

Propagating the Uncertainty of the Market Value by the Use of a Bayesian Regression Approach

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SUMMARY

The real estate and finance crisis has shown the importance of real estate valuation: The market value has to satisfy high objective requirements. Besides, the German jurisdiction demands a maximum dispersion of $\pm 20\%$ of the market value. The sales comparison approach as one of the valuation methods is from a mathematical-statistical point of view based on a multiple linear regression analysis. Since decades it has been considered as a standard procedure for analysing the real estate market and to determine the current market value. Nevertheless, the method has not been enhanced significantly since its introduction. The estimated comparative value is in particular depending on the number and the type of value influencing characteristics which are considered within the regression model. The aim of this research is to enhance the use of regression analysis in real estate valuation by the use of a Bayesian regression approach, which is able to consider the uncertainty of the value affecting characteristics as a prior information and thus to quantify the impact to the market value. For this purpose, the prior information of the data has to be derived empirically from the data itself using empirical Bayes method. The resulting density function after applying the Bayes theorem, the posterior density, has to be estimated by means of Monte Carlo techniques. After initialization, the estimates and their uncertainty are used as a prior information for following analysis. Thus, the uncertainty of single analysis can be propagated at any subsequent data set. The methodology is tested on a real data set. The establishment of the advanced mathematical approach should allow predicting any real estate values for objects within the selected spatial and objective submarket. It can be supposed, that this approach should provide more precise and appropriate uncertainty of predicted values and the use of information that are not yet included in the regression analysis.