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Expert opinion versus actual transaction evidence in the valuation of non-market amenities

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ABSTRACT

Actual property values are overwhelmingly employed as a dependent variable in hedonic pricing models. Yet, assessed property values are generally more readily available than actual sales values and have, in some studies, been used in lieu of market prices. In this study, we compare estimates of different non-market amenity values based on actual transactions and assessed values. We estimate a Seemingly Unrelated Regression (SUR) model with two hedonic price equations, one with actual market values as the dependent variable and the other with assessed property values, and compare the resulting estimates of shadow prices for open space amenities. We also take into account spatial autocorrelation and combine Method of Moment estimates of the spatial parameters in both equations to create our test statistic. The results indicate that we cannot accept the hypothesis that the impacts of open space on property values are the same for actual sales and assessed values. Moreover, we do observe some differences between the distributions of assessed versus sales values, although the difference between the sizes of open space effects measured within the two equations is rather limited. Thus, while this one study is insufficient to enable one to draw definitive conclusions, there remains the possibility that policy makers cannot reliably base decisions on amenity values obtained from a hedonic model using assessed values.

1. Introduction

Hedonic pricing models are generally used to estimate the value of open space and the externalities that different land uses impose on one another, because these non-market values leave traces in property markets. That is, prices are decomposed into their constituent parts to reflect the value of separate property characteristics. Thus, prices of residential properties can be used to value open space, forest landscapes, viewscapes, urban sprawl, and other (positive or negative) externalities that affect people's purchasing behavior (Doss and Taff, 1996, Hardie, et al., 2007, Lichtenberg and Hardie, 2007). In some cases, hedonic price models are also used for policy purposes to determine, for example, the welfare and income distributional effects of proposed zoning legislation or other regulations that affect land use (Jaeger and Plantinga, 2007, Lichtenberg, et al., 2007).

Actual property values are overwhelmingly preferred as a dependent variable in hedonic pricing models, because they reflect how people allocate their money and thereby how they value housing compared to other goods (Darling, 1973). However, assessed property values are generally more readily available than actual sales values and have in some cases been used in lieu of market prices (Darling, 1973, Doss and Taff, 1996, Jaeger and Plantinga, 2007, Lee, et al., 2008, Seiler, et al., 2001). Therefore, assessed values are potential proxies for true property values. In contrast to prices observed when properties are sold on the market, assessed values are 'calculated' primarily for tax purposes. In most jurisdictions in North America and Europe, properties are assessed regularly to determine property taxes, and are often available each year for all properties. Therefore, a large panel dataset of assessed values is available. The advantage of such a large panel dataset is that, inevitably, there will be unobservable factors that affect housing values and are correlated with observed factors. The ability to control for time-invariant unobservables is a considerable benefit from using a panel data of assessed values that would not be available for actual market values as sales occur too infrequently.

Although assessors are obliged to assess properties at their market values, with Minnesota even having made this a legal requirement (Doss and Taff, 1996), assessed values might not truly reflect market values. At worst, assessed values simply reflect the personal opinion of assessors (Darling, 1973), but more often appraisers rely on market values plus historical appraisals to determine current assessed value, which leads to appraisal smoothing (Geltner, et al., 2003).

Clearly, property assessors employ different appraisal methods across jurisdictions. In Canada, for example, some provinces rely on cost-based approaches while others employ a market value approach. The cost-based approach uses the value of the land and the amount of money required to rebuild existing structures, adjusted for market value and depreciation. Market value approaches use regression

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models based on market sales to estimate property values, much like an economist would use a hedonic pricing model but without variables that account for nearness to an open space, views, et cetera.

There are some downsides to using sales prices in hedonic analyses, however. Although sales prices reflect a “free expression of different individuals' evaluations of properties relative to other purchase options” (Darling, 1973), there may be errors in sales price data, including recording errors (Doss and Taff, 1996). Further, markets might be distorted so that the purchase price does not reflect marginal cost. This occurs as a result of asymmetric information and because coercion is common in markets where real estate agents and lenders play a large role (Doss and Taff, 1996). Real estate agents often affect the list price and the bidding strategy of buyers, especially when markets are thin, one party to the transaction is perceived to be in a rush to buy or sell, or the real estate agent is under pressure to get the transaction done. Real estate agents may provide kickbacks that amount to several percentage points, while lenders may affect the market by offering or not offering liberal terms (e.g., easy approvals and 100% financing). The sale of multiple properties as a bundle confounds the value of individual properties, as do land swaps or sales between relatives (say) that are registered at the land title office at prices that do not reflect actual values. Moreover, confidentiality might complicate information provision (Geltner, et al., 2003). As noted by the Ministry of Municipal Affairs (2008), sale prices do not necessarily have to equal market values, because sale prices are historical facts and can be very specific depending on the circumstances surrounding the sale. For example, transactions might not be arms-length (e.g., sales to relatives and non-cash sales).

In addition to distorted sales prices, sample selection might be a problem when hedonic pricing models are based on actual sales, and this could result in biased coefficient estimates. Potential sample selection occurs for several reasons: First, some properties might be sold more often than others and sales prices are only available for those properties that were actually sold within a certain time frame (Clapp and Giaccotto, 1992). Second, sales values are often collected by private real estate agents, in which case only properties that were traded through these agents get used in the analysis (Clapp and Giaccotto, 1992). Sample selection can be a problem even if the residential property market is in equilibrium. Simply because a property is not sold within a given time frame, this does not imply that the market is not in equilibrium; it only implies that you will not observe the property's true value. If this is the case for specific types of properties, you can still have sample selection problems when you estimate a hedonic pricing model based on observed sales data.

Along with assessed values, actual transaction values are in some sense also a proxy measure for the true value of residential properties and thus the shadow prices of property attributes. Indeed, we cannot truly distinguish which of these two proxies (assessed or actual values) is closest to the true property value. Nonetheless, sales values are expected to be closer to true market values than assessed values (Doss and Taff, 1996), as evidenced by the fact that sales values are overwhelmingly employed in hedonic analyses; however, some studies support the idea that assessed and market values are closely aligned (Berry and Bednarz, 1975, Nicholls and Crompton, 2007). In this study, we estimate hedonic regression models employing both sales and assessed property values to determine whether the estimated values of the various non-market amenities or attributes, resulting from the sales and assessment equations, are close enough for policy purposes. Our objective is, therefore, to test whether assessed values and sales values give similar estimates of the effect that different amenities have on property values. In the current study, we focus on the values of open space (farmland and nature) because these amenities are often included in hedonic analyses. We employ only assessed values that were determined using a cost-based approach as assessed values derived from a market-based approach would require some knowledge of the underlying model used by the assessor. Without this knowledge, if you happen to rely upon the same regressors as the assessor employed, the estimated parameters on the variables of interest, such as open space, would be biased toward zero. Our empirical application is to the Saanich Peninsula of Vancouver Island, near Victoria, the capital of British Columbia, Canada, where the cost-based approach is used for property assessments.

Some previous studies have already roughly compared estimates for the value of open space using regression equations with sales versus assessed values as the dependent variable (Bowman, et al., 2009, Nicholls and Crompton, 2007). However, no studies have attempted to develop test statistics for comparing estimates of amenity values obtained from actual sales versus assessed values. Our contribution is to provide a full analysis and statistically test for differences in parameter estimates. To do so, we estimate a Seemingly Unrelated Regression (SUR) hedonic price model with two equations — one with actual market values as the dependent variable and the other with assessed property values. We then compare the resulting estimates of the shadow prices for open space amenities. We also take spatial autocorrelation into account and use the Method of Moments estimator (Kelejian and Prucha, 2004).

2. Methods

2.1. Model specification

To compare the estimates of the open space premium associated with residential properties, both transaction prices of sold properties and assessed values are analyzed. We pair the actual sales and assessed values and specify a SUR model for each of the properties for which both actual sales and assessed values are available. By working with both equations in one model, relevant test statistics can be derived to test the hypothesis that parameters in the equation with actual market prices as the dependent variable are equal to the parameters in the equation with assessed values as the dependent variable.

Since spatial dependencies are often present in hedonic models (see Bell and Dalton, 2007, for an overview), the SUR model should also allow for potential spatial effects. Spatial econometrics assumes that observations located close to each other are more related than observations that are farther apart. In our model specification, we allow for spatial lag and error dependence. Spatial error dependence is often caused by unobserved variables. Spatial lag dependence is caused by a direct relationship between the dependent variables in the model. In hedonic pricing models, property values can be assumed to be directly related, because people that want to buy or sell their house will investigate property values of recently sold properties in the relevant market area.

To address these issues, we first define a general spatial SUR model, including a spatial lag and error component, as follows:

$$\begin{aligned} &P_m = \lambda_m M_m P_m + X\beta_m + \varepsilon_m, \; \varepsilon_m = \rho_m W_m \varepsilon_m + \mu_m, \\ &\mu_m \sim N\left(0, \sigma_m^2\right) \ni (I_N - \rho_m W_m)\varepsilon_m = \mu_m, \end{aligned} \tag{1}$$

where P_m is a vector of property prices; X a matrix of property characteristics that is the same for both equations[1]; β_m a vector of associated parameters to be estimated; ε_m is the spatially correlated error term; W_m and M_m are the pre-specified weight matrices; and ρ_m and λ_m are the associated parameters to be estimated. Further, m

[1] Due to the inclusion of the spatial lag variable in both equations, the set of regressors is not exactly the same in each. Therefore, the SUR model does not reduce to an equation-by-equation least squares model.