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Housing Reassessments in Amherst, New York

A Linear Regression Analysis

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Recent housing reassessments in the town of Amherst, New York, caused controversy when homeowners found their property values had skyrocketed. In this paper we construct a linear regression model of the assessment process and compare that model to the assessments of homes owned by town officials.

Introduction.

The Town of Amherst, New York, is a suburb of Buffalo, New York, comprising 48,476 households with an over-25 population of 79,329 and a labor force of 62,503.[1] The median value of a home is $157,600. Amherst is predominantly white with an estimated 51.6% of those over 25 years old possessing at least a bachelor's degree and 94.3% with at least a high school diploma. Both statistics are higher than the United States averages, respectively 27.4% and 84.5%.

In the mid-1990s, geological features of the land under the town caused houses to begin to sink.[2] Amherst is built in part on drained wetlands. Many houses are built on clay. As a result, droughts and other geological shifts have caused the houses to sink, with attendant foundation damage and concerns about property values. In the midst of the sinking-houses controversy, property values were reassessed in early 2009. Many residents found that their property values, and the related property tax burden, had "skyrocketed."[3]

Although the rises in property values were controversial, and the assessment process considered confusing or impenetrable by residents,[4] Assessor Harry Williams was reluctant to participate in a public forum on the issue.[5] Former Supervisor and sitting Council Member Daniel Ward spearheaded an initiative to question the assessments.[6] These public comments show a stark contrast. Why might Council Member Ward be interested in questioning the

[1] U.S. Census Bureau American FactFinder, 2006-2008 three-year estimates.

[2] New York Times, March 10, 2003: "As Houses Tilt, A Market Teeters"

[3] See, e.g., "Assessing the Process in Amherst" (Niki Cervantes, *Buffalo News* blogs: http://blogs.buffalonews.com/burbs/2009/03/assessing-the-process-in-amherst.html, March 4, 2009); "Sky-High Reassessments Infuriate Amherst Homeowners" (Cervantes and Janice L. Habuda, *Buffalo News*, March 3, 2009); "Ward Calls For Suspension of Amherst Reassessment Program" (Sandra Tan, *Buffalo News*, March 12, 2009)

[4] See "Assessing the Process" and "Sky-High Reassessments," *Id.*

[5] "Ward Calls For Suspension," note 3: "Town Assessor Harry Williams, who said there was no way he would participate in such a meeting…."

[6] *Id.*

assessments while Assessor Williams, Deputy Supervisor Mark Manna, and Supervisor Satish Mohan seemed to be satisfied with the results?

Hypothesis.

H_0: Property owned by Amherst's elected officials was assessed without regard to their elected status; that is, assessment models should predict property values for elected officials equally well as for other citizens.

H_A: There exists some differential factor in assessment of property owned by Amherst's elected officials.

Methodology.

Observations consisted of single-family year-round residential homes in the town of Amherst, New York as they appeared in Amherst's Comprehensive Property Information (CPI) system. For all observations, a series of data was collected. These datapoints included the street number, street name, Section Block & Lot (SBL) number, dummy variables to ensure that the properties matched single-family year-round criteria, the style of the house as entered into CPI, the year the home was built, the square footage of the home, the number of bedrooms, the number of bathrooms, the number of fireplaces, the school and fire districts of the property, the total value of the property, its land value component, the information pertaining to the last sale, and the neighborhood code as entered into CPI.

After we collected an observation, we coded the information about building style, year built, school district, and fire district as dummy variables. We coded building styles as they appeared in CPI and included split-level, ranch, colonial, contemporary, Cape Cod, old style, duplex, and other. We broke year built into ten-year categories with all decades from 1920s to 2000s represented. Sweet Home, Williamsville, and Amherst school districts were all represented, as were Getzville, East Amherst, Swormville, Eggertsville, Ellicott Creek, Williamsville, and Snyder fire districts. Once these variables were coded, we calculated a number of interaction terms between year built and the subdivisions of the town, generating a binary variable for decade built-school district interaction and a binary variable for decade built-fire district interaction. This process was meant to capture the subdivision of Amherst into smaller geographic neighborhoods, which tend to be built around the same time. The use of interaction terms was suggested by the professor supervising this research.

We used two data collection procedures. The first, to ensure a sufficiently representative sample, used arbitrary street numbers and street names to select an arbitrary property. We collected the observation, then found the property with the next consecutive SBL number by adding 1 to the Lot component. We continued this process until there was no longer a property with the next consecutive SBL number, then arbitrarily selected another property.

Because of our interest in whether elected officials' property is valued using the same parameters as non-officials, we used a second procedure to find properties in the same geographic area as the officials of interest. We used the Property Sales function on the CPI to find property sales ranging since January 1, 2000 on the street on which each official lives, then collected data on several arbitrary recent sales selected using a random number generator. In total, 158 observations were collected, not including the data about the elected officials' homes. The elected officials' homes were not included in any step of data analysis until they were compared to our regression estimate in order to avoid bias.

We assembled the data into an Excel file in order to simplify calculation of interaction terms. After we finished the collection step, we created a simplified dataset by removing redundant variables (e.g. qualitative variables which had been coded into binary form) and imported it into SAS. We then performed a series of regression analyses using SAS to determine the most correct model.

Model.

We tested several models, ranging in complexity from only five terms (square footage, square footage squared, number of bedrooms, number of bathrooms, and number of fireplaces) to including several interaction terms. We then compared those models using a variety of descriptive statistics to evaluate their effectiveness.

In all cases, we used the natural logarithm of the property's assessed total value as the output (left-hand side) variable. Though we intended to model total value, we chose to take advantage of the natural logarithm transformation's useful properties.

All models had fairly high F-values, ranging from 97.98 (for a model including interaction terms between fire districts and decade built) to 214.18 (for a model including only fire districts). R^2 and adjusted R^2 statistics were also fairly high, with models generally in the range of explaining 88% to 90% of variation. The selected model had an F-statistic of 214.18 with a corresponding probability of less than .0001, an R^2 of .9358, and an adjusted R^2 of .9314. Thus, the model explains about 93% of the variation among the different observations.

This model surprised us, as we expected the most useful model to be one that exploited interaction terms in some way. However, the parsimony of simply subdividing the town into fire districts appears to have sufficiently explained most of the geographically-based variation in housing prices. Our final model was

$$\log(\mathit{total\ value}) = 11.45892 + .00061646(sqft) - .0000000667086(sqft)^2 - .05217(bdrm) + .03855(bthrm) + .02379(firep) - .24384(getzfire) + .12497(eafire) - .40465(eggfire) - .21652(wmfire) - .12788(snyfire)$$

where log refers to the natural logarithm, *total value* is total assessed value, *sqft* is square footage, *bdrm* is the number of bedrooms, *bthrm* is the number of bathrooms, *firep* is the number of fireplaces, and *getz*, *ea*, *egg*, *wm*, and *sny* refer to Getzville, East Amherst, Eggertsville, Williamsville, and Snyder, respectively.

The negative coefficient on bedrooms is cause for concern. We speculate that the effect is negative because it represents only an increase in the number of bedrooms rather than an addition to the house – that is, that it can be interpreted as carving out an additional sleeping space from the constant square footage of the house rather than as an addition of one bedroom and the attendant square footage to the house. Intuitively, designating an office or dining room as an additional sleeping area would indicate that the house was overcrowded. Adding a bedroom as a physical addition, however, would add value if the square footage was sufficient. For example, a modest 8x12 room (96 square feet) would have a positive effect of about .05857 on log(*total value*), more than making up for the loss of .05217 for the additional bedroom (a net addition of about .0064 to log(*total value*), or about a .64% positive effect on the total value of the home). Therefore, the addition of a bedroom has the expected positive effect.

Results.

The table reproduced below contains the relevant statistics. The information about the officials' homes was entered into the regression equation described above in order to estimate log(*total value*). We compared the expected log(*total value*) to the actual log(*total value*) by subtracting the actual value from the expected value. A positive residual represents an under-assessed home (that is, a home where the expected value is higher than the assessed value). A negative residual represents an over-assessed home (where assessed value is higher than expected value).

Official	Residual
Williams (Assessor)	0.154743281
Mohan (Supervisor)	0.050118099
Manna (Deputy Supervisor)	0.216861966
Marlette (Council)	0.102673958
Schratz (Council)	0.680425752
Ward1 (Council)	-0.045352813
Ward2 (Council)	-0.183891727
Weinstein*** (Council)	0.379683545
Bruch Bucki (Clerk)	-0.02028988
Farrell (Town Justice)	-0.026990187
Klein (Town Justice)	0.295828914

Note that Dr. Barry Weinstein's home has incidental commercial use as a doctor's office and thus cannot be evaluated reliably using a regression model estimated without commercial property. Two properties are owned by Daniel J. Ward according to the CPI system; both were evaluated and both have negative residuals. Town Justice Klein's home is in the Lehn Springs fire district, which was not represented in our dataset and so Klein's assessment cannot be evaluated reliably.

We feel we can reject the null hypothesis.

Since a change of .01 in log(*total value*) represents a 1% change in *total value*, the residuals can be multiplied by 100 to determine the residual in percentage form. Thus, Harry Williams' home was under-assessed by approximately 15.47%, whereas Deborah Bruch Bucki's was over-assessed by a relatively modest 2%.

The pattern is striking. Williams, Mohan, Manna, and three of the four council members were under-assessed by a significant amount according to our estimate. Ward was over-assessed, as was Bruch Bucki and one of the two town justices.

Further Research Opportunities.

Foremost in the minds of future researchers should be the small sample collected. In order to determine whether our findings can be extrapolated to all of Amherst, more data must be collected. Of the 48,476 households in Amherst, only 158 were used in forming our regression model.

Researchers seeking to evaluate our conclusions should focus on refining the data collection procedure. For example, the ideal procedure would have included neighborhood-specific dummy variables, but the small number of observations made using collector-created neighborhood dummy variables unwieldy. As a result, the compromise of using interaction terms of decade built, fire district, and school district was developed. A more robust system for classifying neighborhoods should be developed.

The high residuals of Amherst officials should be analyzed using additional information such as political party and voting records to determine whether the distribution of the residual can be explained by party solidarity or quid-pro-quo reasons. Future research outside the scope of economics could focus on the public comments of elected officials and seek a correlation between a positive or negative attitude about the reassessment project with a positive or negative residual assessment.