

Weekly Hedonic House Price Indexes: An Imputation Approach with Geospatial Splines and Kalman Filters

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Paper Abstract:

The hedonic imputation method provides a viable way of constructing quality-adjusted house price indexes. However, the method becomes unreliable at higher frequencies (e.g., for weekly indexes), since then the underlying price trend will be close to zero and even in large data sets there may not be enough price observations in each period. As a consequence computational and statistical problems occur (e.g., no observations for some postcodes, a loss in degrees of freedom, or an increased variance of estimated parameters). We show how the reliability of weekly indexes can be improved by replacing postcode dummies by a geospatial spline and then using a Kalman filter. This approach has two advantages. First, the dimensionality of the model is reduced. Replacing postcode dummies by values from the geospatial spline function at each location in the data set very significantly reduces the number of parameters that need to be estimated, and the number of covariance restrictions that must be imposed to make the Kalman filter operational. Second, the small number of observations in each period causes larger variability in estimated parameters (shadow prices) which should not change that much from one week to the next. Estimation of a dynamic linear model with the Kalman filter interconnects those parameters over time. Applying this hedonic geospatial spline/Kalman filter approach to data for Sydney (Australia) we show that it outperforms competing alternatives for computing house price indexes at a weekly frequency.