



Measuring the Quality of Reappraisal

Commercial Property – 2015 Reappraisal

Montana Department of Revenue

November 2015

(This page intentionally left blank)

Executive Summary

This report demonstrates that the Department of Revenue met statutory and industry standards for accuracy for the 2015 reappraisal of commercial property. The median assessment level is 98.27 percent, within the International Association of Assessing Officers (IAAO) acceptable range of 90 percent to 110 percent. In addition to standard statistics presented in ratio studies, confidence intervals and t-tests are used to further test the quality of the commercial reappraisal. All four administrative regions also meet the assessment level requirement when confidence intervals are used.

The quality of commercial reappraisal includes confidence intervals and hypothesis testing because of fewer sales and a more complex market. Residential reappraisal was the best possible; commercial reappraisal is the best that could be done given the available data and resources.

This report also demonstrates that the assessment level for both the cost and income approaches is the same. This is an important equity requirement. It also shows that the assessment level for residential and commercial properties is similar so that each category is paying only its fair share of property taxes.

(This page intentionally left blank)

Introduction

The main goal when appraising property is to appraise it at 100 percent of true market value (15-8-111, MCA). An appraised value represents an estimate of the true market value of property. It is important that these estimates be as accurate as possible. This analysis will provide confidence in the results of the 2015 reappraisal.

The reappraisal cycle ending December 31, 2014 is now complete. The Department of Revenue assigned a new appraised value to each residential and commercial property that replaced an appraised value assigned to each property six years ago. The new appraised value represents an estimate of the true market value of the property on January 1, 2014. The old appraised value represents an estimate of the true market value of the property on July 1, 2008.

Similar to residential properties, prices declined shortly after the last reappraisal was completed as a result of The Great Recession. It appears that commercial prices have regained a majority of the lost value and have seen some slight appreciation on a state-wide basis, relative to the prior appraisal value. However, there does seem to be areas where appreciation (or depreciation) is much more pronounced relative to state wide totals. For this reason, the Department must provide assurance that the reason for increases or decrease in appraised values is due to the genuine changes in property value and not due to faulty or poor reappraisal performance.

Criteria of Ratio Studies

For any ratio study to be valid the following criteria must be met:

- Sales prices represent the market value of the property.
- Properties that sell are representative of the universe of properties.
- Both properties that sell and those that do not are valued consistently.

Especially for commercial property, the data needs to be analyzed to determine whether the sales meet these criteria.

Oftentimes, sales prices for commercial property include the real property and also the business interest or personal property located inside that property. For example, a gas station may sell for \$250,000, but the land could be purchased for \$75,000 and the building could be built for \$50,000. The cost approach to valuation would value the property at \$125,000. The other \$125,000 in the sale price is for the established business and personal property (like the gas pumps and the signs). When this is the case, the sale price is not a valid indicator of the market value of real property, but

instead represents the market value of the entire business, including the personal property.

The Property Assessment Division (PAD) verifies the sales that do occur to determine if the sales are usable for valuation purposes. This includes making sure that the sale price is representative of only the market value of real property and insuring that the sales are arms-length transactions.

Single-family residential property is rarely purchased for anything other than to provide housing. This generally means that there is significantly less distortion in the residential sales price because of business interests or personal property, as there is in commercial sales.

The second criterion is that the properties that sell are representative of all properties that are being evaluated. In this case, the Department wants to determine if the reappraisal of all commercial properties is accurate. So, the commercial sales must be representative of the commercial properties in the state. This means that the distribution in terms of geography, use, and value of the properties that sell is representative of all commercial properties in the state. Some types of properties only have a very specific use, and there may be only one or two properties of its kind in the state. It is unlikely that these properties sell in any given year, so it is hard to use sales to verify the assessed values on these types of properties. The more sales that occur, the more likely that the sample of sales is representative of the universe of properties.

Even if the sales are not representative of the universe of commercial properties, confidence intervals can be calculated. A confidence interval determines the range that the true assessment ratio is between. This acknowledges that there may be some variation between the universe and the sample. The use of confidence intervals can also make up for having fewer sales.

Because there are significantly more residential sales, it is more likely that the sales are representative of all the residential properties in the state. Also, there is less variation among residential properties.

The third criterion is that properties that sell and those that do not are valued in the same way. This is a procedural requirement. For commercial property the two most common methods of calculating the assessed value is with either the income approach or the cost approach.

- Cost Approach - The cost approach uses the value of the lot and cost of the building less depreciation to arrive at the market value of the property. This method works best with newer improvements and when income and sales of comparable property are scarce.

- Income Approach – The income approach uses the potential income of the property to determine its market value. This reflects the fact that commercial property is an investment and investors in commercial property buy and sell properties based on the potential return on that investment.

Both methods are used by PAD to value commercial property. Because only real property is assessed for reappraisal purposes, the cost approach is used when the income of a property is also due to the business located within the property. The income approach is the preferred method of assessing commercial property, but it is often hard to find sufficient income and sales data for similar properties.

It is also important that the models and cost tables are not tailored to provide an accurate price only for property that sold, but are accurate for other properties as well. It would be easy to assign the sales price to a property as its market value so those properties looked good, but the assessed value of all other properties would be meaningless.

Most residential property is valued using comparative sales. In a residential assessment ratio it is still important that properties that sell are valued the same as those that do not sell. This practice is followed by PAD.

Because of limited sales and the complexity of commercial real estate markets, assessing the quality of the appraisal for commercial property is more difficult than assessing the quality of reappraisal for residential property. Statistical tools and tests can be used to overcome some of the challenges in validating the commercial mass appraisal. This report relies on t-tests and confidence intervals to test the quality of the Department's 2015 assessment of commercial property.

One final caveat, the results for commercial property are not directly comparable to the results presented for residential property. In acknowledging the complexity of mass appraisal for commercial property, the IAAO has different standards for assessment level and uniformity for commercial and residential property.

Measuring the Quality of Reappraisal

Despite the limitations related to commercial property, a common method of measuring the performance of property reappraisal is the ratio study. Ideally, the ratio study compares the appraised value with the true market value of property. Because market values cannot be directly observed, sales prices usually represent true market values in ratio studies. A ratio study analyzes the relationship between the appraised value and sale value of property.

The key data element in any sales ratio study is the ratio of appraised value to sale price. To calculate this ratio, divide the appraised value of the property by the sale price of the property.

$$\text{Sales Ratio} = \frac{\text{Reappraisal Value}}{\text{Sales Price}}$$

This, of course, assumes that the sale of the property was an arm's-length transaction, and that the sale value is a reliable estimate of true market value. A ratio of less than 1.00 indicates that the property is under appraised. A ratio of greater than 1.00 indicates that the property is over appraised. In the following example, a property with an assessed value of \$80,000 that sold for \$100,000 has a ratio expressed as .80 or 80%.

Reappraisal Value

$\frac{\$80,000}{\$100,000} = .8 \text{ or } 80\%$

Numeric expression of the relationship

Sales Price

The diagram illustrates the calculation of a sales ratio. It shows the formula: Reappraisal Value divided by Sales Price equals the ratio. In this example, \$80,000 is divided by \$100,000, resulting in a ratio of .8 or 80%. Arrows point from the labels 'Reappraisal Value' and 'Sales Price' to their respective values in the fraction. Another arrow points from the text 'Numeric expression of the relationship' to the result '.8 or 80%'.

Ratio studies measure two primary aspects of appraisal accuracy: level and uniformity.

Appraisal level: Appraisal level refers to the overall level at which properties are appraised. In Montana, the desired appraisal level is 100 percent of true market value. The appraised values never exactly match the true market values of property. In good appraisal performance, the over appraisals and under appraisals will balance such that the overall appraisal level is close to 100 percent of true market value.

Appraisal uniformity: Appraisal uniformity refers to the magnitude of over appraisals and under appraisals. The degree to which the appraisals differ from true market value is important. In good appraisal performance, the degree to which appraisals differ from true market values is within acceptable standards.

There are standard statistical techniques for measuring and analyzing appraisal level and uniformity that apply to both commercial and residential property. Chapter 5 of *Mass Appraisal of Real Property*, published by the IAAO, outlines these measures and techniques.

Measures of Appraisal Level

The three most common measures of appraisal level are the median sales ratio, mean sales ratio and weighted mean sales ratio. Each measure has advantages and disadvantages. It is common practice to compute all three measures. Comparison of the measures provides useful information about the distributions of the ratios. For

example, wide differences among the measures indicate undesirable patterns of appraisal performance.

Median: The median ratio is the middle ratio when all ratios are ordered by magnitude. The median is the most common measure of appraisal level. An advantage of the median is that it is easy to compute and easily understood. By nature, the median is not affected by extreme ratios.

The upper and lower 95 percent confidence intervals were calculated for the median. The median assessment level will be within the confidence interval 95 out of 100 times for a random sample of commercial property in the state. Confidence intervals are used to determine if the appraisal level can be reasonably assumed to comply with the given standards. If the upper or lower bound of the confidence interval is within 10 percent of the statutory requirement of 1.0 (0.90 to 1.10), then the appraisal level is assumed to meet the IAAO standards.

Mean: The mean is the average ratio (the sum of the ratios divided by the number of ratios). Like the median, the mean is easy to compute and understand. However, unlike the median, the mean is impacted by extreme ratios. The mean is the least used measure of assessment level. For commercial properties, the upper and lower 95 percent confidence levels were calculated. The mean assessment ratio is between the lower and upper bounds of the confidence interval 95 percent of the time.

Weighted Mean: The weighted mean is an aggregate ratio (the sum of all the appraised values divided by the sum of all the sales values). The weighted mean is the appropriate measure for estimating the total market value of the population. The weighted mean gives equal weight to each dollar of value in the sample; the mean and median give equal weight to each parcel. As with the median and mean, 95 percent confidence intervals were also calculated for the weighted mean sales ratio.

Measures of Appraisal Uniformity

Part of determining the quality of reappraisal requires measuring uniformity. It is possible for the appraisal level to be good (close to 100 percent), yet still have unfavorable appraisal performance if the appraisal is not uniform. Appraisal uniformity is measured by the frequency distribution of the ratios, standard deviation, and the coefficient of dispersion. These statistics are expected to show that reappraisal is less uniform as the heterogeneity and complexity of the property being appraised increases. In general there is likely to be less uniformity among commercial properties than residential property.

Frequency Distribution: A frequency distribution is a display of the number of ratios falling within specified intervals. When observing a graph, graphs with a large percentage of the ratios close to the overall level of assessment and symmetry with respect to the overall level of assessment indicate a good level of uniformity.

Standard Deviation: The standard deviation is the primary measure of dispersion in scientific research and can be a powerful measure of appraisal uniformity. The standard deviation is calculated using the following formula:

$$\sigma = \sqrt{\left(\frac{\sum_{i=1}^n (Ratio_i - \overline{Ratio})^2}{n - 1}\right)}$$

In a normal distribution, 68% of the observations will be one standard deviation from the mean, 95% will be within two standard deviations, and 99% will be within three standard deviations. For example, if a property group has an average mean ratio of 1.01 (101 percent), and a standard deviation of 0.10 (10 percent), it is assumed that 68 percent of the properties will fall between 0.91 (91 percent) and 1.11 (110 percent). In ratio studies, the larger the standard deviation, the wider the range within which a given portion of properties are appraised relative to market value.

Coefficient of Dispersion: The coefficient of dispersion (COD) is the most commonly used measure of uniformity in ratio studies. The COD is the average absolute deviation expressed as a percentage of the level of assessment, and is calculated by dividing the average absolute deviation by the median. The average deviation is calculated by subtracting the median from each ratio, summing the absolute values of the computed differences, and dividing this sum by the number of ratios. The COD can be represented with the following equation:

$$COD = \left(\frac{\left(\frac{\sum_{i=1}^n |Ratio_i - Median|}{n}\right)}{Median}\right) \times 100$$

For example, a COD of 10 percent means that the average percent deviation from the median is (+ or -) 10 percent. Good appraisal uniformity for commercial properties is associated with CODs of 15 percent or less for larger metropolitan areas with large samples, and 20 percent or less for smaller or rural areas (IAAO).

Price-Related Differential: The price-related differential (PRD) is a statistic for measuring assessment regressivity or progressivity. Assessment regressivity exists if high-value properties are under appraised relative to low-value properties. Conversely, assessment progressivity exists if high-value properties are over appraised relative to low-value properties. The PRD is calculated by dividing the mean sales ratio by the

weighted mean sales ratio. A PRD greater than 1.00 suggests appraisal regressivity. A PRD less than 1.00 suggests appraisal progressivity. As a general rule, PRDs should range between 0.98 and 1.03 (IAAO).

Data

The sale prices and corresponding assessment values were extracted from the Department's Orion database and provided the data for this analysis. The data set contained 1,083 commercial properties that sold from June 1, 2013 to June 1, 2014 that the PAD considered valid sales. The PAD used standard screening processes to determine the validity of sales. This screening insures that the first criterion, that the sales price represents the market value of the real property, is met. The screening eliminated sales where the sales price represents the market value of the real property and personal property or an established business.

Ideally, there would be enough sales in the first half of 2014 that sales from the prior year are not needed. Sales before January 1, 2014 were used in the models to determine assessment value so the assessed values are not strictly independent of the sales prices. The sales after January 1, 2014 are independent and would be the preferred measure of market value, given enough data.

The assessment ratios for properties that sold in the second half of 2013 were compared to properties that sold in the first half of 2014. The mean and median assessment ratio was similar and a t-test indicated that there was no statistical difference between the mean assessment levels of the two groups. The full years' worth of sales can be used to estimate the assessment level for all commercial and industrial properties.

The first criterion is that the properties that sold are representative of the commercial property in the state. To test this hypothesis, a t-statistic was calculated. The null hypothesis is that the two groups of commercial properties have the same mean 2015 reappraisal value. The T-statistic shows that we cannot reject the null hypothesis at the 95th percent confidence level. In other words, the properties that sold have similar assessed value as properties that did not sell, indicating that they are similar.

Observations that have log assessment ratios outside 1.5 times the inter-quartile ranges from the 25th and 75th percentile were dropped. This is standard practice in IAAO ratio

studies¹. Trimming the sales in this fashion eliminates ratios that are unreasonable. They can be unreasonable for a variety of reasons:

- the sales price is not accurate
- the assessed value is not accurate
- there is a mistake in the data entry, or
- the nature of the parcel changed between the sale date and assessment date.

In the case that assessment values do not represent market value, these values are likely to be adjusted by informal reviews. This screening eliminated 150 sales, 13.85 percent of the total, leaving 933 verified valid sales for the assessment ratio study.

Results

Statewide Analysis

The statewide overall level of assessment, as measured by the median ratio, is 98.27 percent. This is within the IAAO standard of being within 10 percent of the target assessment level (100 percent). The mean assessment ratio is 99.49 percent, which is also within the standard. The current 2015 assessed values are much closer to the actual market value of properties than the old 2008 appraisal values.

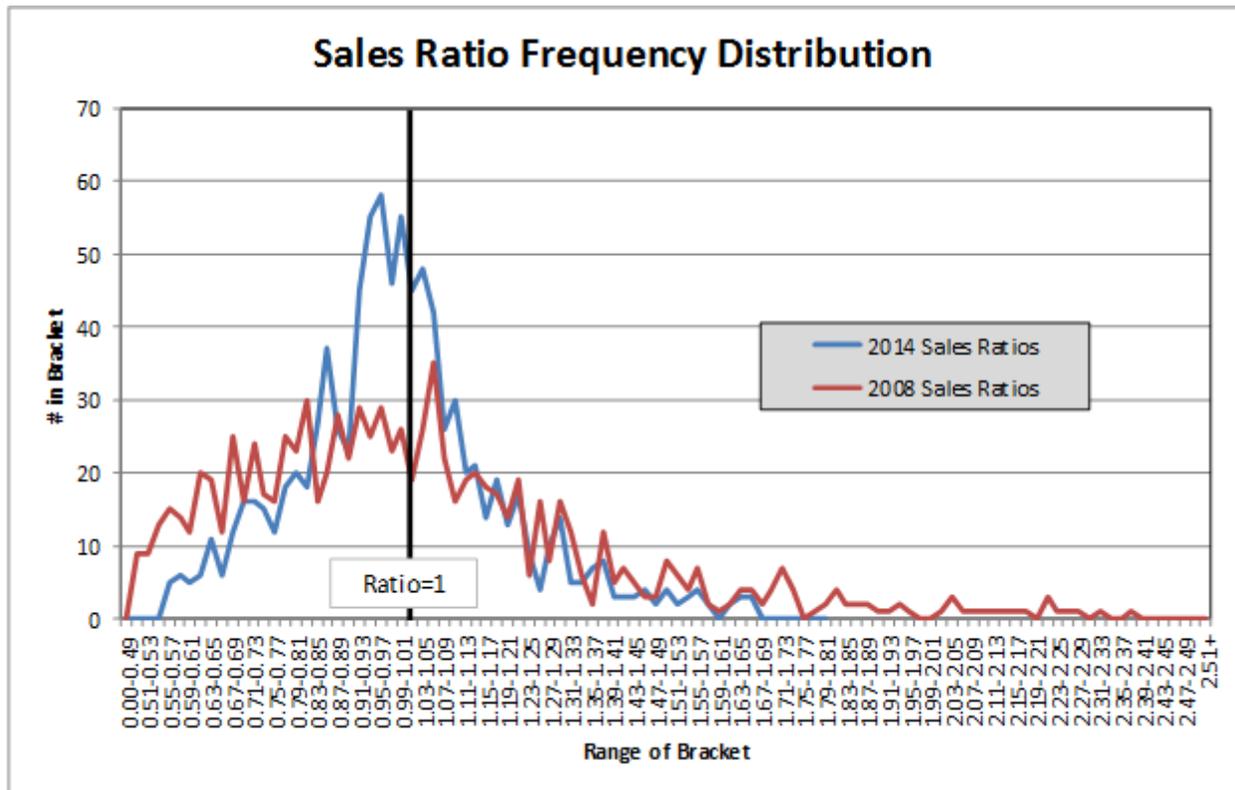
The measures of uniformity show that the coefficient of dispersion is 14.94. This is Close to the edge of acceptable IAAO standards for *residential* property of 15, but the COD is expected to increase as the complexity and heterogeneity of the appraised properties increases, as is the case with commercial property. IAAO sets a

standard of 20.0 or less for income-producing properties, which is much greater than the observed state-wide COD of 14.94. The PRD is 1.04 which is above the IAAO standard of 1.03. However, for the new values, the PRD is much better than the PRD using the 2008 values.

Statewide Sales Ratio Statistics New vs. Old		
	<u>New</u>	<u>Old</u>
N	933	999
Measures of Appraisal Level		
<i>Upper Bound</i>	99.36%	96.88%
Median Assessment Ratio	98.27%	94.77%
<i>Lower Bound</i>	96.75%	92.20%
<i>Upper Bound</i>	100.76%	100.44%
Mean Assessment Ratio	99.49%	98.19%
<i>Lower Bound</i>	98.22%	95.94%
<i>Upper Bound</i>	97.41%	94.95%
Weighted Mean Assessment Ratio	95.37%	91.12%
<i>Lower Bound</i>	93.32%	87.29%
Measure of Appraisal Uniformity		
Coefficient of Dispersion	14.9397	28.9501
Standard Deviation	0.1977	0.3627
Price Related Differential	1.0433	1.0777

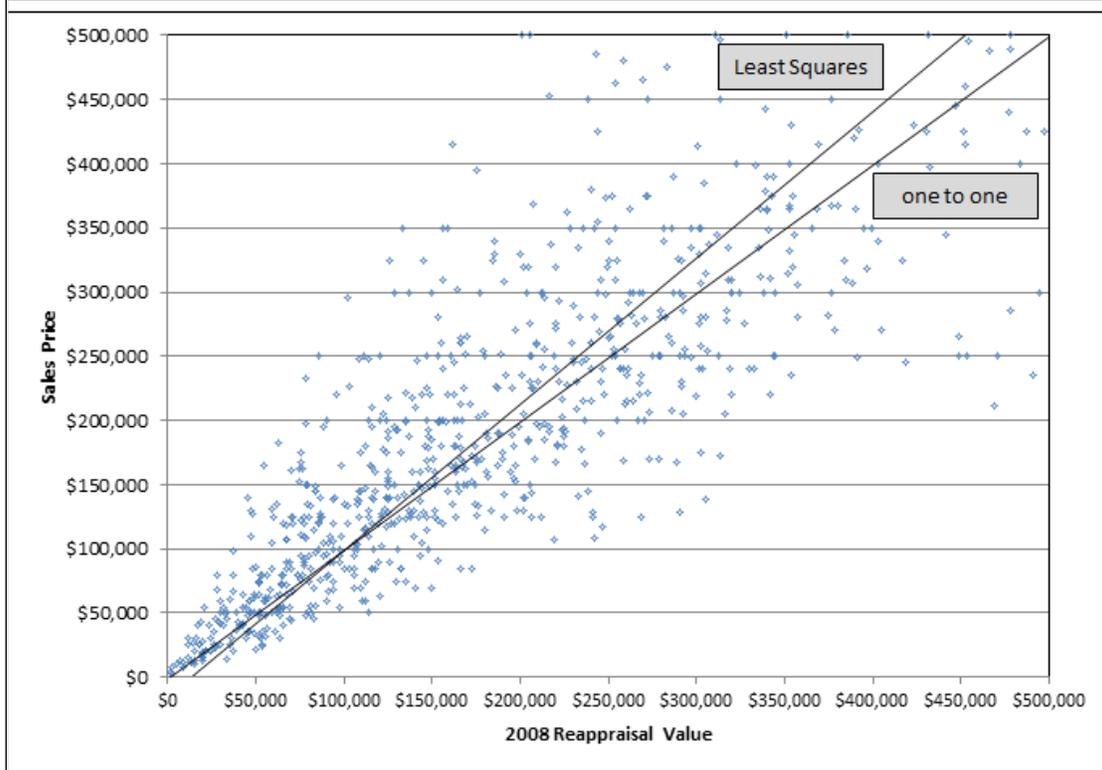
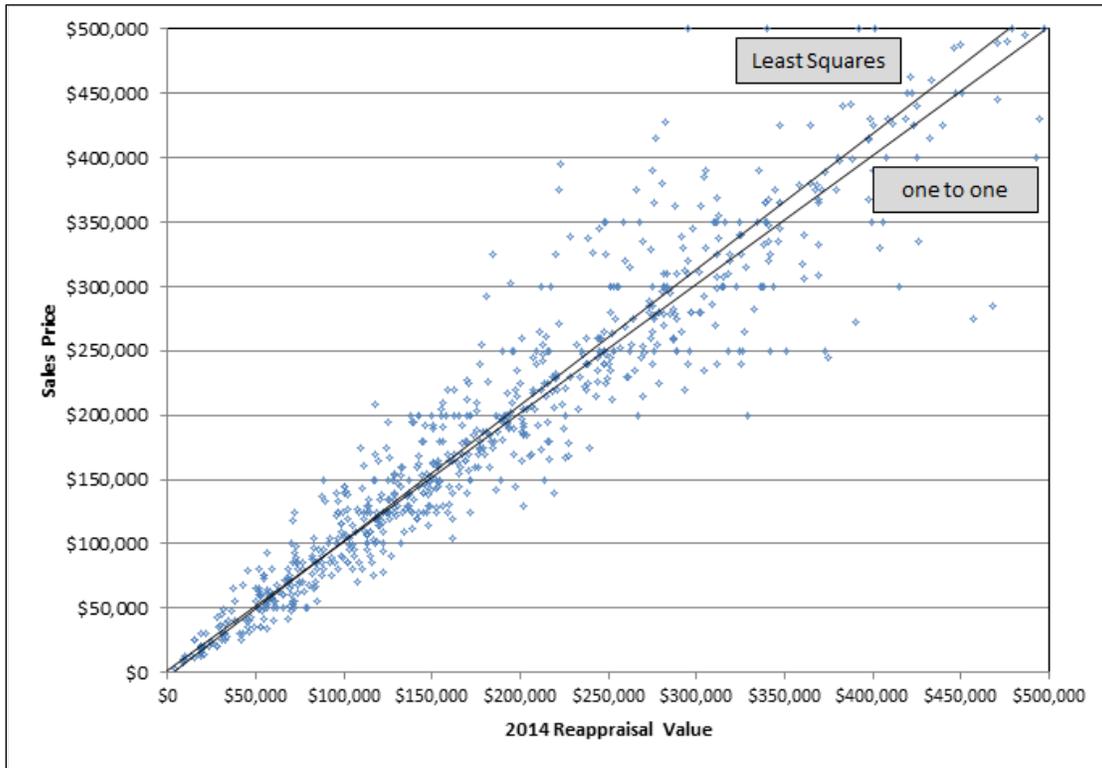
¹ International Association of Assessing Officers (IAAO). 2007. *Standard on Ratio Studies*. Kansas City: International Association of Assessing Officers.

The following graph shows the distribution of assessment ratios for the new, 2015 values and the old, 2008 values. Ideally, the distribution would show a tight, symmetrical distribution centered around 1.0. The commercial property has more variation, and the line is not as smooth relative to the residential distribution. This is the nature of commercial property assessment studies because there are fewer sales and there are more factors in determining the value of commercial property. As the graph shows, there are clearly more properties with an assessment level around 1.0. It is also clear from the graph that the assessment ratios for the old values (red line) are much less uniform, as the peak is lower and the tails are wider.



The following two graphs show a scatter plot of the relationship between sales prices and assessed values. The first graph uses the current 2015 appraisal values, while the second graph uses the prior 2008 appraisal value. Each plot has a 'Least Squares' line, which is the (ordinary) least squares line, sometimes referred to as the best fit, which minimizes the sum of the squared errors. The line labeled 'One to One' is the line where 100% of market value is attained, or where sales price equals the assessed value. A 'Least Squares' line above the 'One to One' line means the sales price is typically higher than the assessed value. What is important about these lines is how close they lie to one another. For appraisal quality, the closer the 'Least Squares' line is to the 'One to One' line, the closer the appraisal effort is to 100 percent. As can be seen in the graphs, the divergence between the two lines, 'Least Squares' and 'One to

One' is much smaller using current reappraisals than old reappraisals. This, along with the tighter distribution of the plots themselves, shows the current reappraisal is generally better determinant of current market value than the old reappraisal.

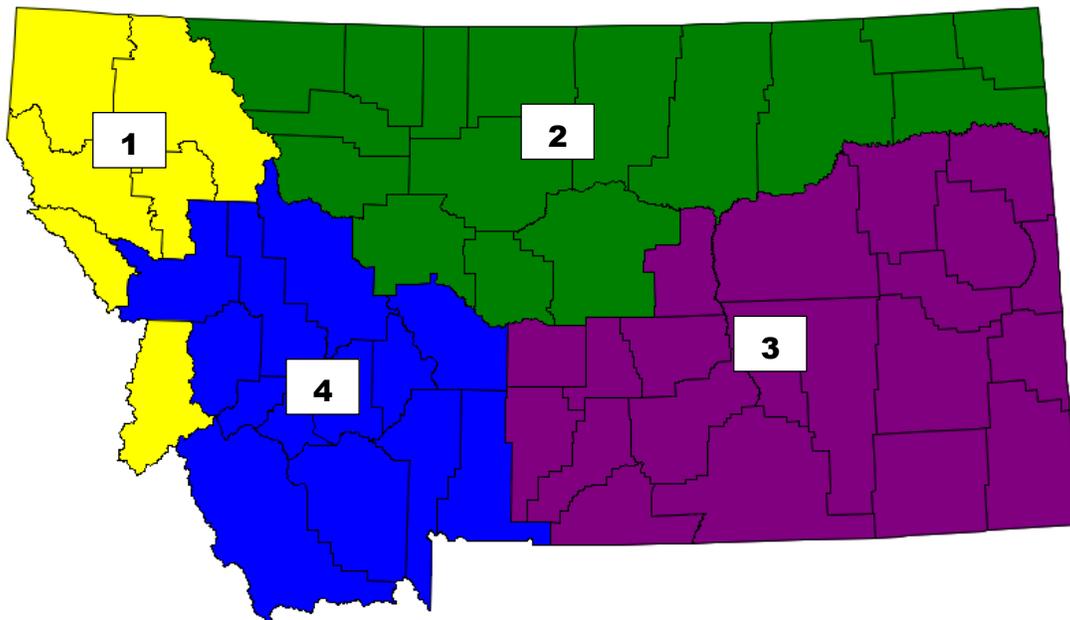


The COD using the old appraisals is 28.95 percent. This is above the recommended measure of 15 percent to 20 percent. Having a COD of 14.94 percent versus 28.95 percent indicates that the reappraisal effort reduced the degree to which the sales ratios differ from the overall assessment level.

The price related differential of 1.04 is slightly above the recommended standard of IAAO of 1.03. This value would indicate that high value properties may be slightly under appraised. However, when compared to the PRD value using the 2008 appraisal value, it is clear that 2015 appraisal is superior in regard to progressivity.

Region Analysis

Department of Revenue staff calculated reappraisal statistics for the state as a whole and for each of the Department's management regions shown in the map below.



The following table shows the number of verified sales, statistics of central tendencies, and statistics concerning the distribution of the sales assessment ratios.

As can be seen in the tables, the regional analysis is very similar to the statewide analysis for each of the four regions. All of the appraisal levels are within the IAAO standards of +/- 10% and the COD is less than 20 in all regions. Also similar to the statewide analysis, the PRD is slightly above IAAO recommendations, but is better than the PRD for the region using the prior appraisal values. The largest PRD values are located in regions one and two, implying higher valued properties are more likely to be under appraised in these areas relative to regions three and four.

Region 1 Sales Ratio Statistics New vs. Old			Region 2 Sales Ratio Statistics New vs. Old		
	<u>New</u>	<u>Old</u>		<u>New</u>	<u>Old</u>
N	170	179	N	134	152
Measures of Appraisal Level			Measures of Appraisal Level		
<i>Upper Bound</i>	100.67%	117.04%	<i>Upper Bound</i>	106.29%	94.77%
Median Assessment Ratio	98.67%	113.31%	Median Assessment Ratio	103.71%	86.86%
<i>Lower Bound</i>	96.67%	106.61%	<i>Lower Bound</i>	101.58%	81.33%
<i>Upper Bound</i>	103.07%	119.15%	<i>Upper Bound</i>	110.00%	97.24%
Mean Assessment Ratio	100.42%	113.97%	Mean Assessment Ratio	106.14%	91.43%
<i>Lower Bound</i>	97.77%	108.79%	<i>Lower Bound</i>	102.28%	85.61%
<i>Upper Bound</i>	99.74%	109.12%	<i>Upper Bound</i>	103.45%	84.34%
Weighted Mean Assessment Ratio	94.34%	102.58%	Weighted Mean Assessment Ratio	98.89%	78.69%
<i>Lower Bound</i>	88.95%	96.04%	<i>Lower Bound</i>	94.32%	73.05%
Measure of Appraisal Uniformity			Measure of Appraisal Uniformity		
Coefficient of Dispersion	12.0767	23.7408	Coefficient of Dispersion	15.9892	30.7389
Standard Deviation	0.1749	0.3511	Standard Deviation	0.2260	0.3629
Price Related Differential	1.0644	1.1110	Price Related Differential	1.0734	1.1619
Region 3 Sales Ratio Statistics New vs. Old			Region 4 Sales Ratio Statistics New vs. Old		
	<u>New</u>	<u>Old</u>		<u>New</u>	<u>Old</u>
N	234	249	N	395	419
Measures of Appraisal Level			Measures of Appraisal Level		
<i>Upper Bound</i>	99.09%	79.49%	<i>Upper Bound</i>	98.26%	103.09%
Median Assessment Ratio	96.22%	75.89%	Median Assessment Ratio	95.97%	99.79%
<i>Lower Bound</i>	93.71%	71.84%	<i>Lower Bound</i>	94.96%	96.50%
<i>Upper Bound</i>	98.43%	83.34%	<i>Upper Bound</i>	101.07%	107.55%
Mean Assessment Ratio	95.90%	79.73%	Mean Assessment Ratio	99.16%	104.15%
<i>Lower Bound</i>	93.38%	76.12%	<i>Lower Bound</i>	97.26%	100.74%
<i>Upper Bound</i>	97.09%	82.40%	<i>Upper Bound</i>	98.99%	98.64%
Weighted Mean Assessment Ratio	93.10%	77.03%	Weighted Mean Assessment Ratio	95.99%	95.81%
<i>Lower Bound</i>	89.11%	71.65%	<i>Lower Bound</i>	92.99%	92.99%
Measure of Appraisal Uniformity			Measure of Appraisal Uniformity		
Coefficient of Dispersion	15.8455	28.4273	Coefficient of Dispersion	14.9517	25.8180
Standard Deviation	0.1960	0.2892	Standard Deviation	0.1927	0.3546
Price Related Differential	1.0301	1.0352	Price Related Differential	1.0331	1.0870

The following table shows the measures of quality for the seven counties with more than 30 valid sales. As the table shows, the only appraisal measurement outside of the IAAO standards is the weighted mean ratio for Butte-Silver Bow, but the range of the confidence intervals would indicate that we cannot reject the notion that the measure is outside of the IAAO standards at the 95 percent confidence level.

The COD calculations for the seven counties indicate the 2015 appraisal meets or exceed IAAO standards for uniformity and are an improvement on the COD using the 2008 values. Yellowstone and Lewis & Clark Counties are the only two counties where the PRD is within the IAAO standards of between 0.98-1.03. However, in Gallatin Flathead, Cascade, and Butte-Silver Bow counties the PRD improved relative to the PRD using the 2008 values. In Missoula County, the PRD seems to have gotten slightly worse relative to the calculated value using the 2008 values.

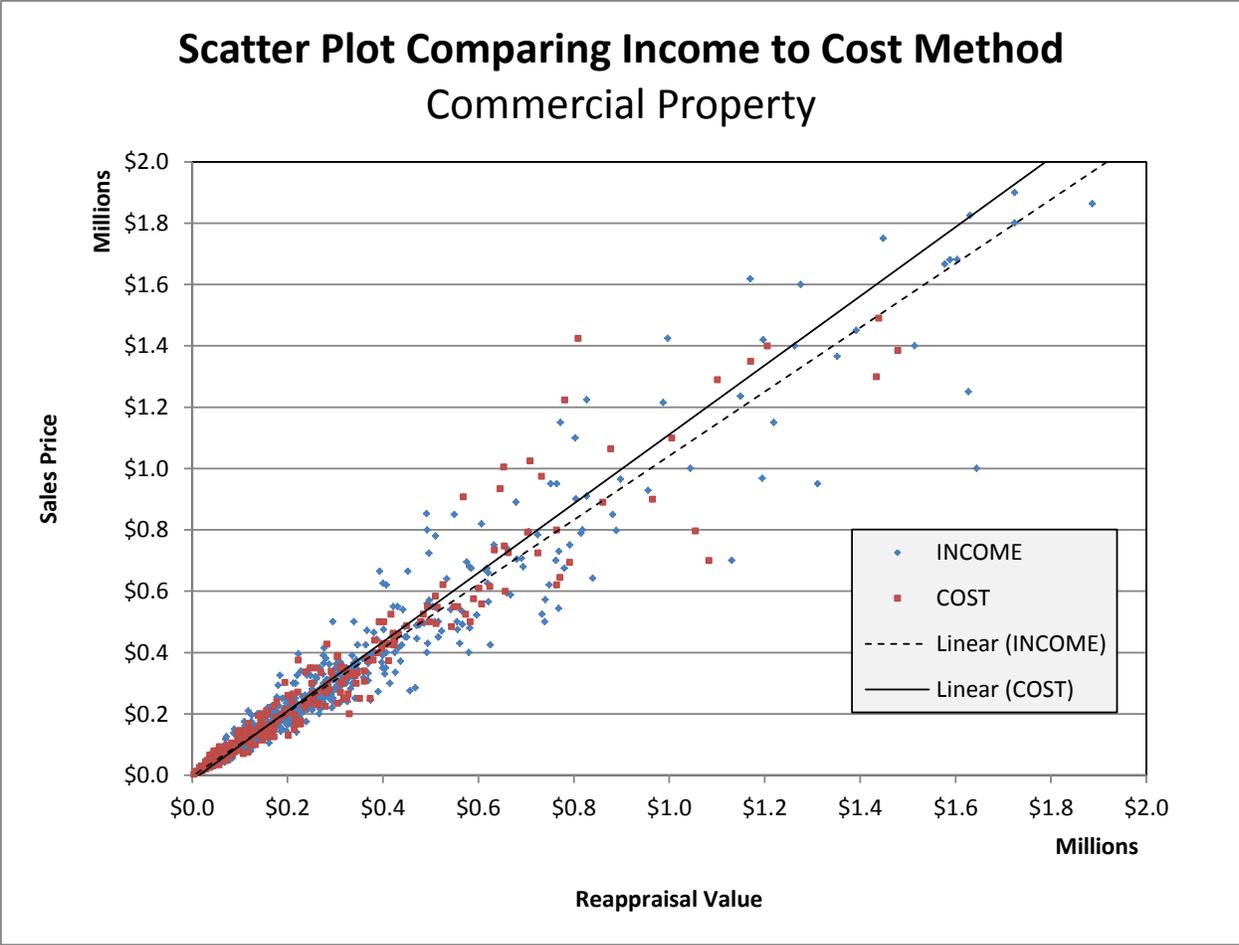
Assessment Levels and Coefficients of Dispersion for Select Counties															
County	Number of Sales	Measures of Appraisal Level									Measure of Appraisal Uniformity				
		Median Assessment Ratio			Mean Assessment Ratio			Weighted Mean Assessment Ratio			COD 2014 Appraisal	COD 2008 Appraisal	Standard Deviation	PRD 2014 Appraisal	PRD 2008 Appraisal
		Lower Bound	Value	Upper Bound	Lower Bound	Value	Upper Bound	Lower Bound	Value	Upper Bound					
Gallatin	149	95.79%	99.50%	102.88%	100.43%	103.66%	106.89%	94.64%	100.37%	106.10%	14.9625	30.1111	0.1998	1.0328	1.1814
Yellowstone	144	94.57%	97.47%	100.38%	94.29%	97.05%	99.80%	91.65%	96.46%	101.27%	13.0921	25.7816	0.1674	1.0060	0.9852
Missoula	103	89.68%	94.06%	97.31%	92.00%	95.24%	98.48%	86.29%	91.13%	95.97%	13.9206	17.2433	0.1660	1.0451	1.0370
Flathead	98	96.42%	98.61%	101.42%	97.47%	100.49%	103.51%	85.36%	93.03%	100.69%	9.8376	32.5355	0.1506	1.0802	1.1549
Cascade	55	100.82%	103.72%	106.00%	99.60%	103.82%	108.05%	91.36%	97.89%	104.41%	9.8370	19.0650	0.1563	1.0606	1.1519
Lewis and Clark	45	83.28%	94.96%	100.44%	87.01%	92.46%	97.92%	85.59%	90.53%	95.46%	14.4833	20.8427	0.1815	1.0214	0.9284
Butte-Silver Bow	32	84.88%	92.45%	99.81%	89.22%	97.16%	105.10%	79.79%	88.00%	96.21%	15.9402	27.6516	0.2201	1.1041	1.1545

The next table shows the ratio statistics for the cities with over 30 sales. Perhaps unsurprisingly, these statistics appear to reflect the county statistics for the county where the municipality is located.

Assessment Levels and Coefficients of Dispersion for Select Cities															
City	Number of Sales	Measures of Appraisal Level									Measure of Appraisal Uniformity				
		Median Assessment Ratio			Mean Assessment Ratio			Weighted Mean Assessment Ratio			COD 2014 Appraisal	COD 2008 Appraisal	Standard Deviation	PRD 2014 Appraisal	PRD 2008 Appraisal
		Lower Bound	Value	Upper Bound	Lower Bound	Value	Upper Bound	Lower Bound	Value	Upper Bound					
BILLINGS	121	95.47%	99.09%	100.67%	94.67%	97.70%	100.73%	91.17%	96.31%	101.45%	12.6995	26.7955	0.1686	1.0144	1.0144
MISSOULA	89	88.20%	92.96%	95.96%	90.65%	94.15%	97.65%	84.87%	90.03%	95.20%	13.9186	17.6066	0.1661	1.0458	1.0458
BOZEMAN	73	97.26%	101.43%	106.84%	100.84%	105.78%	110.73%	93.39%	100.54%	107.69%	15.4078	25.9083	0.2119	1.0521	1.0521
KALISPELL	52	94.46%	96.46%	100.55%	93.93%	97.69%	101.45%	81.22%	90.19%	99.16%	9.0020	34.5618	0.1352	1.0832	1.0832
GREAT FALLS	50	100.82%	103.78%	106.18%	99.92%	103.72%	107.51%	90.54%	98.12%	105.69%	8.8502	18.1792	0.1335	1.0571	1.0571
BELGRADE	42	94.17%	95.40%	104.39%	95.53%	101.26%	106.98%	94.15%	103.43%	112.70%	13.7289	34.1971	0.1838	0.9790	0.9790
HELENA	36	76.30%	90.59%	99.42%	83.35%	89.66%	95.98%	83.03%	88.67%	94.31%	15.8870	21.6140	0.1866	1.0112	1.0112
BUTTE	30	85.05%	92.45%	98.21%	88.35%	96.30%	104.25%	78.95%	88.56%	98.17%	15.0120	28.0030	0.2129	1.0874	1.0874

As a final measure for the 2015 commercial reappraisal, the ratio statistics were calculated and compared for properties where the income approach was used and where the cost approach was used. Both methods are similar in all measures of the quality of reappraisal. In addition to comparing the summary statistics, a t-test was performed indicating that there is no difference in the assessment levels between the two valuation methods. The ratio statistics for these two appraisal methods are presented in the accompanying table, as well as a scatter plot of sales price and appraisal value for the two methods.

Sales Ratio Statistics Income vs. Cost			
		<u>Income</u>	<u>Cost</u>
N		605	319
Measures of Appraisal Level			
Upper Bound		100.18%	99.36%
Median Assessment Ratio		99.04%	97.40%
Lower Bound		97.11%	95.02%
Upper Bound		101.55%	100.88%
Mean Assessment Ratio		100.01%	98.61%
Lower Bound		98.46%	96.34%
Upper Bound		98.76%	96.83%
Weighted Mean Assessment Ratio		96.38%	92.86%
Lower Bound		94.00%	88.89%
Measure of Appraisal Uniformity			
Coefficient of Dispersion		14.4265	15.8176
Standard Deviation		0.1932	0.2061
Price Related Differential		1.0376	1.0619



Residential reappraisal generally produces a more satisfying set of reappraisal statistics; that is because residential property is much more homogeneous compared to commercial. It can be expected that reappraisal of commercial property is more complicated, so the measures of appraisal level and the measures of uniformity are likely to be farther from the ideal, however, the 2015 reappraisal seems to have performed generally well relative to IAAO standards.

The final question for judging the quality of commercial reappraisal is whether there exists a meaningful difference between the assessment ratios of residential and commercial property. A t-test was used to test if residential and commercial properties had a statistically significant difference in assessment ratios. The null hypothesis is that the difference between the mean assessment level for residential and commercial property equals 0. The null hypothesis cannot be rejected at the 95% confidence level, meaning that there is not a statistically significant difference in the assessment levels. Residential and commercial properties are assessed at similar levels.

Conclusion

The Department attempted to measure the quality of the reappraisal of commercial property using a sales assessment ratio study. There is more variation and fewer sales (relative to residential sales), so more exacting statistical measures were used to evaluate the reappraisal.

Statewide, the assessment level is within accepted standards. All regions, as well as counties and municipalities with sufficient sales, are within the IAAO standards for assessment level when confidence intervals are used. The PRD measures of uniformity are not ideal in all cases, but still generally acceptable given the limitations of a commercial assessment study. Overall, the reappraisal of commercial property is within the desired required assessment level. There is no bias to either the cost or income approach to value, and there is no statistical evidence that the assessment levels for commercial and residential properties are different.