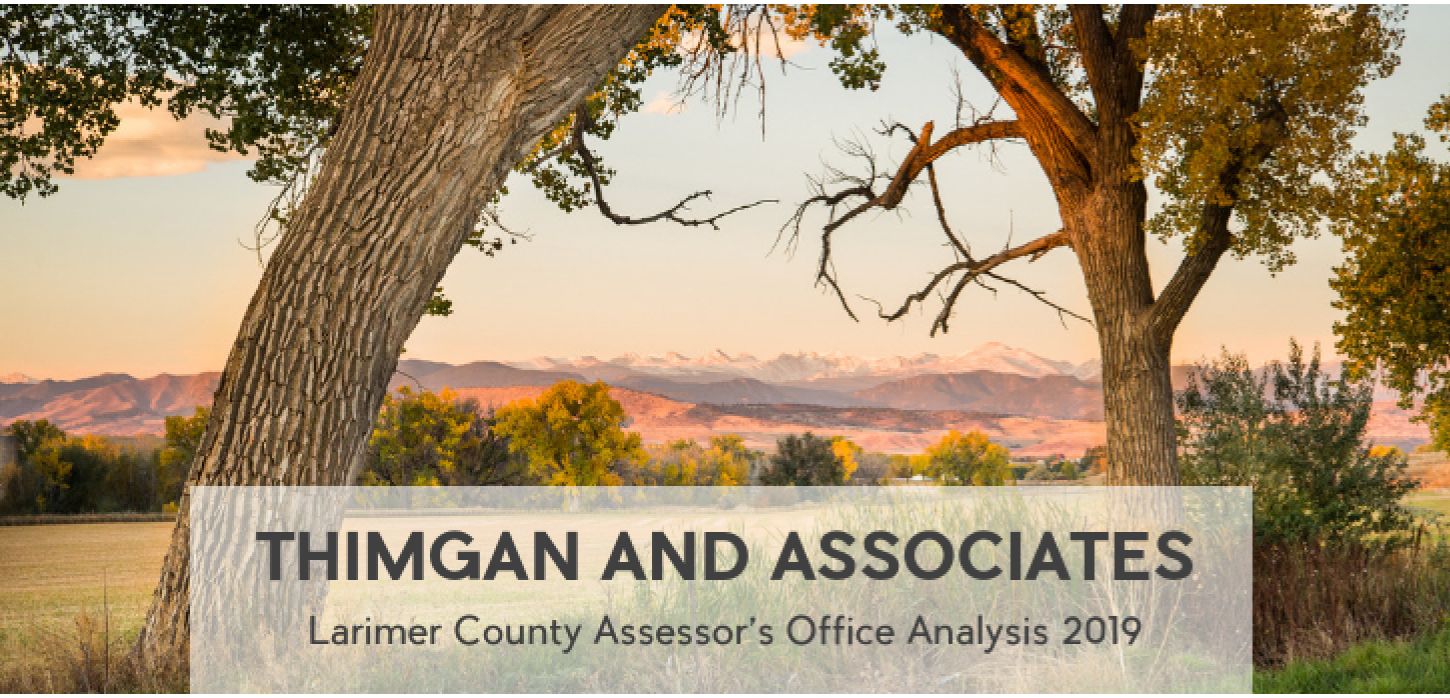


THIMGAN AND ASSOCIATES

Larimer County Assessor's Office Analysis 2019

Bob Overbeck, Larimer County Assessor
200 W. Oak, 2nd Floor
Fort Collins, CO 80522

August 30, 2019

RE: Valuation Review & Analysis

Dear Mr. Overbeck:

On behalf of Thimgan & Associates, we are pleased to submit our review and analysis addressing the valuation processes of the Larimer County Assessor's Office.

Our analysis of your office over the past five months has looked at your valuation process. We have included information on the model process, the models themselves and a brief portion about the appeal process. In addition, we have included a complete ratio study for residential properties. We performed an analysis in GIS of the ratios and property characteristics. A few snapshots from that analysis have been included in the report as discussion items.

In summary, your office first should be commended on the hard work and dedication they bring to the office. This is evident by their correspondence with us and the analysis of the work they performed. There are many critiques within this report, but none are aimed at any individual currently in the office. Some of the critiques may relate to the need for additional training and changes in existing policies. Our analysis found your office in compliance with standards set by the State of Colorado. However, those standards represent the minimum requirements required by the State. There are several problems that were manifested in the high number of appeals received. The main problem lies with four issues. The first was the decision to utilize only two years of sales in the model building process. This unnecessarily handicaps the analyst by removing historical information that can perfect the models. The second issue is the over-stratification of the models, in addition to the choice to not simultaneously analyze the population while performing the models. The third issue is the lack of GIS in the modeling process. This also attributes to poorer performance in the model. Finally, a more proactive approach for the appeal process needs to be put in place. Your first outreach endeavors to the public, via the publication of an interactive value-change map, did provide information to taxpayers on the results of the revaluation, which is a very positive start. In addition to the maps, the values should be analyzed prior to the notice deadline by using comparable sales to ensure the sales can support the subject (population) properties. Based on the overall reductions of 67% during the appeal season, this step should be able to ensure that the work product produced can be supported during the appeal process.

In conclusion, the office has a lot of qualified staff that need only proper direction and additional education to improve this process. Implementing a change in policy to utilize a minimum of five years of sale data; performing models in IBM SPSS or equivalent; using a multiplicative model converted to natural logarithms in order to utilize linear regression analysis; simultaneously utilizing GIS throughout the whole process; and applying a proactive appeal strategy will greatly enhance the success of your office in the revaluation process.

Should you have any questions or comments concerning this report or require clarification on any matter, please do not hesitate to contact us.

Respectfully submitted,

James R. Thimgan

President

EXECUTIVE SUMMARY

Thimgan & Associates has conducted a thorough review and analysis of the Larimer County Assessor's office processes and procedures related to estimating market values. This analysis has been broken out into three sections: the model process, valuation models, and appeals and public outreach. These analyses utilized IBM SPSS Statistics software, discussions with the Assessor and Staff, a review of the documentation provided by the Assessor's office, and an analysis of the results in GIS. Items such as market trend analysis and total assessment to sale ratio studies utilizing the Count, Mean, Median, Weighed Mean, Minimum, Maximum, Price Related Differential, Price Related Bias, and Coefficient of Dispersion, were performed using data provided from the office. Values and Characteristics were plotted in GIS to determine if any inconsistencies could be identified. Modeling techniques and processes utilized in value development were reviewed to help determine if the County was utilizing best practices.

The Larimer County Assessor's Office produced a roll for the 2019 tax year that is in compliance with the State of Colorado and does adhere to all the testing metrics performed by the independent auditor for the State of Colorado. In fact, the statistical analysis indicates an average dispersion of about 8.4 to 9% (based on the sales not utilized in the time study period). However, the processes utilized for valuation need to be improved upon in order to regain taxpayer confidence in the values produced by the office. The fact that the models had relatively low coefficients of dispersion, but the County experienced such a high number of appeals with 67% overall reductions on the appeals, indicates a need for improvement. There appears to be a disconnect between the modeling process and the application of the models on the population. There are several factors that caused this disconnect. The valuation models were built in Excel and imported into the Realware system. This is not the best practice for valuation in a jurisdiction this size. Excel is a wonderful tool when utilized for the right function. However, when creating models, it is critical that the analyst also analyzes the population concurrently when building the model. No analysis was completed on the impact on the population of properties during the time of the model building. In fact, the County's computer system, RealWare, also does not have sufficient tools for this analysis. Because no model analysis included the population, the review process after the model building was very difficult, time consuming, and lacking a systematic process. Also, no GIS analysis was completed in conjunction with the valuation models. This is an extremely helpful tool when calibrating a model and can cure many issues that may not be seen directly in the statistical analysis. The late starting time for the value analysis also reduced the ability of staff to properly vet the values. The decision and policy change of the previous administration in shortening the time period study to 24 months caused significant fluctuations in values that would have otherwise not occurred.

RECOMMENDATIONS

The Larimer County Assessor's Office should implement policies which start the valuation analysis no later than July of the year before notices are due. This will provide nine months for value analysis and review. All values should be finalized no later than the first of April. The review process for the new values should run concurrently with the model building process and not be deferred to the end of the valuation process. Statistical programs such as IBM SPSS or equivalent should be utilized to calibrate the models. Tools such as ArcGIS, ArcGIS Pro, or equivalent should be concurrently utilized during the model building process to ensure no spatial bias exists. It is critically important to ensure each adjustment in the model is valid and is supported by statistical methods. It is also critically important that the adjustments follow appraisal and economic theory. Departures indicate flaws in either the model or the data used in the model. An analysis of sales that happen after June at the end of the time period should be utilized as a holdout sample to best determine if the models are accurately predicting the market. Properties should be pre-analyzed for their appeal potential by performing comparable sales analyses before values are finalized to ensure values can be defended. Once values have been finalized, the Assessor's office needs to assist the public in understanding the new roll, and what changes can be expected. Included in this should be documentation available to the public that explains the valuation process along with the model reports explaining the details of the models utilized. Transparency is the best way to display to the public the confidence the office has in its work product and its willingness to correct any issues when they arise.

With the understanding that the implementation of all these recommendations at the same time might not be feasible, the following are the four most critical suggestions: (1) begin the valuation process no later than July of the year before notices are due, (2) run the review process concurrently with the model building process, (3) utilize IBM SPSS or equivalent and ArcGIS or equivalent in the model building process, and (4) analyze sales that occur after June at the end of the time period to check the accuracy of the model in predicting the market. These recommendations form the foundation for sustainable and accurate valuation for the county. Pre-analyzing properties for their appeal potential and public outreach efforts are also highly desired, and when possible should be incorporated into the mass appraisal process.

MODEL PROCESS

The County initially stated that the valuation models were utilizing multiple regression analysis (ordinary least squares) and five years of market data (sales). The use of five years of sales had been the practice of the former Assessor and had been the policy during his tenure. There are many benefits to utilizing five years of sales and it is a good practice when utilizing market valuation models. Some of the benefits include creating stabilized models from one revaluation to another, retaining a majority of the sales sample from the previous study, and having more market observations. These benefits provide a much-enhanced product that can better predict market influences and reduce fluctuations between cycles. However, upon further discussion with the staff, it was determined that the models utilized in the RealWare system only utilized two years of sales. It is difficult to determine the rational for the change except to note that the decision was made by the previous Assessor. This change in policy dramatically changed the nature of the models. The new models did not contain any of the market transactions from the previous models. In addition, location adjustments were based on a much smaller sample size than in the past. With this smaller sample size, additional characteristics that may influence the market cannot be properly calibrated. These factors caused significant variances in the predicted market values compared to the previous valuation cycle. In general, predicted market values should not change radically from one period to the next. The main influence in the change of values should be the adjustment for current market changes to inflation or deflation (time adjustments). Any departures from the adjustments for time indicate either enhanced information that improves predictability, or a deterioration in predictability due to declining data quality or reduction in the number of observations.

Colorado statute sets forth a calendar for the valuation cycle that coincides with the election cycle. This is unfortunate because any newly elected official in the Assessor's office comes into the calendar at the end of the preparation time period for setting new values. However, although the Assessor was new to the process and only arrived on the job in January, he kept the Director of Valuation (formally of the title of Deputy Assessor) and all of the office staff, which had years of experience in the Assessor's Office. The Director's duties are to oversee the office and ensure the valuation process is on schedule and that the results will be as good as possible. This is the position that directly guides the office towards a successful reappraisal. In the event of a new Assessor stepping in near the end of the analysis period, it is critically important for the Director of Valuation/Deputy Assessor to ensure the roll is a success.

In general, Assessor's offices should be finalizing their values during the months of January through the end of March. The start of the analysis process should begin no later than July 1st of the previous year (2018). Statute requires that jurisdictions utilize a minimum of 18 months of sales, going back from June of the calendar year before notice of values are published to the public. Therefore, even if all transactions are not fully vetted or in the system, work can begin in July to start the valuation process. This process should not take more than six months. Therefore, January through March are generally review periods where staff analyzes the results and corrects data or valuation anomalies that were not addressed in the valuation models. Unfortunately, it appears that the analysis period for the valuation models in Larimer County did not start until either late December or January. This left very little time to properly calibrate the models and perform the necessary reviews. Fortunately, the end results were well within the accepted standards required in the State of Colorado. The staff should be commended on their hard work and the efforts they took to ensure the values were acceptable by the independent Colorado Auditor. However, the policy change that was made by the previous Assessor in shortening the time period, and the shortened time period for analysis, all but guaranteed changes in values that helped confuse taxpayers about their change in property values. The record number of appeals following the notice of value attest to the public concern that values had changed in a way that was inconsistent with market expectations. In total, there were 24,190 appeals. This is a significant number in relation to previous years and indicates there were issues, or at a minimum, swings in values that taxpayers did not understand or felt did not reflect the current market. In fact, there must be some truth to their concerns as 67.27% of those who appealed received a reduction. There was clearly a disconnect with the model analysis and the final results. It is interesting to note that the coefficient of dispersion changes significantly from the two-year time period that was utilized in the model versus either the three years prior to the time period, or to the 13 months after the time period. This indicates that either the model was over-fit to the sales sample utilized, or that sales transactions were over-screened and eliminated as being unrepresentative. It also helps explain some of the problems encountered during the appeal season. The chart below shows a ratio study comparing the three groups studied. 39 outliers were removed from these two time periods that were not utilized in the valuation analysis. They were removed to give the benefit of the doubt that they had not been properly vetted. The removal of the outliers did not significantly change the results of the analysis and represented 0.9% of the total number of sales. This analysis assumes that the market trends for time were appropriate and could be utilized for this analysis.

Ratio Statistics for VALTOTAL / TMADJSALEP

Group	Mean	Median	Weighted Mean	Min	Max	PRD	COD
3 Years Before Time Period	.994	.988	.970	.274	1.978	1.025	.093
24 Month Time Period	**.995**	**.996**	**.988**	**.027**	**3.098**	**1.008**	**.065**
13 Months After Time Period	.982	.985	.977	.343	1.959	1.005	.080
Overall	.993	.991	.978	.027	3.098	1.015	.081

PRD = Price Related Differential
COD = Coefficient of Dispersion

When initially contracted to study the models, it was stated that multiple linear regression analysis was utilized to create the models. This is a very acceptable technique which is known to produce exceptional results when applied properly. Based on the output from the RealWare system, a multiplicative model format was utilized in the development of all models. This model technique is preferable to simple additive model structures in that they can account for non-linear trends found in the market. For example, the market generally provides a discount when buying large quantities of an item. The same is true in real estate. The price one is willing to pay for additional square feet of living area declines as the size of the home gets larger. The market follows the principal of diminishing utility or diminishing returns. In addition to being able to handle non-linear trends, the technique utilized for multiplicative modeling (natural log models) compresses the relationship between sale prices, which lends itself to a more even weighting of each sale transaction and can help prevent over-fitting a model. In addition, Larimer County is comprised of four economic areas utilized for residential properties. A model is comprised of similar classes of properties and a single economic area which contains many neighborhoods and/or sub-neighborhoods for refinement to location. Based on the parcel counts and the number of economic areas, the county should have four residential models made up of single-family homes, duplexes and triplexes; one model for condominium properties and one model for townhouse properties. The condo and townhouse properties could be combined into a single model if desired. Duplexes and triplexes could be modeled separately though they generally model best with the single-family properties. Therefore, in total, there should not be more than six or seven residential models. The County utilized 25 models that were entered into the RealWare system. This over-stratification of the model process will also lead to large fluctuations in value from one valuation cycle to another especially when time periods are shortened, and the sample size is greatly reduced. In addition, because of the smaller size, the model must be much simpler and cannot always account for all the value influences that are recognized in the market.

Unfortunately, when interviewing staff about the model process, it became evident that regression analysis using IBM SPSS was not utilized in the model creation. In fact, the actual program utilized appears to be a combination of analysis in Excel and appraiser adjustments based on appraiser opinion and experience. Regression analysis may have been utilized in Excel but since there's no documentation about where or how the model was built, it is difficult to know if the proprietary system built by the previous Assessor, or regression analysis in Excel, was utilized. If regression analysis was utilized in Excel, the over-stratification of the models would have required the model to be simpler than what the market demanded. In addition, Excel is not the preferred tool for regression analysis because it can be difficult to maneuver. Actual statistical programs like IBM SPSS, R, or SAS are much better at calibrating models. If the previous Assessor's proprietary system was utilized, it too would have been constrained by the same problem of over-stratification of the models in the regression analysis. Because the previous Assessor's system is not a nationally recognized tool for model calibration, it really should be vetted though organizations like the International Association of Assessing Officers (IAAO) before use within a jurisdiction. Vetting the math and the process it uses are extremely important for transparency when using a tool that has a direct impact on property taxes. Experts within IAAO can test the process and determine if it is a viable approach for modeling. In any case, most of this model work was not performed within the county system and none of the analysis was available for review. Therefore, no direct observation can be made. However, for a jurisdiction this size, Excel is not considered to be the optimal tool for model calibration. One additional comment should be made on the subject of model building. At some point in the revaluation process, seven models were built in IBS SPSS. These models would have been a great improvement over the models that were utilized. The employees that created these models should be commended for attempting to create models that follow IAAO standards on model building and do not over-fit the data. This initiative exemplifies the direction the office should pursue in the future. A small table showing the naming convention of the models is listed below.

Revised-Multiplicative-All-Eco4-Syntax.SPS
Revised-Multiplicative-Eco1Condo&THSyntax.SPS
Revised-Multiplicative-Eco1ResSyntax.SPS
Revised-Multiplicative-Eco2Condo&THSyntax.SPS
Revised-Multiplicative-Eco2ResSyntax.SPS
Revised-Multiplicative-Eco3CondoSyntax.SPS
Revised-Multiplicative-Eco3ResSyntax.SPS

VALUATION MODELS

It is important to analyze the actual adjustments utilized in the model when determining if a model is performing within model standards. Unfortunately, these models were created off site. The only documentation on the model building process is the analysis of time trends and assessment to sale ratio documentation. Even though the models are input into the RealWare system, it is very difficult to gage the statistical reliability of the adjustments made within the model. However, an analysis of the specific adjustments applied in the RealWare system gives good insight into certain aspects of the modeling process. The models appear to be hybrid models where some items are multiplied, and others are added together. In general, the formulas look like this:

Predicted Value = [(Main Living Area Formula) + (Basement Formula) + (Finished Basement Formula) + (Garage Formula)] multiplied by all of the binaries which include: Quality, Neighborhood, Design, Occupancy, Floor Level, and Land Attribute adjustments.

Where:

Main Living Area Formula = b_0*(MAINSF^^{b1}) * MAINSF

Basement Formula = b_0*((MAINSF+BSMNTSF)^^{b1}) * basement factor * BSMNTSF

Finished Basement Formula = b_0 *((MAINSF+BSMNTSF)^$^{-b1}$) * finished basement factor * BSMNTF

Garage Formula = b_0 *((MAINSF+BSMNTSF+GARSF)^^{b1}) * garage factor * GARSF

The Following Parcels are examples of properties that are valued in a model. Specifically, the model is for neighborhood 29502. In both cases there are no land attribute adjustments for the properties. Therefore, those adjustments are not listed. Other characteristics commonly displayed were added for context.

	Characteristics		Running Total
ACCOUNTNO	**R1559052**		
Economic Area	EA2		
Year Built	1912		
Adjusted Year Built	1925		
Number of Baths	1		
Land Size	12,625		
Living Area	1,083		241,396
Total Basement Size	0		0
Finished Basement Size	0		0
GARSF	255		17,107
		Sum of Area Values:	**258,502**
NBHD	29502	Multipliers	
Neighborhood Extension	2207	0.89	230,067
Built-As Type	Ranch	1.00	230,067
Occupancy Code	125	1.00	230,067
Quality Grade	Fair	0.95	218,564
		Total Value	**218,564**
		Land Value	- 38,000
		Improvement Value	**180,564**

	Characteristics		Running Total
ACCOUNTNO	**R1602797**		
Economic Area	EA2		
Year Built	2015		
Adjusted Year Built	2015		
Number of Baths	4		
Land Size	3.00		
Living Area	7,370		329,696
Total Basement Size	1,680		23,730
Finished Basement Size	1,680		58,516
GARSF	1,680		33,619
		Sum of Area Values:	**445,560**
NBHD	29502	Multipliers	
Neighborhood Extension	256112	1.025	456,699
Built-As Type	Ranch	1.00	456,699
Occupancy Code	125	1.00	456,699
Quality Grade	Average Plus	1.05	479,534
		Total Value	**479,534**
		Land Value	- 87,000
		Improvement Value	**392,534**

All the models utilize a very similar formula. In fact, all models are somewhat simplistic in that none of them take into consideration the age or effective age of the property. Neither do they adjust for the number of bathrooms, land size, condition, porches or patios. In fact, there are several missing characteristics that generally are included in a model that help better predict market values. There are several reasons these additional variables are not included in the models. Foremost is that these models are over-stratified. Because the models are generally at the neighborhood level, there isn't a sufficient sample size available for all these additional variables. In fact, all the models utilized for residential properties in Larimer County are overfit models, meaning that statistically the model begins to describe random error rather than the actual relationships between variables.

As an example of model over-fitting, residential model R19Res19601, was analyzed. It has a total of 70 variables in the model, with 37 characteristic variables and 33 location variables. There is a total of 246 sales within the two-year time period. That averages out to 3.51 sales per adjustment. This is well below the minimum requirement and indicates significant overfitting of the model. If the whole five years had been utilized, there would have been 566 sales available. That still only averages out to 8.09 sales per adjustment. This indicates that this neighborhood should probably be combined with other neighborhoods in order to have sufficient observations for the adjustments. As such, it would have been very difficult to add in the additional variables for age, bathrooms and land size. Another model, model R19Res29522, contained the most sales in the two-year time period with 1,388 sales. It has a total of 240 variables in the model with 39 characteristic variables and 191 location variables. That averages out to 5.78 sales per adjustment, which is still well below minimum standards. Again, if all five years had been utilized, 3,256 sales would have been available. That averages out to be 13.6 sales per adjustment. That is still on the low side of the standards but could be considered sufficient. However, best practices would dictate combining this neighborhood with something else. Again, with so many variables already in the model, it would have been difficult to add any additional ones. It does appear that the main problem with the overfitting is the heavy dependence on location adjustments. Rather than depending on all the characteristics that are generally considered in the market, the models focus on very specific location adjustments. In total the 25 models are utilizing 2,108 location adjustments. There are approximately 126,300 residential properties in Larimer County. Therefore, the parcel-to-location relationship is about 60 properties per location. As an extreme minimum, location variables should contain no less than 100 properties.

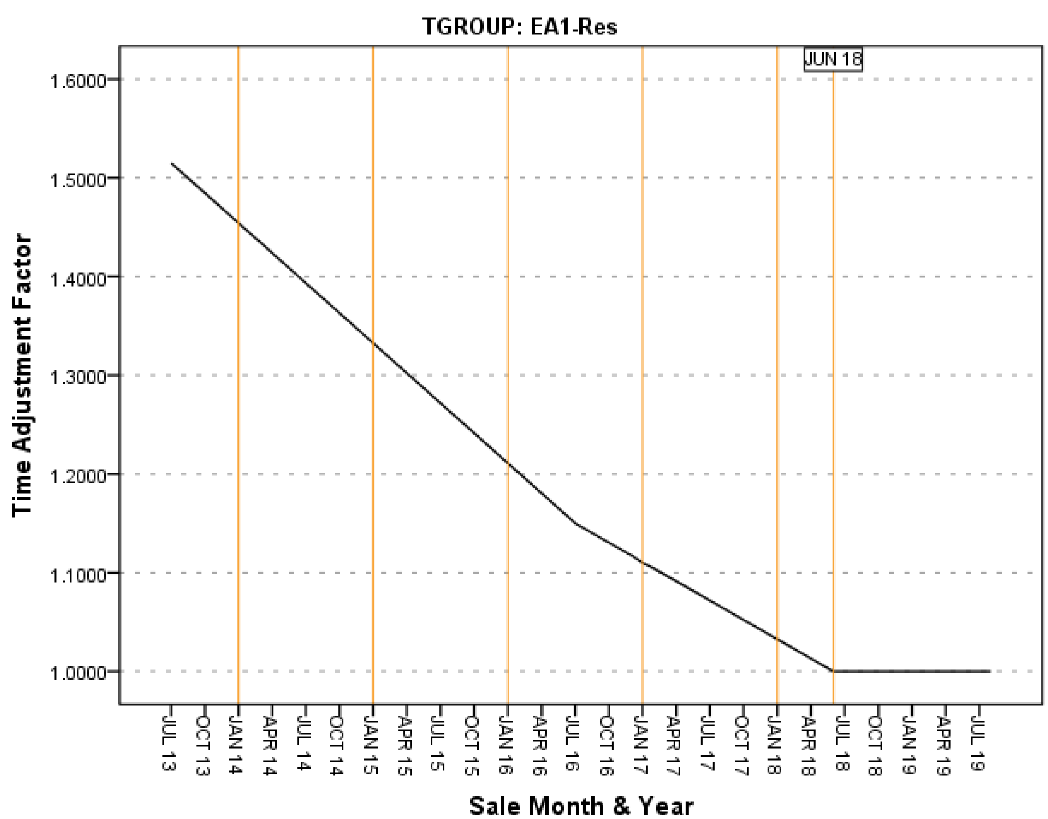
In fact, when looking at the specific adjustments applied in the RealWare system it doesn't appear to be a pure model result. Not having a pure model is not the problem. In some cases, it is necessary to enforce appraisal logic in a model when there are insufficient observations.

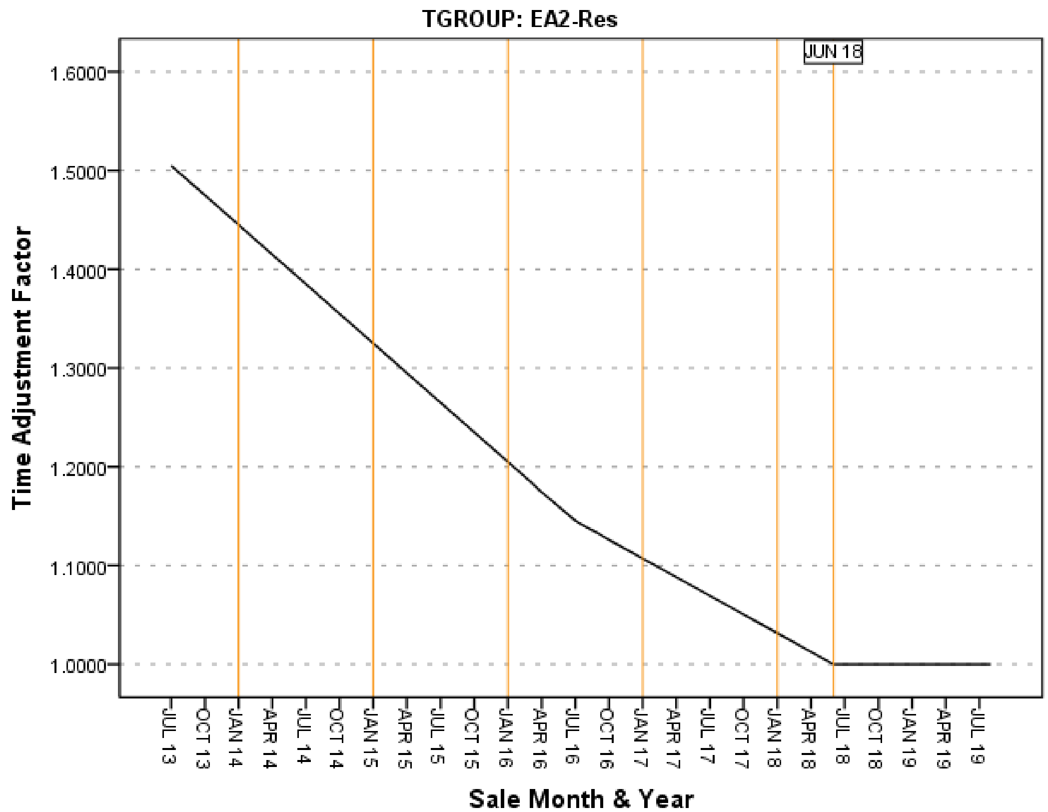
However, here the extent to which there appears to be departures seems extreme. If 25 different models were calibrated, it is statistically improbable that so many of the land attributes would be the same. As can be seen in the table below, many of these adjustments appear to be based on appraisal opinion and not statistical analysis. The first two columns have been color coded to highlight the similarities in adjustments between models. Another observation with the two duplex models is that they do not have any of these location adjustments. It should be noted that none of the duplexes or triplexes are on a golf course. However, one property has the Lake Dir. Premium and one property has the Lake Ind. There are 43 properties next to a park and 134 properties negatively influenced by the railroad. 129 properties have traffic A and 118 properties have traffic H. It probably would have been better if the duplex and triplex properties had been included in the other residential models based on their location rather than being in their own model.

Adjustment Factors								
		Frontage Variables				Negative Influence Variables		
Model	**All View**	**Golf**	**Lake Dir**	**Lake Ind**	**Park**	**Railroad**	**Traffic A**	**Traffic H**
R19CondoEA1	1.120	1.200	1.120	1.100	1.030	0.970	0.945	0.980
R19CondoEA2	1.100	1.070	1.140	1.130	1.010	0.980	0.970	0.980
R19DuplexEA1								
R19DuplexEA2								
R19Res18729	1.050	1.050	1.350	1.200	1.040	0.970	0.970	0.980
R19Res18933	1.130	1.050	1.100	1.060		0.965	0.970	0.990
R19Res19601	1.050	1.150	1.150	1.120	1.040	0.960	0.970	0.980
R19Res19613	1.050	1.150	1.150	1.120	1.040	0.960	0.970	0.980
R19Res19614	1.050	1.150	1.150	1.120	1.040	0.960	0.970	0.980
R19Res19711	1.100	1.100	1.215	1.080	1.050	0.965	0.860	0.935
R19Res19715	1.100	1.100	1.215	1.080	1.050	0.965	0.920	0.965
R19Res19722	1.100	1.050	1.350	1.200	1.090	0.960	0.900	0.990
R19Res19724	1.100	1.100	1.215	1.080	1.050	0.965	0.920	0.965
R19Res19734	1.100	1.100	1.190	1.060	1.010	0.965	0.950	0.965
R19Res19829	1.100	1.100	1.190	1.060	1.020	0.990	0.900	0.995
R19Res19836	1.130	1.150	1.226	1.080	1.040	0.960	0.970	0.990
R19Res28506	1.030	1.150	1.250	1.140	1.020	0.970	0.950	0.960
R19Res28623	1.060	1.140	1.120	1.050	1.040	0.960	0.970	0.980
R19Res29414	1.070	1.150	1.100	1.070	1.010	0.970	0.970	0.980
R19Res29502	1.020	1.010	1.350	1.200	1.015	0.960	0.930	0.945
R19Res29517	1.050	1.150	1.200	1.190	1.040	0.960	0.900	0.980
R19Res29522	1.010	1.150	1.160	1.120	1.010	0.960	0.970	0.980
R19Res29635	1.050	1.150	1.150	1.120	1.040	0.960	0.970	0.980
R19Res3all	1.040	1.080	1.110	1.090		0.970	0.915	0.920
R19Res4all	1.060	1.110	1.300	1.100		0.970	0.890	0.930

TIME TRENDS

An analysis of the time trends utilized by the County has been performed. Time trends were applied by using the sale to assessment ratio technique. This technique creates a ratio of the sale price divided by the previous predicted values. The theory behind this approach is that all valuation considerations have been accounted for in the previous roll. Therefore, any changes in the ratio must reflect changing market trends. There are a few assumptions with this technique to keep in mind. First, the assumption is that the previous values are of a specific date. Second, no changes have occurred to the property between the date it was valued and the day it sold. If either one of these assumptions are not true, then the ratio is invalid for analysis. The County applied time trends based on the economic areas. In total, there were four analyses for residential property, and based on the data provided, it appears the County has done a good job estimating the change in market prices over time. However, to improve this process, it is recommended that a second analysis use time as an additional independent variable in the model. This will allow for a comparison of the created trends. The following charts show the adjustments that would be applied to any sale in order to trend it to June 2018. For example, if a residential sale took place in January 2017, a factor of approximately 1.11 would be necessary to trend the sale to the June 2018 date.

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1.5000
1.4000
1.3000
1.2000
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Time Adjustment Factor
JUL 13
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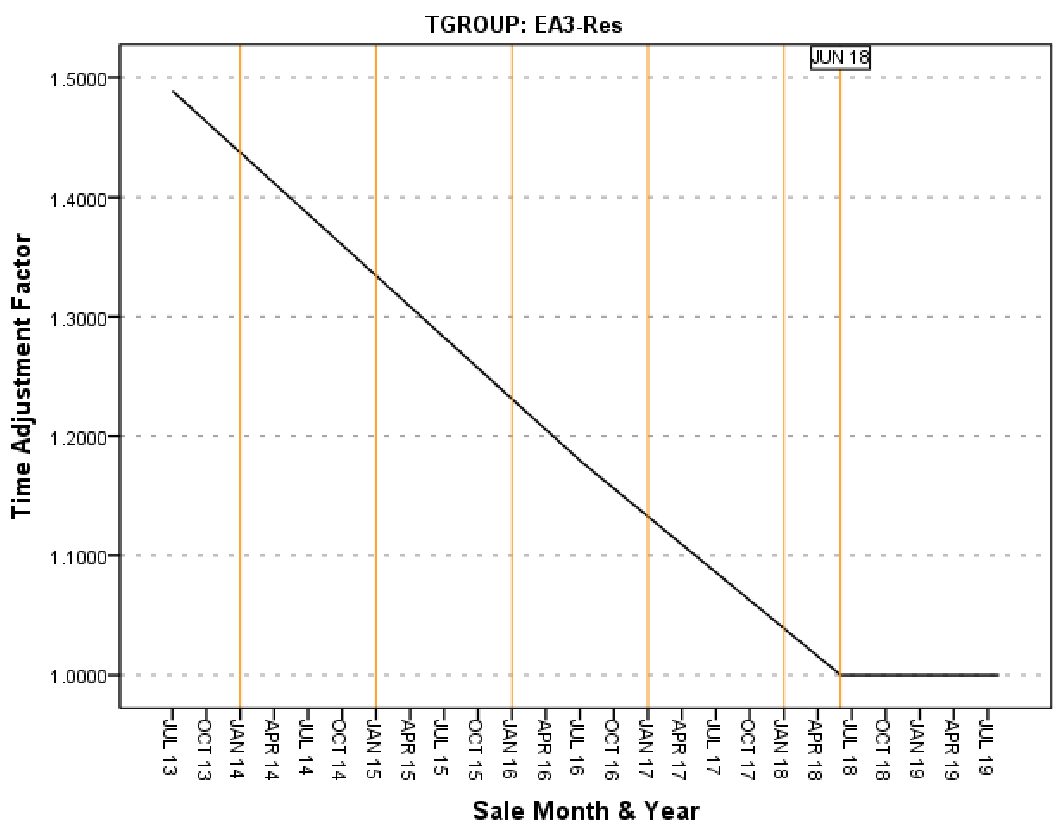
Sale Month & Year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Time Adjustment Factor
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OCT 13
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JUL 14
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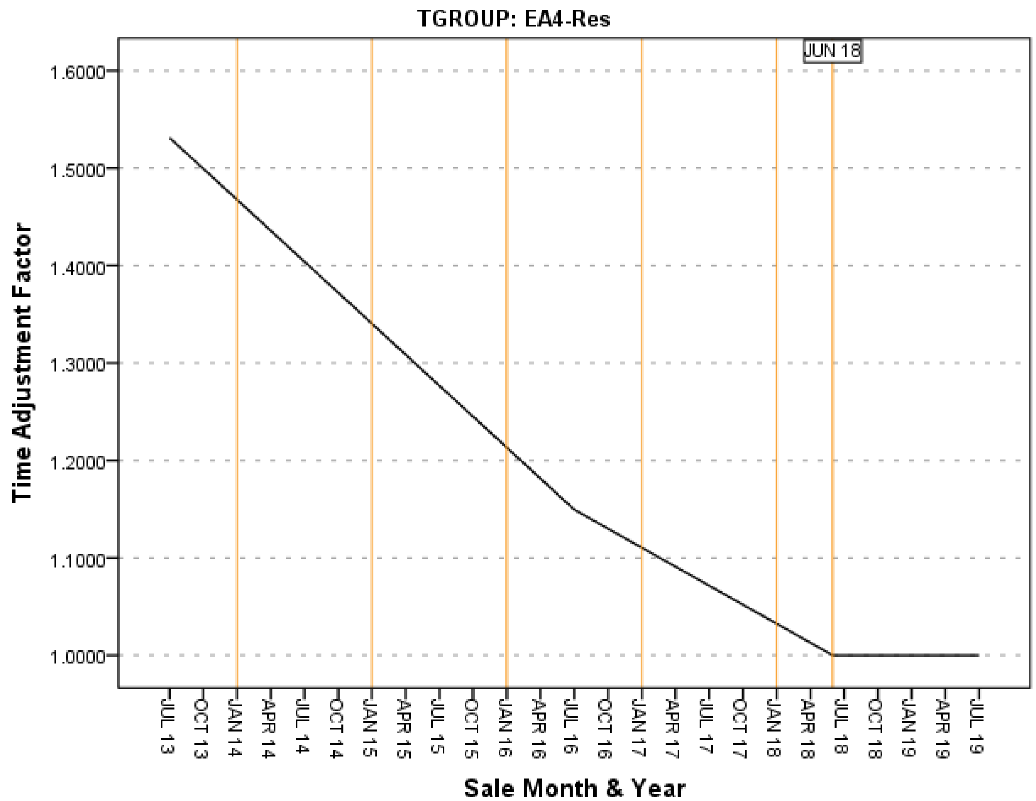
APR 19
JUL 19
Sale Month & Year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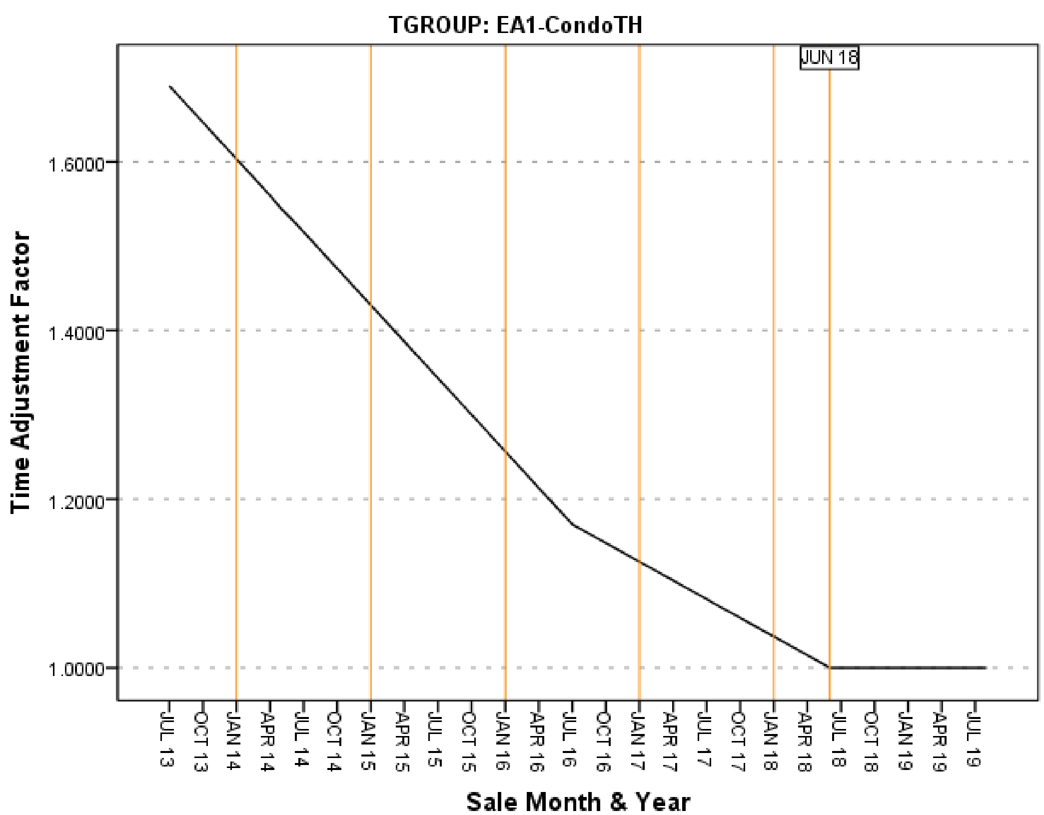
Sale Month & Year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1.0000
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OCT 13
JAN 14
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OCT 14
JAN 15
APR 15
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OCT 15
JAN 16
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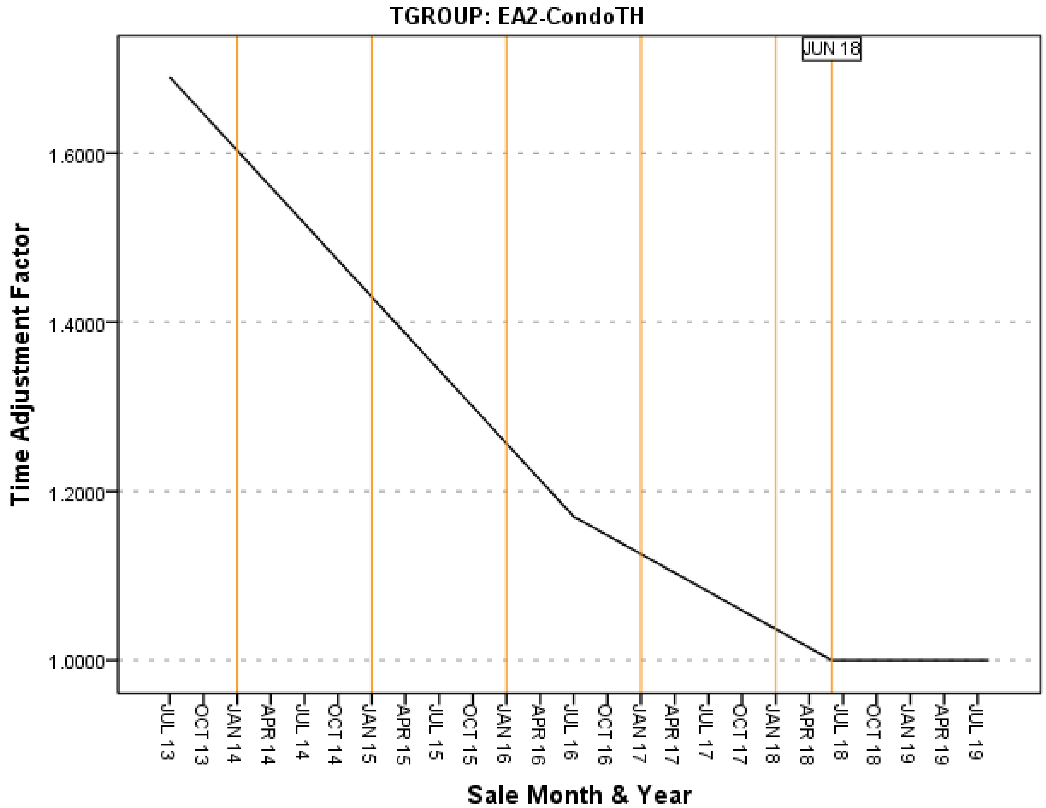
JUL 19
Sale Month & Year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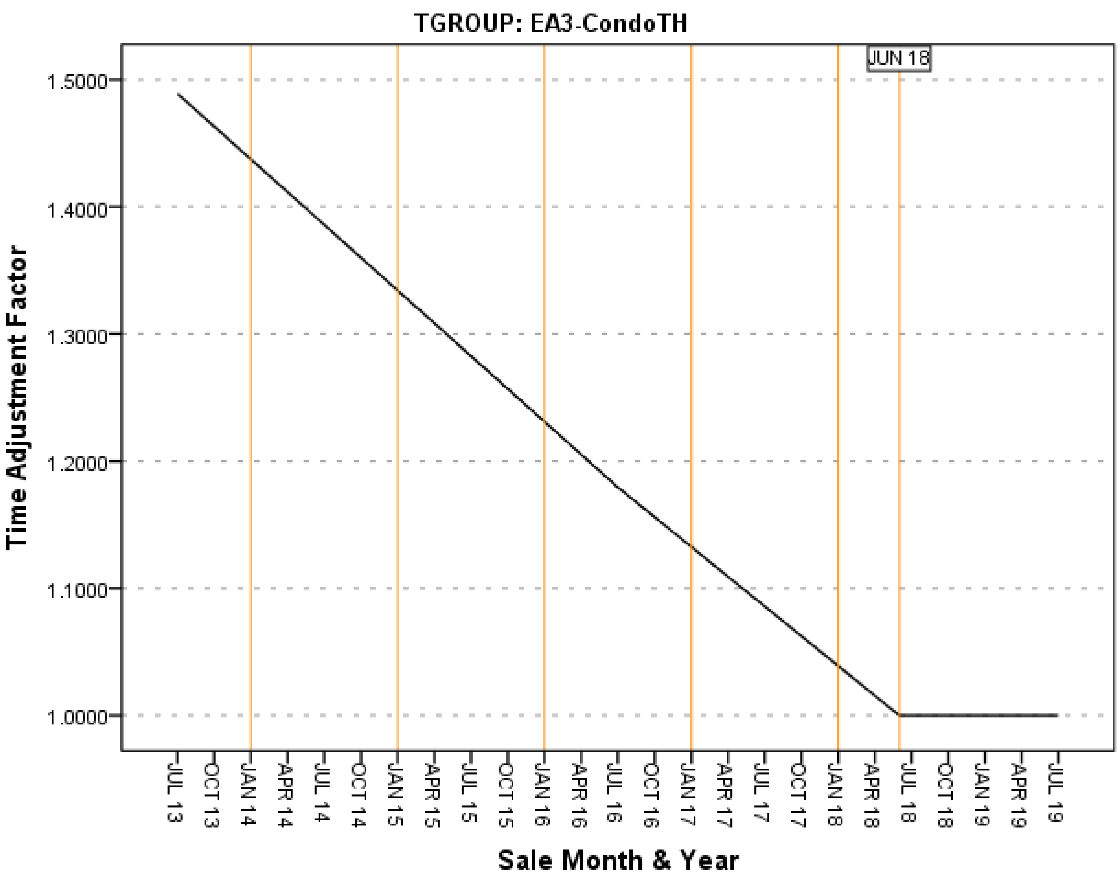
APR 19
JUL 19
Sale Month & Year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APR 17
JUL 17
OCT 17
JAN 18
APR 18
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OCT 18
JAN 19
APR 19
JUL 19
Sale Month & Year

RATIO STUDIES

Appendix A and B are ratio studies using the total values divided by the time adjusted sale price. Appendix A only contains the sales utilized in the two-year time period. Appendix B contains the five-year sale time period. Keep in mind that because of the over-fitting of the model, the ratio statistics will look better for the two-year time period than for the five-year time period. With that said, there are a few interesting results. First, is that properties that have a low quality have a large coefficient of dispersion. This is seen in both studies. In many cases, this is a problem with incorrect inventory. It is recommended that a plan be put in place to reinspect all low-quality properties. The variable Condition does not appear to be accurately collecting the actual condition of the property. This variable can be very helpful in predicting values, as the condition of the property is one of the common features prospective buyers look at when negotiating price. For this characteristic to be useful, a complete recanvass of the properties will need to be done. The recanvass could possibly be done at a desk using street views like Google Maps. However, there will be times when properties will need to be physically inspected. There are a significant number of properties that indicate they do not have a bathroom. The coefficient of dispersion for this group is also quite large and indicates that there are inventory issues. Properties with zero bedrooms, like the ones that do not have bathrooms, also have a large coefficient of dispersion. Both zero-bathroom and zero-bedroom properties should also be recanvassed. Properties with no heating, cooling or ventilation (HVAC) have a large coefficient of dispersion. This probably is a problem with errors in the data. These properties should be re-inspected. Another possible issue arises among exterior wall types. Exterior wall style "Pine Finished Cabin" has a very high coefficient of dispersion, and there are plenty of additional observations in this group to help support the statistics. These properties should be investigated to identify why the values are not accurately predicting this exterior wall type. It appears that sales below $240,000 are slightly over-valued, while sales over $575,000 are under-valued. The pattern of undervaluation for the high end is stronger than the pattern of overvaluation on the low end. The high end appears to be undervalued by approximately 7%. The high-end sales should be re-inspected to ensure that all the appropriate characteristics have been accurately collected.

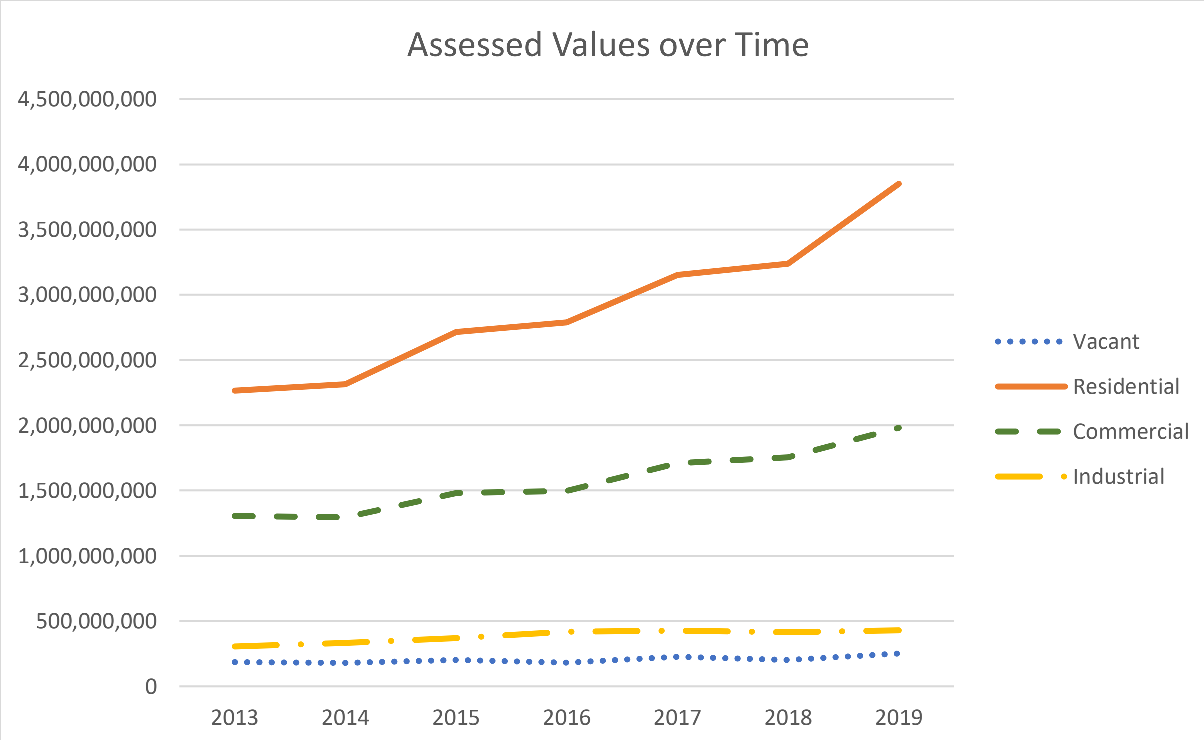
APPEALS AND PUBLIC OUTREACH

Like much of the front range of Colorado, Larimer County has experienced significant growth, and with that growth, significant increases in the market values of real estate. This first chart displays the assessed values for the past seven years. Assessed values are the values calculated using the State mandated ratios. For 2013 through 2016 the ratios have been 7.96% for Residential properties and 29% for all other classes. For 2017 and 2018 the ratios have been 7.2% for Residential properties and 29% for all other classes. It should be noted that the Division of Property Taxation implemented a new ratio of 7.15% as of April 10, 2019 for 2019 and 2020. While vacant land and industrial properties have only shown modest gains, if any, residential and commercial properties have seen values escalate.

	ASSESSED VALUES				
	Vacant	**Residential**	**Commercial**	**Industrial**	**Total**
2013	184,304,260	2,266,205,520	1,304,062,500	306,016,980	4,216,132,563
2014	180,043,660	2,314,554,800	1,295,365,000	331,554,230	4,283,471,513
2015	200,613,216	2,716,923,283	1,483,529,131	368,180,774	4,949,084,858
2016	181,807,482	2,790,261,608	1,499,641,185	418,898,411	5,056,844,202
2017	226,859,653	3,153,582,179	1,710,838,127	428,029,119	5,706,036,722
2018	201,031,534	3,239,172,733	1,756,747,617	414,410,251	5,802,311,942
2019[1]	251,720,711	3,851,303,897	1,981,320,519	429,706,166	6,746,538,101[2]

[1]2019 estimated from "Report of Authorities by Value Type"

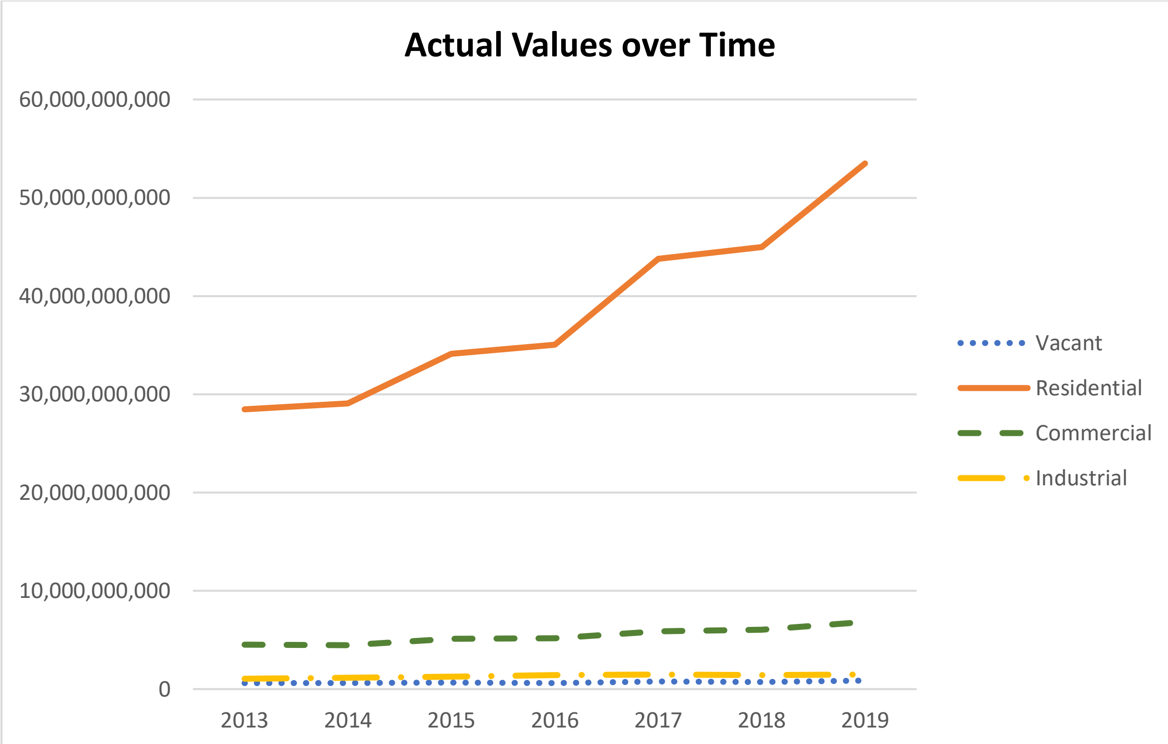
[2] Total represents all classes, not just those listed.



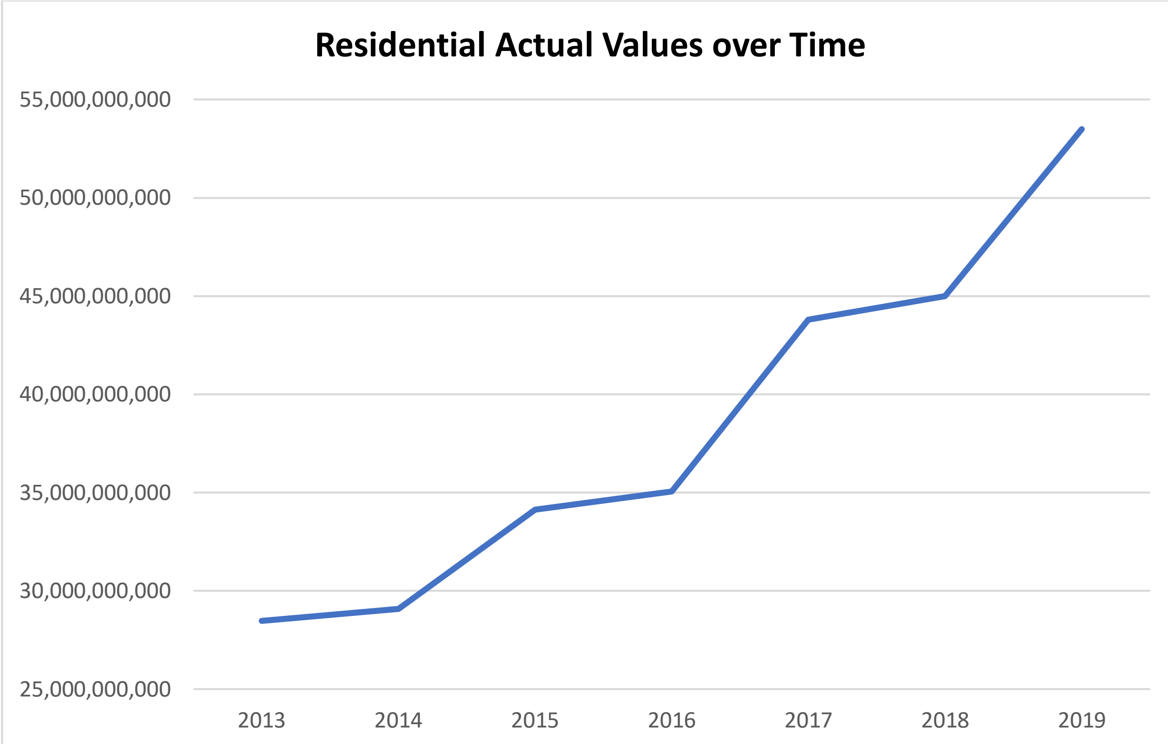
A look at the actual market values placed on these four classes shows a more startling contrast over time. The residential market has outpaced all other categories.

	Actual Values				
	Vacant	Residential	Commercial	Industrial	Total
2013	635,531,931	28,469,918,593	4,496,767,241	1,055,230,966	35,193,804,948
2014	620,840,207	29,077,321,608	4,466,775,862	1,143,290,448	35,866,689,584
2015	691,769,710	34,132,202,048	5,115,617,693	1,269,588,876	41,829,310,927
2016	626,922,352	35,053,537,789	5,171,176,500	1,444,477,279	42,869,339,837
2017	782,273,990	43,799,752,486	5,899,441,817	1,475,962,479	52,601,319,200
2018	693,212,186	44,988,510,181	6,057,750,403	1,429,000,866	53,826,921,246
2019[1]	868,002,450	53,490,331,900	6,832,139,720	1,481,745,400	63,473,898,121[2]

[1] 2019 estimated from "Report of Authorities by Value Type"
[2] Total represents all classes, not just those listed.

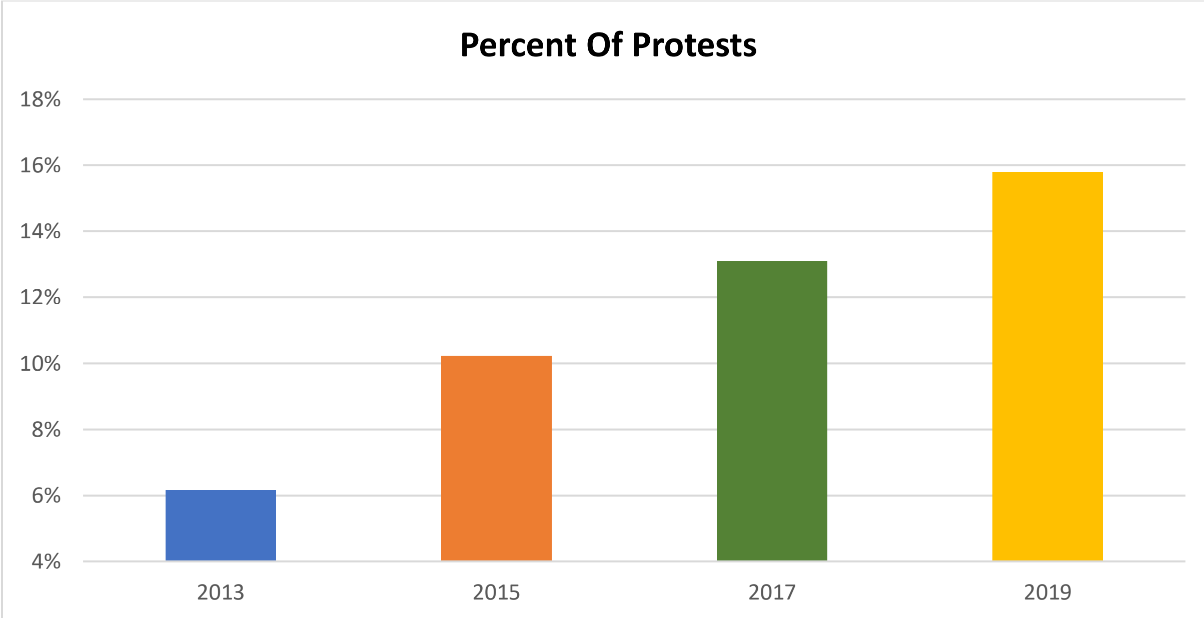


It is easy to see why many people attribute the increasing percentage of appeals to the tremendous increase in the market values over this time period. The amount of expansion and growth in the residential market has been exceptional. However, most people understand that the market is increasing. Generally, in times of expected growth, appeals tend to drop because the increase in value is expected. When appeals increase during this scenario, there must be a perception in the general public that the increases over-expressed market expectations. It is important for an Assessor's Office to educate the public on the market changes and demonstrate that even though values are increasing, they are simply following the change in the market. It is important for this message to get out early and regularly to the public. Since most of the work for the roll should be completed by the end of December, January should be the start of the marketing campaign to help educate the public on the changes that will be seen from the Assessor's Office. It is important to explain why the residential values have increased by 8.5 billion dollars (2018 to 2019) or 18.9%. Some of this will be explained as new growth, while another part of it will be based on the inflation in market prices. In any case, being able to explain charts like the one below, will go a long way in helping the public understand the hard work the Assessor's office has been doing. We commend the office in publishing an interactive value-change map that assisted taxpayers in understanding the impacts of the reassessment.



As stated before, there were 24,190 appeals for the 2019 tax roll. This continues a trend in appeals that has seen the number unceasingly grow. The chart on the following page shows this comparison in terms of the percent of properties contested. This may indicate that the problems in valuation are continuous issues that have not been resolved. Of course, some of the increase is directly related to the policy changes made by the previous assessor in cutting the analyzed sample size to only two years of sales. However, much of it may be due to problems with the models being too generic and not covering enough characteristics about the properties. Additionally, the county consistently giving reductions to taxpayers when they appeal is creating an incentive for people to appeal. It implies that the values produced are not very good and that most likely, 67% of the time, a reduction will be granted. This is not the first instance where this large of a percentage was reduced. An article published by The Coloradoan[1] this summer (June 2019) recalled how 60% of contests were won and values were reduced during the 2015 valuation cycle. The years 2001, 2003 and 2005 also experienced high numbers of appeals. This indicates that perhaps this problem has existed for decades.

[1] Marmaduke, J. (2019) 'Larimer County hasn't gotten this many property value protests in at least 20 years', *Fort Collins Coloradoan*, 8 June, pp. 7–10. Available at: https://www.coloradoan.com/story/news/2019/06/07/larimer-county-got-almost-23-000-property-value-protests-2019/1382727001/.



It is also necessary to check the reductions to identify if they seem justified. Thimgan & Associates randomly checked five parcels that were reduced. Based on our review, two properties were justified in getting a reduction while three properties were not justified. Additional training of staff in the handling of appeals appears to be warranted. A review of the policies and procedures should also be performed and updated to include robust documentation for any adjustments given as well as any reasons for a denial. The details of the five properties reviewed are listed below.

Property 1 – No justification for reduction

This property is a little bit bigger than anything that sold in the subdivision. It is 2,266 square feet (sqft). The property is valued at $227.14 per square foot. All the sales are smaller (average size for the sales is 1,540 sqft and 1,523 sqft for the population). There are 16 sales that span 2013 through 2019, with 3 sales in 2018 (one sale in 2019 which should not be used), 1 sale in 2017, 3 sales in 2016 and all the rest in 2013 and 2014. There were no sales in 2015. The time adjusted sale price per square foot is $253.13. The sales from 2017 and newer seem to be holding values that are about the same. Their unadjusted rate per square foot is $244.80. I don't see any justification for reducing this property. In addition, the ratios for all sales in this subdivision are at the proper level.

RATIO

SUBNO	Mean	Median	Minimum	Maximum	N
1483	1.0145	.9935	.91	1.19	16

Property 2 – No justification for reduction

The subject is bigger than average for the subdivision (average size for the sales is 2,079 sqft and 2,046 sqft for the population). It is 2,736 sqft. The property is valued at $205.08 per square foot. There are 20 sales that span 2013 through 2018, with 4 sales in 2018, 2 sales in 2017, 3 sales in 2016, 3 sales in 2015, and all the rest in 2013 and 2014. The time adjusted sale price per square foot is $240.65. The sales clearly show an escalation in value except for in 2015, which stayed about the same as 2014. Therefore, only sales in 2018 can be looked at for the unadjusted rate per square foot, which is at $268.80. Also, this property is listed as Average quality grade. Of the 20 sales, 16 were average. Looking at this description, issues with quality grade may be had here. The market really isn't showing any difference between the two quality grades in this subdivision. So, once again, there doesn't seem to be any justification for a reduction. The ratio study below shows the proper level of assessment for this subdivision.

RATIO

SUBNO	Mean	Median	Minimum	Maximum	N
11437	.9926	.9894	.84	1.22	20

Property 3 – Reduction Justified

The subject is bigger than average for the subdivision (average size for the sales is 2,079 sqft and 964 sqft for the population). It is 1,672 sqft. The property is valued at $369.14 per square foot. There are only two sales in this subdivision of 32 homes. Both sales have very high ratios. Without doing a complete review which would require a look at this neighborhood, there is reasonable doubt that the value originally placed on this property was correct. Therefore, an adjustment was justified. This probably was caused because of the shortened number of years of sales that were utilized.

Property 4 – Reduction Justified

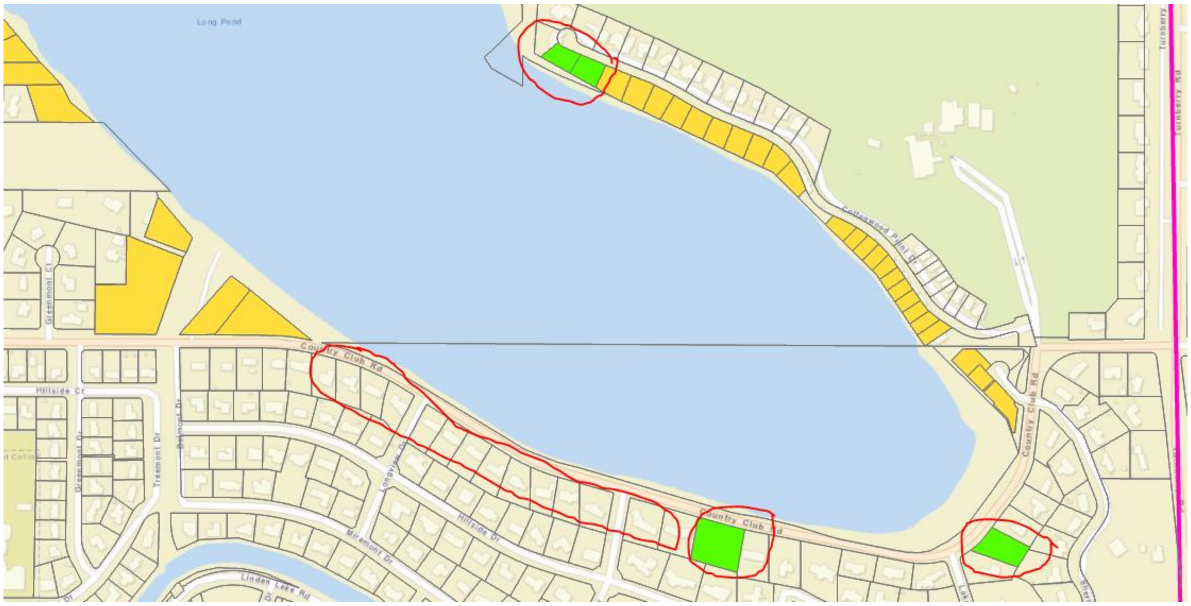
The subject is slightly bigger than average for the subdivision (average size for the sales is 2,079 sqft and 1,850 sqft for the population). It is 2,114 sqft. The property is valued at $369.14 per square foot. In this subdivision there are 10 sales that occurred during the time period in 2018, 27 sales in 2017, and 30 sales in 2016. It is difficult to tell if the time adjustments are correct here because of the shift in ratios during the first half of 2018 and the low counts per month. However, if looking at the median sale price per square foot of only the time period of July 2017 to June 2018, the difference between the time adjusted rate ($271.52) and the unadjusted rate ($267.28) is only about $4.23. Both numbers are quite lower than this particular property. However, the property is on a greenbelt, so a slight premium for location might exist. In addition, the property sold in 2013 for $350,000. It was adjusted for time to $451,500. Based on all these factors, the adjustment is warranted.

Property 5 – No justification for reduction

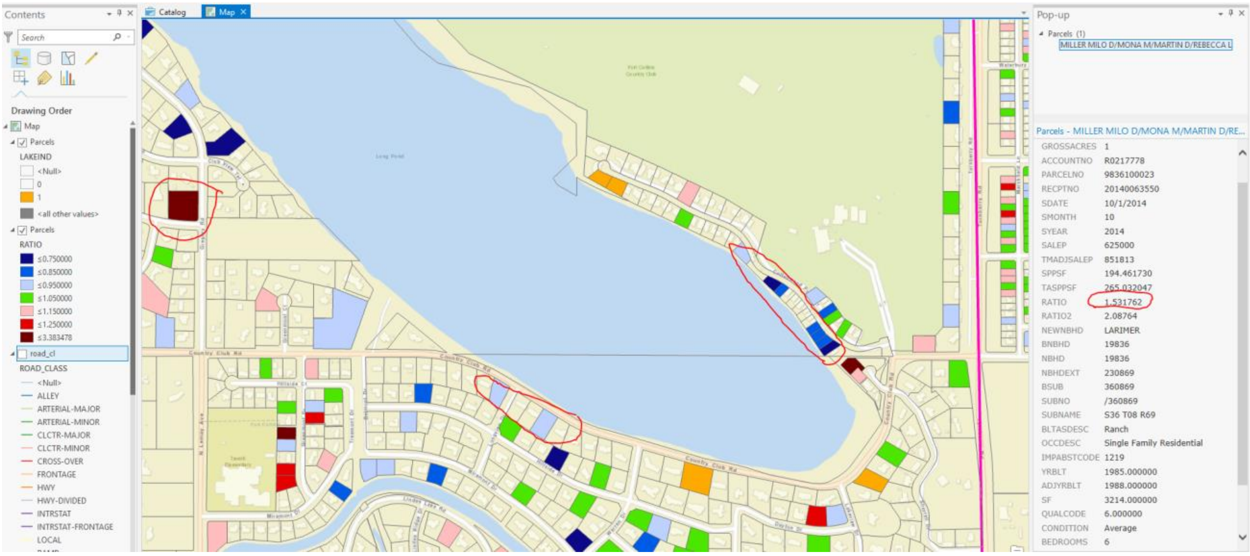
The subject is located in neighborhood 29414, with a little over 4,000 other properties. The average age of homes in this subdivision is 31 years. The average size of homes is almost 2,000 square feet. Over 86%of the homes here are of average quality. The subject is a 1,429 square foot average ranch property built in 1979 on 2 ½ acres. Because the land size for the parcel is so large, it is very important to look at comparable sales that also have similar lot sizes. In this case, sales between 2 and 3 acres were reviewed. This group represents 9 sales within this neighborhood. From 2018 through 2013, there were 2 sales in 2018, 1 sale in 2017, 2 sales in 2015, 2 sales in 2014, and 1 sale in 2013. The unadjusted rate per square foot for the 9 sales is $280.45. The time adjusted rate per square foot is $330.68. The subject property was valued at $283.20. No adjustment was warranted.

GIS Analysis & Review

The importance of GIS in the model building and review processes cannot be overstated. Utilization of tools that help look at data geographically often identifies issues or problems that do not expose themselves through statistical analysis. As mentioned previously, when building valuation models GIS should be utilized during the process to ensure all spatial issues have been accounted for. Just to illustrate this point, the following image from ArcGIS Pro maps-out direct lake proximity in yellow and indirect lake influence in green. The first issue seen here is that the upper two properties identified as "indirect lake influence" should probably be "direct lake influence." Second, properties on the south side of the lake generally are not listed as having indirect lake access. However, two properties did receive this characteristic. A quick look using google street view indicates that probably all of these properties should receive indirect lake influence.



To further illustrate the usefulness of GIS, if looking at this same area, the modeler can also review ratios to help identify outliers or valuation issues that were not resolved in the model. In this example, there is one property that might be considered an outlier with a ratio over 1.50. A quick look at the characteristics may help identify if the inventory is correct. On the south side of the lake, there were two sales that, if they had received the indirect lake adjustment, might have been correctly predicted rather than being valued lower. The blue parcels on the lake, on the righthand size of the image, imply that the direct lake adjustment applied in this situation is not adequately applying enough of a premium for this location.



As the County moves forward with changes in the model building process and value review, it is recommended that all staff be trained in GIS property review and value review. Special attention should be paid to ensure modelers are well-versed in this program as well, since modelers will be higher users of GIS because of its concurrent use with their models.

Appendix A

Two Year Time Period Ratio Study

	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
OVERALL	15,196	0.995	0.996	0.988	1.008	0.065

ECONAREA	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
EA1	8,246	0.994	0.996	0.987	1.007	0.061
EA2	5,668	0.997	0.996	0.989	1.008	0.063
EA3	698	0.991	0.997	0.982	1.009	0.081
EA4	584	0.997	0.996	0.985	1.012	0.119

SYEAR	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
2016	3,776	0.998	0.996	0.988	1.010	0.068
2017	7,693	0.993	0.995	0.985	1.008	0.064
2018	3,727	0.996	0.998	0.992	1.004	0.063

PROPTYPE	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
Condo	1,024	1.001	0.999	0.995	1.006	0.058
Duplex	129	0.979	0.995	0.973	1.006	0.051
Residential	11,983	0.995	0.996	0.987	1.008	0.068
Townhouse	2,053	0.994	0.995	0.990	1.005	0.051
Triplex	7	1.005	0.995	1.009	0.996	0.023

QUALITY	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
Low	12	0.952	0.932	0.913	1.043	0.260
Fair	477	0.995	0.985	0.976	1.020	0.116
Average	11,329	0.995	0.996	0.990	1.006	0.062
Average Plus	2,490	0.996	0.998	0.989	1.007	0.063
Good	717	0.993	0.999	0.979	1.014	0.073
Good Plus	122	0.988	0.995	0.974	1.014	0.074
Very Good	46	0.995	1.000	0.949	1.048	0.102
Excellent	3	0.932	0.998	0.921	1.012	0.068

CONDITION	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
Worn Out	1	0.875	0.875	0.875	1.000	0.000
Badly Worn	1	0.965	0.965	0.965	1.000	0.000
A	4	0.969	0.977	0.969	0.999	0.035
Average	15,170	0.995	0.996	0.988	1.008	0.065
Good	20	0.961	0.973	0.954	1.008	0.057

BATHS	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	51	0.974	1.000	0.879	1.108	0.245
0.5	1	0.617	0.617	0.617	1.000	0.000
0.75	17	0.912	0.945	0.893	1.022	0.199
1	1,606	0.993	0.988	0.980	1.013	0.092
1.5	318	0.987	0.991	0.983	1.004	0.075
1.75	810	0.992	0.993	0.982	1.010	0.069
2	3,727	0.997	0.997	0.990	1.007	0.065
2.25	18	1.003	0.969	0.996	1.007	0.080
2.5	3,466	0.994	0.995	0.991	1.003	0.053
2.75	470	0.999	0.998	0.993	1.006	0.059
3	2,082	1.001	0.999	0.992	1.009	0.063
3.25	12	0.968	0.973	0.967	1.002	0.055
3.5	1,633	0.995	0.997	0.988	1.007	0.057
3.75	76	1.009	0.999	1.006	1.002	0.055
305	1	1.083	1.083	1.083	1.000	0.000
4	451	0.993	0.995	0.984	1.009	0.063
4.25	1	1.000	1.000	1.000	1.000	0.000
4.5	264	0.997	1.000	0.984	1.014	0.067
4.75	15	1.003	0.999	0.995	1.008	0.043
5	89	0.994	1.000	0.978	1.016	0.078
5.34	1	1.086	1.086	1.086	1.000	0.000
5.5	44	0.975	0.990	0.944	1.034	0.098
5.75	1	1.222	1.222	1.222	1.000	0.000
6	22	0.953	0.984	0.935	1.019	0.066
6.5	8	0.964	0.961	0.945	1.020	0.088
7	9	0.988	0.998	0.991	0.998	0.044
8	2	1.083	1.083	1.035	1.046	0.132
8.5	1	0.566	0.566	0.566	1.000	0.000

BEDROOMS	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	34	0.930	0.989	0.870	1.069	0.258
1	292	0.980	0.990	0.967	1.013	0.105
2	2,856	0.990	0.989	0.981	1.009	0.071
3	6,830	0.994	0.994	0.987	1.007	0.063
4	3,673	1.001	0.999	0.992	1.009	0.060
5	1,289	1.003	1.000	0.993	1.010	0.062
6	193	0.999	1.000	0.985	1.014	0.065
7	17	1.000	1.000	0.999	1.001	0.061
8	4	0.897	1.000	0.749	1.199	0.114
9	2	1.049	1.049	1.041	1.007	0.052
10	1	1.000	1.000	1.000	1.000	0.000
12	1	0.902	0.902	0.902	1.000	0.000
15	1	1.324	1.324	1.324	1.000	0.000
25	1	0.980	0.980	0.980	1.000	0.000
175	1	0.741	0.741	0.741	1.000	0.000
250	1	0.990	0.990	0.990	1.000	0.000

BLTASDESC	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
1½ Story Fin	414	0.995	0.996	0.973	1.023	0.081
2 Story	4,444	0.996	0.998	0.993	1.003	0.057
2½ Story	25	0.993	0.994	0.952	1.043	0.061
3 Story	5	0.985	0.983	0.984	1.001	0.027
A Frame	8	0.962	0.984	0.933	1.031	0.123
Bi Level 2 Story	411	1.021	1.000	1.011	1.010	0.074
Cabin	55	0.964	0.980	0.892	1.080	0.212
Condo <= 3 Stories	901	1.005	1.000	1.000	1.005	0.055
Condo > 3 Stories	59	0.979	0.968	0.970	1.009	0.088
Cottage	13	1.029	0.993	1.010	1.019	0.202
Detached Garage	3	0.030	0.031	0.030	1.020	0.050
Dome	5	0.991	0.994	1.018	0.974	0.147
Duplex 1 1/2 Story	2	0.928	0.928	0.932	0.997	0.074
Duplex One Story	103	0.986	0.998	0.980	1.006	0.052
Duplex Split Level	1	0.962	0.962	0.962	1.000	0.000
Duplex Two Story	23	0.955	0.955	0.952	1.004	0.038
Modular	133	1.003	0.999	0.994	1.010	0.107
Modular 1 1/2 Story	1	0.977	0.977	0.977	1.000	0.000
Modular 2 Story	2	1.329	1.329	1.252	1.062	0.305
Rammed Earth	1	0.647	0.647	0.647	1.000	0.000
Ranch	5,411	0.993	0.995	0.982	1.011	0.073
Split Level	1,115	0.994	0.990	0.989	1.005	0.064
Townhouse 1 1/2 Story	34	0.989	0.991	0.990	0.999	0.038
Townhouse 3 Story	32	0.987	1.000	0.944	1.045	0.051
Townhouse One Story	590	0.993	0.997	0.987	1.006	0.054
Townhouse Split Level	20	0.982	0.974	0.955	1.029	0.077
Townhouse Two Story	1,378	0.996	0.994	0.993	1.002	0.050
Triplex 1 1/2 Story	1	0.995	0.995	0.995	1.000	0.000
Triplex One Story	4	0.993	0.998	0.995	0.998	0.020
Triplex Split Level	1	0.994	0.994	0.994	1.000	0.000
Triplex Two Story	1	1.077	1.077	1.077	1.000	0.000

HVAC	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
	11	0.993	0.990	1.002	0.991	0.047
Air Exchange	5	0.977	1.001	0.981	0.995	0.106
Central Air to Air	9,723	0.993	0.995	0.987	1.007	0.056
Cool Air in Heat Ducts	5	0.971	0.978	0.970	1.001	0.027
Electric Baseboard	794	0.999	0.999	0.992	1.007	0.081
Electric Panel	2	0.743	0.743	0.843	0.882	0.310
Electric Radiant	25	1.007	1.006	1.020	0.987	0.096
Floor/Wall Furnace	209	0.990	0.995	0.972	1.019	0.111
Forced Air	3,667	0.999	0.996	0.990	1.010	0.074
Heat Pump	10	0.977	0.998	0.972	1.005	0.043
Hot Water Baseboard	561	1.005	0.999	0.996	1.009	0.085
Hot Water Radiant	70	1.015	1.000	1.007	1.008	0.081
None	114	0.970	0.982	0.919	1.055	0.185

EXTERIOR	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
Cedar A-Frame	3	1.029	1.000	0.991	1.039	0.159
Cedar Finished Cabin	4	1.132	1.020	1.089	1.040	0.113
Finished Cottage	12	1.075	0.998	1.034	1.040	0.174
Frame Aluminum	3	1.092	1.114	1.127	0.969	0.052
Frame Brick Veneer	2	1.008	1.008	1.008	1.000	0.008
Frame Cement Fiber	1	0.962	0.962	0.962	1.000	0.000
Frame Hardboard	40	1.018	1.011	1.015	1.003	0.096
Frame Masonry Veneer	153	0.990	1.000	0.978	1.013	0.071
Frame Plywood	1	0.995	0.995	0.995	1.000	0.000
Frame Rustic Log	83	0.966	0.974	0.952	1.015	0.101
Frame Shingle	70	0.977	0.980	0.973	1.004	0.054
Frame Siding	13,289	0.996	0.997	0.990	1.006	0.064
Frame Stucco	399	0.977	0.983	0.961	1.016	0.078
Frame Syn Plaster	418	0.992	0.994	0.980	1.012	0.069
Frame Vinyl	316	0.999	0.992	0.998	1.001	0.060
Hardboard Sheet	237	0.996	0.998	0.995	1.001	0.042
High Profile Dome	2	1.173	1.173	1.172	1.001	0.150
Log	5	0.988	1.019	0.965	1.023	0.050
Low Profile Dome	3	0.870	0.900	0.884	0.984	0.103
Masonry Common Brick	62	0.969	0.981	0.924	1.049	0.069
Masonry Concrete Block	33	1.018	1.007	0.980	1.040	0.125
Masonry Face Brick	1	0.960	0.960	0.960	1.000	0.000
Masonry Poured Concrete	2	0.824	0.824	0.800	1.029	0.214
Masonry Stone	1	0.950	0.950	0.950	1.000	0.000
Pine A-Frame	5	0.921	0.968	0.898	1.025	0.094
Pine Finished Cabin	49	0.959	0.978	0.884	1.086	0.215
Unfinished Cottage	1	0.470	0.470	0.470	1.000	0.000

ROOFCOVER	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
	88	0.961	0.987	0.940	1.022	0.136
Built Up Rock	139	1.005	0.998	0.982	1.023	0.086
Clay Tile	85	1.011	1.000	0.992	1.020	0.077
Comp Shingle Heavy	768	0.987	0.995	0.977	1.010	0.062
Composition Roll	89	0.978	0.994	0.984	0.994	0.075
Composition Shingle	12,652	0.996	0.996	0.990	1.006	0.063
Concrete Tile	257	0.995	0.989	0.993	1.002	0.051
Formed Seam Metal	58	0.990	0.994	0.972	1.018	0.099
Preformed Metal	48	1.002	0.994	1.002	1.000	0.105
Slate	36	1.005	0.992	0.940	1.070	0.132
Wood Shake	970	0.998	0.997	0.981	1.017	0.083
Wood Shingle	6	0.963	0.961	0.983	0.979	0.108

ROOFTYPE	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
	21	0.904	0.954	0.928	0.974	0.128
Flat	219	0.988	0.997	0.969	1.019	0.063
Gable	12,323	0.995	0.996	0.989	1.006	0.065
Gambrel	58	1.025	1.000	1.014	1.011	0.104
Hip	1,343	0.993	0.994	0.982	1.012	0.071
Hip/Gable	1,167	0.996	1.000	0.984	1.012	0.055
Irregular	12	0.999	1.000	0.991	1.008	0.088
Shed	53	1.021	0.991	0.981	1.041	0.122

UNITTYPE	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
	11,993	0.995	0.996	0.987	1.008	0.068
End	2,206	0.998	0.998	0.990	1.008	0.054
Inside	997	0.993	0.992	0.990	1.003	0.052

FIRE	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	15,155	0.995	0.996	0.988	1.008	0.065
1	41	0.992	0.999	0.987	1.005	0.122

FLOOD	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	15,103	0.995	0.996	0.988	1.008	0.065
1	93	1.016	1.000	1.013	1.003	0.103

GOLF	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	15,028	0.995	0.996	0.988	1.008	0.065
1	168	0.993	0.997	0.984	1.009	0.075

GREENBELT	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	14,944	0.995	0.996	0.988	1.008	0.065
1	252	0.996	0.994	0.982	1.014	0.066

LAKEDIR	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	15,077	0.995	0.996	0.988	1.007	0.065
1	119	0.971	0.998	0.948	1.024	0.084

LAKEIND	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	15,117	0.995	0.996	0.988	1.007	0.065
1	79	0.991	0.989	0.949	1.044	0.100

PARK	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	15,088	0.995	0.996	0.987	1.008	0.065
1	108	1.015	1.000	1.009	1.006	0.064

RAILROAD	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	14,827	0.995	0.996	0.988	1.008	0.065
1	369	0.999	0.994	0.991	1.008	0.078

RIVER	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	15,157	0.995	0.996	0.988	1.008	0.065
1	39	1.001	0.990	0.995	1.005	0.071

SITEVIEW	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	15,018	0.995	0.996	0.988	1.008	0.065
1	178	0.990	0.995	0.979	1.012	0.085

TRAFFA	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	14,812	0.995	0.996	0.988	1.008	0.065
1	384	0.994	0.993	0.985	1.009	0.072

TRAFFH	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	14,817	0.995	0.996	0.988	1.008	0.064
1	379	0.998	0.993	0.990	1.009	0.083

NBHD	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
18729	1,027	0.992	0.995	0.989	1.003	0.047
18933	2,344	0.993	0.998	0.986	1.007	0.054
19601	372	0.993	0.996	0.985	1.008	0.058
19613	724	0.990	0.993	0.984	1.006	0.060
19614	255	0.997	0.988	0.996	1.001	0.062
19711	358	0.985	0.995	0.972	1.014	0.089
19715	574	1.001	0.996	0.989	1.012	0.074
19722	954	0.998	0.999	0.994	1.004	0.059
19724	748	1.003	0.998	0.996	1.007	0.067
19734	383	0.996	0.994	0.994	1.002	0.061
19829	239	0.988	0.993	0.973	1.016	0.091
19836	268	0.989	0.986	0.981	1.008	0.077
28506	981	0.992	0.994	0.983	1.009	0.064
28623	524	0.980	0.990	0.973	1.008	0.065
29414	881	0.998	0.996	0.996	1.002	0.052
29502	862	1.001	0.997	0.996	1.004	0.062
29517	446	0.990	0.995	0.985	1.006	0.068
29522	1,621	1.004	0.998	0.996	1.009	0.070
29635	353	0.996	0.996	0.991	1.005	0.058
33525	698	0.991	0.997	0.982	1.009	0.081
41428	132	0.978	0.999	0.978	1.000	0.121
41626	131	0.999	0.998	0.991	1.008	0.106
42915	94	0.995	0.993	0.998	0.998	0.124
43028	227	1.008	0.993	0.980	1.029	0.124

SF Range	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
<= 1,000	1,504	0.969	0.976	0.953	1.017	0.095
1,001 – 1,200	1,636	0.988	0.985	0.978	1.010	0.068
1,201 – 1,350	1,340	0.992	0.988	0.985	1.006	0.062
1,351 – 1,500	1,517	0.992	0.992	0.985	1.007	0.059
1,501 – 1,650	1,707	0.995	0.996	0.988	1.008	0.058
1,651 – 1,800	1,515	0.999	0.994	0.990	1.008	0.062
1,801 – 2,000	1,611	0.997	0.998	0.989	1.008	0.059
2,001 – 2,200	1,170	1.001	0.999	0.988	1.013	0.058
2,201 – 2,600	1,732	1.008	1.000	0.999	1.010	0.059
2,601 +	1,464	1.012	1.000	0.995	1.016	0.067

Sale Range	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
<= 240 K	1,516	1.042	1.005	1.036	1.006	0.105
241 – 280 K	1,587	1.007	0.999	1.007	1.000	0.064
281 – 310 K	1,663	0.995	0.998	0.995	1.000	0.059
311 – 330 K	1,424	0.991	0.994	0.991	1.000	0.058
331 – 350 K	1,237	0.997	0.998	0.996	1.000	0.054
351 – 380 K	1,585	0.987	0.991	0.987	1.000	0.054
381 – 420 K	1,775	0.994	0.998	0.994	1.000	0.056
421 – 470 K	1,394	0.990	0.995	0.989	1.000	0.058
471 – 575 K	1,523	0.984	0.993	0.984	1.001	0.062
575 K +	1,492	0.964	0.978	0.957	1.007	0.076

YB Range	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
<= 1970	1,529	0.998	0.997	0.982	1.016	0.099
1971 - 1980	2,014	1.006	0.999	0.997	1.009	0.081
1981 - 1990	1,510	0.998	0.997	0.991	1.007	0.067
1991 - 1995	960	0.997	0.998	0.992	1.004	0.059
1996 - 2000	1,682	1.000	0.996	0.997	1.003	0.060
2001 - 2005	2,162	0.995	0.997	0.991	1.005	0.058
2006 - 2010	797	0.989	0.994	0.978	1.011	0.061
2011 - 2015	1,326	0.984	0.990	0.980	1.005	0.052
2016 +	3,216	0.989	0.995	0.982	1.007	0.053

Land Range	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
Zero	1,852	0.999	0.997	0.994	1.005	0.056
1 – 4,000	1,285	0.988	0.990	0.983	1.005	0.056
4,000 – 5,500	1,405	0.995	0.995	0.991	1.004	0.059
5,501 – 6,500	1,484	0.997	0.997	0.994	1.003	0.057
6,501 – 7,200	1,600	0.997	0.999	0.994	1.002	0.056
7,201 – 8,000	1,532	1.000	0.998	0.996	1.004	0.063
8,001 – 9,000	1,448	0.995	0.997	0.990	1.005	0.064
9,001 – 10,890	1,534	1.002	0.997	0.993	1.009	0.070
10,891 – 21,780	1,768	0.992	0.994	0.978	1.014	0.075
21,781+	1,288	0.985	0.994	0.972	1.013	0.097

APPENDIX B

FIVE YEAR TIME PERIOD RATIO STUDY

	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
OVERALL	35,587	0.996	0.993	0.978	1.018	0.082

GROUP	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
3 Years Before Time Period	20,391	0.996	0.988	0.971	1.026	0.094
Time Period	15,196	0.995	0.996	0.988	1.008	0.065

ECONAREA	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
EA1	19,916	0.995	0.993	0.978	1.017	0.077
EA2	12,804	0.997	0.992	0.979	1.018	0.080
EA3	1,615	0.987	0.991	0.969	1.018	0.100
EA4	1,252	1.012	0.995	0.986	1.027	0.148

SYEAR	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
2013	3,113	0.993	0.986	0.960	1.033	0.105
2014	6,490	1.003	0.997	0.971	1.033	0.100
2015	7,205	0.990	0.980	0.970	1.021	0.090
2016	7,359	0.997	0.992	0.985	1.012	0.075
2017	7,693	0.993	0.995	0.985	1.008	0.064
2018	3,727	0.996	0.998	0.992	1.004	0.063

PROPTYPE	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
Condo	2,458	1.019	1.008	0.995	1.024	0.078
Duplex	299	0.980	0.992	0.967	1.013	0.061
Residential	28,149	0.995	0.992	0.978	1.018	0.085
Townhouse	4,655	0.986	0.986	0.974	1.013	0.067
Triplex	26	0.970	0.997	0.965	1.005	0.051

QUALITY	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
Low	28	1.162	1.014	1.038	1.119	0.367
Fair	1,123	1.035	1.000	1.008	1.027	0.136
Average	26,653	1.003	0.997	0.991	1.012	0.078
Average Plus	5,883	0.966	0.969	0.956	1.010	0.080
Good	1,564	0.960	0.969	0.943	1.018	0.097
Good Plus	236	0.961	0.963	0.942	1.021	0.108
Very Good	93	0.976	0.969	0.914	1.067	0.149
Excellent	7	0.818	0.797	0.809	1.011	0.121

CONDITION	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
Worn Out	4	1.328	1.191	0.903	1.471	0.514
Badly Worn	8	1.080	0.975	0.997	1.084	0.162
A	4	0.969	0.977	0.969	0.999	0.035
Average	35,539	0.995	0.993	0.978	1.018	0.082
Good	31	1.048	0.978	0.998	1.050	0.144
Excellent	1	0.914	0.914	0.914	1.000	0.000

BATHS	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	**102**	**0.960**	**0.990**	**0.856**	**1.121**	**0.254**
0.5	1	0.617	0.617	0.617	1.000	0.000
0.75	43	0.926	0.938	0.905	1.024	0.154
1	3,808	1.029	1.001	1.008	1.020	0.115
1.5	823	1.019	1.001	1.007	1.012	0.092
1.75	1,939	1.009	0.999	0.997	1.012	0.081
2	8,972	1.010	1.000	0.996	1.013	0.080
2.25	40	0.983	0.974	0.976	1.007	0.089
2.34	1	1.008	1.008	1.008	1.000	0.000
2.5	7,879	0.983	0.984	0.974	1.008	0.065
2.75	1,099	0.997	0.993	0.985	1.012	0.079
205	1	0.952	0.952	0.952	1.000	0.000
3	4,782	0.991	0.991	0.976	1.015	0.081
3.25	26	0.962	0.973	0.943	1.020	0.069
3.5	3,855	0.971	0.976	0.959	1.012	0.073
3.75	196	0.973	0.980	0.952	1.022	0.073
305	1	1.083	1.083	1.083	1.000	0.000
4	1,021	0.971	0.975	0.960	1.012	0.080
4.25	3	0.917	0.916	0.898	1.021	0.060
4.5	590	0.959	0.963	0.940	1.020	0.090
4.75	31	0.954	0.973	0.929	1.026	0.073
5	185	0.975	0.957	0.953	1.024	0.115
5.34	3	1.003	1.014	0.997	1.005	0.058
5.5	107	0.941	0.932	0.912	1.032	0.112
5.75	2	1.125	1.125	1.131	0.995	0.086
6	42	0.928	0.936	0.905	1.025	0.087
6.5	14	0.928	0.937	0.911	1.018	0.097
6.75	1	0.975	0.975	0.975	1.000	0.000
7	11	0.979	0.998	0.983	0.995	0.048
7.5	3	1.005	0.960	0.916	1.096	0.228
8	5	0.932	0.893	0.890	1.048	0.126
8.5	1	0.566	0.566	0.566	1.000	0.000

BEDROOMS	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
0	70	0.937	0.989	0.870	1.077	0.244
1	732	1.006	1.001	0.976	1.031	0.123
2	6675	1.000	0.994	0.981	1.020	0.087
3	15987	0.998	0.993	0.983	1.015	0.079
4	8703	0.992	0.993	0.975	1.018	0.078
5	2949	0.986	0.988	0.970	1.017	0.079
6	408	0.975	0.982	0.955	1.021	0.086
7	42	0.982	0.988	0.973	1.010	0.077
8	5	0.896	1.000	0.768	1.166	0.113
9	7	0.996	0.999	0.989	1.007	0.046
10	2	0.959	0.959	0.948	1.012	0.043
12	1	0.902	0.902	0.902	1.000	0.000
15	2	1.173	1.173	1.154	1.017	0.129
25	1	0.980	0.980	0.980	1.000	0.000
175	2	0.795	0.795	0.791	1.005	0.068
250	1	0.990	0.990	0.990	1.000	0.000

BLTASDESC	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
1½ Story Fin	985	0.985	0.984	0.959	1.027	0.107
2 Story	10,194	0.982	0.983	0.973	1.010	0.072
2½ Story	86	0.935	0.943	0.917	1.019	0.093
3 Story	8	0.972	0.960	0.968	1.004	0.025
A Frame	21	0.977	1.000	0.950	1.028	0.113
Bi Level 2 Story	1,009	1.044	1.016	1.032	1.011	0.088
Cabin	117	0.995	0.994	0.898	1.107	0.235
Condo <= 3 Stories	2,199	1.028	1.013	1.014	1.014	0.073
Condo > 3 Stories	120	0.954	0.963	0.883	1.081	0.123
Cottage	30	1.058	0.993	1.036	1.021	0.222
Detached Garage	7	0.091	0.031	0.030	2.989	2.126
Dome	7	0.994	0.997	1.011	0.983	0.106
Duplex 1 1/2 Story	6	0.912	0.921	0.886	1.029	0.087
Duplex One Story	239	0.987	0.998	0.978	1.010	0.059
Duplex Split Level	9	0.990	0.991	0.986	1.004	0.043
Duplex Two Story	45	0.946	0.941	0.933	1.014	0.060
Modular	317	1.040	1.000	1.005	1.035	0.160
Modular 1 1/2 Story	2	1.093	1.093	1.097	0.997	0.107
Modular 2 Story	4	1.144	0.958	1.087	1.053	0.217
Ranch	12,751	0.999	0.994	0.976	1.023	0.091
Split Level	2,748	1.010	1.000	1.002	1.008	0.071
Townhouse 1 1/2 Story	87	0.983	0.987	0.978	1.005	0.056
Townhouse 3 Story	38	0.985	1.000	0.947	1.040	0.052
Townhouse One Story	1,423	0.969	0.971	0.953	1.017	0.075
Townhouse Split Level	46	1.010	0.996	0.988	1.022	0.076
Townhouse Two Story	3,062	0.994	0.991	0.985	1.009	0.064
Triplex One Story	12	0.977	0.997	0.972	1.005	0.042
Triplex Split Level	8	0.960	0.996	0.954	1.006	0.051
Triplex Two Story	5	0.963	0.998	0.961	1.002	0.084

HVAC	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
	13	1.051	0.990	0.998	1.053	0.115
Air Exchange	8	0.943	0.932	0.944	0.999	0.125
Central Air to Air	22,314	0.983	0.986	0.969	1.015	0.071
Complete HVAC	1	0.937	0.937	0.937	1.000	0.000
Cool Air in Heat Ducts	12	0.982	0.981	0.966	1.016	0.060
Electric Baseboard	1,928	1.025	1.004	1.006	1.019	0.103
Electric Panel	3	0.819	0.970	0.871	0.940	0.158
Electric Radiant	51	1.005	1.002	1.007	0.999	0.106
Floor/Wall Furnace	498	1.027	1.000	0.992	1.035	0.149
Forced Air	9,019	1.016	1.000	0.999	1.017	0.092
Heat Pump	28	0.975	0.961	0.941	1.036	0.095
Hot Water Baseboard	1,319	1.015	1.000	0.992	1.023	0.107
Hot Water Radiant	140	0.979	0.994	0.961	1.018	0.102
None	251	0.978	0.980	0.919	1.064	0.198
Package Unit	1	1.110	1.110	1.110	1.000	0.000
Warm and Cool Air Zone	1	0.677	0.677	0.677	1.000	0.000

EXTERIOR	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
	1	1.009	1.009	1.009	1.000	0.000
Cedar A-Frame	7	1.018	1.000	0.993	1.026	0.111
Cedar Finished Cabin	11	1.043	1.015	1.032	1.010	0.106
Finished Cottage	25	1.107	0.996	1.064	1.041	0.228
Frame Aluminum	7	0.948	1.058	0.983	0.965	0.149
Frame Brick Veneer	3	1.030	1.016	1.032	0.998	0.024
Frame Cement Fiber	1	0.962	0.962	0.962	1.000	0.000
Frame Hardboard	84	1.038	1.004	1.023	1.015	0.122
Frame Masonry Veneer	391	0.989	0.994	0.970	1.019	0.093
Frame Plywood	2	1.022	1.022	1.024	0.999	0.027
Frame Rustic Log	195	0.950	0.959	0.929	1.023	0.122
Frame Shingle	179	0.982	0.988	0.968	1.014	0.064
Frame Siding	31,527	0.999	0.994	0.984	1.015	0.080
Frame Stucco	820	0.935	0.944	0.914	1.024	0.096
Frame Syn Plaster	984	0.956	0.967	0.939	1.019	0.091
Frame Vinyl	745	0.994	0.988	0.982	1.011	0.071
Hardboard Sheet	238	0.996	0.997	0.994	1.001	0.043
High Profile Dome	4	1.086	1.000	1.075	1.011	0.088
Lap Siding	1	1.853	1.853	1.853	1.000	0.000
Log	9	0.958	0.990	0.947	1.012	0.119
Low Profile Dome	3	0.870	0.900	0.884	0.984	0.103
Masonry Common Brick	147	0.988	0.988	0.957	1.033	0.101
Masonry Concrete Block	76	1.038	1.008	1.005	1.034	0.130
Masonry Face Brick	2	1.000	1.000	1.008	0.992	0.040
Masonry Poured Concrete	2	0.824	0.824	0.800	1.029	0.214
Masonry Stone	1	0.950	0.950	0.950	1.000	0.000
Pine A-Frame	14	0.956	1.003	0.926	1.032	0.114
Pine Finished Cabin	99	0.992	0.996	0.881	1.127	0.245
Pine Unfinished Cabin	4	1.050	0.864	1.035	1.014	0.356
Unfinished Cottage	5	0.809	0.873	0.847	0.956	0.152

ROOFCOVER	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
	188	1.021	0.999	0.995	1.026	0.158
Built Up Rock	312	1.024	1.002	0.987	1.038	0.116
Clay Tile	194	0.959	0.963	0.923	1.039	0.101
Comp Shingle Heavy	1,861	0.962	0.970	0.949	1.014	0.080
Composition Roll	201	0.984	0.986	0.973	1.011	0.099
Composition Shingle	29,488	0.998	0.995	0.983	1.015	0.079
Concrete Tile	674	0.953	0.958	0.933	1.020	0.071
Formed Seam Metal	132	1.002	0.982	0.972	1.031	0.147
Preformed Metal	128	0.989	0.983	0.966	1.023	0.139
Slate	96	0.965	0.954	0.926	1.041	0.127
Wood Shake	2,306	0.998	0.994	0.976	1.023	0.096
Wood Shingle	7	0.943	0.916	0.960	0.982	0.112

ROOFTYPE	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
	33	0.893	0.949	0.917	0.974	0.138
Flat	453	1.014	1.000	0.984	1.031	0.095
Gable	29,285	0.997	0.994	0.982	1.016	0.081
Gambrel	126	1.029	1.000	0.997	1.032	0.130
Hip	3,068	0.994	0.991	0.970	1.024	0.090
Hip/Gable	2,481	0.975	0.983	0.953	1.022	0.070
Irregular	21	1.008	1.003	0.988	1.021	0.086
Shed	120	1.028	0.993	0.993	1.036	0.120

UNITTYPE	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
	28,223	0.995	0.992	0.978	1.018	0.085
End	5,116	0.996	0.995	0.976	1.020	0.071
Inside	2,248	1.002	0.995	0.990	1.012	0.070

FIRE	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
No	35,497	0.995	0.993	0.978	1.018	0.082
Yes	90	1.033	1.000	0.998	1.035	0.163

FLOOD	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
No	35,392	0.995	0.993	0.978	1.018	0.081
Yes	195	1.038	1.000	1.015	1.023	0.142

GOLF	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
No	35,203	0.996	0.993	0.979	1.018	0.082
Yes	384	0.953	0.955	0.931	1.023	0.096

GREENBELT	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
No	34,963	0.996	0.993	0.979	1.018	0.082
Yes	624	0.981	0.980	0.955	1.027	0.084

LAKEDIR	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
No	35,326	0.996	0.993	0.979	1.018	0.082
Yes	261	0.950	0.962	0.924	1.028	0.116

LAKEIND	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
No	35,399	0.996	0.993	0.979	1.018	0.082
Yes	188	0.953	0.942	0.916	1.041	0.115

PARK	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
No	35,293	0.995	0.993	0.978	1.018	0.082
Yes	294	1.020	1.003	1.009	1.012	0.081

RAILROAD	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
No	34,675	0.995	0.993	0.978	1.018	0.081
Yes	912	1.016	0.996	0.991	1.025	0.101

RIVER	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
No	35,502	0.996	0.993	0.978	1.018	0.082
Yes	85	0.958	0.963	0.939	1.020	0.095

TRAFFA	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
No	34,674	0.995	0.993	0.978	1.018	0.081
Yes	913	1.012	0.999	0.996	1.017	0.091

TRAFFH	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
No	34,710	0.995	0.993	0.978	1.018	0.081
Yes	877	1.015	0.999	0.988	1.026	0.108

SITEVIEW	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
No	35,180	0.996	0.993	0.978	1.018	0.081
Yes	407	0.969	0.970	0.954	1.016	0.108

SF Range	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
<= 1,000	3,621	1.004	0.997	0.981	1.024	0.111
1,001 – 1,200	4,061	1.005	0.997	0.991	1.014	0.083
1,201 – 1,350	3,369	1.003	0.994	0.991	1.012	0.081
1,351 – 1,500	3,536	1.000	0.993	0.988	1.012	0.076
1,501 – 1,650	3,972	0.995	0.994	0.983	1.013	0.073
1,651 – 1,800	3,526	0.998	0.990	0.984	1.014	0.079
1,801 – 2,000	3,714	0.993	0.993	0.979	1.014	0.077
2,001 – 2,200	2,721	0.989	0.990	0.972	1.018	0.076
2,201 – 2,600	3,836	0.983	0.989	0.969	1.015	0.076
2,601+	3,231	0.982	0.991	0.963	1.020	0.086

Sale Range	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
<= 240 k	8,170	1.061	1.033	1.052	1.008	0.101
241 – 280 k	5,021	1.007	1.000	1.006	1.001	0.071
281 – 310 k	3,703	0.987	0.988	0.985	1.002	0.067
311 – 330 k	2,694	0.981	0.981	0.979	1.002	0.068
331 – 350 k	2,287	0.975	0.980	0.972	1.003	0.065
351 – 380 k	2,879	0.972	0.974	0.970	1.003	0.066
381 – 420 k	3,062	0.973	0.979	0.969	1.004	0.068
421 – 470 k	2,467	0.968	0.975	0.964	1.004	0.072
471 – 575 k	2,768	0.957	0.966	0.952	1.005	0.078
575 k +	2,536	0.933	0.944	0.923	1.011	0.096

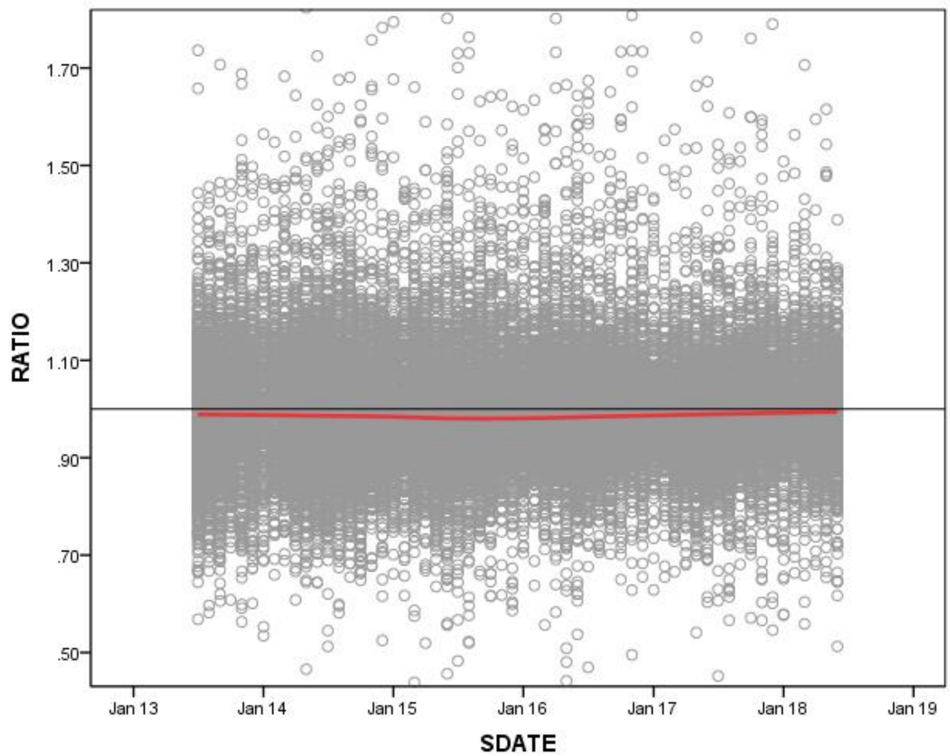
YB Range	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
<= 1970	3,726	1.028	1.000	1.006	1.022	0.118
1971 – 1980	4,921	1.030	1.003	1.013	1.016	0.098
1981 – 1990	3,751	1.012	1.000	0.997	1.016	0.085
1991 – 1995	2,372	0.990	0.994	0.977	1.013	0.078
1996 – 2000	4,152	0.994	0.992	0.984	1.011	0.073
2001 – 2005	5,536	0.987	0.987	0.971	1.016	0.071
2006 – 2010	1,992	0.968	0.975	0.948	1.021	0.077
2011 – 2015	5,775	0.958	0.963	0.946	1.013	0.071
2016+	3,362	0.991	0.994	0.983	1.008	0.056

Land Range	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
Zero	4,401	1.008	1.000	0.989	1.019	0.075
1 – 4,000	2,817	0.988	0.988	0.980	1.008	0.066
4,001 – 5,500	3,525	0.993	0.991	0.981	1.012	0.073
5,501 – 6,500	3,356	0.996	0.992	0.983	1.013	0.074
6,501 – 7,200	3,695	0.997	0.994	0.986	1.011	0.073
7,201 – 8,000	3,623	1.003	0.998	0.993	1.011	0.074
8,001 – 9,000	3,407	1.001	0.997	0.986	1.015	0.078
9,001 – 10,890	3,710	1.001	0.995	0.985	1.017	0.086
10,891 – 21,780	4,125	0.986	0.982	0.963	1.024	0.097
21,781+	2,928	0.977	0.976	0.949	1.029	0.123

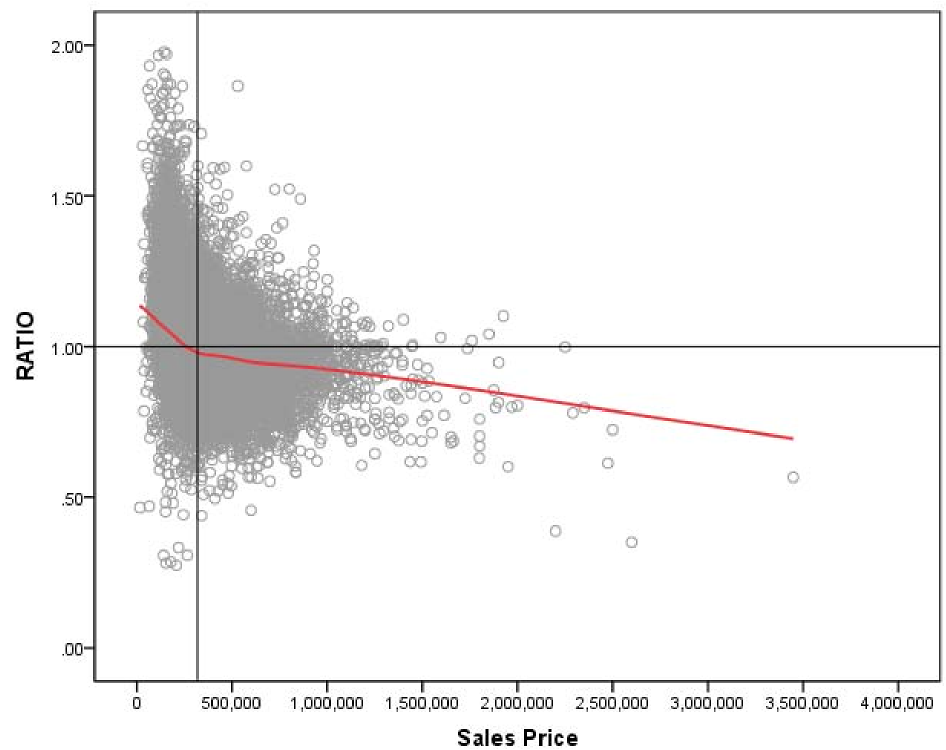
NBHD	COUNT	MEAN	MEDIAN	WGTMEAN	PRD	COD
170	1	0.937	0.937	0.937	1.000	0.000
18729	2,399	0.976	0.980	0.970	1.006	0.056
18933	5,337	0.991	0.994	0.975	1.016	0.068
19601	879	0.978	0.981	0.962	1.017	0.076
19613	2,005	0.971	0.976	0.947	1.026	0.082
19614	612	0.984	0.971	0.979	1.005	0.075
19711	844	0.996	0.994	0.972	1.025	0.117
19715	1,463	1.027	1.000	1.011	1.016	0.092
19722	2,458	1.012	1.000	1.002	1.010	0.072
19724	1,767	1.017	1.000	1.000	1.017	0.086
19734	885	1.001	0.997	0.995	1.007	0.070
19829	568	0.996	0.987	0.972	1.024	0.114
19836	698	0.989	0.987	0.975	1.014	0.094
28506	2,117	0.980	0.983	0.964	1.017	0.074
28623	1,208	0.944	0.947	0.934	1.010	0.081
29414	1,511	1.004	0.998	0.997	1.007	0.067
29502	2,133	1.009	0.999	1.000	1.009	0.073
29517	1,005	0.974	0.979	0.962	1.012	0.086
29522	3,866	1.023	1.000	1.006	1.017	0.089
29635	964	0.978	0.979	0.968	1.010	0.077
32530	1	0.743	0.743	0.743	1.000	0.000
33524	1	0.667	0.667	0.667	1.000	0.000
33525	1,613	0.987	0.991	0.970	1.017	0.100
41428	269	0.994	0.991	0.972	1.023	0.160
41626	268	1.024	0.998	0.995	1.029	0.139
42915	219	1.015	0.997	1.009	1.005	0.137
43028	496	1.014	0.993	0.976	1.039	0.150

The following graphs compare the assessment to time adjusted sale ratio to determine if horizontal equity exists. Sometimes it is easier to see the relationship through a graph rather than through stratification groups. The red line represents a running average line and best depicts the moving relationship of the data. Unfortunately, many of the graphs do not show horizontal equity throughout the whole range of values. The worst of these is the comparison of the ratios to the original sale prices. This chart indicates that as the prices get larger, the values become more and more undervalued. In fact, the properties under $320,000 have the oposite problem. The lower the sale price, the more overvalued the sale becomes.

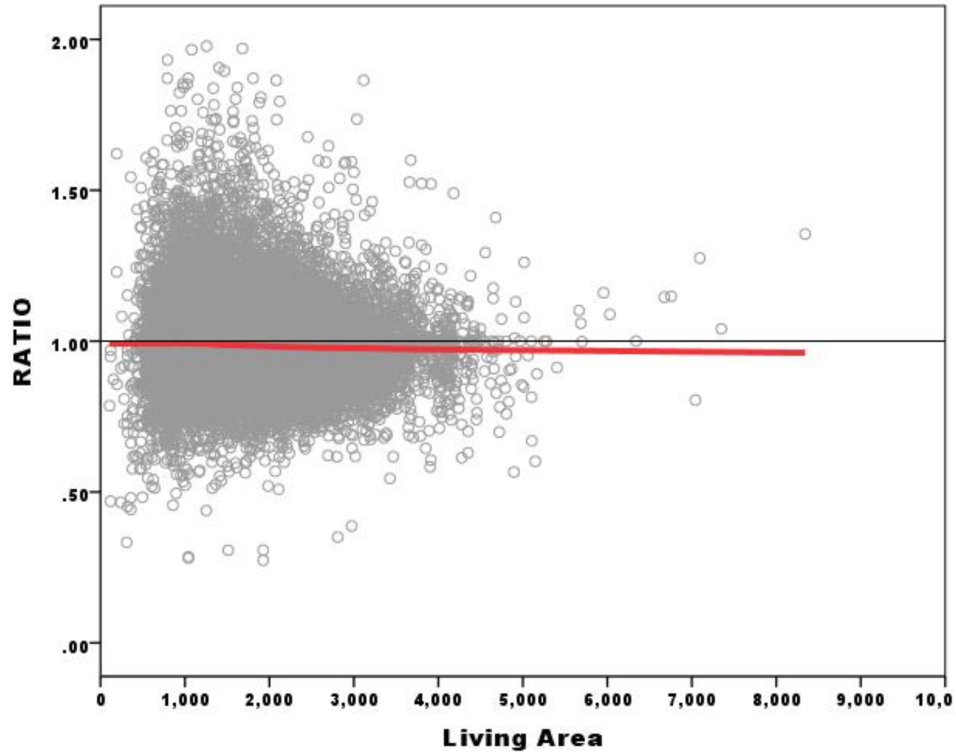
This chart compares ratio to the month and year that the sale took place. This graph indicated that there is no bias with regards to sale date.



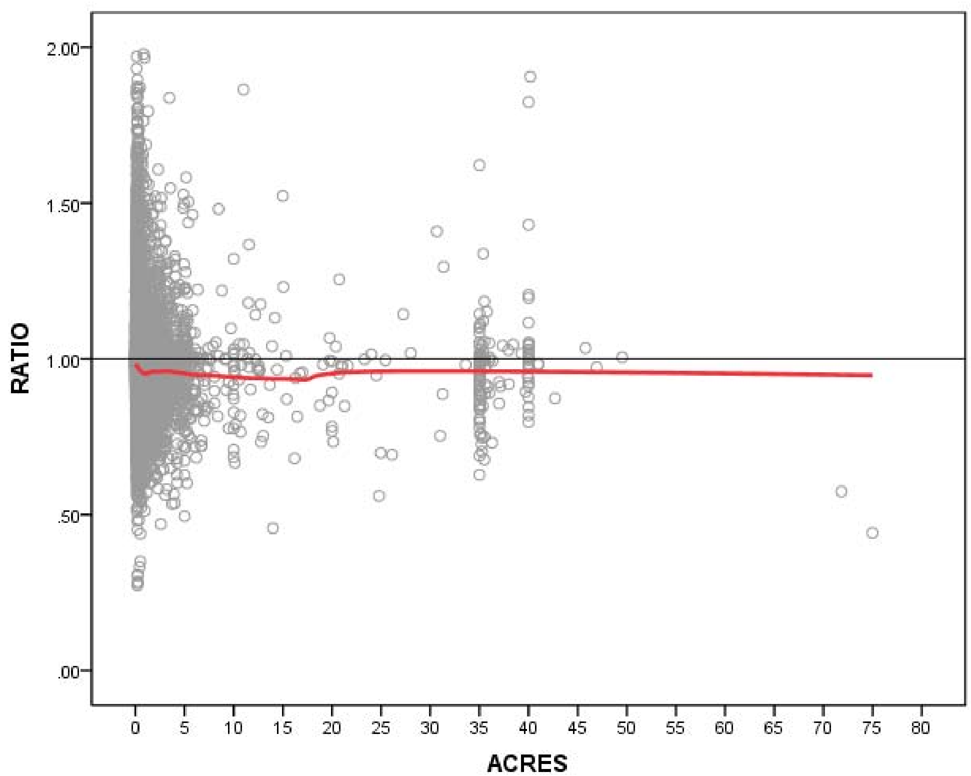
This chart compares ratio to the original sale price. As indicated above, this chart indicates that there is a biaswith regards to sale price. Higher priced homes are being undervalued relative to lower end homes.



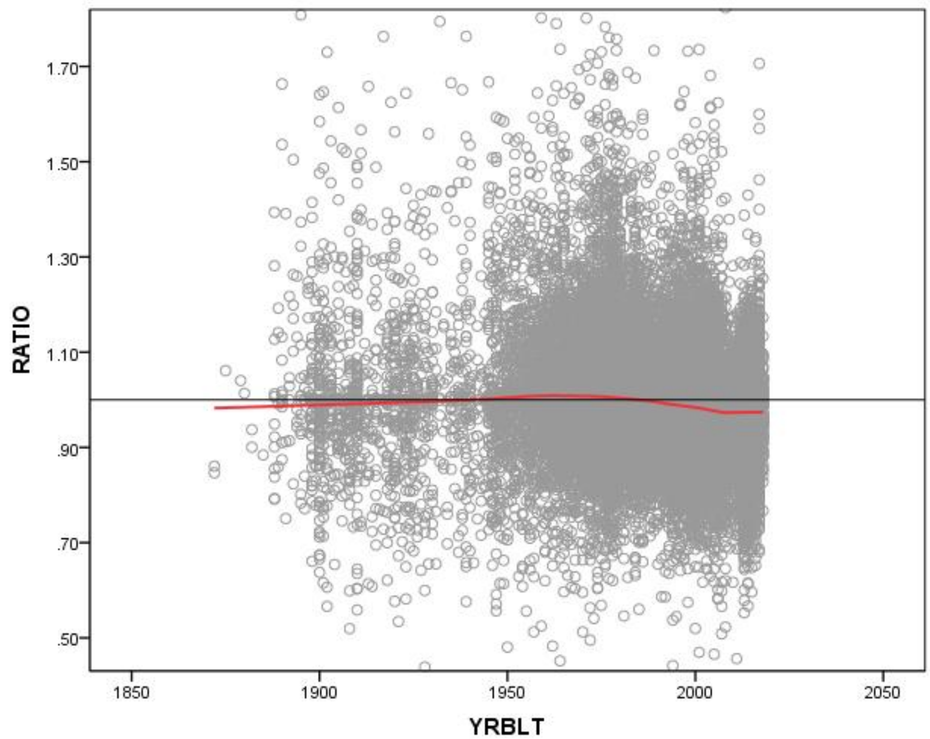
This chart compares ratio to living area. This graph indicates that there is no bias with regards to the size of the home.



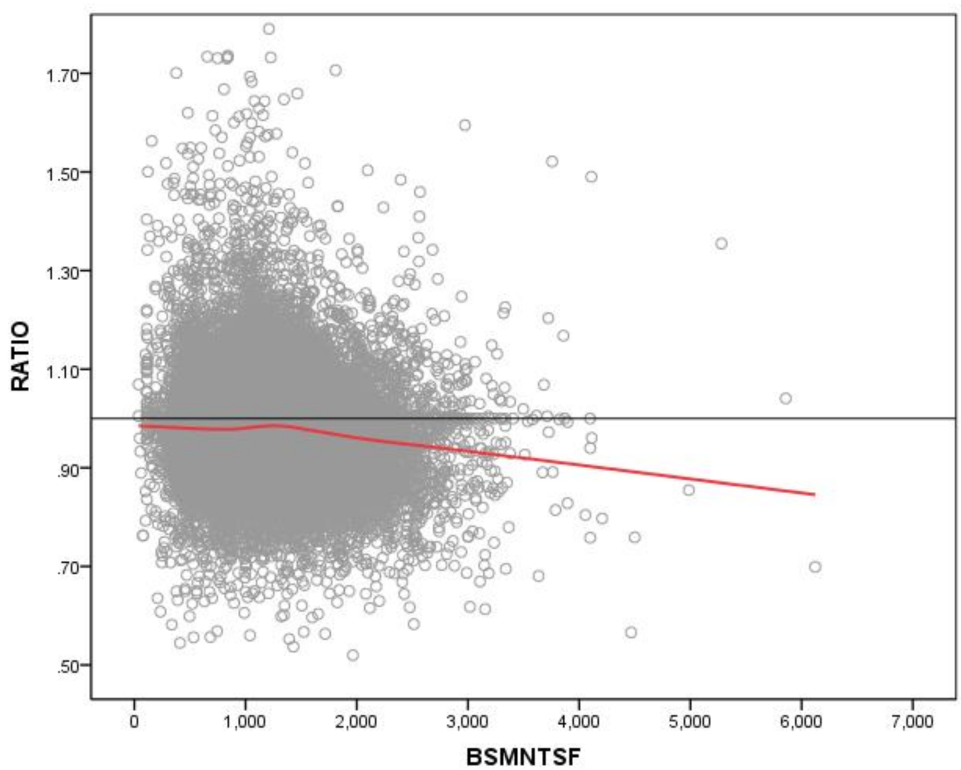
This chart compares ratio to lot size. This graph indicates that there is minimal bias with regards lot size.



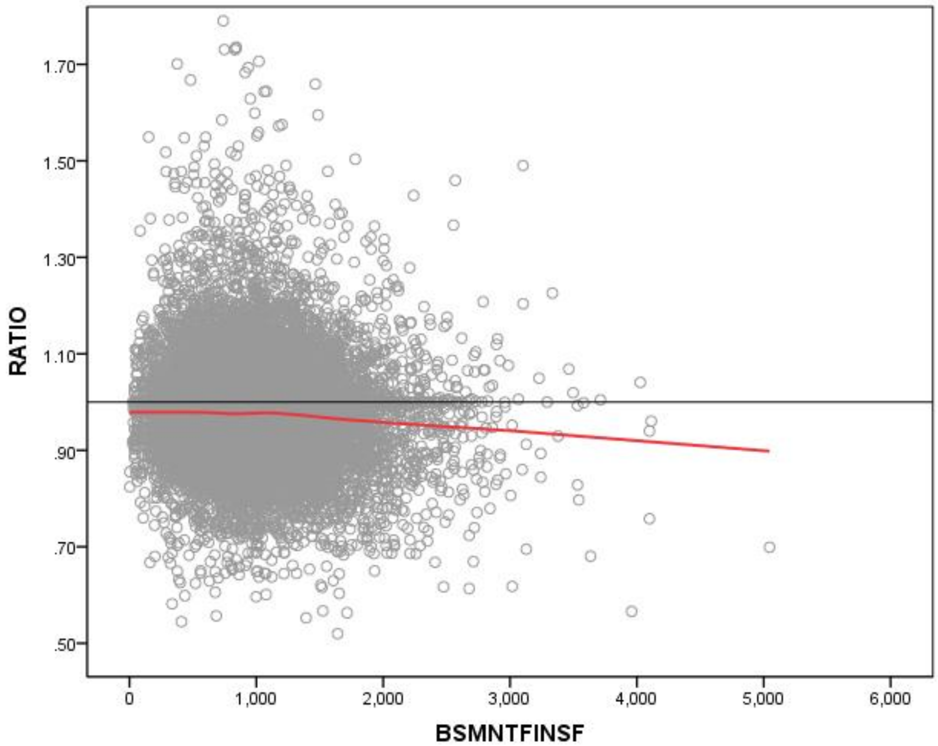
This chart compares ratio to the actual year built. This graph indicates a slight bias where the newest homes are slightly undervalued compared to older homes.



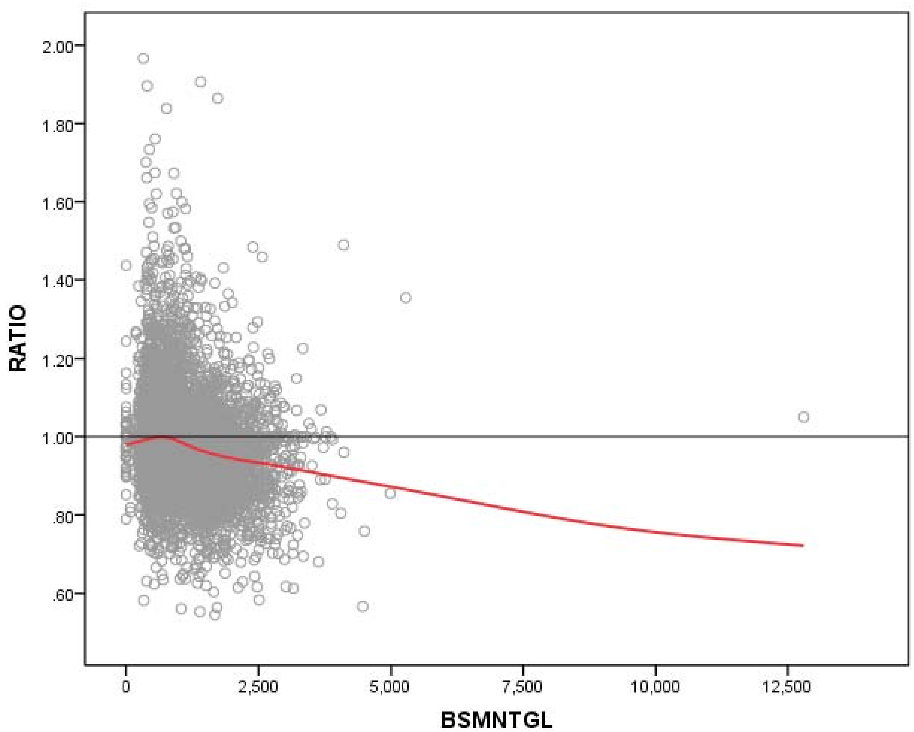
This chart compares ratio to total basement size. This graph indicates that there is a significant bias as the size of the basement gets larger. It appears the bias starts somewhere around 1,400 square feet.



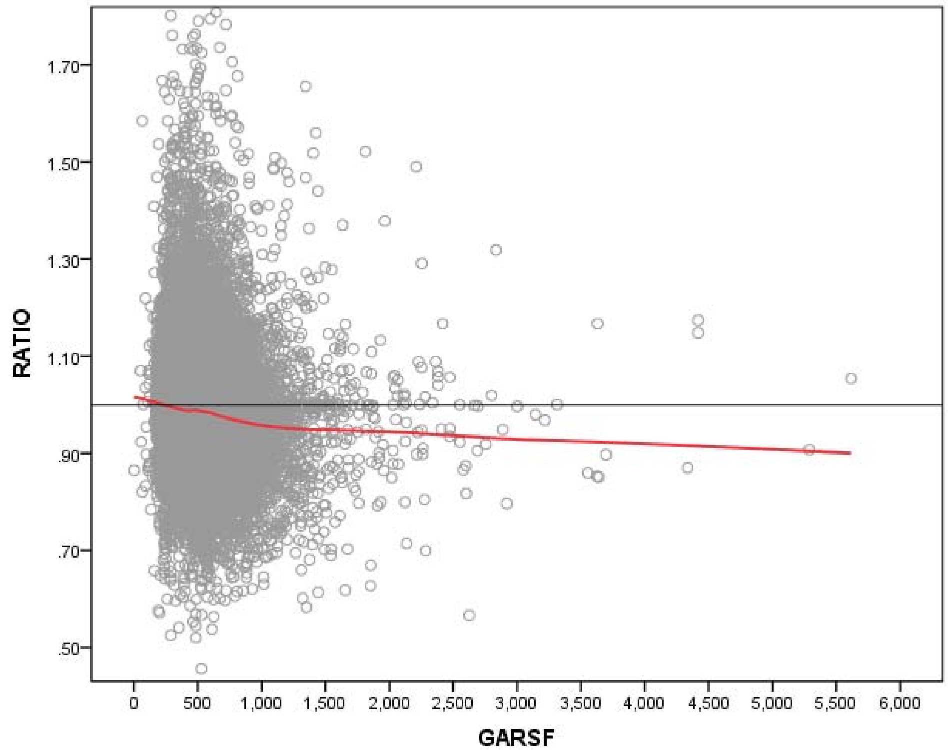
This chart compares ratio to finished basement area. This graph also indicates that there is a significant bias as the size of the finished basement gets larger.



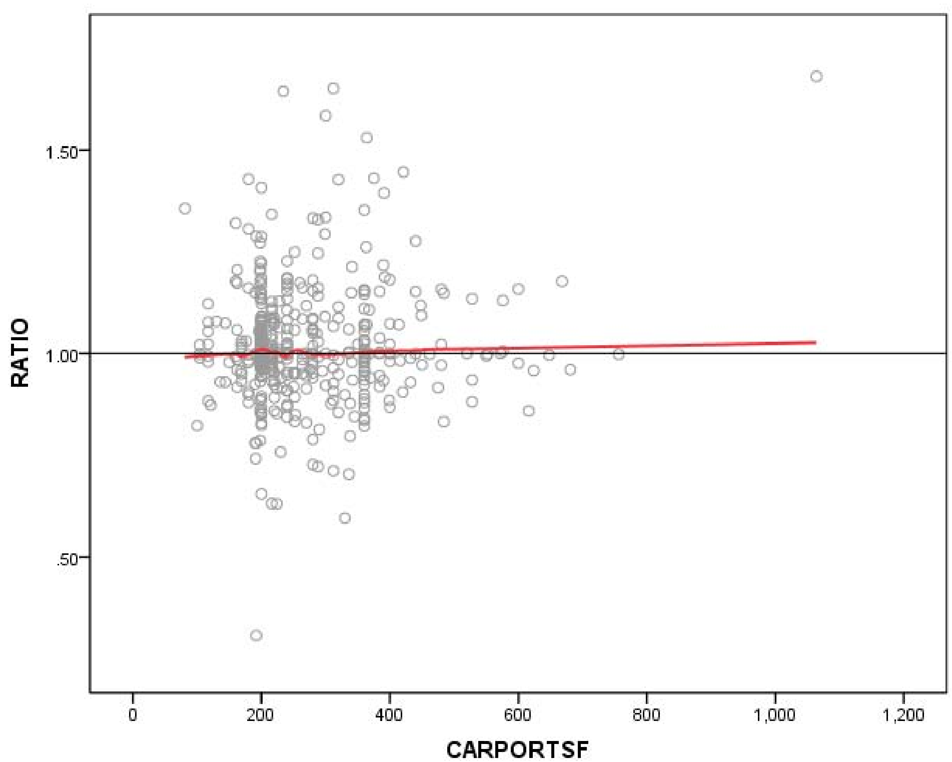
This chart compares ratio to garden level basement area. This graph also indicates that there is a significant bias as the size of the garden level basement gets larger.



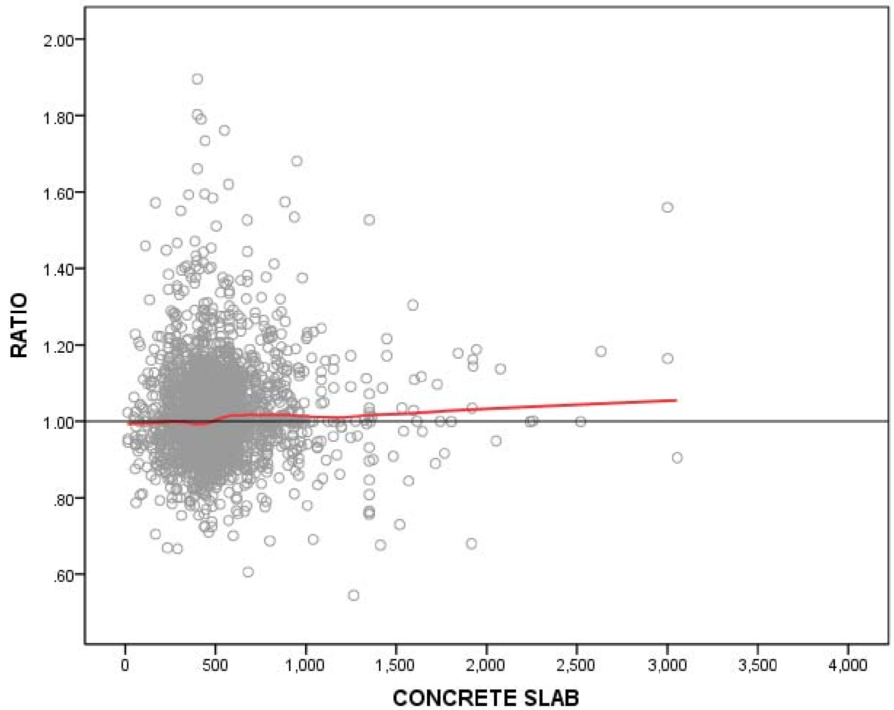
This chart compares ratio to garage area. This graph also indicates that there is a significant bias as the size of the garage gets larger. The bias seems to start just past the size of a typical two car garage.



This chart compares ratio to carport area. This graph indicates that no bias exists.



This chart compares ratio to concrete slab area. This graph indicates that no bias exists.



The final chart is a comparison between the time adjusted sale prices and the predicted values. The desired pattern here is a tight clustering around the red diagonal line. This graph indicates that the extreme high end time adjusted sale prices are being undervalued. Otherwise, the pattern is fairly tight. It would be preferable if the grouping sloped down slightly, but the pattern isn't too drastic.