quantiles. In this paper we introduce a trickier approach to model real estate data, namely the quantile regression that gets along without a specific distribution assumption. Thus, it is much more flexible and allows for evaluating individual marginal effects for each quantile.

We develop a semiparametric model that involves linear, nonlinear and spatial effects. Non-linear effects are modeled with P-splines, spatial effects are represented by Gaussian Markov random fields. Due to the high complexity of the model the final estimations are based on a Bayesian approach. The results are analyzed in detail and then compared with those of the classical mean regression under the normal distribution assumption. The remarkable differences for some covariates suggest the use of a model selection criterion that finally shows the quantile regression to be superior.

To sum up, quantile regression can provide a comprehensive picture of the distribution of house prices and allows for new insights in modeling real estate data. Thus, the model developed may offer a useful addition to common valuation systems of financial institutes.