

**Preliminary Ratio Study Analysis
2009 Revaluation**

**Prepared for
Montana Department of Revenue**

**Almy, Gloudemans, Jacobs & Denne
February 15, 2010**

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Preliminary Ratio Study Analysis 2009 Revaluation

1. Executive Summary

The Montana Department of Revenue commissioned Almy, Gloudemans, Jacobs & Denne to conduct a series of market price trend and sales ratio studies to monitor assessment levels and related performance measures subsequent to the 2009 revaluation. The studies are designed to measure assessment performance at various points in time and help formulate policies and strategies for assessments until the next general revaluation, including possible indexing of values to recognize changing market conditions.

This is our first study in the series. It is a preliminary study to develop and test appropriate methodologies and programs. It produces estimates of assessment levels and various assessment uniformity measures as of January 1, 2009 for each major property type (residential improved, residential vacant, and commercial) in each of the State's nine major economic areas (see table on next page). Results are further stratified by property subtypes within each of these three major property types. The study is based on assessed values, sale price data, and other property data supplied by the Department. Sales data are generally current through March 2009 in the case of residential vacant and improved properties and through at least December 2008 (and often March 2009) for commercial properties.

Section 2 of this report describes the methodology used in the study. Section 3 reports results for residential improved property, section 4 for residential vacant land, and section 5 for commercial property (both vacant and improved). Sections 3-5 are each further divided into subsections: time trends analyses, treatment of outliers, and ratio study analyses and results.

Because of the comparatively large volume of sales, results for residential properties are most reliable. The results indicate that values were closely centered on market values as of January 1, 2009 with median assessment-to-sales ratios for eight of the nine economic areas between 0.94 and 1.00. In area 85 (Gallatin, Madison, Beaver, and Park counties), where the market turned down earlier and more steeply than in the other areas, the median ratio is 1.08. All nine areas are within the range of 0.90 to 1.10 recommended by the International Association of Assessing Officers (IAAO). Assessment equity or uniformity is also generally good, particularly given the wide range of economic conditions and residences found across the State.

Estimating performance for vacant land and commercial properties is more difficult. Median ratios for vacant land range between 0.84 and 1.11 and between 0.91 and 1.01 for commercial properties, which again largely complies with IAAO standards. However, as elsewhere, ratios vary more widely than for improved residential properties. While uniformity in many areas is quite good, in other areas it falls short of recommended standards. Sections 4.3 and 5.3 discuss specific problems areas. Vacant land (both residential and commercial) in a number of areas exhibits assessment regressivity, the tendency of assessment levels to be higher for low-value properties than for high-value properties. At the same time it should be emphasized that the most problematic areas are those where appraisal challenges are the most difficult, that is,

sparsely populated rural or recreation areas or areas with relatively depressed markets and thin, often volatile sales prices. In urban and more active markets, assessment performance appears reasonably good in most cases.

Our next study, an update to this study using sales through September 2009, is scheduled for completion by March 2010. A full study with results further broken down by appraisal “market areas” using sales through June 2010 will be completed by December 1, 2010. In effect, that study will provide a snapshot of assessment performance as it stands on July 1, 2010, two years subsequent to the valuation date used in the 2009 revaluation.

Montana Economic Areas

81	Flathead, Lake
82	Cascade, Fergus, Hill, Chouteau, Toole, Blaine, Pondera, Teton, Judith Basin, Glacier, Liberty
84	Missoula, Ravalli
85	Gallatin, Beaverhead, Madison
87	Powder, Phillips, Custer, Dawson, Roosevelt, Valley, Big Horn, Richland, Rosebud, Treasure, Sheridan, Daniels, Fallon, McCone, Carter, Prairie, Garfield, Wibaux
88	Yellowstone, Carbon, Musselshell, Stillwater, Sweet Grass, Wheatland, Meagher
89	Lewis & Clark, Broadwater, Jefferson
90	Butte - Silver Bow, Powell, Anaconda - Deer Lodge, Granite
91	Sanders, Mineral, Lincoln

2. Methodology

Ratio studies are the chief means by which assessment performance is measured. In a ratio study, assessed values are compared against surrogates for market value, usually in the form of sales prices. If assessment performance is good, assessed values should be closely related to sales prices. Ratio studies measure the degree of relationship.

$$\text{Ratio} = \text{Assessed Value} \div \text{Sale Price}$$

Ideally the middle or average ratio should be near 1.0 and the individual ratios should be relatively uniform or consistent.

The primary guideline on how to perform such studies is the *Standard on Ratio Studies* (IAAO, 2007). Our study follows the methodology outlined in the IAAO standard. This section describes our procedures and methodology.

2.1 Data Assembly

The Montana Department of Revenue provided all the data used in our study. Department staff regularly screens sales as valid or invalid for appraisal and sales ratio analyses and provided us those sales coded as valid, although not all had been verified with a party to the transfer. The data were provided on three files: (1) residential improved; (2) residential vacant; and (3) commercial vacant and improved. We converted the data to the statistical package, SPSS (Statistical Package for the Social Sciences) for analysis. Multiple parcels commercial sales were aggregated to a single record by summing the assessed values to match with the sale price. Residential sales ranged from January 2007 through March 2009. Commercial sales ranged from January 2005 through March 2009.

The data were edited to remove invalid or otherwise unusable or atypical records. The primary edits in this regard were as follows.

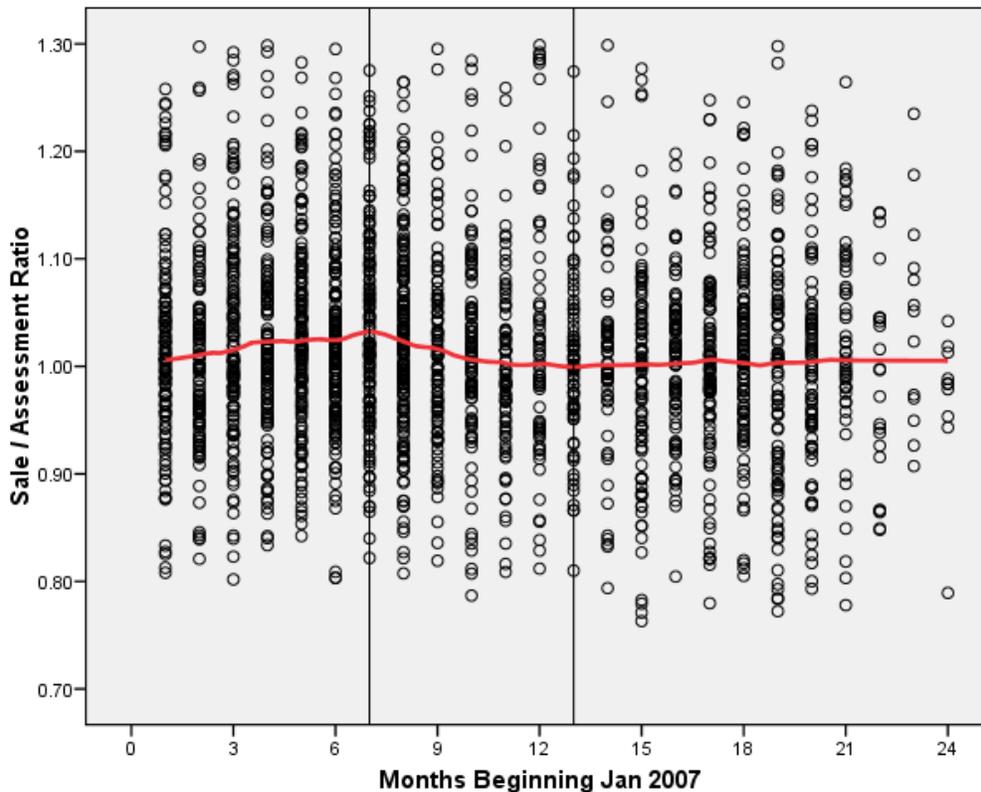
- Exempt property or easements
- Sale type does not match property type, for example, a vacant land sale for a subsequently improved property
- Missing or abnormally low sale price
- Missing or abnormally low assessed value
- Year built greater than sale year
- Improved property sale with little building value (generally less than 30% of total value)
- Sales classified as vacant land sales but with the majority of value in improvements
- Atypical or difficult-to-analyze commercial properties (e.g., amusement parks, feed lots, parking garages, and hotels/motels where a significant portion of the sale price can be attributable to non-real estate components)

2.2 Time Trend Analysis

The base date in our analysis is January 1, 2009. Because sales occurred at different dates spanning several years, it is important that all sales be adjusted to their equivalent price as of this date. As in prior analyses, time trends were developed using sales ratio trend analysis, which is likely the most common method used by mass appraisers to track and quantify time trends. In the method, sales prices over the time frame selected for analysis are compared against assessed values for the most recent assessment year. Since the assessments reflect a common, fixed date and the sales prices reflect transaction dates, an upward trend in sale/assessment (S/A) ratios indicates price appreciation and a downward trend indicates price deflation. A graph of the ratios will show the direction and magnitude of the trend.

Exhibit 2-1 below contains an example of one such chart. The graph indicates that values climbed slightly during the first half of 2007, peaked, and then declined during the second half of the year, after which they remained level. As in this case, time trends were segmented into up to three “splines” or spans over the study period. Regression analysis was used to quantify the trends. A separate analysis was conducted for each property type and economic region. In the case of commercial properties, separate trends were specified for vacant, apartment, and other commercial properties.

Exhibit 2-1
Example of Time Trend Graph



Once rates of change were established for each time segment, all sales were adjusted to January 1, 2009 at the indicated rates. The use of time adjustments enabled much larger samples, resulting in greater statistical precision and reliability, than if only sales from a short period of time were analyzed.

2.3 Treatment of Outliers

A common problem in ratio studies is the treatment of outliers, that is, atypically low or high ratios that can potentially distort a number of assessment performance measures.

We followed IAAO guidelines in determining trim points based on the inter-quartile range, which represents the difference between the 75th and 25th percentiles of a distribution. For example, if the 25th percentile is 0.82 (meaning that 25% of ratios are less than 0.82) and the 75th percentile is 1.14 (meaning that 75% of ratios are lower than 1.14 and 25% are higher), the inter-quartile range (IQR) is:

$$\text{IQR} = 1.14 - 0.82 = 0.32$$

Subtracting 1.5 IQR from the 25% percentile and adding 1.5 IQR to the 75% percentile gives the bounds used to identify statistical “outliers”. In our example, $1.5 \times .32 = .48$ and the cut points for identifying outliers is:

$$\text{Lower bound} = 0.82 - 0.48 = \underline{.34}; \text{ Upper bound} = 1.14 + 0.48 = \underline{1.62}$$

Thus any ratios below 0.34 or greater than 1.62 are outliers and could be potentially excluded.

Similarly, adding and subtracting three IQR identifies “extremes”. In our example, $3 \times .32 = .96$ and the cut points for identifying extreme ratios is:

$$\text{Lower bound} = 0.82 - 0.96 = \underline{-0.14}; \text{ Upper bound} = 1.14 + 0.96 = \underline{2.10}$$

Since assessed value and assessment ratios cannot be negative, the lower bound defaults to 0.

Trimming based on logarithms of ratios (which is equivalent to working with percentages) avoids cases like this and results in a more even balance of low and high outlier and extreme ratios. This is the approach we followed.

Of course, one does not have to use exactly 1.5 or 3.0 IQRs to identify appropriate trim points, which can vary with the nature of the data distribution. Nevertheless, as a general rule, when working with logarithms of the ratios, trimming based on 1.5 IQR usually excludes less than 10% of ratios and trimming based on 3.0 IQR usually excludes less than 5% of the data.

We determined trimming rules based on examination of the data. For residential properties, we used 3 IQR. For vacant land and commercial properties, for which the ratios exhibited much greater spread, we generally used 1.5 IQR. For vacant residential land and commercial properties, cut points were further adjusted to conform to logical break points in the data.

Specific trimming procedures and the percentage of sales excluded are discussed in conjunction with the ratio analyses conducted for each property.

2.4 Statistical Analyses

There are two primary aspects of assessment performance: level and uniformity. Assessment level relates to how close overall assessments are to market value. Uniformity relates to the consistency or equity of assessed values.

Three measures of central tendency are used in ratio studies: the median, the mean, and the weighted mean.

- **Median.** The median is the middle ratio when the ratios are arrayed from smallest to largest. There are an equal number of ratios above and below the median. Since it simply represents the middle ratio, the median is no more affected by extreme or “outlier” ratios than any other ratio in the sample. In other words, each ratio is afforded equal weight. The median is the most appropriate measure of central tendency when gauging whether assessments are centered on market value. According to IAAO standards, median ratios should fall between 0.90 and 1.10. A 95% confidence interval can be constructed about the calculated median to determine whether one can conclude with 95% confidence that the recommended standard has not been achieved.
- **Mean.** The mean is ratio is simply the average ratio. It is computed by summing the ratios and dividing by the number of ratios. Like the median, the mean assigns equal weight to each sale; however, it is more impacted by outliers than the median. For this reason, and because it has no offsetting advantages, the mean enjoys little prominence in ratio studies. While we sometimes report the mean for completeness, it should not be viewed as a primary indicator of assessment level.
- **Weighted Mean.** The weighted mean weights each ratio based on its sale price; for example a \$1 million sale has 10 times the weight of a \$100,000 sale (and a \$5,000,000 sale has the same weight as 100 sales of \$50,000 each). Because of this weighting feature, the weighted mean is the most appropriate measure for estimating the total value of property in a jurisdiction. However, the weighted mean can be disproportionately influence by outlier ratios, particularly if they occur for high-value sales. In our studies, the weighted mean should be viewed as a secondary, dollar-weighted measure of the assessment level.

The primary measure of assessment uniformity is the coefficient of dispersion (COD), which expresses the average percentage deviation of ratios around the median. For example, a COD of 15 means that, on average; ratios differ from the median by 15%. In general, lower CODs indicate better assessment uniformity. However, as properties become more complex and heterogeneous and as markets become more thin or unstable, good CODs are more difficult (or impossible) to achieve. The IAAO offers the following guidelines for the COD.

- Residential properties. CODs should be 10 or less in newer, homogeneous areas; 15 or less in older or heterogeneous areas; and 20 or less in rural, recreational, or seasonal areas. The standard of 15 could be applied to largely urban economic areas and 20 to the other economic areas covered in the present study.
- Commercial properties. CODs should be 15 or less in larger, urban areas and 20 or less in rural or depressed areas with less market activity.
- Vacant land. CODs should be 25 or less.

In addition to uniformity within property groups, it is important that each group be assessed at a similar percentage of market value. This aspect of assessment uniformity is termed horizontal equity. One can evaluate horizontal equity by comparing medians among property groups. A final aspect of assessment uniformity, known as vertical equity, relates to uniformity in assessments among low and high value properties. Ideally, of course, both should be assessed at a similar percentage of market value.

A long-standing measure of vertical equity is the price-related differential (PRD), which is the mean assessment ratio divided by the weighted mean assessment ratio:

$$\text{PRD} = \text{mean} \div \text{weighted mean}$$

When high value properties are under-assessed relative to other properties, the weighted mean falls below the mean and the PRD climbs above 1.00, signaling “assessment regressivity”. When high value properties are relatively over-assessed, the weighted mean exceeds the mean and the PRD falls below 1.00, signaling “assessment progressivity”. Because the mean and weighted mean are both impacted by outliers and because the weighted mean is highly sensitive to ratios for the highest value properties, the PRD provides only a crude, inadequate gauge of price-related bias.

We report a superior measure obtained by regressing assessment ratios on value¹. The coefficient from the regression quantifies the relationship (if any) between property values and assessment levels. For example, a coefficient of -.05 indicates that a doubling of value (100% increase) is associated with a 5% decline in assessment level. Regression analysis also quantifies the statistical strength or significance of the relationship. If no price-related bias is present, the coefficient from the regression will not be significantly different from zero. We suggest that price-related bias should be noted when (a) the regression coefficient is less than -.03 or greater than .03 and (b) the relationship is statistically significant at the 95% confidence level. Regression coefficients below -.05 should be viewed with concern, again assuming they are significant at the 95% confidence level.

¹ To express the relationship in percentage terms and to avoid statistical bias, logarithms of assessment ratios were regressed on logarithms of value, where value is computed as ½ of time-adjusted sale price plus ½ of assessed value. For commercial properties, the analysis was centered on median values: percentage changes from the median ratio were regressed on percentage changes from the median value.

3. Improved Residential Analyses

3.1 Residential Time Trends

Sales from 2007 through March of 2009 were analyzed to develop the time trends illustrated in Exhibit 3-1 below. With the exception of economic areas 85 (Gallatin, Madison, Beaver, and Park counties), where the market declined beginning in the second half of 2007, and economic area 90 (Butte-Silver Bow, Powell, Anaconda-Deer Lodge, Granite counties), where sales were rather thin and the market more volatile, the other areas exhibited quite consistent and fairly flat trends over the study period. Exhibit 3-2 shows the trends in table format.

Exhibit 3-1
Graph of Improved Residential Time

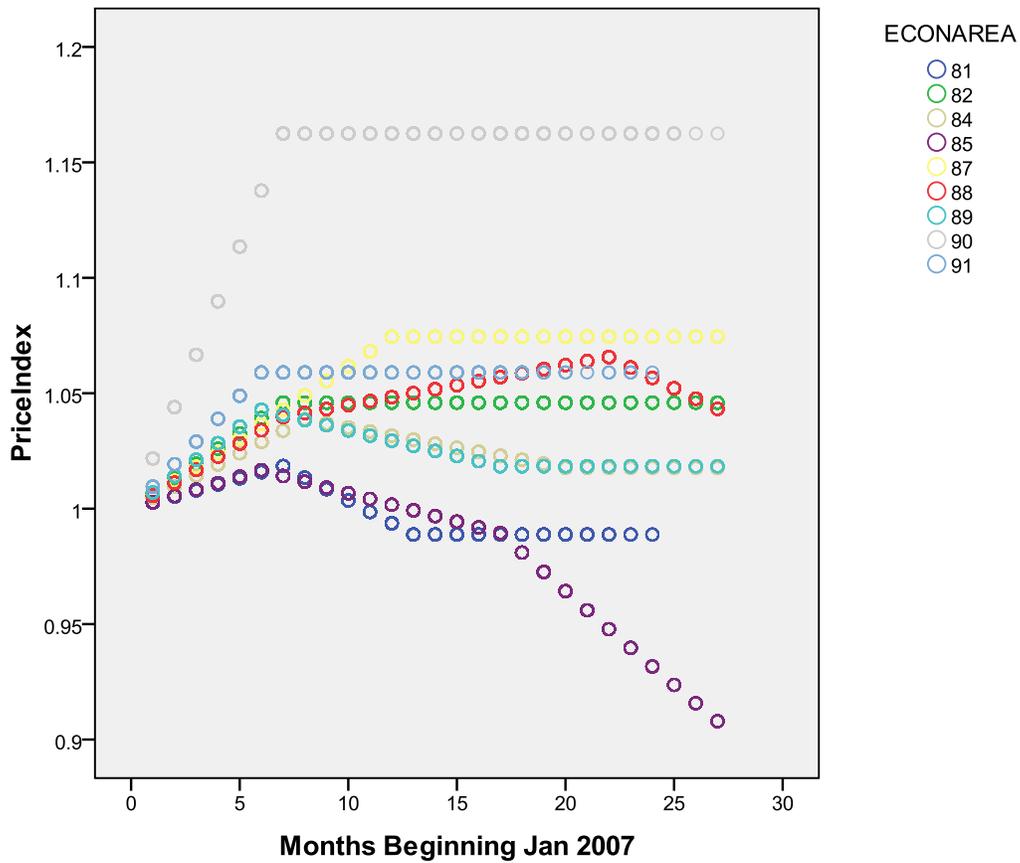


Exhibit 3-2
Table of Improved Residential Time

Area	Start	End	Rate	Start	End	Rate	Start	End	Rate
81	Jan 07	July 07	0.003	Aug 07	Jan 08	-0.005	Fab 08	Mar 09	0
82	Jan 07	July 07	0.006	Aug 07	Jan 08	0	Feb 08	Mar 09	0
84	Jan 07	Aug 07	0.005	Sep 07	Aug 08	-0.002	Sep 08	Mar 09	0
85	Jan 07	Jun 07	0.003	July 07	May 08	-0.002	Jun 08	Mar 09	-0.009
87	Jan 07	Dec 07	0.006	Jan 08	Aug 08	0	Sep 08	Mar 09	0
88	Jan 07	July 07	0.006	Aug 07	Oct 08	0.002	Nov 08	Mar 09	-0.004
89	Jan 07	Jun 07	0.007	July 07	May 08	-0.002	Jun 08	Mar 09	0
90	Jan 07	July 07	0.022	Aug 07	8-Feb	0	Mar 08	Mar 09	0
91	Jan 07	Jun 07	0.01	July 07	Jun 08	0	July 08	Mar 09	0

3.2 Residential Outlier Analysis

In contrast to the other property classes analyzed in the following sections, the removal of extreme ratios (3 IQRs beyond the nearer quartile, as described above in section 2.3), was generally adequate for removing atypical improved residential ratios. Exhibit 3-3 summarizes the percentage of ratios found to be extreme in each economic area, and hence eliminated from further analysis.

Exhibit 3-3
Percentage of Improved Residential Ratios found to be Extreme

Region	81	82	84	85	87	88	89	90	91
Percent	4.0	4.7	2.4	5.2	3.7	2.0	2.1	2.3	1.5

In addition to these extremes, in some regions a small number of high-value properties were selectively removed in conducting the price-related bias analyses presented in Appendix A-2 to address the possibility that such properties may exert “undue” leverage on the statistics reported. Ratios for these properties are not to be considered either extreme or outliers. The supplemental analyses with these properties removed are presented in the spirit of “drilling down” to reveal further detail and to help to dispel concerns about the extent to which such properties may influence overall results.

3.3 Residential Sales Ratio Analysis

Exhibit 3-4 below summarizes the ratio study results at the regional level. Additional detail, including sub-stratification by property type, is presented in Appendix A-1.

Exhibit 3-4
Summary of Residential Ratios by Economic Region

Region	81	82	84	85	87	88	89	90	91
Number of Sales	2,767	3,531	3,742	3,756	1,556	5,447	2,195	1,418	466
Median	1.00	1.00	1.00	1.08	0.95	0.98	0.95	0.96	0.94
Lower 95% Conf Limit	1.00	1.00	1.00	1.08	0.94	0.98	0.95	0.94	0.93
Upper 95% Conf Limit	1.01	1.00	1.01	1.08	0.96	0.98	0.96	0.97	0.96
Weighted Mean	0.98	1.00	0.99	1.05	0.93	0.97	0.93	0.91	0.91
Lower 95% Conf Limit	0.98	0.99	0.98	1.04	0.92	0.97	0.92	0.89	0.89
Upper 95% Conf Limit	0.99	1.00	0.99	1.06	0.94	0.98	0.94	0.92	0.93
Minimum Ratio	0.66	0.65	0.68	0.68	0.39	0.68	0.51	0.31	0.46
Maximum Ratio	1.49	1.54	1.47	1.67	2.35	1.40	1.71	3.04	1.85
COD	0.08	0.09	0.08	0.09	0.20	0.07	0.12	0.25	0.14
Price-Related Bias	-0.030	-0.019	-0.028	-0.020	-0.088	-0.016	-0.037	-0.203	-0.076
PRB Significance	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note that with the exception of area 85, median ratios all range between 0.94 and 1.00, indicating that assessment ratios were closely centered on market value. Both median and weighted mean ratios for all nine economic areas fall within the range of 0.90 to 1.10 recommended by IAAO.

Coefficients of dispersion (COD), which measure the average percentage deviation from the median, are less than 15% in seven of the nine economic areas, and less than 10% in five areas, indicating excellent uniformity in values. The COD of 20% for area 87 is reasonable for this diverse group of rural counties that largely comprise northeastern Montana and complies with the recommended IAAO standard of 20% for rural areas. The most problematic COD is 25% for area 90 (Butte-Silver Bow, Powell, Anaconda-Deer Lodge, Granite counties), which is arguably the most difficult of the nine areas. A review of the sales ratio graph for this area in appendix A-2 will reveal a large number of high ratios for the lowest value properties, which are too numerous to be dismissed as outliers. However, if sales below \$50,000 are omitted, the COD improves to .187 and the coefficient of price-related bias reduces to -.099.

The coefficient of price-related bias (PRB) is less than -.05 in three of the nine areas, meaning that a doubling of values is associated with more than a 5% decline in assessment ratio. A review of the ratio graphs for these areas in appendix A-2 will reveal that this is largely a function of high ratios for the lowest value properties (particularly in area 90, as discussed above). Appendix A-2 presents a detailed analysis of price-related bias for each region, including scatter plots of ratios with value and related summary statistics. As mentioned in section 3.2 above, the highest value properties are, where indicated, omitted in supplemental analyses for some of the regions.

4. Vacant Residential Analyses

4.1 Vacant Residential Time Trends

Sales from 2007 through March of 2009 were analyzed to develop the time trends illustrated in Exhibit 4-1 below. Five of the nine areas exhibited value increases over the first part of the study period and then showed no statistically significant trend through March 2009. The other four areas exhibited no discernible trend over the 27-month study period. Exhibit 4-2 shows the trends in table format.

Exhibit 4-1
Plot of Vacant Land Time Trends

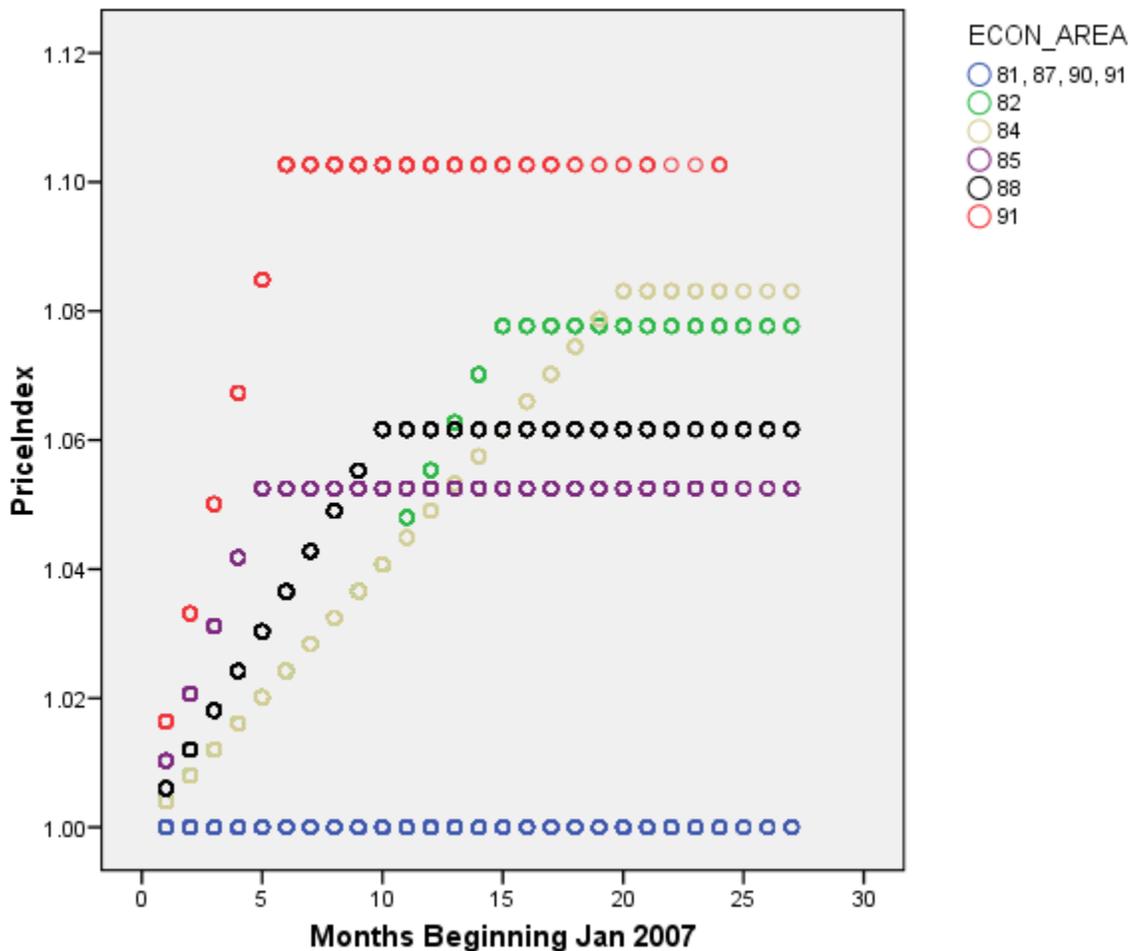


Exhibit 4-2
Table of Vacant Land Time Trends

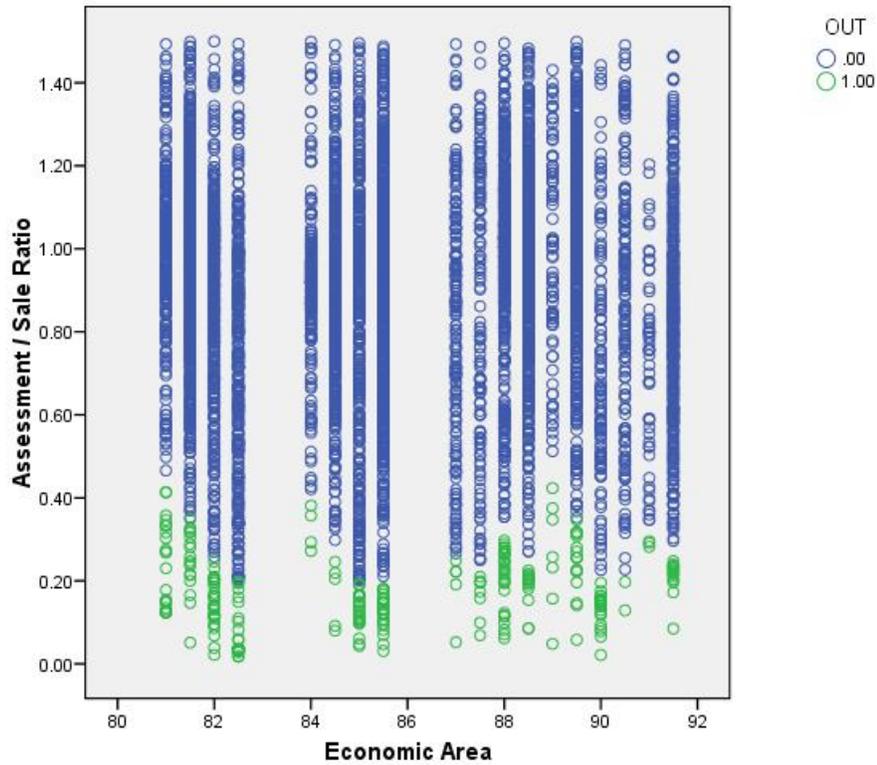
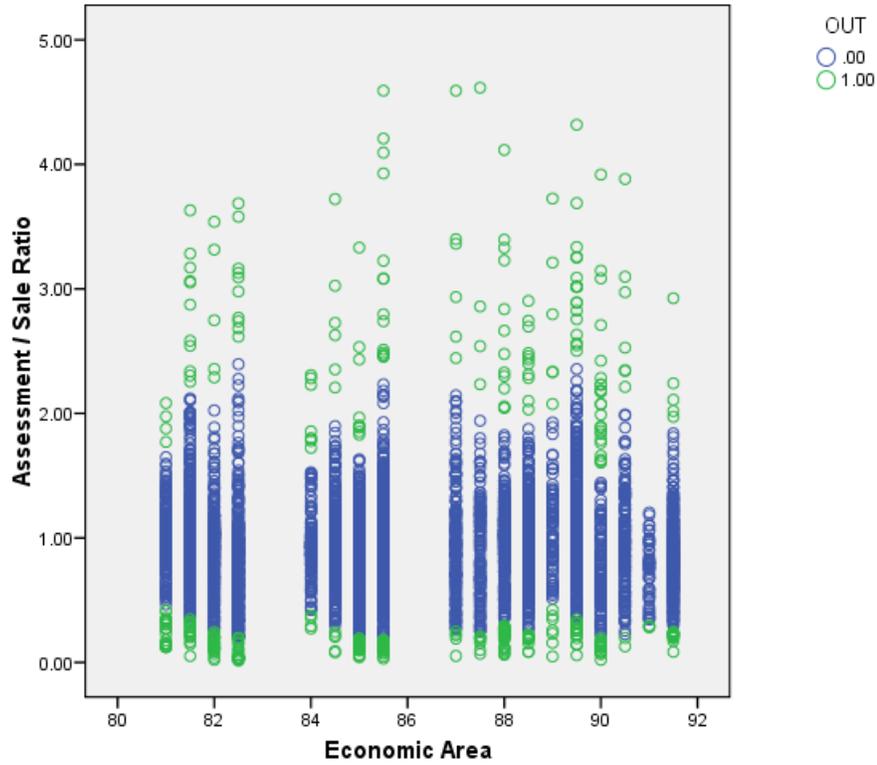
Area	Start	End	Rate	Start	End	Rate	Start	End	Rate
81	Jan 07	Mar 09	0						
82	Jan 07	Oct 07	0.004	Nov 07	Mar 08	0.007	Apr 08	Mar 09	0
84	Jan 07	Aug 08	0.004	Sep 08	Mar 09	0			
85	Jan 07	May 07	0.010	Jun 07	Mar 09	0			
87	Jan 07	Mar 09	0						
88	Jan 07	Oct 07	0.006	Nov 07	Mar 09	0			
89	Jan 07	Mar 09	0						
90	Jan 07	Mar 09	0						
91	Jan 07	Jun 07	0.016	Nov 07	Mar 09	0			

4.2 Vacant Residential Outlier Analysis

Very low and a few very high values sales, as well as any properties with a total assessed value of less than 50% of the minimum retained price were removed. For example, if the minimum accepted sale price was \$10,000, the minimum accepted assessed value was \$5,000. After the application of time adjustments, sales ratios were computed and analyzed for outliers. Ratios more than 1.5 IQR (inter-quartile range) were identified and further scrutinized so as to set cut point at logical break points. Exhibit 4-3 displays these break points with outliers coded in green and non-outliers in blue. The upper graph shows all ratios less than 5.00, and the lower graph shows only ratios less than 1.50 so that lower break points are more apparent. The first bar for each economic area represents urban properties, the second represents rural vacant land.

Exhibit 4-4 summarizes the number and percentage of sales excluded as outliers. The percentage excluded ranges from 3.0% in area 84 to 16.3% in area 90. Overall 489 sales (6.4%) were excluded as outliers. After trimming outliers, ratios for 7,154 remaining sales ranged from 0.202 to 2.395.

Exhibit 4-3 Vacant Residential Outlier Graphs



**Exhibit 4-4
Vacant Residential Outlier Summary**

			OUT		Total
			.00	1.00	
ECONAREA	81	Count	1146	58	1204
		% w ithin ECONA REA	95.2%	4.8%	100.0%
	82	Count	842	85	927
		% w ithin ECONA REA	90.8%	9.2%	100.0%
	84	Count	754	23	777
		% w ithin ECONA REA	97.0%	3.0%	100.0%
	85	Count	1175	88	1263
		% w ithin ECONA REA	93.0%	7.0%	100.0%
	87	Count	378	25	403
		% w ithin ECONA REA	93.8%	6.2%	100.0%
	88	Count	1235	72	1307
		% w ithin ECONA REA	94.5%	5.5%	100.0%
	89	Count	796	52	848
		% w ithin ECONA REA	93.9%	6.1%	100.0%
	90	Count	314	61	375
		% w ithin ECONA REA	83.7%	16.3%	100.0%
	91	Count	514	25	539
		% w ithin ECONA REA	95.4%	4.6%	100.0%
Total		Count	7154	489	7643
		% w ithin ECONA REA	93.6%	6.4%	100.0%

4.3 Vacant Residential Sales Ratio Analysis

The table below shows vacant residential ratios for urban and rural properties. The overall median ratio of 0.963 indicates that assessed values are closely centered on market value. There is also very good overall equity between urban and rural vacant land as indicated by their similar medians of .955 and .967, respectively. The COD statistics are reasonably good for vacant land and fall within the IAAO recommended upper limit of .250. The coefficient of price-related bias for urban properties is slightly outside the desired range of -.030 to .030, indicating mild regressivity, while the coefficient for rural properties is within the desired range. Exhibit 4-5 displays a plot of ratios with value (computed as one-half of time-adjusted sale price plus one-half of 2009 assessed value).

Location	Sales	Median	Wtd Mean	Minimum	Maximum	COD	Price-Related Bias	
							Coef.	Sig.
1 Urban	2435	.955	.841	.202	2.144	.231	-.032	.000
2 Rural	4719	.967	.901	.202	2.395	.247	-.015	.000
Overall	7154	.963	.885	.202	2.395	.242	-.017	.000

Exhibit 4-5 Plot of Vacant Residential Ratios with Value

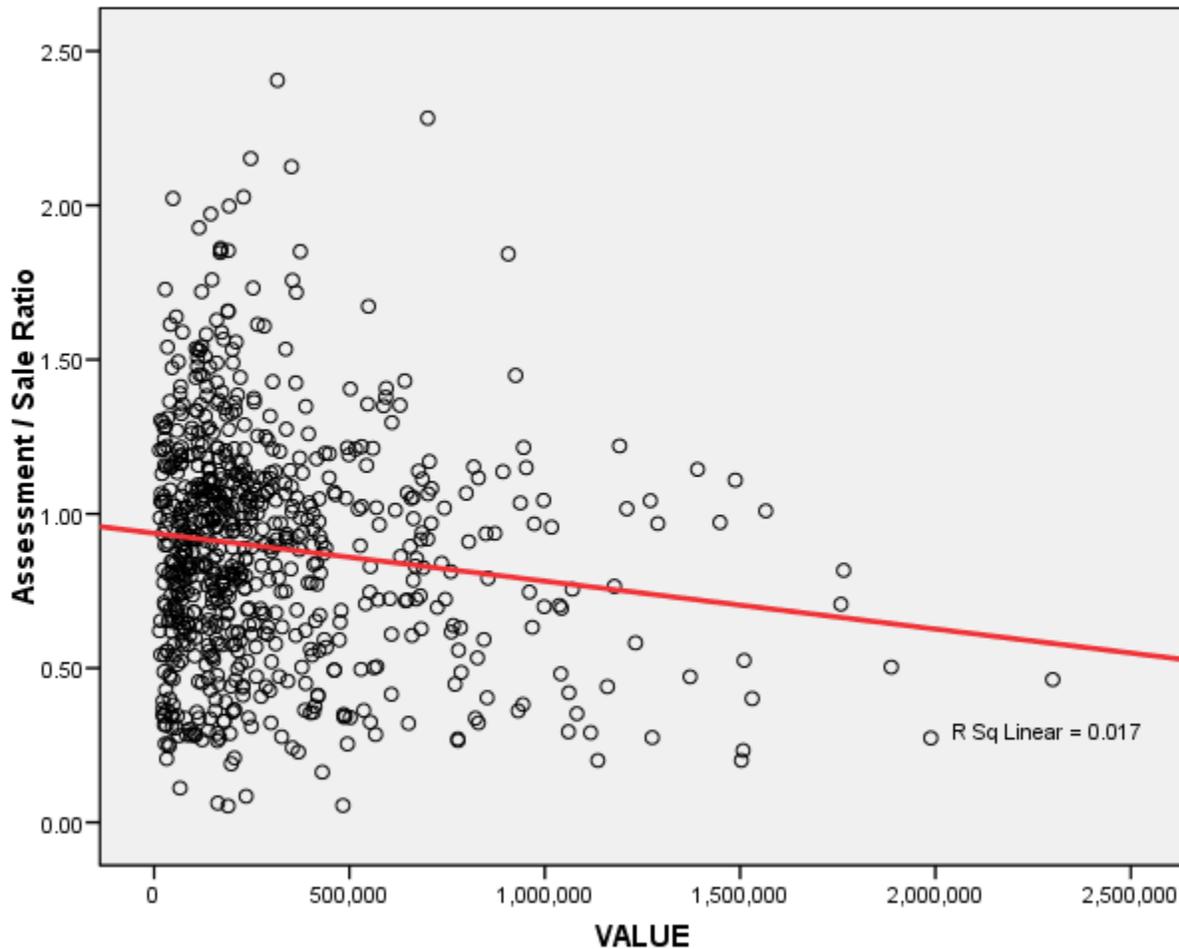


Exhibit 4-6 below presents vacant residential ratio statistics by economic area. Median ratios range from 0.829 in area 91 to 1.103 in area 89. The 95% confidence limits for the median ratio in area 91 (Sanders, Mineral, Lincoln counties) fall short of the IAAO recommended range of 0.90 to 1.10. Problematic CODs and measure of price-related bias have also been highlighted. The problematic PRB measures are significant at the 95% confidence level and the coefficients are less than -.05, indicating that assessment levels fall by more than 5% for each doubling of property values from the median value. Appendix B-1 displays plots of ratio with value for all nine economic areas (in some cases the graphs appear to be dominated by rural properties, not because they are necessarily more numerous, but simply because of overlapping points on the graph).

Exhibit 4-7 breaks down results for urban and rural vacant land within economic areas. In areas 82 and 90 there is more than a 10% difference in median ratios between urban and rural vacant land.

Exhibit 4-6 Vacant Residential Ratios by Economic Area

Region	81	82	84	85	87	88	89	90	91
Number of Sales	1,146	842	754	1,175	378	1,235	796	314	514
Median	1.004	0.889	0.932	0.906	0.924	1.005	1.103	0.854	0.829
Lower 95% Conf Limit	0.997	0.868	0.918	0.884	0.862	0.996	1.072	0.803	0.803
Upper 95% Conf Limit	1.017	0.909	0.944	0.931	0.966	1.016	1.124	0.917	0.848
Weighted Mean	0.969	0.753	0.861	0.825	0.810	0.894	1.039	0.853	0.768
Lower 95% Conf Limit	0.947	0.716	0.839	0.799	0.759	0.868	1.014	0.789	0.741
Upper 95% Conf Limit	0.990	0.791	0.883	0.851	0.860	0.920	1.063	0.916	0.794
Minimum Ratio	0.353	0.202	0.298	0.202	0.250	0.271	0.352	0.226	0.296
Maximum Ratio	2.120	2.395	1.898	2.233	2.144	1.876	2.355	1.991	1.840
COD	0.182	0.283	0.197	0.286	0.350	0.182	0.212	0.346	0.242
Price-Related Bias	-0.009	-0.081	-0.066	-0.024	-0.280	-0.044	-0.070	0.034	-0.113
PRB Significance	0.069	0.000	0.000	0.003	0.041	0.000	0.002	0.199	0.000

Exhibit 4-7
Vacant Residential Land Ratios by Economic Area and Urban/Rural Location

Area	Location	Sales	Median	Wtd Mean	Minimum	Maximum	COD	Price-Related Bias	
								Coef.	Sig.
81	1 Urban	308	1.018	.947	.466	1.648	.144	-.053	.000
	2 Rural	838	.999	.974	.353	2.120	.196	-.005	.601
	Overall	1146	1.004	.969	.353	2.120	.182	-.009	.069
82	1 Urban	424	.937	.804	.258	2.024	.221	-.046	.000
	2 Rural	418	.821	.713	.202	2.395	.350	-.049	.035
	Overall	842	.889	.753	.202	2.395	.283	-.081	.000
84	1 Urban	247	.925	.880	.421	1.526	.136	-.062	.001
	2 Rural	507	.939	.853	.298	1.898	.224	-.091	.000
	Overall	754	.932	.861	.298	1.898	.197	-.066	.000
85	1 Urban	391	.875	.702	.202	1.631	.322	-.104	.000
	2 Rural	784	.920	.871	.211	2.233	.269	-.016	.196
	Overall	1175	.906	.825	.202	2.233	.286	-.024	.004
87	1 Urban	225	.916	.850	.266	2.144	.349	-.023	.442
	2 Rural	153	.941	.771	.250	1.941	.349	-.097	.013
	Overall	378	.924	.810	.250	2.144	.350	-.280	.041
88	1 Urban	563	1.025	.895	.354	1.825	.167	-.040	.000
	2 Rural	672	.981	.892	.271	1.876	.196	-.077	.000
	Overall	1235	1.005	.894	.271	1.876	.182	.044	.000
89	1 Urban	96	1.019	.968	.513	1.927	.250	-.047	.109
	2 Rural	700	1.106	1.051	.352	2.355	.209	-.055	.009
	Overall	796	1.103	1.039	.352	2.355	.212	-.070	.002
90	1 Urban	124	.667	.640	.226	1.442	.357	-.432	.000
	2 Rural	190	.965	.911	.227	1.991	.309	.014	.585
	Overall	314	.854	.853	.226	1.991	.346	.034	.199
91	1 Urban	57	.757	.667	.347	1.203	.243	-.124	.058
	2 Rural	457	.837	.775	.296	1.840	.240	-.121	.000
	Overall	514	.829	.768	.296	1.840	.242	-.113	.000

5. Commercial Analyses

5.1 Commercial Time Trends

In order to obtain adequate samples, available sales from 2005 through March 2009 were used for analysis. The database contained no 2009 sales for some counties. All sales were adjusted to January 1, 2009.

Appendix C-1 contains time trend graphs for all nine economic areas. Time trends were developed by property type (vacant, apartment, and other commercial) where possible. Five of the nine areas showed no discernable difference among property types. In several areas the apartment market peaked earlier than the commercial market. Only in areas 85 (Gallatin, Beaver, Madison, and Park counties) and 90 (Butte-Silver Bow, Powell, Anaconda-Deer Lodge, Granite counties) did some or all property types continue appreciating to the end of 2008. In all other areas property values peaked or flattened earlier, often in the fall of 2007 or first half of 2008.

Exhibit 5-1 at the end of this section summarizes time trends for each economic area and property type.

5.2 Commercial Outlier Analysis

Very low and a few very high values sales, as well as any properties with a total assessed value of less than \$10,000, were removed at the outset of the analysis. After the application of time adjusted, sales ratios were computed and analyzed for outliers. Ratios more than 1.5 IQR (inter-quartile range) were identified and further scrutinized so as to set cut point at logical break points. Exhibit 5-2 displays these break points with outliers coded in green and non-outliers in blue. The upper graph shows all the ratios, and the lower graph shows only ratios less than 1.50 so that lower break points are more apparent.

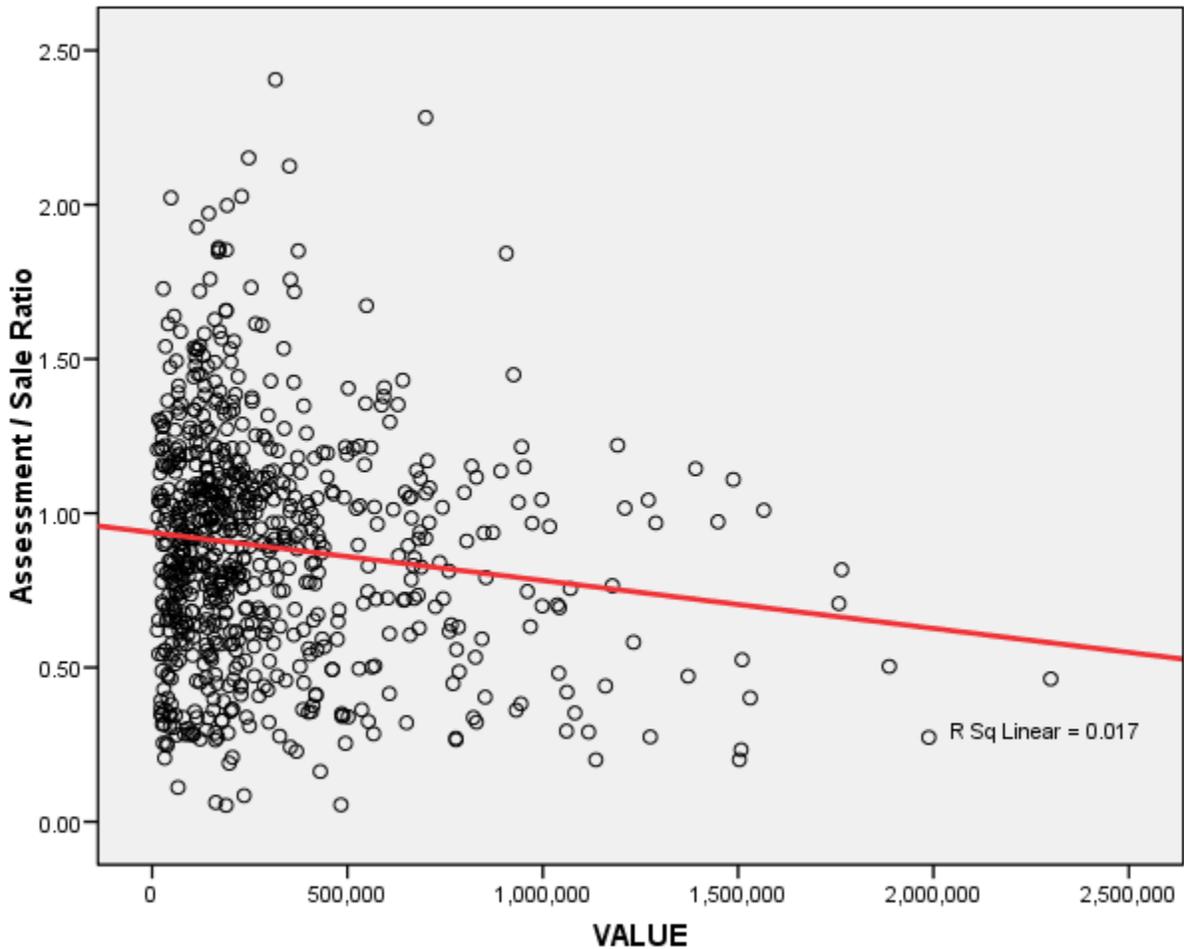
Exhibit 5-3 summarizes the number and percentage of sales excluded as outliers. The percentage excluded ranges from less than 5% in area 81 to 11.4% in area 91. Overall 267 sales (6.5%) were excluded as outliers.

5.3 Commercial Sales Ratio Analysis

The table below shows commercial sales ratio statistics by property type. The overall median ratio of 0.965 indicates that assessed values are closely centered on market value. The COD statistics are somewhat high but not overly so for commercial properties. The coefficients of price-related bias are generally acceptable but indicate assessment regressivity for vacant land (as shown in the graph below, lower value lots are somewhat over-assessed relative to higher value lots).

Commercial Ratio Statistics by Property Type

Prop Type	Sales	Median	Wtd Mean	Minimum	Maximum	COD	Price-Related Bias	
							Coef.	Sig.
1 Vacant	743	.899	.764	.053	2.405	.331	-.052	.000
2 Apartments	763	.983	.988	.428	2.513	.197	-.022	.093
3 Commercial	2321	.968	.941	.285	2.524	.277	-.021	.001
Overall	3827	.965	.919	.053	2.524	.270	-.019	.000



The table below displays ratio study statistics by economic area. Median ratios range from 0.910 to 1.007, and CODs range from .231 to .357 in area 90 (Butte-Silver Bow, Powell, Anaconda-Deer Lodge, and Granite counties). The coefficients of price-related bias in areas 81 and 91 are less than -.05 and statistically significant, indicating regressivity. Appendix C-2 displays plots of ratios with value for all nine economic areas.

Commercial Ratio Statistics by Economic Region

Econ Area	Sales	Median	Wtd Mean	Minimum	Maximum	COD	Price-Related Bias	
							Coef.	Sig.
81	491	.958	.877	.201	2.524	.249	-.067	.000
82	491	.997	1.023	.288	2.464	.231	.018	.138
84	626	.952	.933	.265	2.222	.240	-.011	.350
85	580	.901	.859	.338	2.405	.302	-.043	.006
87	307	1.007	.973	.206	2.192	.294	-.022	.352
88	646	.982	.958	.233	2.404	.268	.006	.625
89	275	.930	.928	.281	2.086	.241	.033	.053
90	310	.991	.874	.053	2.513	.357	-.044	.034
91	101	.910	.876	.255	2.135	.285	-.123	.034
Overall	3827	.965	.919	.053	2.524	.270	-.019	.000

The two tables below show confidence intervals for the median and weighted mean by property type and economic area. In all cases the median confidence intervals overlap the target range of 0.90 to 1.10, meaning that none are systematically under or over-valued. The weighted mean confidence interval for vacant land falls considerably short of 0.90, reflecting the fact that higher value lots, which carry more weight in calculation of the weighted mean, are relatively under-assessed. The weighted mean confidence interval of for area 85 with an upper bound of .895 is marginally shy of 0.90, again due at least in part to the relative under-assessment of higher value properties.

Ratio Statistics with Confidence Intervals by Property Type

Group	Sales	Median	95% Confidence Interval for Median		Wtd Mean	95% Confidence Interval for Weighted Mean	
			Lower Bound	Upper Bound		Lower Bound	Upper Bound
1 Vacant	743	.899	.852	.935	.764	.724	.803
2 Apartments	763	.983	.971	.998	.988	.962	1.013
3 Commercial	2321	.968	.957	.983	.941	.919	.963
Overall	3827	.965	.956	.974	.919	.902	.936

Ratio Statistics with Confidence Intervals by Economic Region

Econ Area	Sales	Median	95% Confidence Interval for Median		Wtd Mean	95% Confidence Interval for Wtd Mean	
			Lower Bound	Upper Bound		Lower Bound	Upper Bound
81	491	.958	.935	.972	.877	.837	.917
82	491	.997	.979	1.009	1.023	.972	1.074
84	626	.952	.931	.968	.933	.898	.968
85	580	.901	.855	.947	.859	.822	.895
87	307	1.007	.955	1.060	.973	.927	1.019
88	646	.982	.961	1.000	.958	.909	1.007
89	275	.930	.899	.974	.928	.860	.996
90	310	.991	.930	1.045	.874	.799	.949
91	101	.910	.874	1.010	.876	.816	.936
Overall	3827	.965	.956	.974	.919	.902	.936

Exhibit 5-4 at the end of this section presents ratio study results by property types within economic areas. Median ratios are all close to 0.90 or above except for vacant land in areas 82, 90, and 91. In addition to the general regressivity already noted in areas 81 and 91, vacant land in area 88 shows a similar bias. The most problematic ratios are vacant land in area 90, due to a schizophrenic distribution with many ratios under 0.40 and the rest showing a normal pattern (see ratio plot for vacant land in area 90 in exhibit C-2). Perhaps special circumstances were involved in the lowest sales ratios (the considerable number of such ratios precludes dismissing them as outliers).

Aside from these specific problems, commercial ratios look reasonably good for such a heterogeneous and difficult-to-value property type. Except for vacant land in certain areas, overall levels of appraisal consistently range from 0.90 to 1.00, indicating good uniformity in the appraisal of residential and commercial properties.

Exhibit 5-1 Commercial Time Trends

Region 81	Start	End	Rate	Start	End	Rate	Start	End	Rate
Vacant	Jan 05	Sep 07	0.006	Oct 07	Jan 09	0			
Apartment	Jan 05	Sep 07	0.006	Oct 07	Jan 09	0			
Commercial	Jan 05	Sep 07	0.006	Oct 07	Jan 09	0			
Region 82	Start	End	Rate	Start	End	Rate			
Vacant	Jan 05	Jan 08	0.004	Feb 08	Jan 09	0			
Apartment	Jan 05	Jan 08	0.004	Feb 08	Jan 09	0			
Commercial	Jan 05	Jan 08	0.004	Feb 08	Jan 09	0			
Region 84	Start	End	Rate	Start	End	Rate			
Vacant	Jan 05	Mar 08	0.004	Apr 08	Jan 09	0			
Apartment	Jan 05	Mar 08	0.004	Apr 08	Jan 09	0			
Commercial	Jan 05	Mar 08	0.004	Apr 08	Jan 09	0			
Region 85	Start	End	Rate	Start	End	Rate			
Vacant	Jan 05	Aug 07	0.008	Sep 07	Jan 09	0.008			
Apartment	Jan 05	Aug 06	0.008	Sep 06	Jan 09	0			
Commercial	Jan 05	Aug 07	0.008	Sep 07	Jan 09	0.008			
Region 87	Start	End	Rate	Start	End	Rate			
Vacant	Jan 05	Mar 08	0.005	Apr 08	Jan 09	0			
Apartment	Jan 05	Mar 08	0.005	Apr 08	Jan 09	0			
Commercial	Jan 05	Mar 08	0.005	Apr 08	Jan 09	0			
Region 88	Start	End	Rate	Start	End	Rate			
Vacant	Jan 05	Mar 08	0.011	Apr 08	Jan 09	0			
Apartment	Jan 05	Mar 09	0						
Commercial	Jan 05	Mar 09	0.006						
Region 89	Start	End	Rate	Start	End	Rate			
Vacant	Jan 05	Jun 06	0.01	Jul 06	Jan 09	0			
Apartment	Jan 05	Sep 07	0.007	Oct 07	Jan 09	0			
Commercial	Jan 05	Jun 06	0.014	Jul 07	Jan 09	0			
Region 90	Start	End	Rate	Start	End	Rate			
Vacant	Jan 05	Mar 09	0.009						
Apartment	Jan 05	Dec 07	0.006	Jan 08	Jan 09	0			
Commercial	Jan 05	Mar 09	0.009						
Region 91	Start	End	Rate	Start	End	Rate	Start	End	Rate
Vacant	Jan 05	Sep 05	0	Oct 05	Jun 07	0.017	Jul 07	Jan 09	0
Apartment	Jan 05	Sep 05	0	Oct 05	Jun 07	0.017	Jul 07	Jan 09	0

Exhibit 5-2 Commercial Outlier Graphs

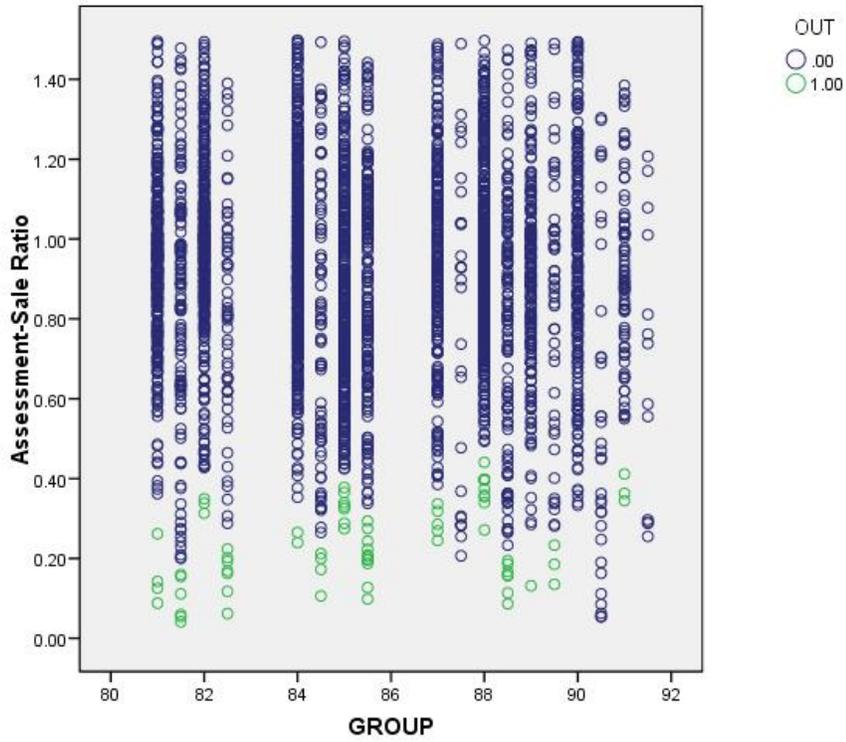
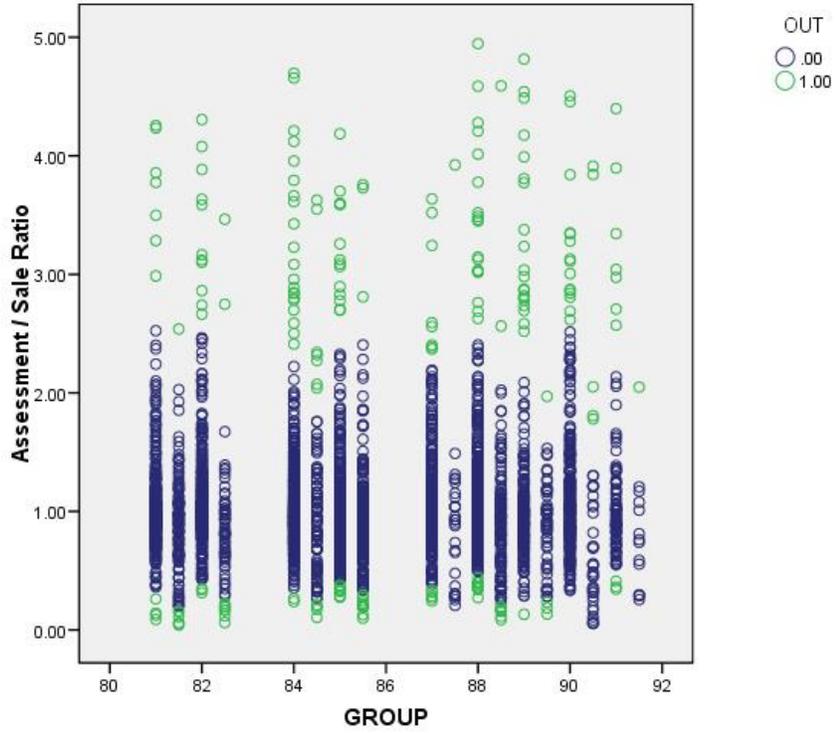


Exhibit 5-3 Commercial Outlier Summary

			OUT		Total
			.00	1.00	
ECONAREA	81	Count	491	24	515
		% within ECONAREA	95.3%	4.7%	100.0%
	82	Count	491	32	523
		% within ECONAREA	93.9%	6.1%	100.0%
	84	Count	626	43	669
		% within ECONAREA	93.6%	6.4%	100.0%
	85	Count	580	42	622
		% within ECONAREA	93.2%	6.8%	100.0%
	87	Count	307	16	323
		% within ECONAREA	95.0%	5.0%	100.0%
	88	Count	646	45	691
		% within ECONAREA	93.5%	6.5%	100.0%
	89	Count	275	30	305
		% within ECONAREA	90.2%	9.8%	100.0%
	90	Count	310	22	332
		% within ECONAREA	93.4%	6.6%	100.0%
	91	Count	101	13	114
		% within ECONAREA	88.6%	11.4%	100.0%
Total	Count	3827	267	4094	
	% within ECONAREA	93.5%	6.5%	100.0%	

Exhibit 5-4
Commercial Ratios by Property Type within Economic Area

Area	Group	Sales	Median	Wtd Mean	Min	Max	COD	Price-Related Bias	
								Coef.	Sig.
81	1 Vacant	125	.907	.714	.201	2.027	.310	-.177	.001
	2 Apartments	66	.961	.924	.442	2.099	.188	-.099	.069
	3 Commercial	300	.962	.914	.362	2.524	.241	-.068	.000
	Overall	491	.958	.877	.201	2.524	.249	-.067	.000
82	1 Vacant	59	.821	.884	.288	1.672	.281	.091	.121
	2 Apartments	117	1.009	1.003	.428	2.160	.174	-.060	.079
	3 Commercial	315	1.002	1.041	.431	2.464	.244	.014	.315
	Overall	491	.997	1.023	.288	2.464	.231	.018	.138
84	1 Vacant	91	.884	.757	.265	1.759	.379	-.144	.083
	2 Apartments	137	.990	1.047	.679	2.007	.165	.020	.599
	3 Commercial	398	.938	.931	.353	2.222	.238	-.010	.444
	Overall	626	.952	.933	.265	2.222	.240	-.011	.350
85	1 Vacant	194	.995	.832	.338	2.405	.279	-.134	.001
	2 Apartments	84	.998	.979	.460	2.037	.186	.034	.491
	3 Commercial	302	.825	.847	.425	2.325	.337	-.027	.160
	Overall	580	.901	.859	.338	2.405	.302	-.043	.006
87	1 Vacant	28	.913	.744	.206	1.489	.357	.052	.653
	2 Apartments	41	.979	.958	.482	1.888	.190	-.108	.074
	3 Commercial	238	1.040	.997	.385	2.192	.297	-.028	.285
	Overall	307	1.007	.973	.206	2.192	.294	-.022	.352
88	1 Vacant	148	.898	.735	.233	2.022	.333	-.097	.009
	2 Apartments	121	.962	.977	.656	1.898	.195	.016	.708
	3 Commercial	377	1.006	1.037	.493	2.404	.265	.014	.359
	Overall	646	.982	.958	.233	2.404	.268	.006	.625
89	1 Vacant	51	.900	.788	.281	1.531	.291	-.084	.395
	2 Apartments	102	.963	.969	.500	2.086	.176	.047	.243
	3 Commercial	122	.914	.934	.285	1.910	.275	.034	.107
	Overall	275	.930	.928	.281	2.086	.241	.033	.053
90	1 Vacant	34	.479	.239	.053	1.303	.689	-.392	.000
	2 Apartments	92	.980	.957	.543	2.513	.315	-.100	.075
	3 Commercial	184	1.042	.917	.333	2.446	.333	-.048	.026
	Overall	310	.991	.874	.053	2.513	.357	-.044	.034
91	1 Vacant	13	.738	.533	.255	1.207	.392	-.804	.046
	2 Apartments	3	1.004	.929	.863	1.054	.063	-.076	.089
	3 Commercial	85	.923	.901	.550	2.135	.274	-.215	.001
	Overall	101	.910	.876	.255	2.135	.285	-.123	.034

Appendixes

Appendix A-1 Improved Residential Ratios by Economic Area and Property Type

Area	Property Type	Sales	Median	Lower Bound	Upper Bound	Wtd Mean	Lower Bound	Upper Bound	Min	Max	COD	PRB Coef.	PRB Sig.
81	Farmstead	6	0.86	0.67	1.10	0.83	0.61	1.05	0.67	1.10	0.16	-0.021	0.827
81	Condo Rural	120	1.00	0.97	1.01	0.97	0.93	1.01	0.66	1.44	0.09	0.023	0.177
81	Condo Urban	234	0.99	0.98	1.01	0.97	0.95	0.98	0.68	1.28	0.07	-0.031	0.004
81	Res Rural	1063	1.00	1.00	1.01	0.99	0.98	1.00	0.67	1.47	0.09	-0.032	0.000
81	Res Urban	1016	1.00	0.99	1.01	0.98	0.97	0.99	0.67	1.49	0.08	-0.047	0.000
81	Thome Rural	68	1.01	0.99	1.03	0.98	0.94	1.02	0.67	1.21	0.06	-0.040	0.033
81	THome Urban	260	1.01	1.00	1.02	1.02	1.00	1.03	0.82	1.49	0.05	-0.002	0.887
81	OVERALL	2767	1.00	1.00	1.01	0.98	0.98	0.99	0.66	1.49	0.08	-0.030	0.000
82	Farmstead	22	0.85	0.74	0.95	0.83	0.75	0.91	0.65	1.29	0.17	-0.119	0.127
82	Condo Urban	236	0.99	0.99	1.00	0.98	0.97	0.99	0.66	1.30	0.05	0.011	0.311
82	Res Rural	386	0.99	0.98	1.01	0.98	0.97	1.00	0.66	1.53	0.11	0.011	0.375
82	Res Urban	2874	1.00	1.00	1.00	1.00	1.00	1.01	0.66	1.54	0.09	-0.021	0.000
82	THome Urban	13	0.99	0.95	1.03	0.98	0.94	1.01	0.91	1.10	0.04	-0.057	0.071
82	OVERALL	3531	1.00	1.00	1.00	1.00	0.99	1.00	0.65	1.54	0.09	-0.019	0.000
84	Farmstead	7	0.92	0.70	1.26	0.82	0.71	0.92	0.70	1.26	0.14	-0.283	0.007
84	Condo Rural	9	1.02	0.99	1.07	1.02	0.99	1.05	0.97	1.07	0.03	-0.110	0.218
84	Condo Urban	331	1.00	0.99	1.01	0.98	0.96	0.99	0.69	1.32	0.07	-0.055	0.013
84	Res Rural	1552	1.00	0.99	1.00	0.98	0.98	0.99	0.68	1.43	0.08	-0.044	0.000
84	Res Urban	1719	1.01	1.00	1.01	1.00	0.99	1.00	0.68	1.47	0.08	-0.022	0.006
84	Thome Rural	16	1.00	0.96	1.02	0.98	0.94	1.02	0.72	1.07	0.05	0.126	0.382
84	THome Urban	108	1.01	1.00	1.01	1.01	1.00	1.02	0.86	1.29	0.04	0.035	0.052
84	OVERALL	3742	1.00	1.00	1.01	0.99	0.98	0.99	0.68	1.47	0.08	-0.028	0.000

Appendix A-1 (Continued)
Improved Residential Ratios by Economic Area and Property Type

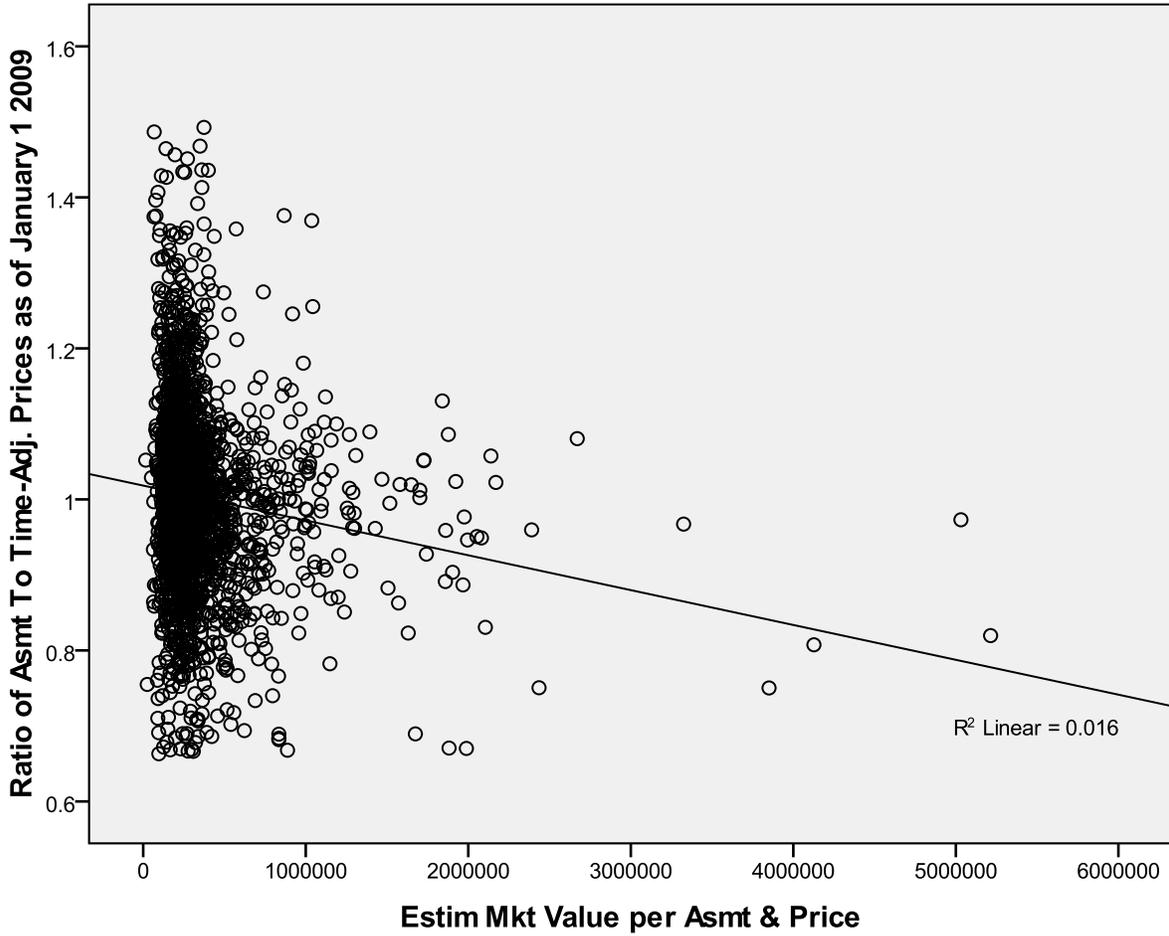
Area	Property Type	Sales	Median	Lower Bound	Upper Bound	Wtd Mean	Lower Bound	Upper Bound	Min	Max	COD	PRB Coef.	PRB Sig.
85	Farmstead	4	1.06	0.86	1.29	1.08	0.67	1.48	0.86	1.29	0.14		
85	Condo Rural	361	1.08	1.08	1.09	1.05	1.02	1.07	0.68	1.63	0.10	-0.023	0.002
85	Condo Urban	751	1.08	1.08	1.09	1.08	1.07	1.09	0.69	1.62	0.06	-0.002	0.846
85	Res Rural	1097	1.07	1.06	1.08	1.04	1.02	1.05	0.68	1.65	0.11	-0.027	0.000
85	Res Urban	1344	1.08	1.07	1.09	1.07	1.06	1.08	0.69	1.67	0.09	-0.012	0.119
85	Thome Rural	22	1.09	1.07	1.11	1.08	1.06	1.10	0.97	1.13	0.02	0.406	0.297
85	THome Urban	177	1.09	1.08	1.10	1.09	1.07	1.11	0.68	1.53	0.07	-0.008	0.719
85	OVERALL	3756	1.08	1.08	1.08	1.05	1.04	1.06	0.68	1.67	0.09	-0.020	0.000
87	Farmstead	13	0.61	0.57	1.03	0.76	0.58	0.94	0.49	1.93	0.42	-0.009	0.965
87	Condo Urban	46	0.94	0.88	1.02	0.96	0.90	1.03	0.46	1.81	0.19	0.055	0.300
87	Res Rural	291	0.89	0.87	0.93	0.86	0.84	0.89	0.39	2.13	0.19	-0.021	0.434
87	Res Urban	1206	0.97	0.95	0.98	0.95	0.94	0.97	0.45	2.35	0.19	-0.094	0.000
87	OVERALL	1556	0.95	0.94	0.96	0.93	0.92	0.94	0.39	2.35	0.20	-0.088	0.000
88	Farmstead	5	0.90	0.83	1.28	0.95	0.77	1.12	0.83	1.28	0.13	-0.085	0.697
88	Condo Rural	12	1.01	0.91	1.09	0.99	0.91	1.07	0.89	1.32	0.09	-0.104	0.199
88	Condo Urban	724	0.99	0.98	0.99	0.99	0.98	1.00	0.74	1.35	0.06	0.016	0.082
88	Res Rural	913	0.97	0.96	0.98	0.96	0.95	0.97	0.68	1.40	0.09	-0.010	0.291
88	Res Urban	3766	0.98	0.98	0.98	0.98	0.97	0.98	0.68	1.40	0.07	-0.015	0.000
88	Thome Rural	1	1.03			1.03			1.03	1.03	0.00		
88	THome Urban	26	0.99	0.89	1.03	0.99	0.95	1.02	0.87	1.13	0.07	0.159	0.002
88	OVERALL	5447	0.98	0.98	0.98	0.97	0.97	0.98	0.68	1.40	0.07	-0.016	0.000

Appendix A-1 (Continued)
Improved Residential Ratios by Economic Area and Property Type

Area	Property Type	Sales	Median	<i>Lower Bound</i>	<i>Upper Bound</i>	<i>Wtd Mean</i>	<i>Lower Bound</i>	<i>Upper Bound</i>	Min	Max	COD	<i>PRB Coef.</i>	<i>PRB Sig.</i>
89	Farmstead	1	0.70			0.70			0.70	0.70	0.00		
89	Condo Rural	20	0.93	0.88	0.97	0.95	0.91	0.98	0.86	1.16	0.06	0.025	0.546
89	Condo Urban	217	1.00	0.98	1.01	0.98	0.96	1.00	0.58	1.55	0.09	0.024	0.357
89	Res Rural	1085	0.94	0.93	0.96	0.92	0.91	0.93	0.51	1.71	0.12	-0.055	0.000
89	Res Urban	847	0.95	0.94	0.96	0.94	0.93	0.95	0.52	1.69	0.11	-0.009	0.477
89	Thome Rural	2	1.05	1.04	1.05	1.05	0.96	1.14	1.04	1.05	0.01		
89	THome Urban	23	1.01	0.92	1.06	0.99	0.94	1.03	0.83	1.18	0.08	0.090	0.209
89	OVERALL	2195	0.95	0.95	0.96	0.93	0.92	0.94	0.51	1.71	0.12	-0.037	0.000
90	Farmstead	1	0.39			0.39			0.39	0.39	0.00		
90	Condo Urban	28	0.84	0.74	0.93	0.80	0.73	0.88	0.49	1.13	0.17	0.114	0.543
90	Res Rural	105	0.81	0.75	0.86	0.77	0.73	0.82	0.37	1.81	0.23	-0.104	0.018
90	Res Urban	1284	0.97	0.96	0.98	0.95	0.93	0.96	0.31	3.04	0.25	-0.200	0.000
90	OVERALL	1418	0.96	0.94	0.97	0.91	0.89	0.92	0.31	3.04	0.25	-0.203	0.000
91	Farmstead	9	0.67	0.61	0.82	0.71	0.62	0.81	0.60	0.86	0.11	0.026	0.784
91	Condo Urban	7	0.83	0.75	0.87	0.82	0.77	0.86	0.75	0.87	0.04	-0.215	0.660
91	Res Rural	252	0.94	0.92	0.96	0.90	0.88	0.93	0.46	1.85	0.15	-0.118	0.000
91	Res Urban	197	0.96	0.93	0.97	0.95	0.93	0.97	0.49	1.70	0.13	-0.021	0.547
91	THome Urban	1	0.89			0.89			0.89	0.89	0.00		
91	OVERALL	466	0.94	0.93	0.96	0.91	0.89	0.93	0.46	1.85	0.14	-0.076	0.000

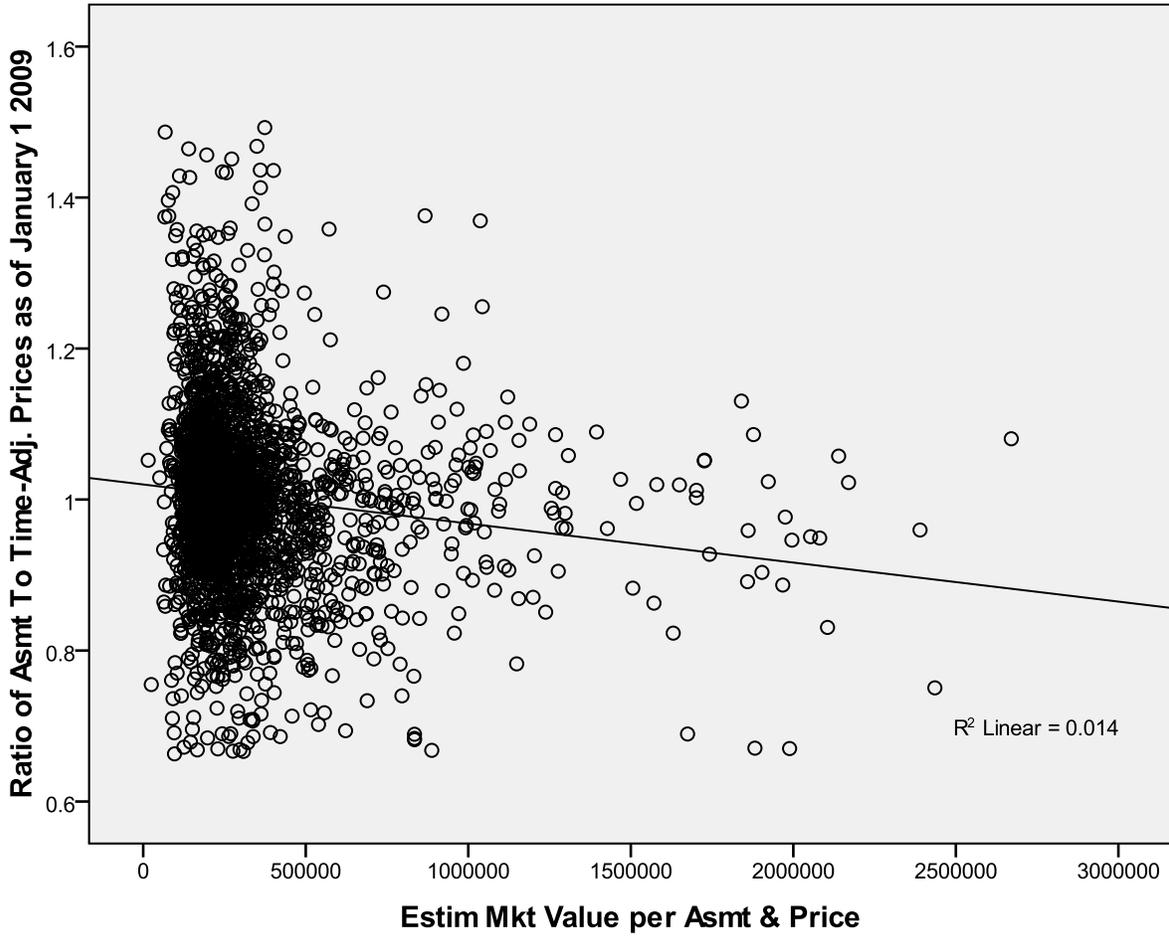
Appendix A-2 Scatter Plots of Residential Ratios with Value

Non-extreme residential ratios for economic area 81:



Region	Median Ratio	Weighted Mean Ratio	Coefficient of Dispersion	Price Related Bias (PRB)	PRB Significance
81	1.00	0.98	8%	-0.030	0.000

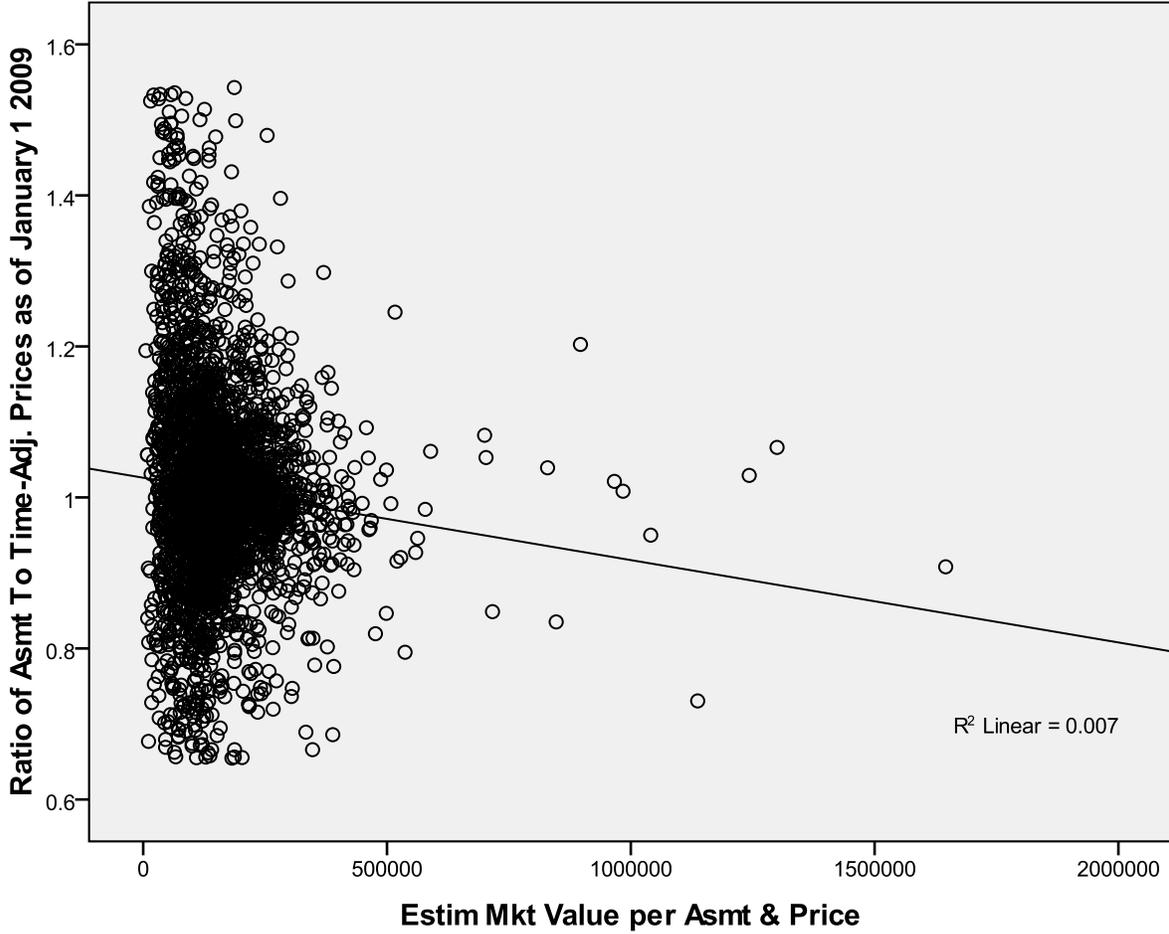
The same, after removing the five highest-valued sales:



Region	Median Ratio	Weighted Mean Ratio	Coefficient of Dispersion	Price Related Bias (PRB)	PRB Significance
81	1.00	0.99	8%	-0.028	0.000

Appendix A-2 (Continued)
Scatter Plots of Residential Ratios with Value

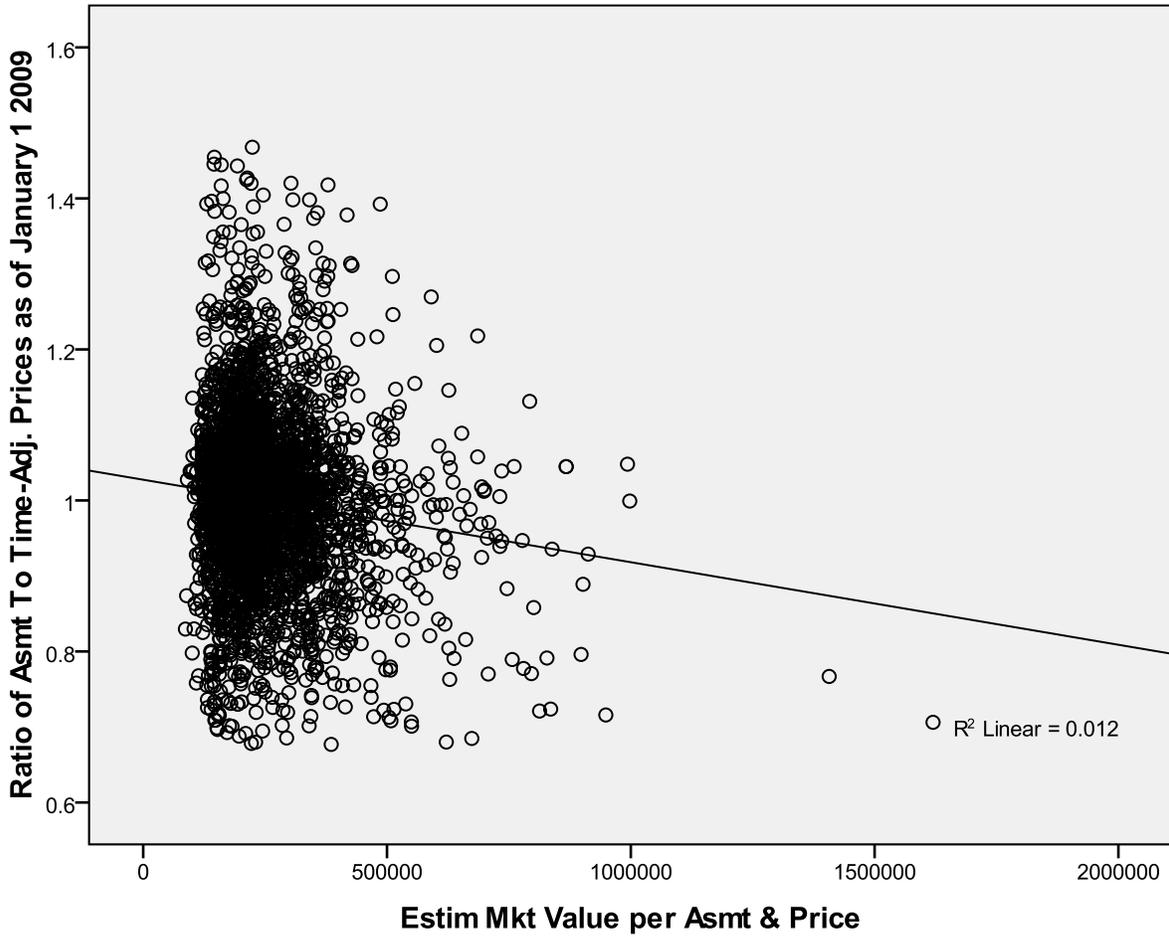
Non-extreme residential ratios for economic area 82:



Region	Median Ratio	Weighted Mean Ratio	Coefficient of Dispersion	Price Related Bias (PRB)	PRB Significance
82	1.00	1.00	9%	-0.019	0.000

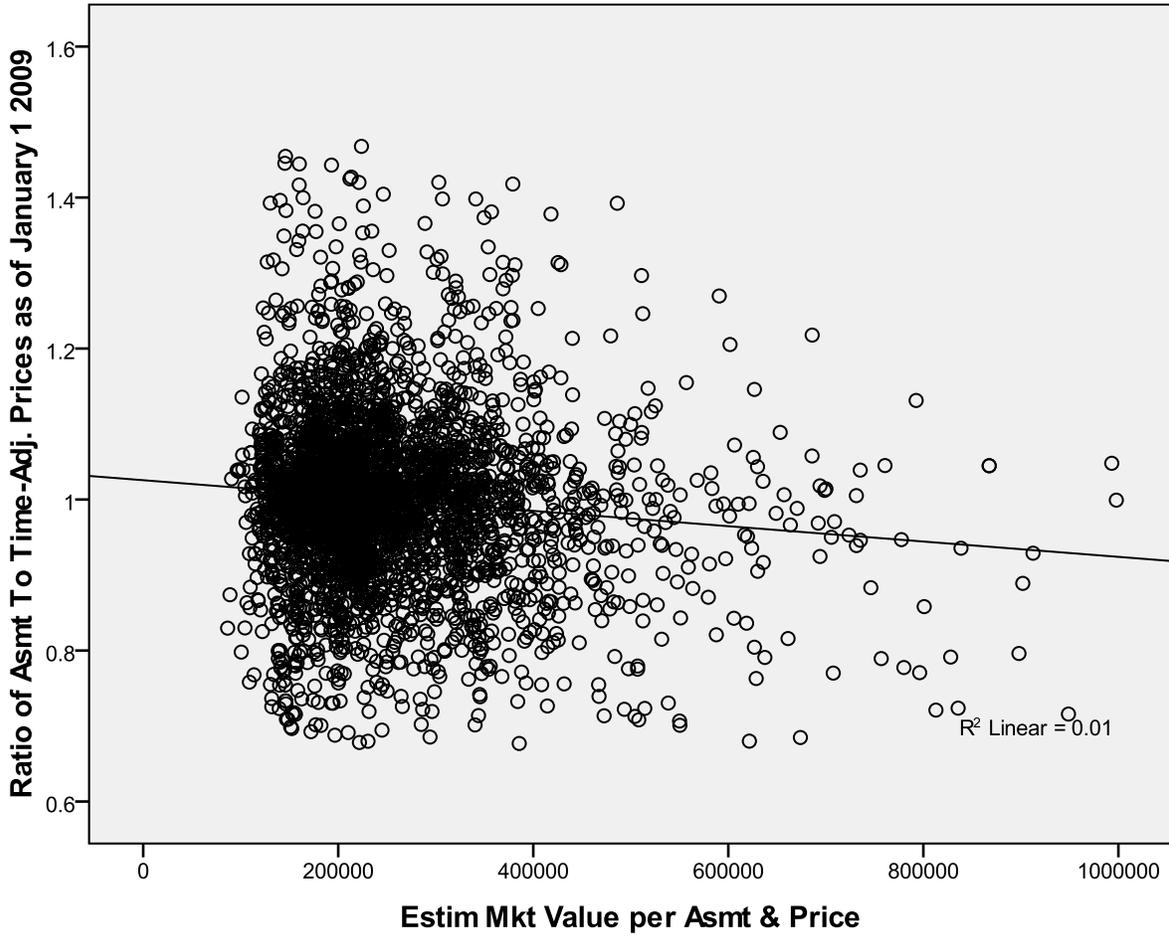
Appendix A-2 (Continued)
Scatter Plots of Residential Ratios with Value

Non-extreme residential ratios for economic area 84:



Region	Median Ratio	Weighted Mean Ratio	Coefficient of Dispersion	Price Related Bias (PRB)	PRB Significance
84	1.00	0.99	8%	-0.028	0.000

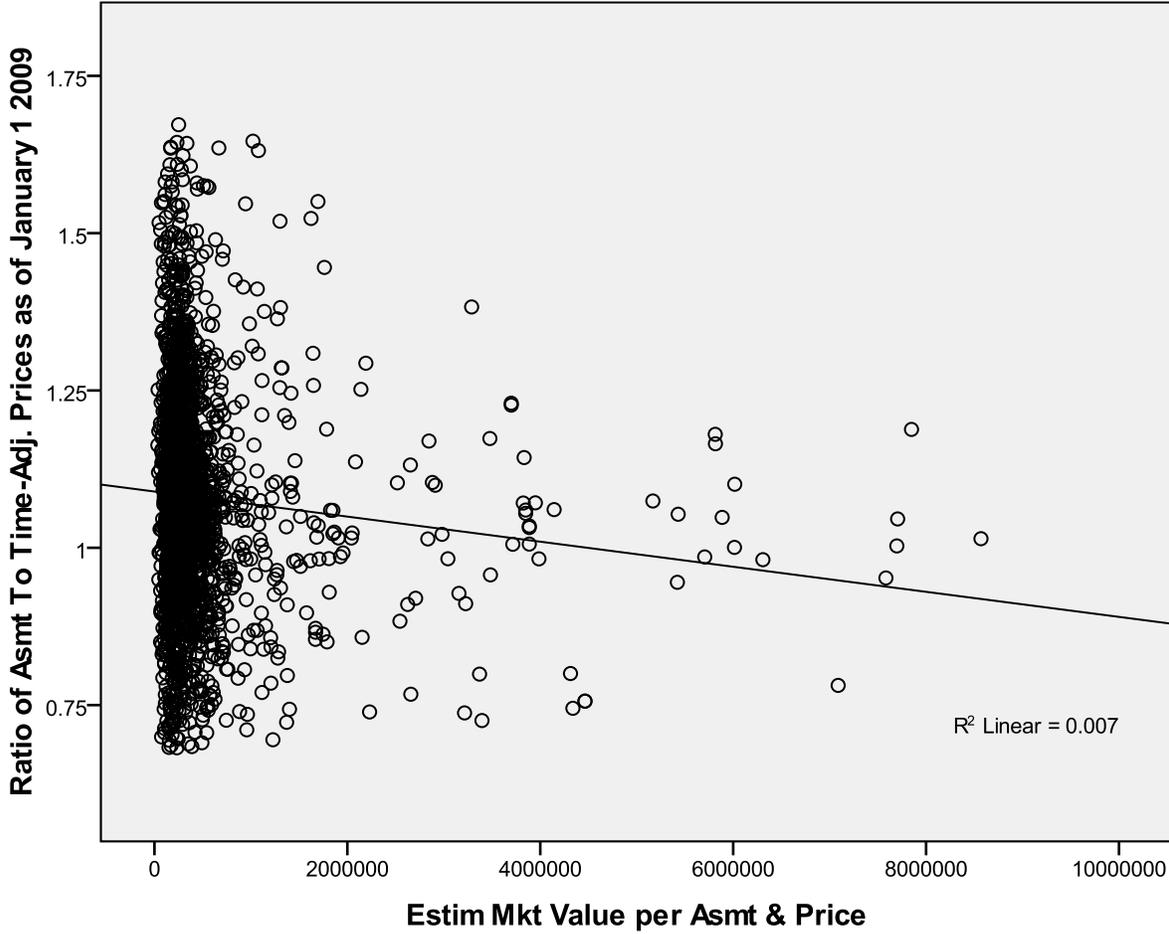
The same after eliminating two high-value parcels:



Region	Median Ratio	Weighted Mean Ratio	Coefficient of Dispersion	Price Related Bias (PRB)	PRB Significance
84	1.00	0.99	8%	-0.026	0.000

Appendix A-2 (Continued)
Scatter Plots of Residential Ratios with Value

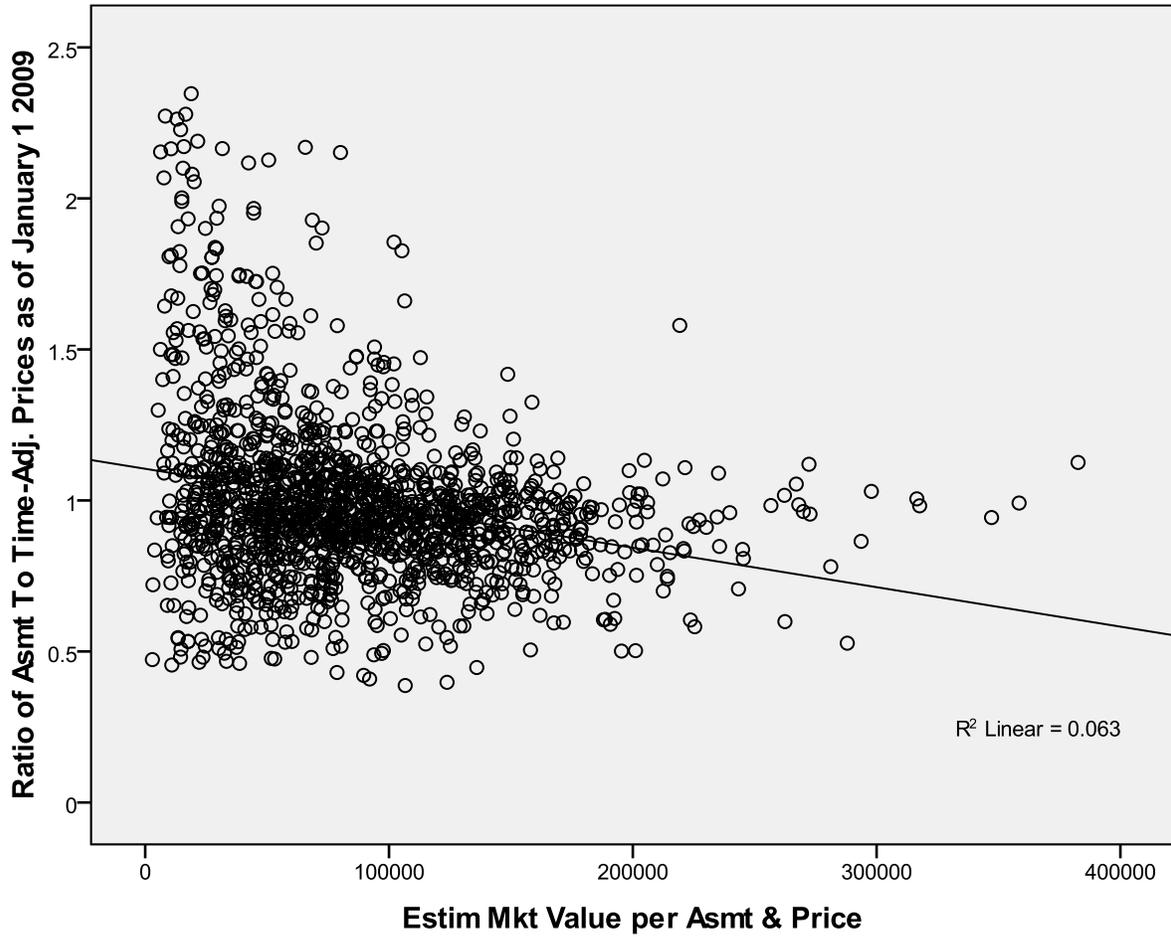
Non-extreme residential ratios for economic area 85:



Region	Median Ratio	Weighted Mean Ratio	Coefficient of Dispersion	Price Related Bias (PRB)	PRB Significance
85	1.08	1.05	9%	-0.020	0.000

Appendix A-2 (Continued)
Scatter Plots of Residential Ratios with Value

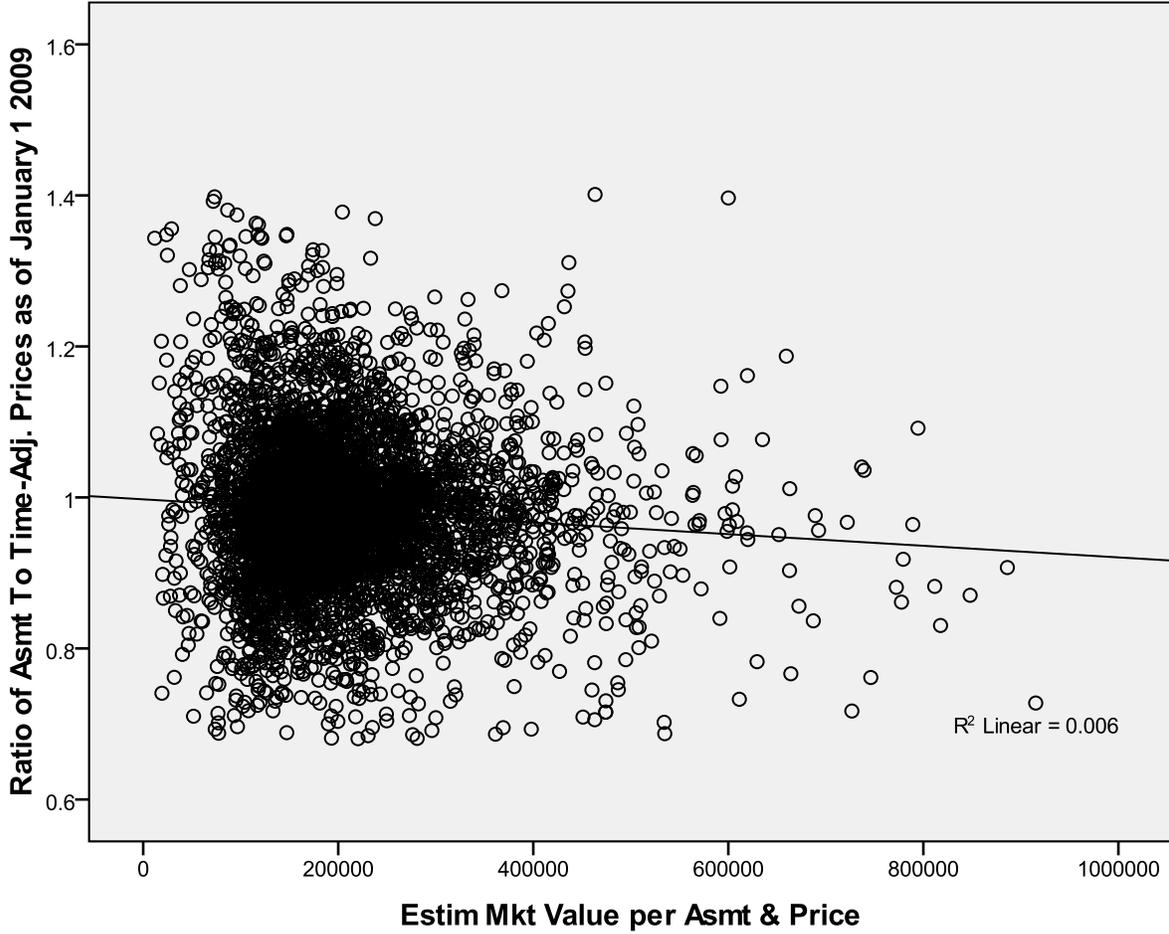
Non-extreme residential ratios for economic area 87:



Region	Median Ratio	Weighted Mean Ratio	Coefficient of Dispersion	Price Related Bias (PRB)	PRB Significance
87	0.95	0.93	20%	-0.088	0.000

Appendix A-2 (Continued)
Scatter Plots of Residential Ratios with Value

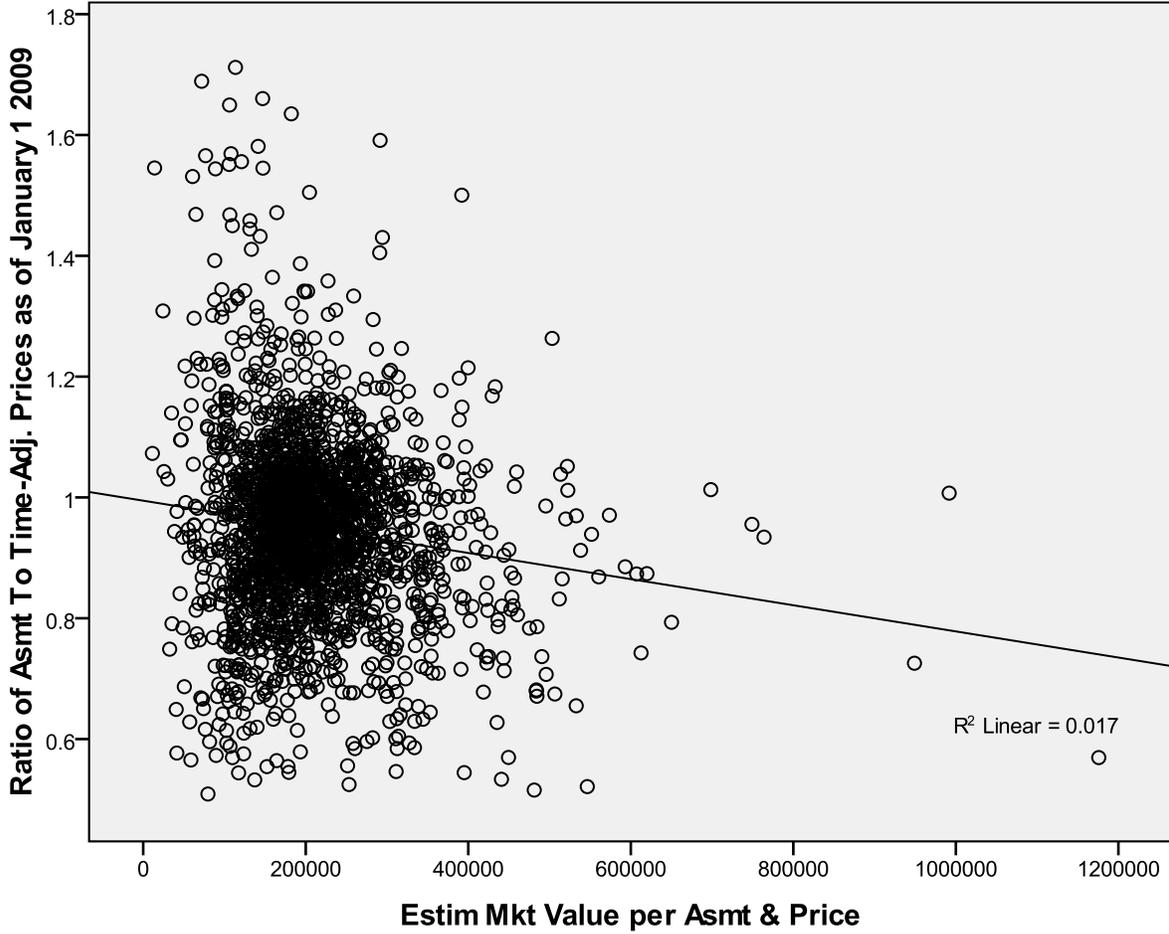
Non-extreme residential ratios for economic area 88:



Region	Median Ratio	Weighted Mean Ratio	Coefficient of Dispersion	Price Related Bias (PRB)	PRB Significance
88	0.98	0.97	7%	-0.016	0.000

Appendix A-2 (Continued)
Scatter Plots of Residential Ratios with Value

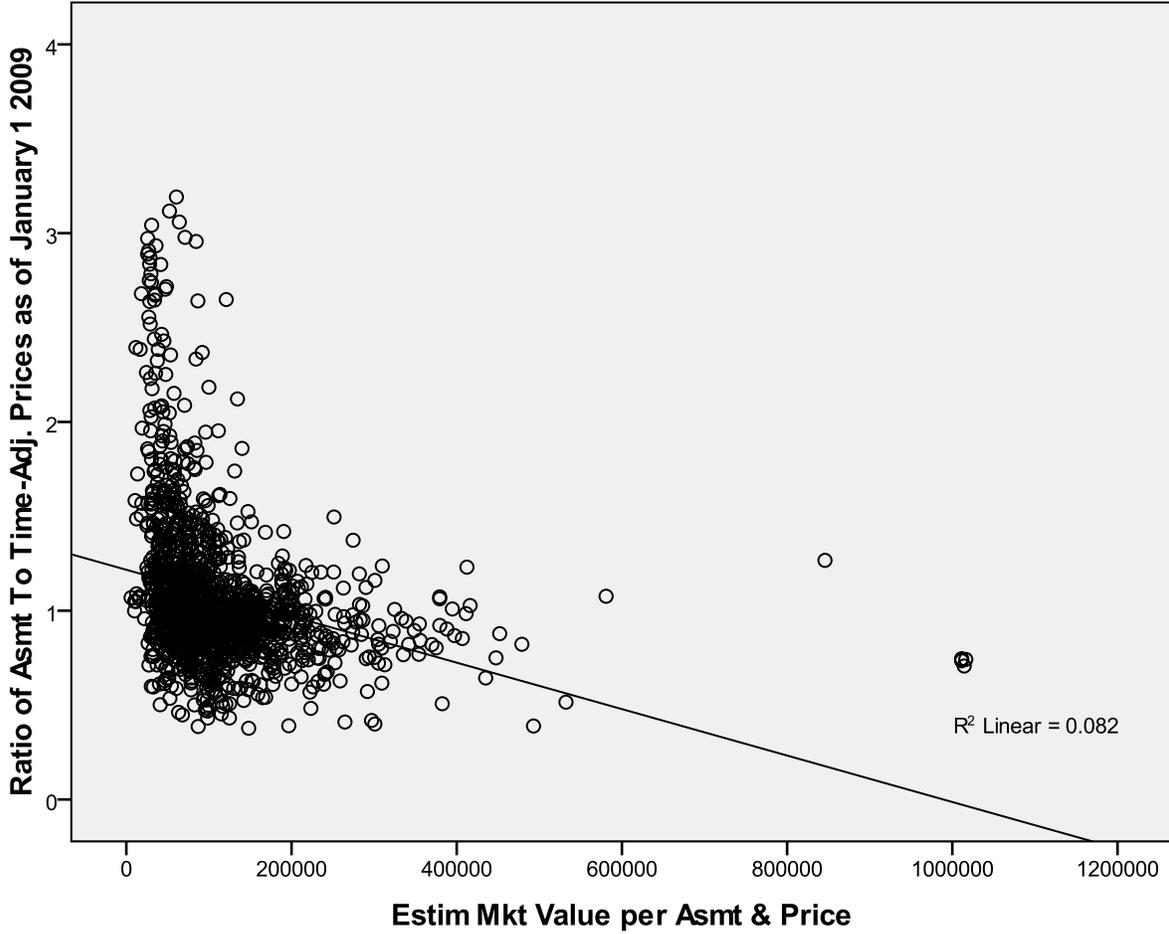
Non-extreme residential ratios for economic area 89:



Region	Median Ratio	Weighted Mean Ratio	Coefficient of Dispersion	Price Related Bias (PRB)	PRB Significance
89	0.95	0.93	12%	-0.037	0.000

Appendix A-2 (Continued)
Scatter Plots of Residential Ratios with Value

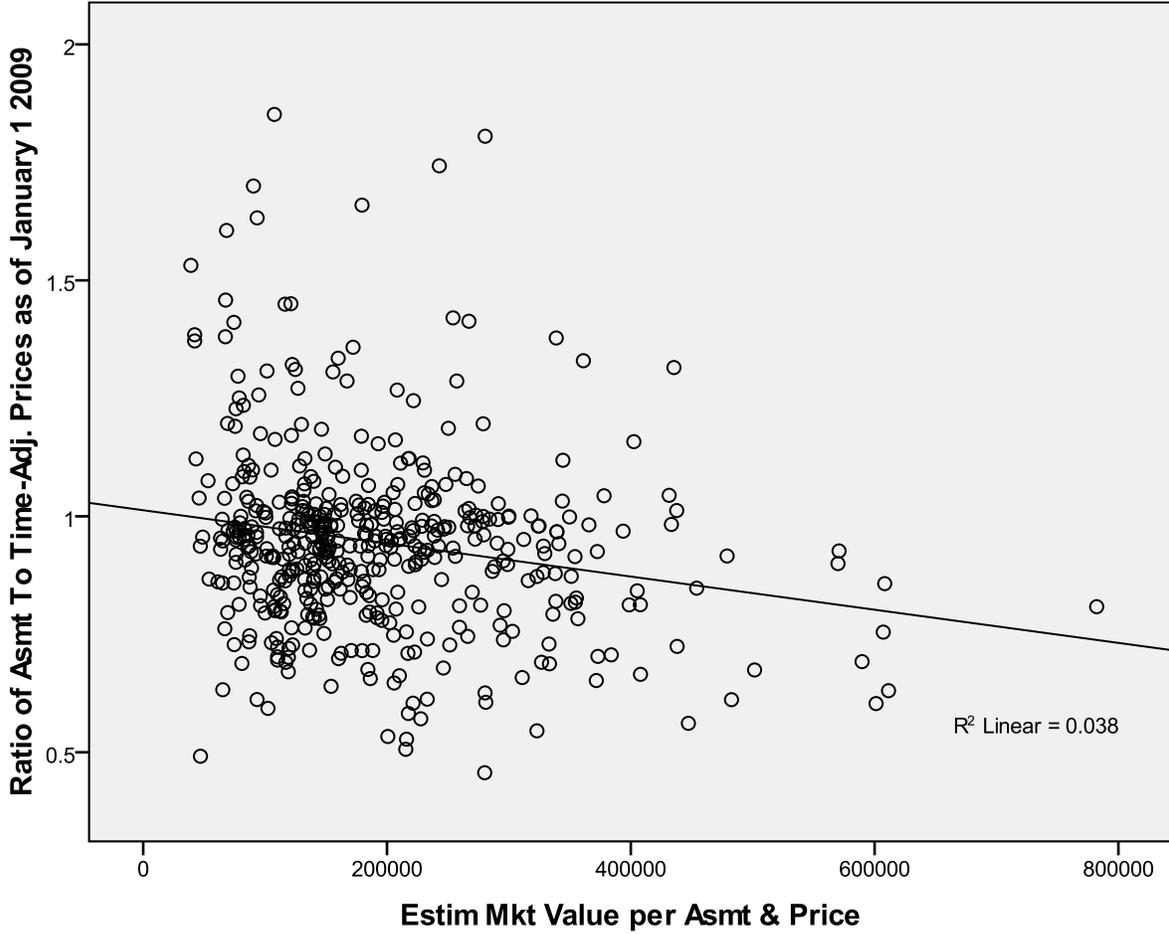
Non-extreme residential ratios for economic area 90:



Region	Median Ratio	Weighted Mean Ratio	Coefficient of Dispersion	Price Related Bias (PRB)	PRB Significance
90	0.96	0.91	25%	-0.203	0.000

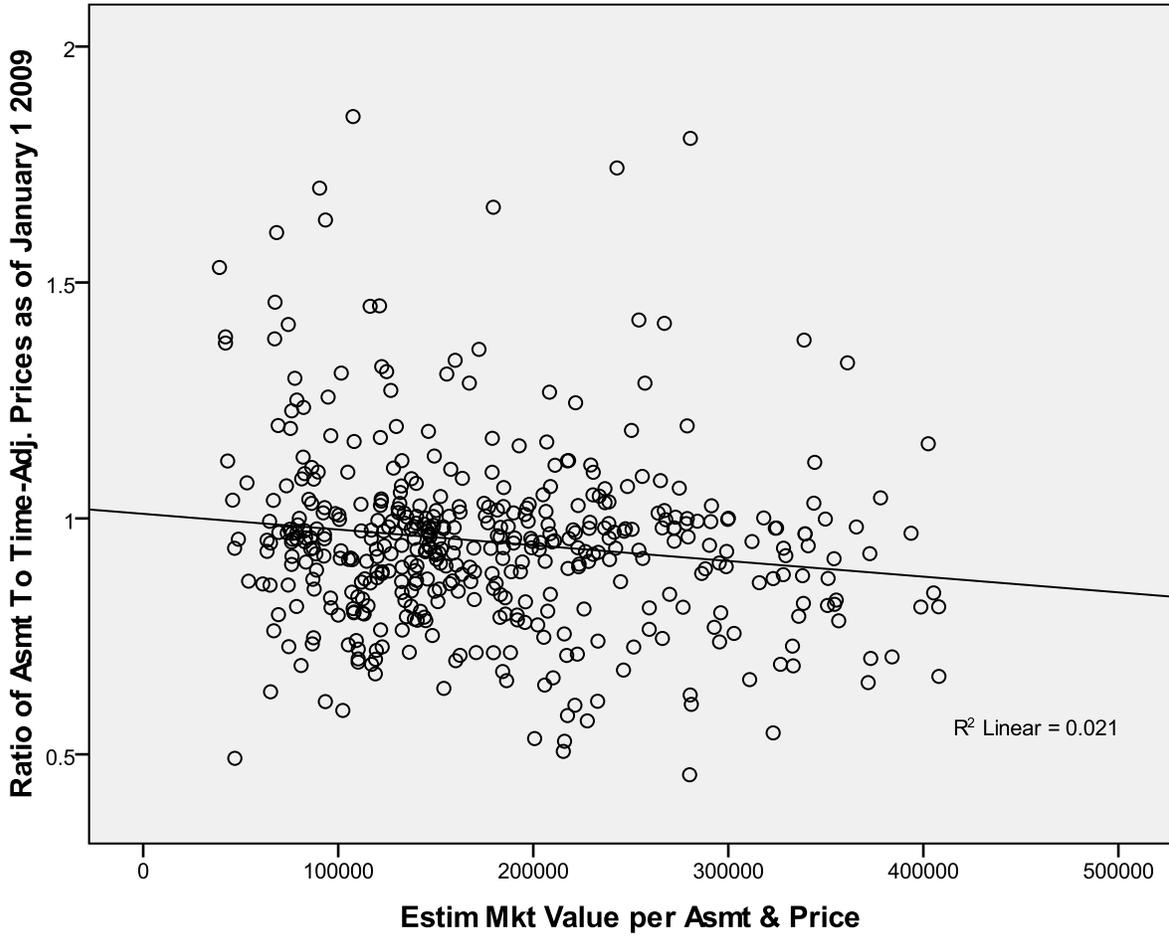
Appendix A-2 (Continued)
Scatter Plots of Residential Ratios with Value

Non-extreme residential ratios for economic area 91:



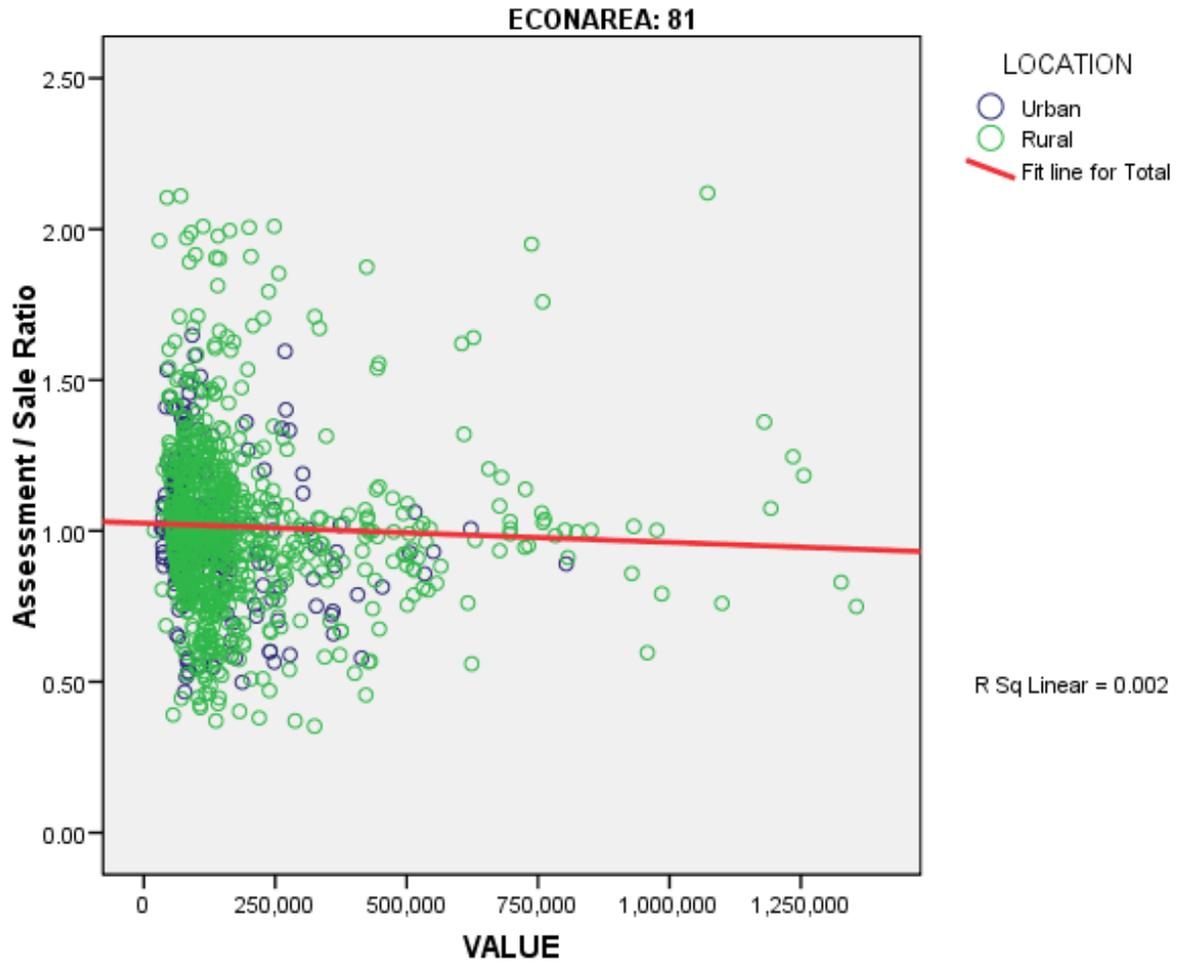
Region	Median Ratio	Weighted Mean Ratio	Coefficient of Dispersion	Price Related Bias (PRB)	PRB Significance
91	0.94	0.91	14%	-0.076	0.000

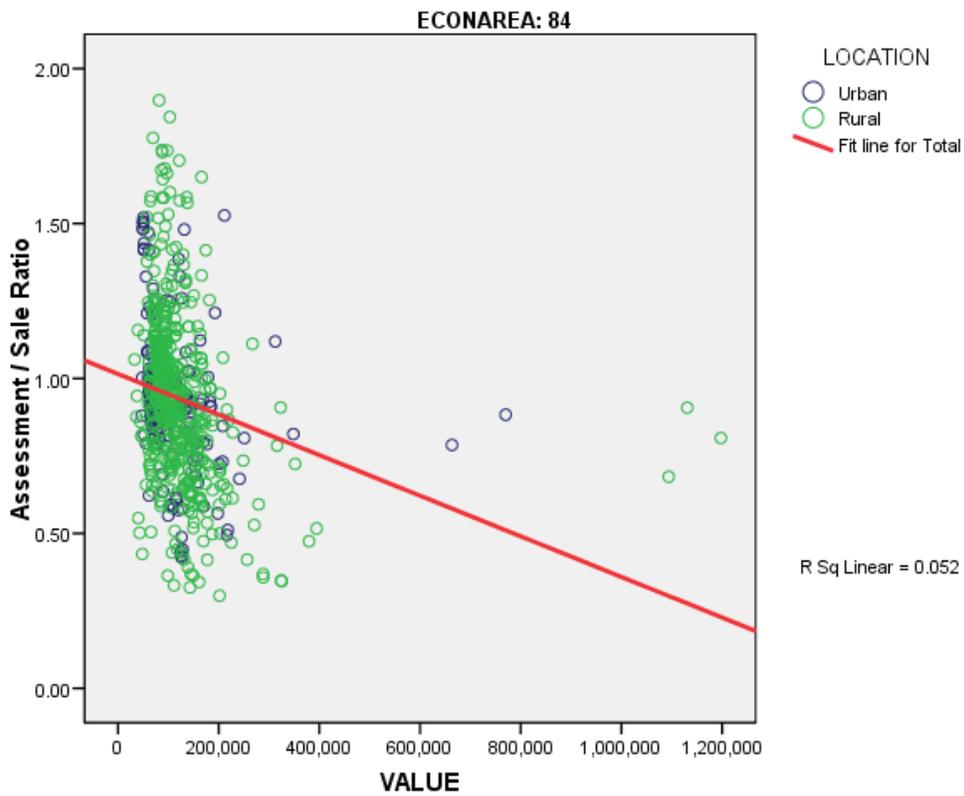
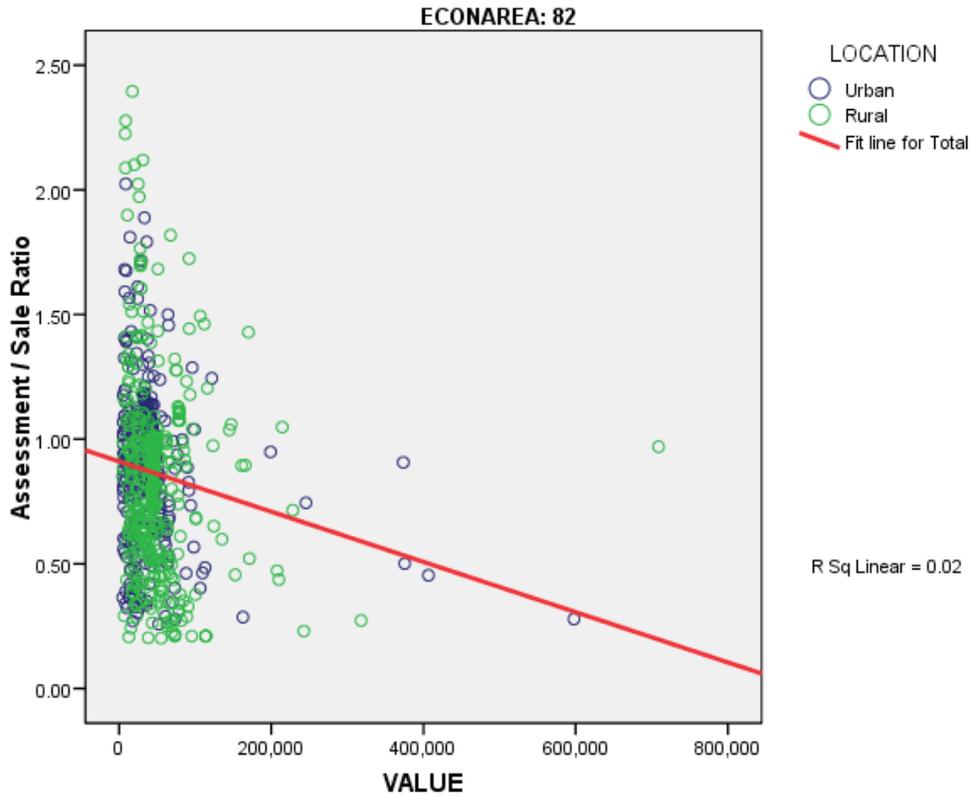
The same, eliminating properties valued over \$425,000

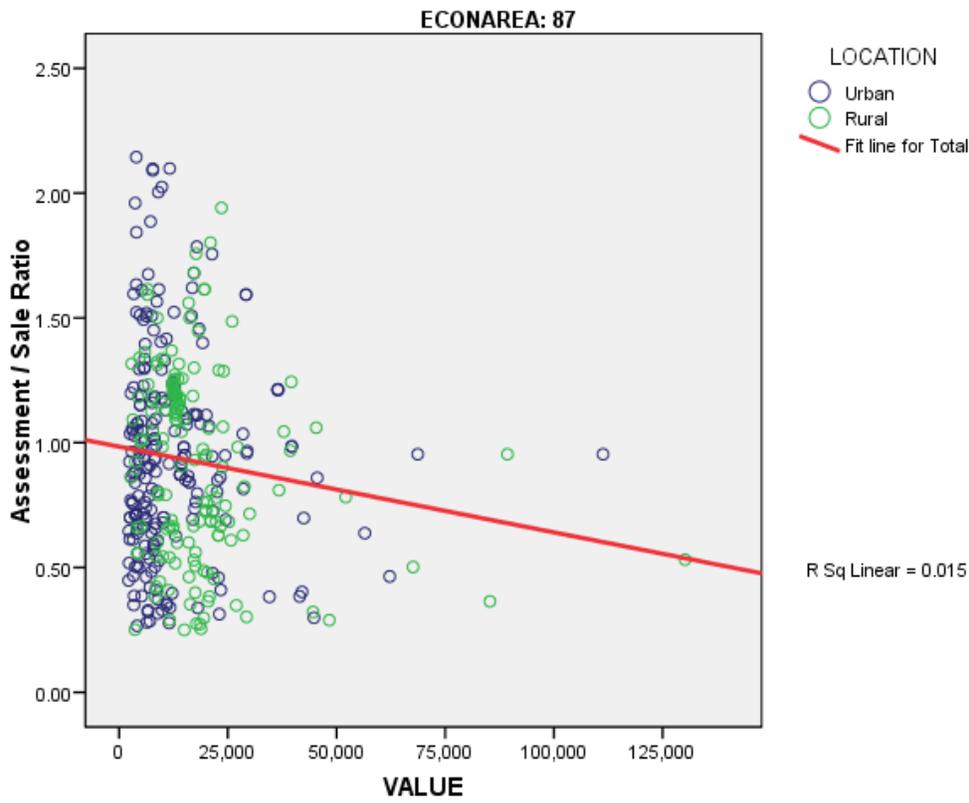
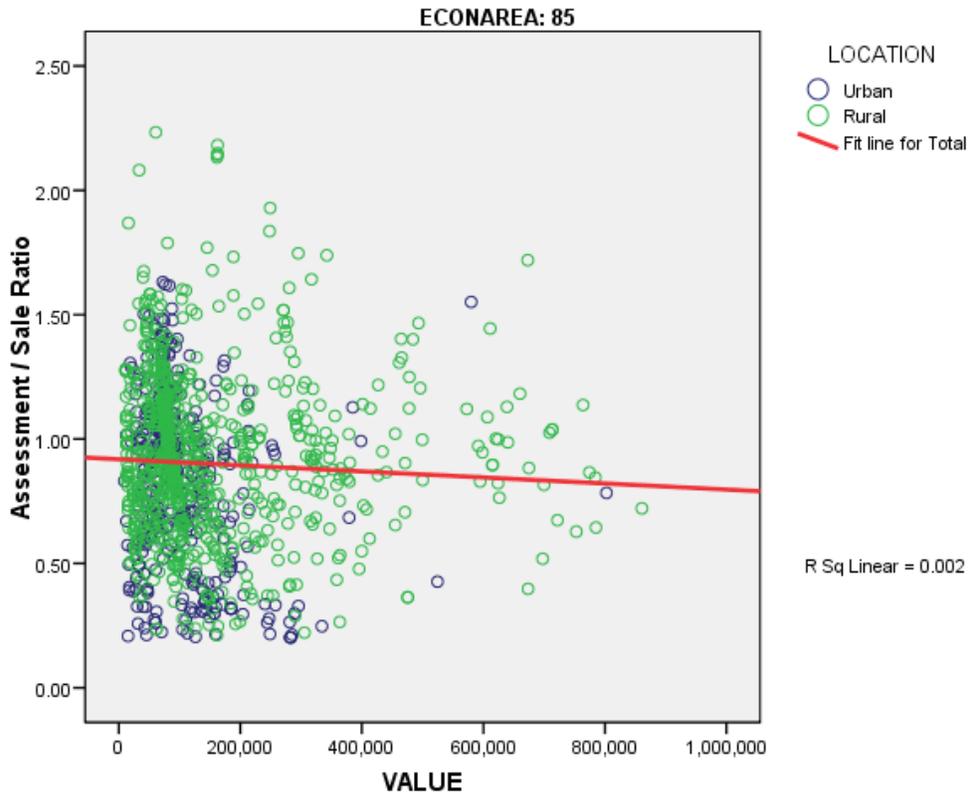


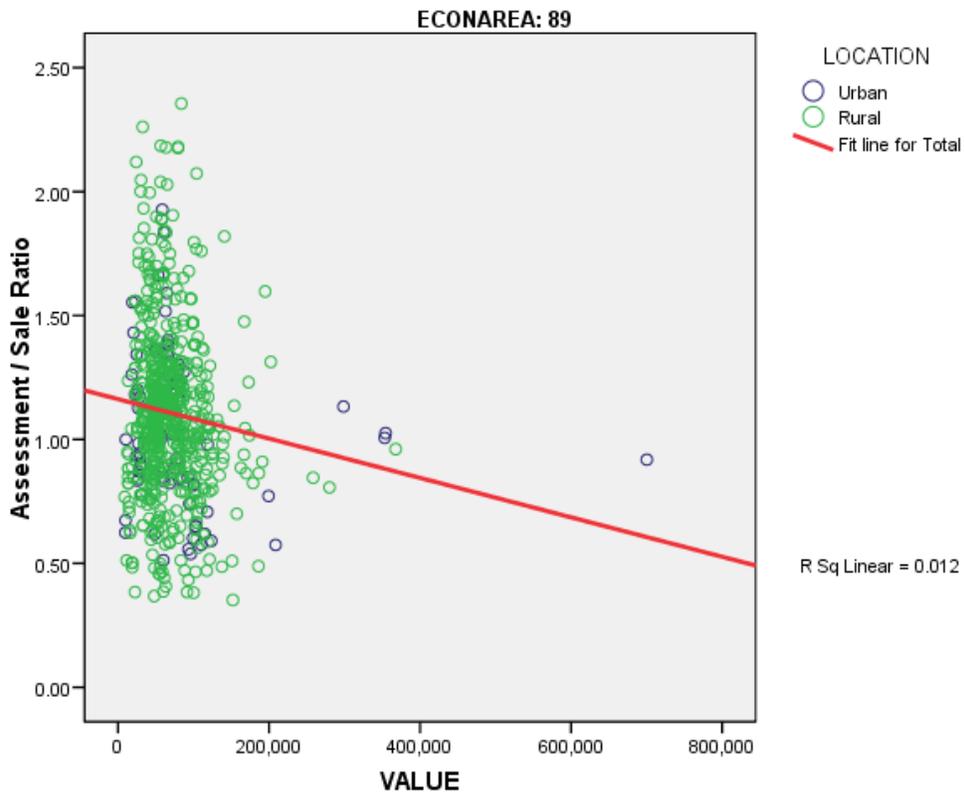
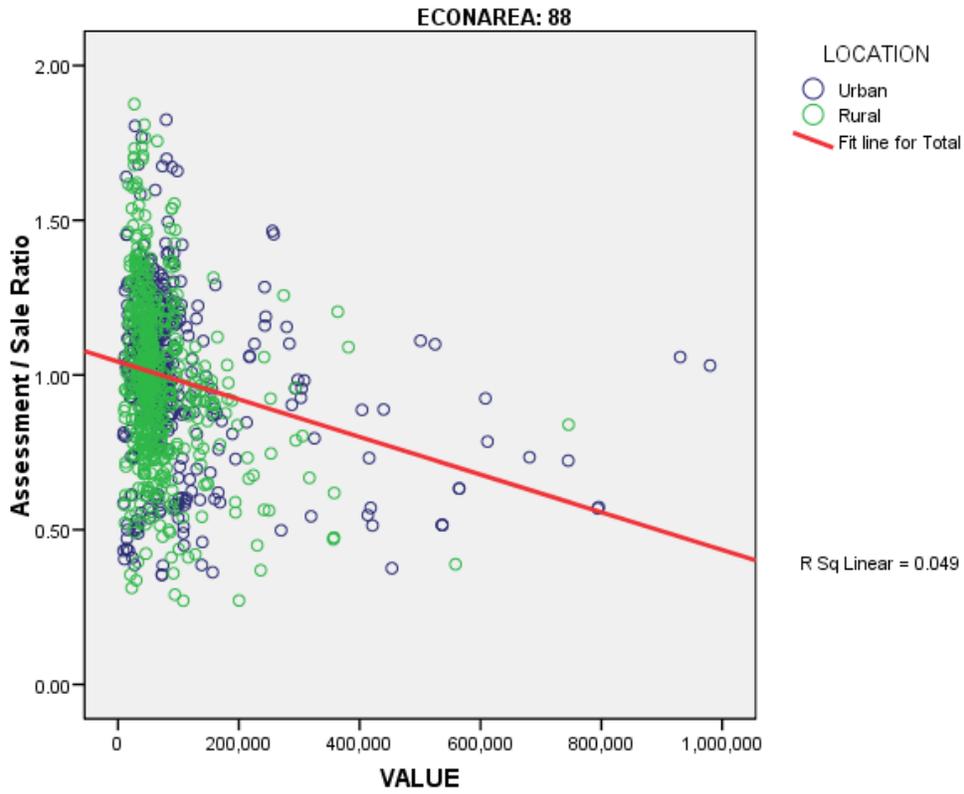
Region	Median Ratio	Weighted Mean Ratio	Coefficient of Dispersion	Price Related Bias (PRB)	PRB Significance
91	0.95	0.92	14%	-0.064	0.001

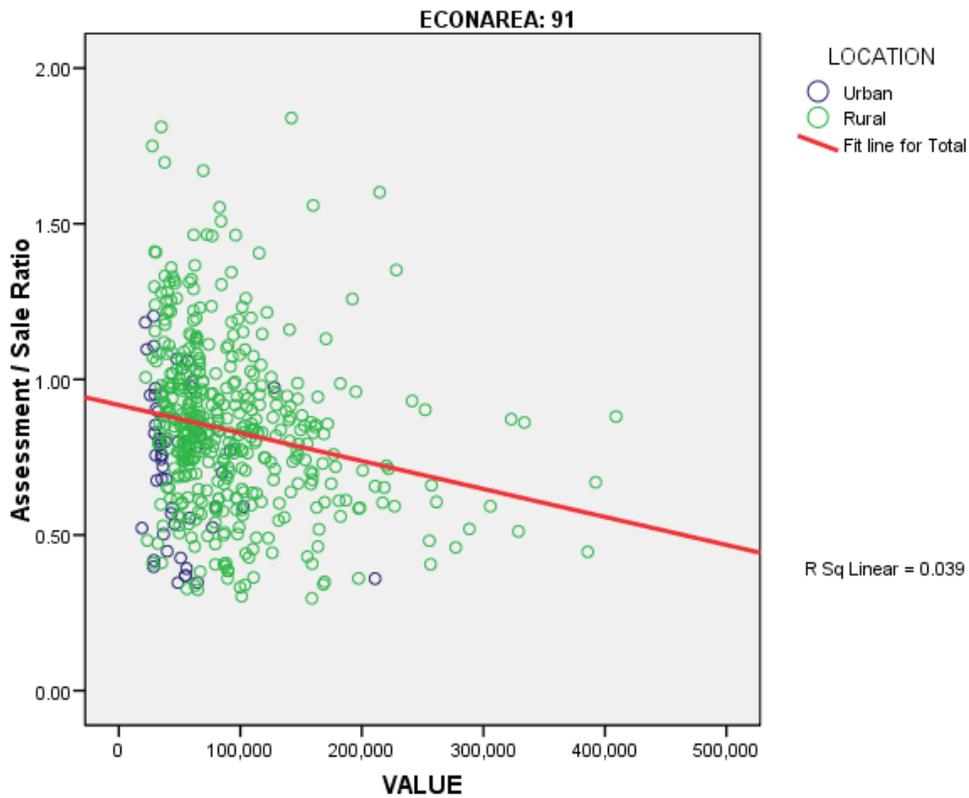
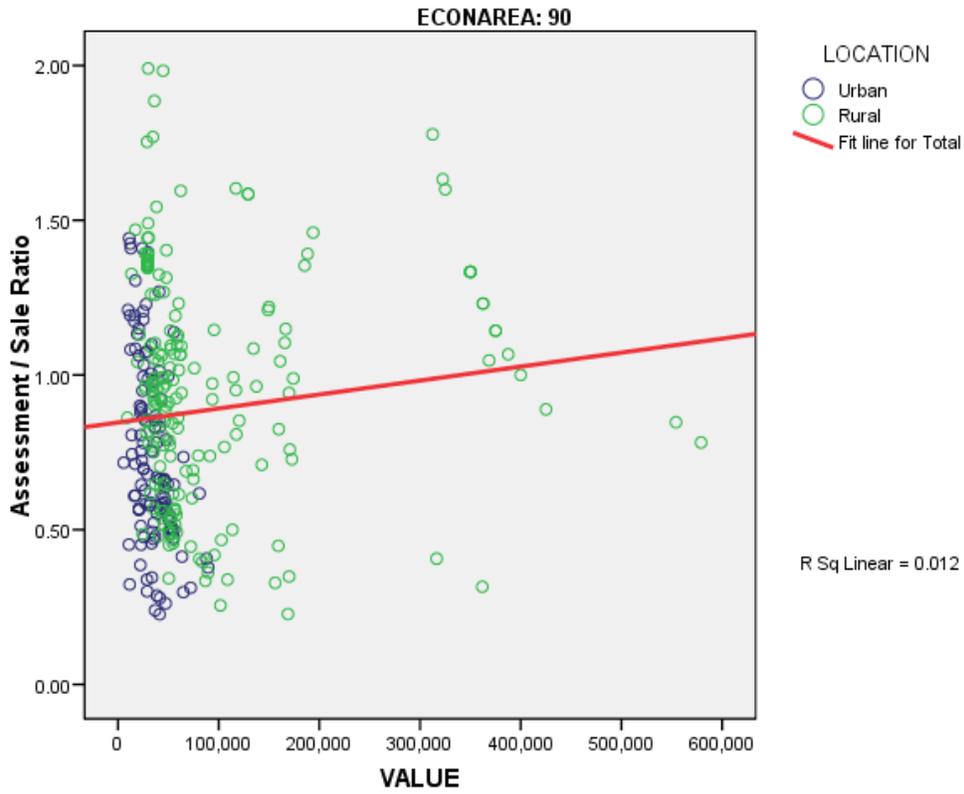
Appendix B Scatter Plots of Vacant Residential Ratios with Value



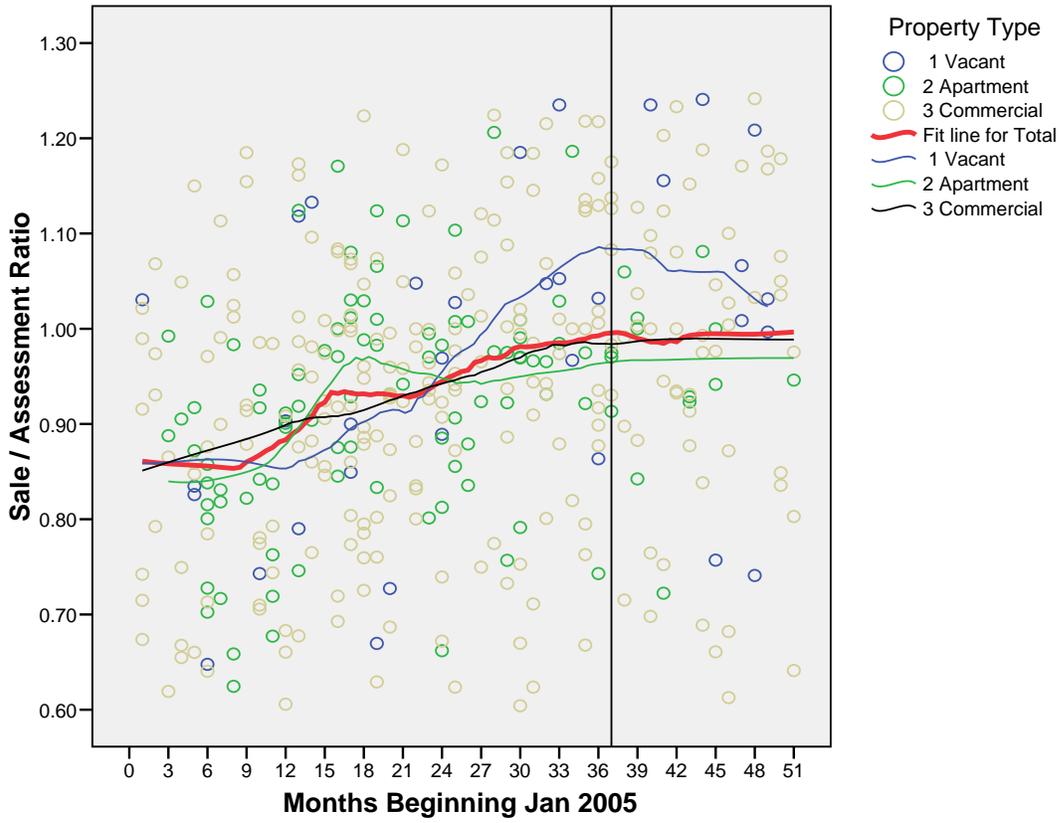




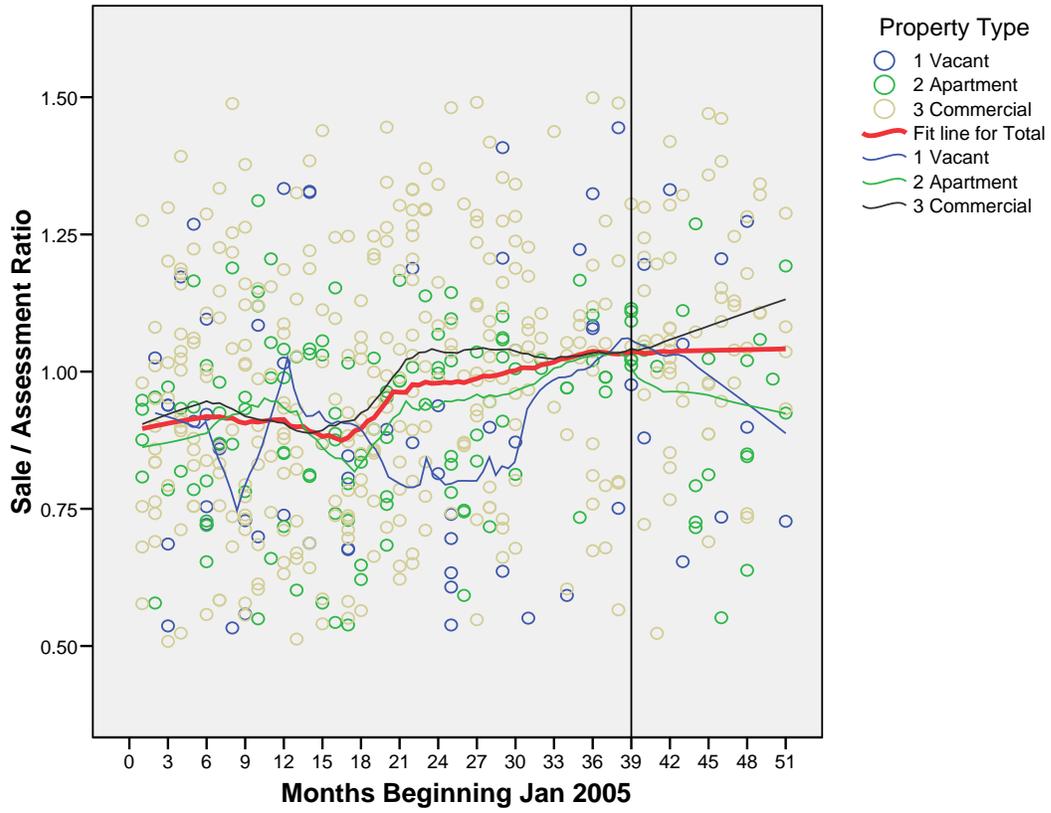




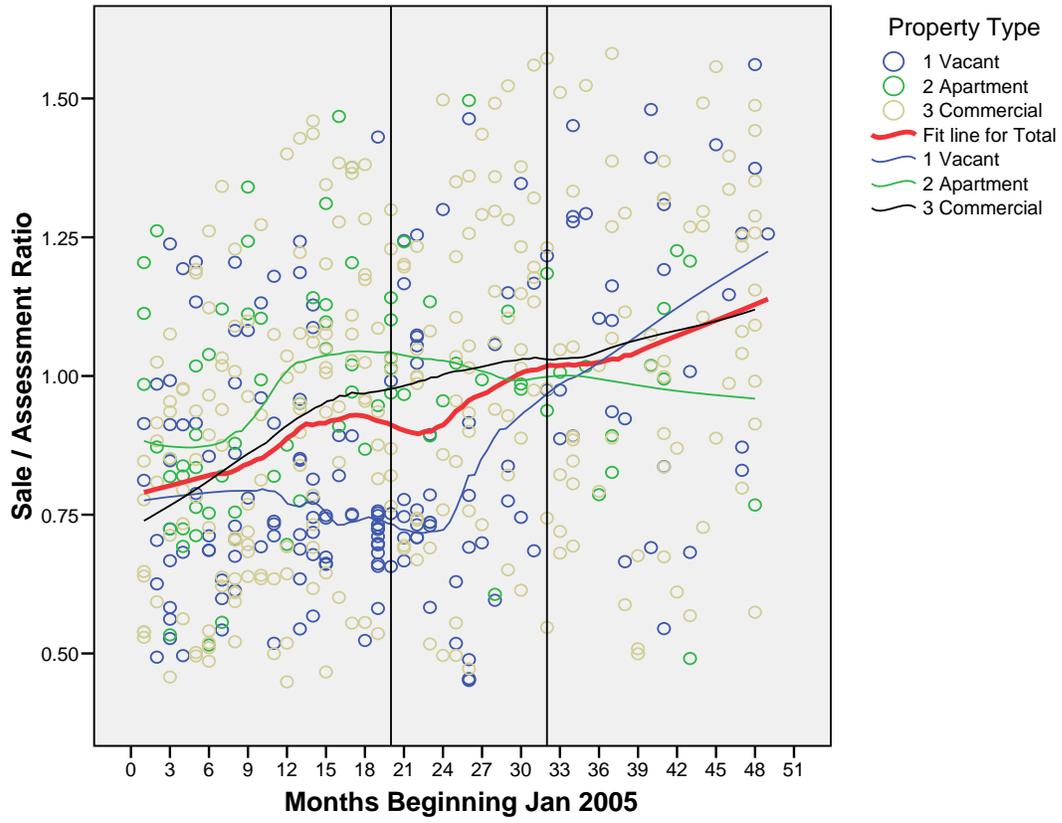
Area 82 (Cascade & 10 Additional Counties)



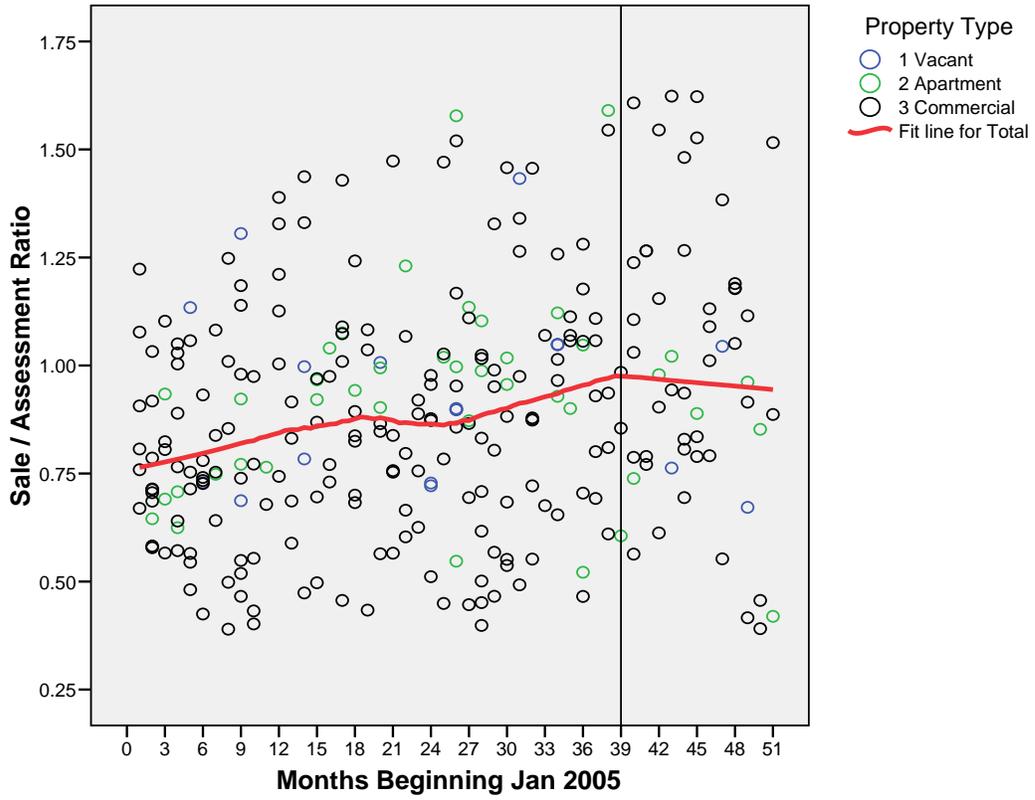
Area 84 (Missoula & Ravalli Counties)



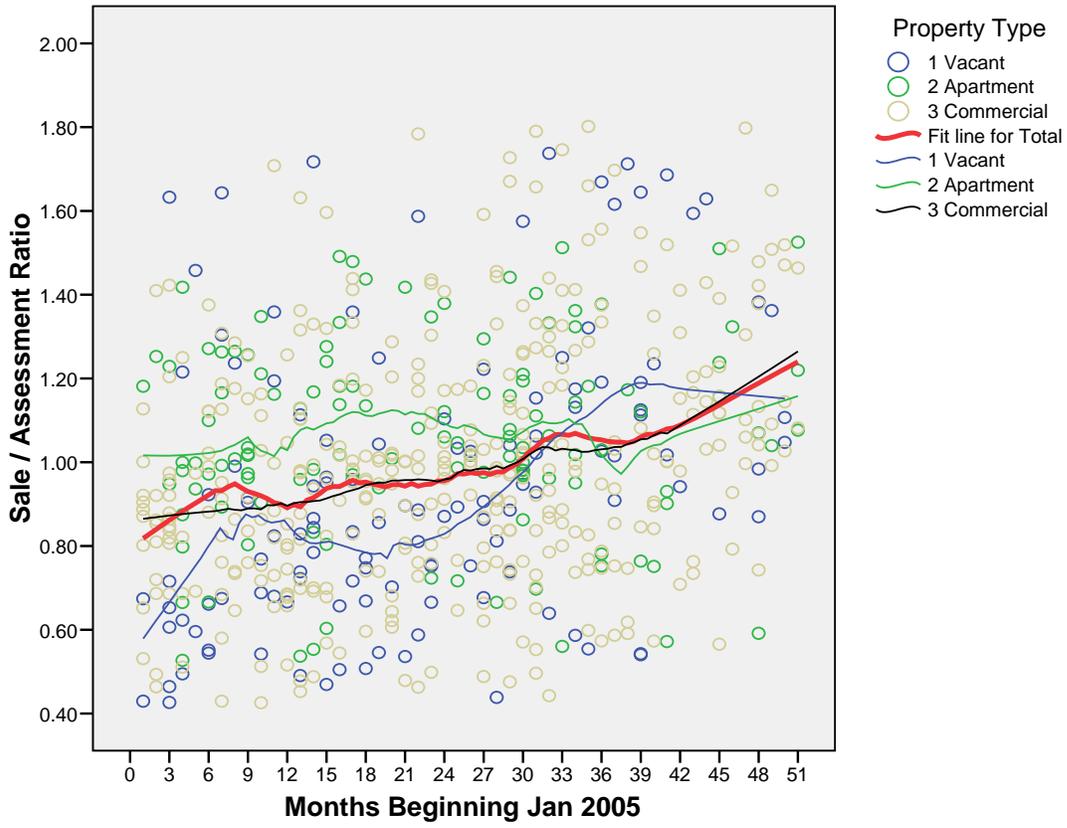
Area 85 (Gallatin, Madison, Beaver, Park Counties)



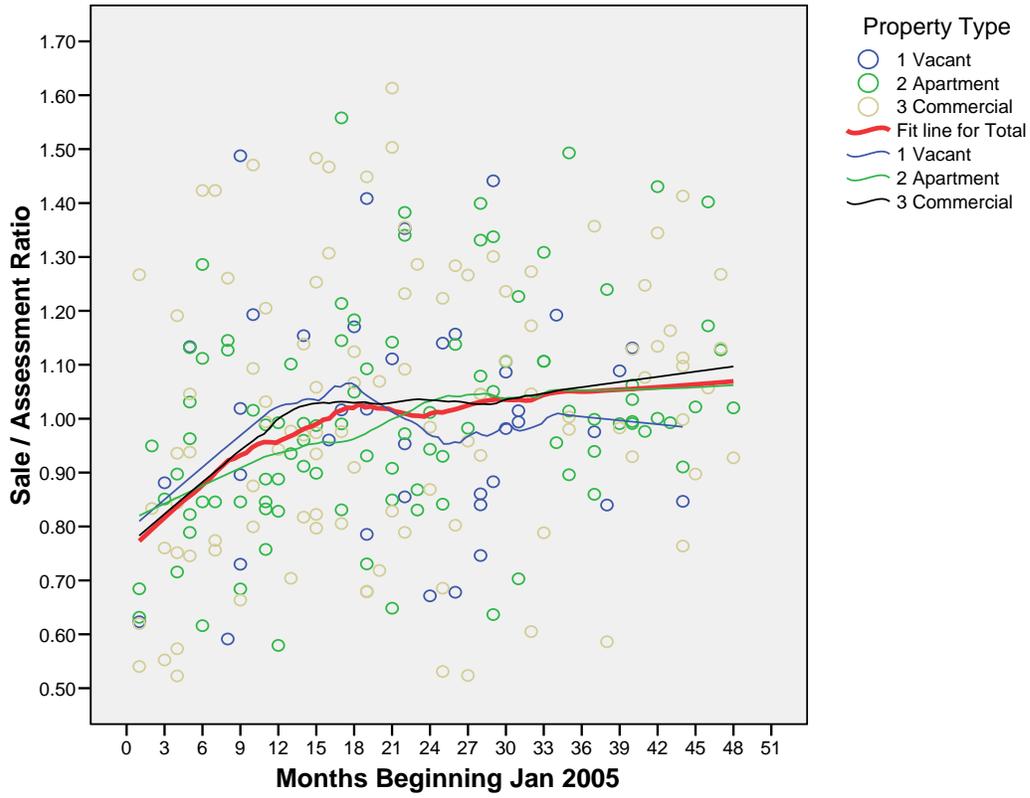
Area 87 (Custer & 17 Additional Counties)



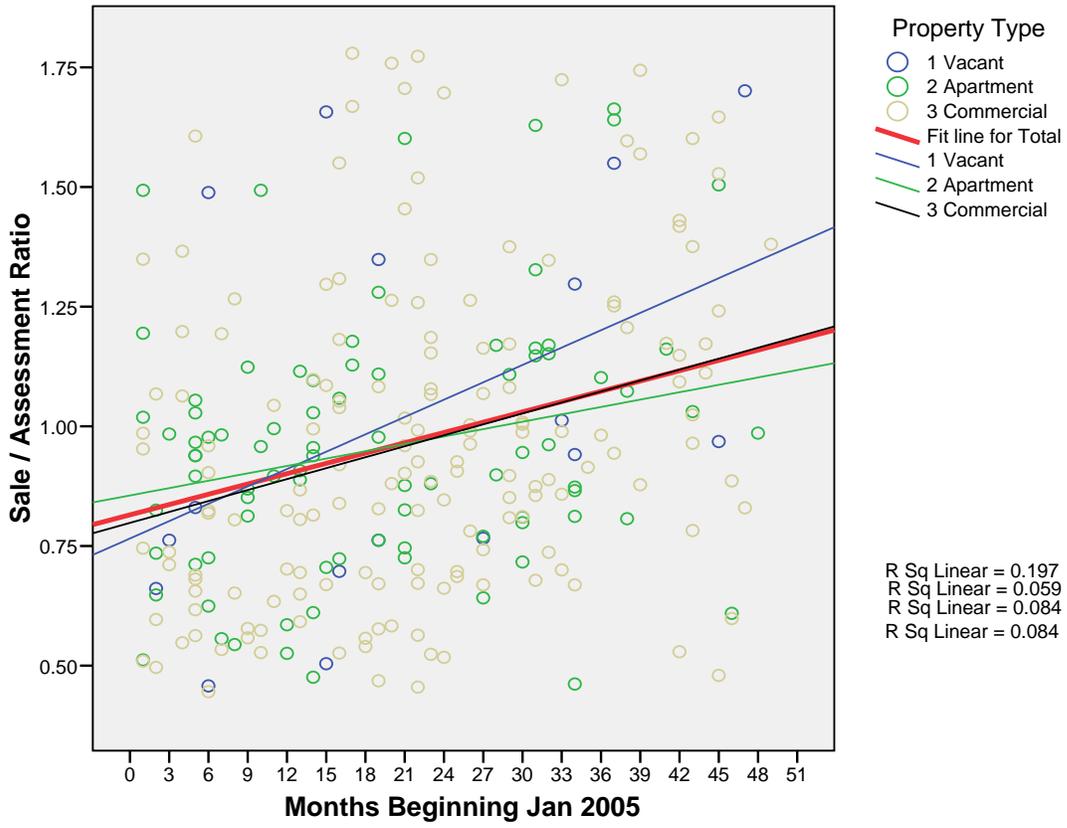
Area 88 (Yellowstone & 7 Additional Counties)



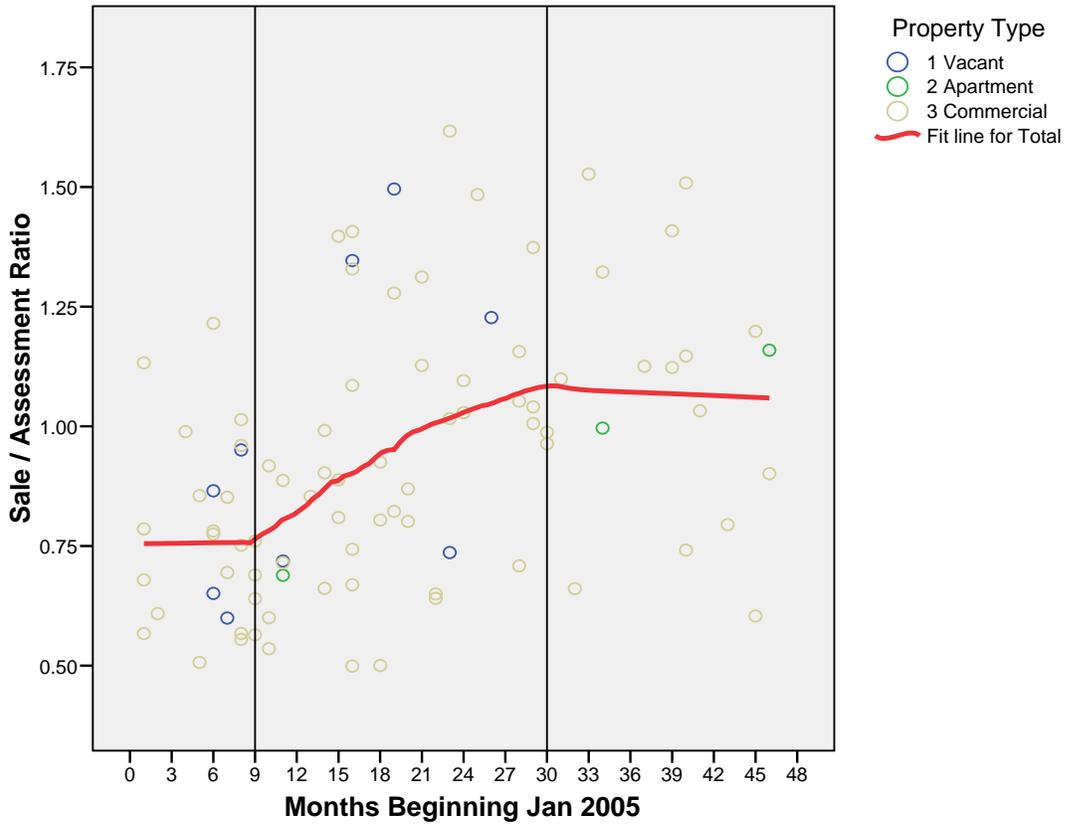
Area 89 (Lewis & Clark, Broadwater & Jefferson Counties)



Area 90 (Butte-Silver Bow, Powell, Anacondo-Deer Lodge, Granite Counties)



Area 91 (Sanders, Mineral & Lincoln Counties)



Appendix C-2 Scatter Plots of Commercial Ratios with Value

