A Model Based Approach to Produce Residential or Commercial Property Price Indices

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HIGHLIGHTS

- Hedonic Double Imputation Laspeyres House Price Indices
- We Link Sold Properties
- Create Pseudo Housing Units
- Calculate Accurate Indices with Reduced Sample Sizes

To answer this questions we apply Mixed Effects Models

- Interesting technique to analyze longitudinal data because they offer us some prerogatives:
  a) Analyze individual trajectories
  b) Identify variance components
  c) Predictors that explain intradividual variance and variance among groups

Methodology

- We define a fixed sample (T) – 60 Specific Properties.
- We specify the Model
- Ex: To calculate Results for Jan/2016
  We estimate Model coefficients taking into account data from the last 24 months
  Generate Predict Values for each property in sample for Dec/15 and Jan/2016
  Calculate the index for Jan/2016 (matrix $\frac{\sum_{j=1}^{12}|(x_{ij} - \bar{x}_j)|}{\sum_{j=1}^{12}|\bar{x}_j|}$)

Model

Variables:
- Site, Month, Condo Characteristics, Neighbor (Zip Code), Distance to the sea

Hedonic Double Imputation Laspeyres Price Indices

6 different Sample Sizes

Indices for 2016 from different samples

Concluding Remarks

- We calculate Quality Adjusted Indices
- Longitudinal models allows more accurate results than other methods with the same sample size
- Results based on transaction prices
- We are analysing alternative data sources and methods (Using Appraisal Prices)

Appendix

Mixed Effects Models

Estimation of a standard linear model:

$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + \beta_4 X_{4t} + \eta_t + \xi_t$

Matrix Notation: $Y_t = (X_t) \cdot (\beta) - \mu$ + (Error)

We can specify distributions: $\mu \sim N(0, \Sigma) \quad \eta_t \sim N(0, \Sigma_e) \quad \xi_t \sim N(0, \Sigma_x)$

Cov Structure given by $\Sigma_e = \Delta \Sigma \Delta'$

Between Variance: ($\sum_{\Delta} \Sigma \sum_{\Delta} \Delta'$)

PS: Covariance Pattern Models (CPM): $Y_t = X_t \cdot (\beta) + \epsilon_t$, where $\text{cov}(\epsilon_t) = 0$

Thank you!