MONTANA
DEPARTMENT OF
REVENUE

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Measuring the Quality of Reappraisal

Residential and Commercial Property 2025 Reappraisal

Montana Department of Revenue

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Executive Summary

This report demonstrates that the 2025 appraisal meets or exceeds the International Association of Assessing Officers (IAAO) standards of appraisal quality in a majority of cases (International Association of Assessing Officers, 2013). The Department of Revenue met the IAAO standard of having a sample appraisal level within 10 percent of market value as determined by the sales ratio of property sales that occurred in the first six months of calendar year 2024. The sales ratio is the assessed value of the property divided by the actual sale price and indicates the accuracy of the appraisal. The median sales ratio was 98.8 percent for residential properties and 93.4 percent for commercial properties. The reappraisal also meets uniformity standards on a statewide level for both types of property being examined. Because the reappraisal values are to be believed as evidenced by this report, the increases and decreases in appraised values are due to genuine changes of property value.

The rest of this report discusses the sales ratio study performed by the Department of Revenue to evaluate the 2025 appraisal. The first section discusses commonly used sales ratio statistics, followed by a section examining the residential sales ratios for the 2025 reappraisal. The final section is a similar analysis examining commercial properties. Statistics for individual regions, select counties, select municipalities, and valuation methods are also reported.

Introduction

The main goal of the Department of Revenue when appraising Class 4 property is to appraise the property at 100% of true market value (15-8-111, MCA). An appraised value represents an estimate of the true market value of property on a specified point in time. It is important that these estimates be as accurate as possible. This analysis will provide confidence in the results of the 2025 appraisal.

The reappraisal cycle ending December 31, 2024, is now complete. The Department of Revenue assigned a new appraised value to each Class 4 residential and commercial property that replaced the previous two-year cycle's value. The new appraised value represents an estimate of what the true market value of the property would have been on January 1, 2024 (42.18.121 ARM).

A vast majority of properties saw an appreciation in value since the last reappraisal; however, significant variation in appreciation levels exists in more narrowly defined areas. For these reasons, the Department of Revenue must provide assurance that the reason for changes in appraised values and the magnitude of the changes are due to the genuine changes of property value and not due to faulty or poor reappraisal performance. Further, because some over-appraised properties will have the effect of 'canceling-out' under-appraised properties, it is important to also examine the uniformity of the current appraisal cycle.

Measuring the Quality of Reappraisal

The most common method of measuring the performance of property appraisal is a sales ratio study. Ideally, the sales ratio study compares the appraised value with the true market value of property. Because market values cannot be directly observed, sales prices are generally assumed to represent true market values in sales ratio studies (International Association of Assessing Officers, 2013). Therefore, a sales ratio study analyzes the relationship between the assessed value and sale price of property. The key data element in any sales ratio study is the ratio of assessed value to sale price. To calculate this ratio, divide the assessed value of the property by the sale price of the property.

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

This assumes the sale of the property was an arm's-length transaction, and 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. For example, a property with an assessed value of $80,000 that sold for $100,000 has a ratio expressed as .80, or 80 percent.

Assessed Value

$\frac{\$80,000}{\$100,000}$ = .8 or 80% ← Numeric expression of the relationship

Sales Price

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

Appraisal level: An appraisal level refers to the overall level at which properties are assessed. In Montana, the desired assessment level is 100 percent of true market value. The assessed values rarely 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 (Gloudemans, 1999).

Appraisal uniformity: The term appraisal uniformity refers to the variation of appraisals and examines over appraisals and under appraisals. The degree to which the appraisals of the sample 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 (Gloudemans, 1999).

There are standard statistical techniques for measuring and analyzing appraisal level and uniformity. Chapter 5 of *Mass Appraisal of Real Property*, published by the International Association of Assessing Officers (IAAO), outlines these measures and techniques (Gloudemans, 1999).

Measures of Appraisal Level

The three most common measures of appraisal level are the

1. median sales ratio,
2. mean sales ratio, and
3. weighted mean sales ratio.

Each measure has advantages and disadvantages, and it is common practice to compute all three measures (International Association of Assessing Officers, 2013). 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. In addition, it is also desirable to calculate the confidence intervals for each of these statistics so that the range of possible values can be determined with a specified degree of confidence (Eckert, Gloudemans, Almy, & International Association of Assessing Officers, 1990).

Median: The median sales ratio is the middle ratio when all ratios are ordered by magnitude. The median is the most common measure of appraisal level. Half of sales ratios are greater than the median and half are less. An advantage of the median relative to other measures is that it is easy to compute and easily understood. By nature, the median is not affected by extreme ratios (International Association of Assessing Officers, 2013) (DeGrouot & Schervish, 2002).

Mean: The mean sales ratio 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 (International Association of Assessing Officers, 2013) (DeGrouot & Schervish, 2002).

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 (as opposed to the mean and median, which give equal weight to each property or each sale) (International Association of Assessing Officers, 2013) (DeGrouot & Schervish, 2002).

Confidence Intervals: When sampling a larger population, it is necessary to be aware of the difference between the attributes of a particular sample and the characteristics of the overall population being sampled. Confidence intervals are a measurement of how likely the sample statistics represent the overall population based on the size and variation of the sample. A confidence interval of a sample statistic is a range of values the true

population statistics is likely to be between based on a predetermined level of confidence, usually 95 percent confidence level (Eckert, Gloudemans, Almy, & International Association of Assessing Officers, 1990) (DeGrouot & Schervish, 2002).

Measures of Appraisal Uniformity

Part of determining the quality of reappraisal requires measuring uniformity. It is possible for the appraisal level to be good (i.e., close to 100 percent), yet still have unfavorable appraisal performance. This occurs when the appraisal is not uniform. Appraisal uniformity can be measured by the frequency distribution of the ratios, standard deviation, and the coefficient of dispersion.

Frequency Distribution: A frequency distribution is a display of the number of ratios falling within specified intervals. The distribution can be displayed as a table or as a graph. When observing a frequency distribution, a large percentage of the ratios close to the overall level of assessment and distribution symmetry with respect to the overall level of assessment indicate a good level of uniformity (Gloudemans, 1999).

Standard Deviation: The standard deviation is the primary measure of dispersion in scientific research and can be a powerful measure of appraisal uniformity. In a normal distribution, 68 percent of data will be one standard deviation from the mean, 95 percent will be within two standard deviations, and 99 percent will be within three standard deviations (DeGrouot & Schervish, 2002). 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 in a normally distributed distribution, 68 percent of data will fall between 0.91 (91 percent) and 1.11 (110 percent). Algebraically, the standard deviation can be calculated with the following formula:

$$s = \sqrt{\left(\frac{\sum_{i=1}^{n}(Ratio_i - \overline{Ratio})^2}{n-1}\right)} \times 100$$

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 Variation: The coefficient of variation (COV) describes the relative variability of a dataset by dividing its standard deviation by its mean. Unlike standard deviation, which is an absolute measure, the COV expresses variability relative to the mean. The algebraic formula for COV is the following:

$$COV = \frac{s}{Mean}$$

Coefficient of Dispersion: The coefficient of dispersion (COD) is the most used measure of uniformity in ratio studies (International Association of Assessing Officers, 2013). 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 sales ratio. The average deviation is calculated by subtracting the median sales ratio for the entire population from each individual ratio, summing the absolute values of the computed differences, and dividing this sum by the number of ratios. For example, a COD of 10% means that the average percent deviation from the median is (+ or -) 10% (Gloudemans, 1999). The COD is expressed algebraically in the following formula:

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

Good appraisal uniformity for residential properties is associated with low CODs, usually 15 or less for older, heterogeneous areas. A COD of 10 would be considered good for newer, homogeneous areas (Gloudemans, 1999).

Price-Related Differential: The price-related differential (PRD) is a statistic for measuring assessment regressivity or progressivity (Gloudemans, 1999). 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 (Gloudemans, 1999). 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. In general, PRDs should range between 0.98 and 1.03 (Gloudemans, 1999).

The following table displays some the IAAO standards for an appraisal being evaluated with a sales ratio analysis (International Association of Assessing Officers, 2013):

Select IAAO Appraisal

Level of Appraisal	
Min=90%	Max=110%

Coefficient of Dispersion	
Area	Standard
Single Family Residence	5.0 to 15.0
Larger Urban Areas	5.0 to 10.0
Income Producing Property	5.0 to 20.0
Larger Urban Areas	5.0 to 15.0
Vacant Land	5.0 to 20.0
Seasonal and Rural Land	5.0 to 25.0

Price Related Differential	
Min=0.98	Max=1.03

2025 Appraisal-Residential

The Department of Revenue's Tax Policy and Research unit in cooperation with the Property Assessment Division conducted a study to assess the quality of the recently completed appraisal. The analysis included computing the measures of assessment level and uniformity as discussed previously. These measures were calculated on a statewide basis, regional basis, county basis (where a sufficient number of sales existed), a municipality basis (where a sufficient number of sales existed), a valuation method basis, and an urban/rural basis.

The sales values and corresponding appraisal values were extracted from the Department of Revenue's property valuation information system and provided the data for the analysis. Only residential property with an improvement (house) was used for the main analysis. Another analysis was run for vacant land. The data set contained 5,460 improved residential properties that sold from January 1, 2024, to June 30, 2024, and were considered to be valid sales using standard screening practices. This time frame was chosen to include enough valid sales from the lien date (January 1, 2024) for a robust analysis without using any sales that were also used in the appraisal model (prior to January 1, 2024).

Observations that had a sales ratio outside 1.5 times the inter-quartile ranges from the 25th and 75th percentile were dropped when calculating any of the sales ratio statistics. This trimming of sales is standard in these types of studies (International Association of Assessing Officers, 2013). This trimming was done at each stratification of the overall sample, as an observation may be an outlier in one circumstance (on a statewide basis for example) but may not be an outlier in another circumstance (on a county or municipal basis for example).

Trimming the sales in this fashion eliminates ratios that are unreasonable. They can be unreasonable for a variety of reasons (International Association of Assessing Officers, 2013):

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

In the cases where the assessment value does not represent market value, the values may be adjusted by informal reviews. Some properties in this analysis may have been adjusted after the initial appraisal, but it is not expected to be impactful enough to affect the overall quality of reappraisal this report is trying to determine.

Residential Analysis Results

Statewide Residential Analysis

The overall statewide level of assessment, as measured by the median ratio, is 98.8 percent. It is recommended that the overall level of assessment should be within 10% of market value (so between 90 percent and 110 percent) (Gloudemans, 1999). The upper and lower bounds of this measurement are also with in this range, so we can say with 95 percent accuracy that the appraisal level satisfies this standard.

The statewide coefficient of dispersion is 8.010 for this sample. This value is below 15, and above 5, the recommended level IAAO, and indicates good appraisal uniformity (Gloudemans, 1999).

The following table displays a summary of the ratio statistics using the 2025 appraisal values.

Residential Ratio Statistics
CY 2024[1] Sales Relative to TY 2025 Values

Number of Sales	Values
Total Observations	**5,460**
Used Observations	**4,921**
Measurement of Appraisal Levels	
Upper Bound Confidence Interval	*99.10%*
Median Ratio	**98.80%**
Lower Bound Confidence Interval	*98.53%*
Upper Bound Confidence Interval	*99.11%*
Mean Ratio	**98.82%**
Lower Bound Confidence Interval	*98.53%*
Upper Bound Confidence Interval	*99.31%*
Weighted Mean	**98.45%**
Lower Bound Confidence Interval	*97.59%*
Measurement of Appraisal Uniformity	
Coefficient of Dispersion	**8.010**
Coefficient of Variation	**10.423**
Standard Deviation	**10.300**
Price Related Differentials	**1.004**
Range (1.5x Inter Quartile Range)	
Maximum Ratio in the Sample	**127.6%**
Minimum Ratio in the Sample	**71.0%**

[1]Sales from 1/1/2024 to 6/30/2024

In examining the statistics measuring appraisal levels, the median, mean, and weighted mean are well within the standards set by IAAO. The statewide price-related differential for the current cycle is 1.004, which is within the 0.98 to 1.03 range suggested by the IAAO (Gloudemans, 1999).

The frequency distribution of the sales ratios is displayed in Figure 1. The distribution is a tight, symmetrically curve, and centered about the assessment level of 98.8 percent. These characteristics are evidence of good appraisal uniformity and is further supported by a low standard deviation of 10.3.

Figure 1: Sales Ratio Histogram

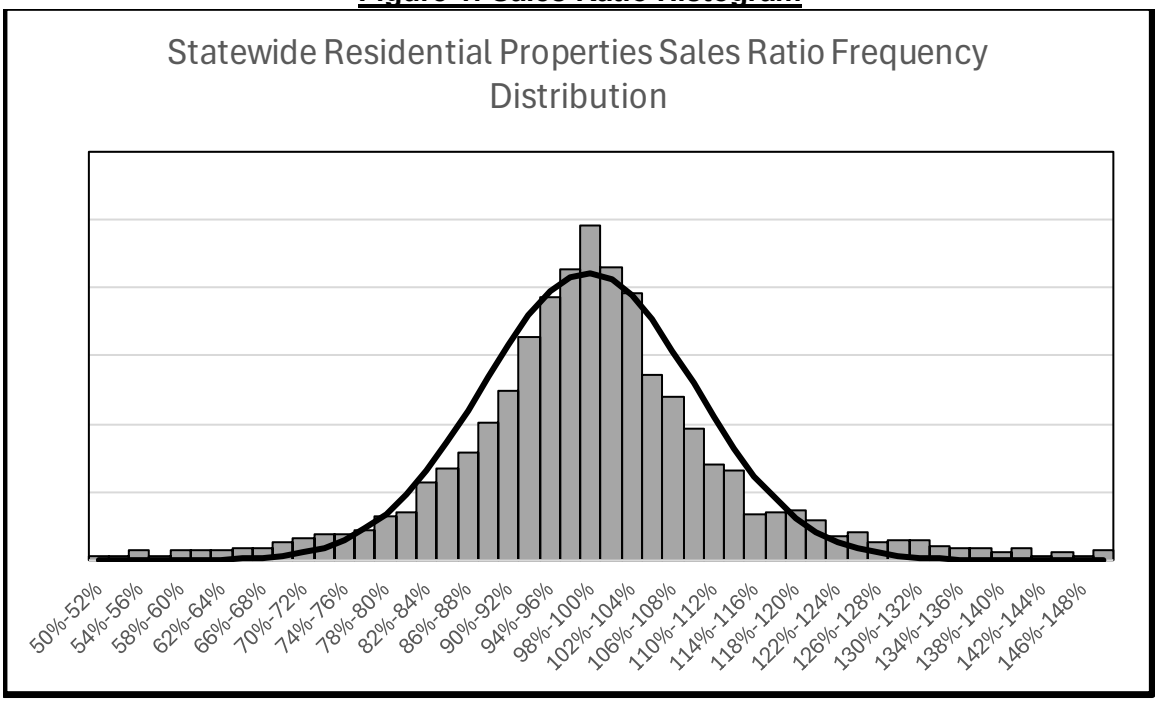
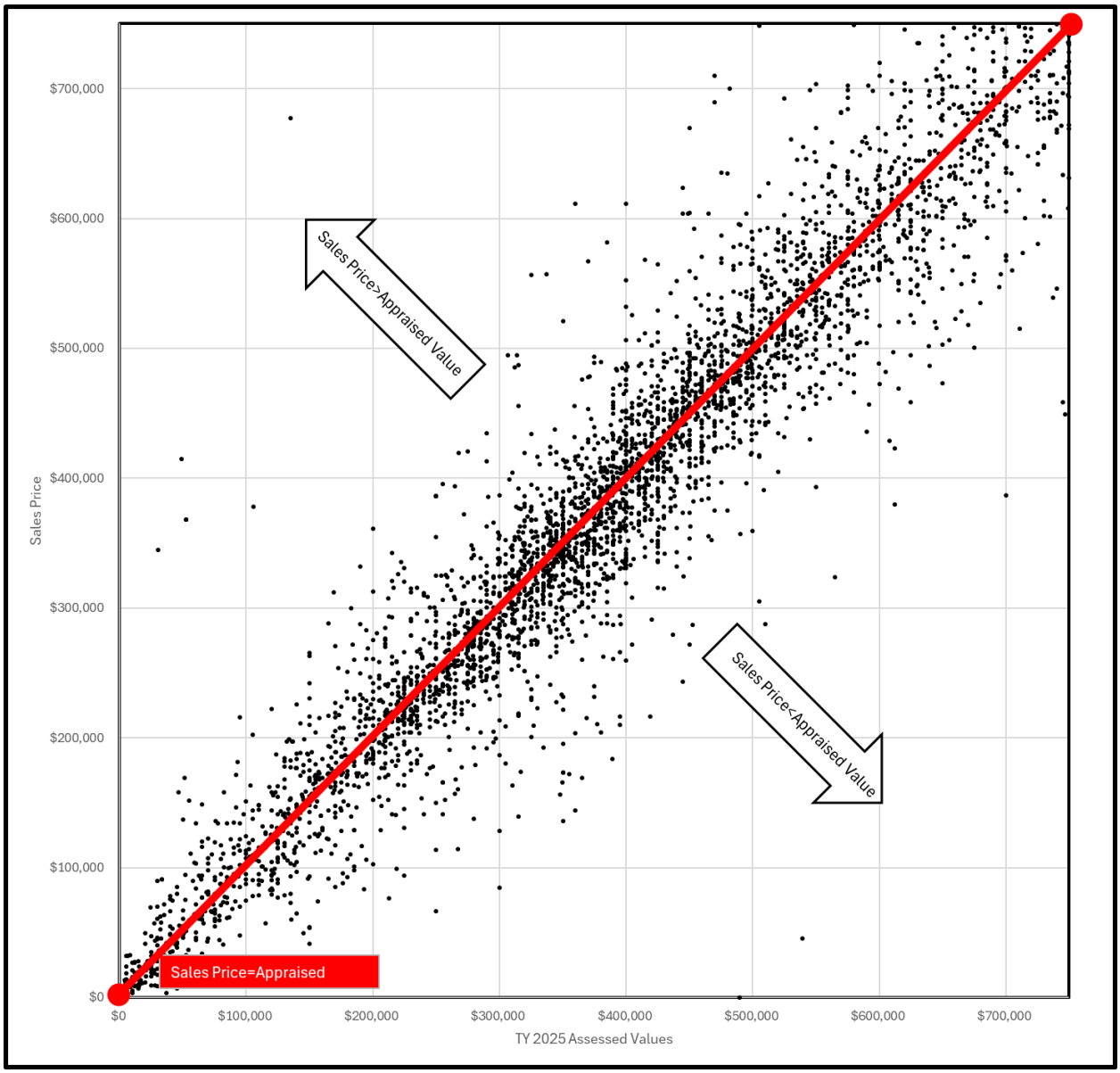


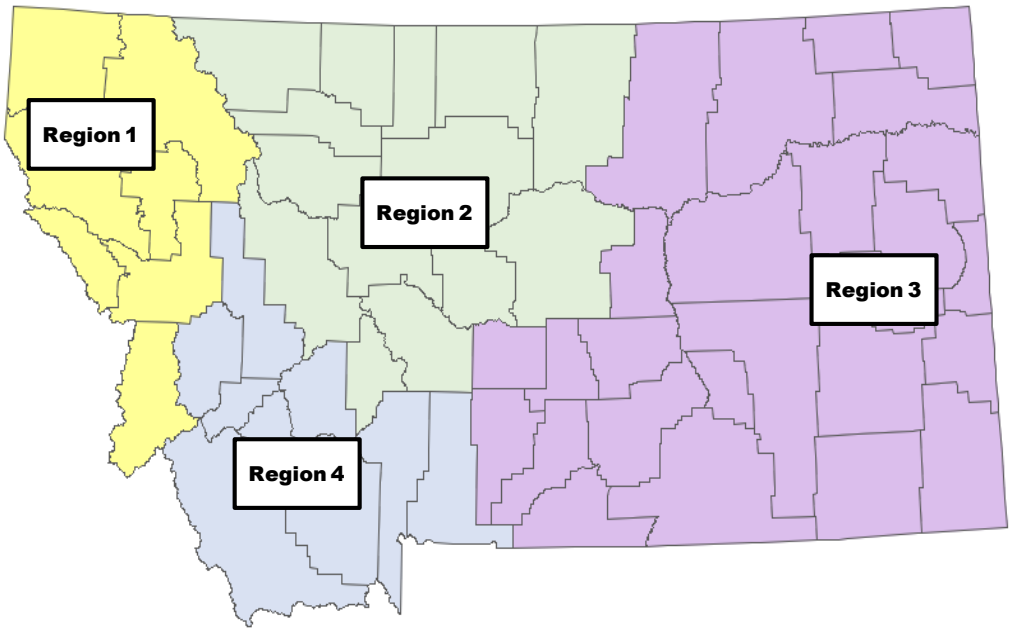
Figure 2 shows a scatter plot of the relationship between sales prices and assessed values. The plot has a line where 100 percent of market value is attained, or where sales price equals the assessed value. Values above the line indicate a sales price greater than the assessed value. Similarly, values below the line indicate an assessed value greater than the sales price. As the graph shows, there does not appear to be any groupings above or below the line, nor does there appear to be a strong relationship between the value of the property and the sales ratio. Again, these trends would be expected given previous statewide table as the scatter plot is essentially a different representation of the same idea.

Figure 2: Plot of Sales Price and Assessed Values



Region Analysis-Residential

For this report, reappraisal statistics are included for the whole state, as well as for each of the Department of Revenue's management regions shown in the following map.



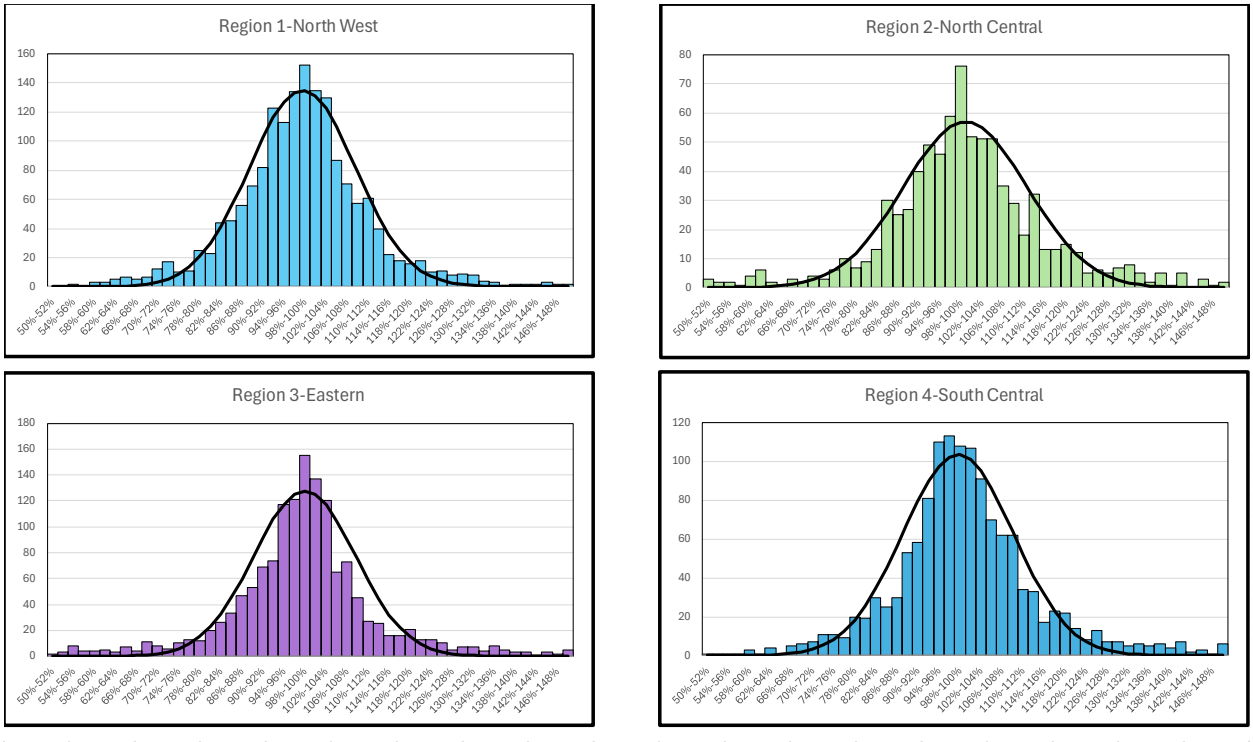
The following tables show the number of verified sales, statistics of central tendencies, and statistics concerning the distribution of the sales assessment ratios for each region. The median assessment ratio of all four regions fall within the IAAO recommendation of 90-110 percent. All four regions have a COD within the IAAO recommendation for a quality appraisal. The PRDs for all regions are also within of the IAAO standard of 0.98-1.03.

Residential Sales Ratio Statistics by Region

Region	Sample Data		Appraisal Levels						Appraisal Uniformity			
	Count (All Sales)	Count (Non-Outlier)	Median	*Conf. Interval*	Mean	*Conf. Interval*	Weighted Mean	*Conf. Interval*	COD	COV	Std. Dev.	PRD
1-North West	1,706	1,581	98.40%	*-0.4%;+0.6%*	98.52%	*±0.5%*	97.12%	*±0.6%*	7.959	10.210	10.059	1.014
2-North Central	841	760	99.35%	*-0.7%;+0.7%*	99.85%	*±0.8%*	99.18%	*±1.0%*	9.094	11.774	11.756	1.007
3-Eastern	1,545	1,338	98.88%	*-0.4%;+0.6%*	98.93%	*±0.5%*	98.31%	*±0.5%*	7.359	9.739	9.635	1.006
4-South Central	1,368	1,245	98.95%	*-0.7%;+0.6%*	98.65%	*±0.6%*	99.34%	*±1.9%*	8.191	10.678	10.534	0.993
State Wide Total	5,460	4,924	98.80%	*-0.3%;+0.3%*	98.82%	*±0.3%*	98.45%	*±0.9%*	8.010	10.423	10.300	1.004

Figure 3 shows the distribution analysis of sales ratios for the four regions using the new appraisal values as well as the normal distribution for comparison.

Figure 3: Regional Sales Ratio Histogram



In all four regions, the distributions appear to be tight and symmetrically centered around the regions' respective assessment level, indicating a good and uniform reappraisal in all four regions.

County Analysis-Residential

There were 25 counties with at least 30 valid sales between January 1, 2024 and June 30, 2024. The following table shows the number of verified sales, statistics of central tendencies, and statistics concerning the distribution of the sales assessment ratios.

Residential County Sales Ratio Statistics												
County	Sample Data		Appraisal Levels						Appraisal Uniformity			
	Count (All Sales)	Count (Non-Outlier)	Median	*Conf. Interval*	Mean	*Conf. Interval*	Weighted Mean	*Conf. Interval*	COD	COV	Std. Dev.	PRD
Beaverhead	54	45	97.56%	*-1.8%;+2.7%*	98.24%	*±1.6%*	98.37%	*±1.6%*	4.368	5.544	5.446	0.999
Broadwater	52	44	97.60%	*-5.8%;+3.0%*	96.41%	*±4.5%*	96.90%	*±4.6%*	11.274	15.310	14.760	0.995
Carbon	73	65	102.33%	*-7.6%;+5.6%*	103.09%	*±3.7%*	101.72%	*±3.5%*	11.682	14.428	14.874	1.013
Cascade	137	126	98.20%	*-1.4%;+2.1%*	99.03%	*±1.7%*	98.18%	*±2.9%*	7.597	9.536	9.443	1.009
Custer	38	34	94.59%	*-9.8%;+12.1%*	97.00%	*±7.4%*	96.76%	*±6.2%*	17.103	21.942	21.284	1.002
Dawson	48	43	101.28%	*-6.2%;+7.8%*	105.48%	*±5.7%*	104.65%	*±5.5%*	14.704	17.700	18.670	1.008
Deer Lodge	36	33	104.79%	*-8.6%;+6.7%*	103.73%	*±4.7%*	102.95%	*±4.2%*	10.178	12.772	13.247	1.008
Fergus	47	44	102.44%	*-5.6%;+5.0%*	106.33%	*±5.3%*	103.28%	*±4.8%*	12.781	16.464	17.506	1.030
Flathead	698	651	99.39%	*-1.0%;+1.0%*	99.29%	*±0.9%*	97.80%	*±1.2%*	9.103	11.712	11.629	1.015
Gallatin	803	741	98.47%	*-0.9%;+0.8%*	98.63%	*±0.7%*	97.42%	*±1.5%*	7.923	10.319	10.177	1.012
Hill	68	66	102.58%	*-6.5%;+6.8%*	104.98%	*±4.9%*	102.92%	*±3.9%*	15.120	18.869	19.808	1.020
Jefferson	44	41	101.24%	*-7.5%;+2.9%*	98.88%	*±3.3%*	97.82%	*±4.0%*	8.049	10.491	10.373	1.011
Lake	66	65	98.93%	*-4.1%;+2.2%*	98.53%	*±2.9%*	97.53%	*±3.2%*	9.072	11.995	11.819	1.010
Lewis And Clark	418	389	100.00%	*-1.2%;+0.9%*	99.97%	*±1.0%*	99.41%	*±1.2%*	7.781	9.965	9.962	1.006
Lincoln	92	89	96.97%	*-3.5%;+3.0%*	96.70%	*±3.3%*	96.49%	*±3.3%*	12.243	16.159	15.626	1.002
Madison	119	110	102.87%	*-3.2%;+4.1%*	104.42%	*±3.0%*	102.77%	*±4.5%*	11.830	15.377	16.056	1.016
Missoula	572	527	97.72%	*-0.8%;+0.6%*	97.39%	*±0.7%*	96.34%	*±0.8%*	6.694	8.532	8.310	1.011
Park	81	68	98.77%	*-2.9%;+3.0%*	97.85%	*±1.8%*	98.29%	*±1.7%*	5.993	7.711	7.545	0.996
Ravalli	225	214	98.81%	*-0.9%;+1.8%*	98.78%	*±1.2%*	97.38%	*±1.3%*	6.778	8.654	8.548	1.014
Richland	54	43	92.07%	*-4.1%;+3.6%*	92.13%	*±3.0%*	91.79%	*±2.8%*	8.101	10.534	9.705	1.004
Sanders	36	32	99.34%	*-5.0%;+4.9%*	99.69%	*±3.3%*	98.66%	*±3.3%*	7.150	9.164	9.136	1.010
Silver Bow	187	169	99.72%	*-2.4%;+2.1%*	100.34%	*±1.5%*	98.98%	*±1.6%*	7.938	10.146	10.181	1.014
Stillwater	44	41	102.26%	*-5.8%;+4.1%*	99.56%	*±6.1%*	99.09%	*±6.4%*	13.691	19.327	19.242	1.005
Valley	48	39	93.60%	*-8.7%;+3.9%*	91.76%	*±5.8%*	86.93%	*±7.1%*	13.845	19.355	17.759	1.055
Yellowstone	1,048	945	99.16%	*-0.5%;+0.5%*	98.81%	*±0.4%*	98.37%	*±0.5%*	5.351	6.873	6.791	1.004
State Wide Total	5,460	5,007	98.80%	*-0.4%;+0.5%*	98.82%	*±0.9%*	98.45%	*±0.8%*	8.010	10.423	10.300	1.004

The level of assessment was calculated for each of these counties. All counties have median assessment levels that fall within the IAAO recommended range of 90%-110% (Gloudemans, 1999). The COD is above the IAAO recommendation of 15 in Custer and Hill Counties, indicating that the sales ratios of residential properties in these counties deviate more from the median than is ideal due to their rural nature and relatively low sample size. However, IAAO standards extend the acceptable COD range to 20 for rural and/or recreational properties due to this heterogeneity. Only Valley County has a PRD outside the IAAO recommendation of 0.98 to 1.03, though the PRD calculation can be skewed upwards in areas with widely varying sale prices and low sample size. Other than the beforementioned counties, the PRD and COD were inside of the recommended standards by IAAO (Gloudemans, 1999).

Municipality Analysis-Residential

The level of assessment and COD were calculated for the 17 cities and towns in which there were 30 or more sales. These statistics are listed in the table below.

Incorporated City and Town Sales Ratio Statistics

City	Sample Data		Appraisal Levels						Appraisal Uniformity			
	Count (All Sales)	Count	Median	*Conf. Interval*	Mean	*Conf. Interval*	Weighted Mean	*Conf. Interval*	COD	COV	Std. Dev.	PRD
Belgrade	139	134	96.98%	*-1.1%;+0.8%*	96.98%	*±0.9%*	96.87%	*±0.9%*	4.317	5.527	5.360	1.001
Billings	791	729	99.39%	*-0.6%;+0.3%*	99.04%	*±0.5%*	98.81%	*±0.5%*	5.187	6.674	6.610	1.002
Laurel	39	39	97.65%	*-4.0%;+3.8%*	97.69%	*±2.4%*	97.77%	*±2.4%*	5.983	7.506	7.332	0.999
Bozeman	296	272	98.60%	*-1.3%;+1.5%*	99.03%	*±1.2%*	97.30%	*±1.4%*	7.851	10.119	10.021	1.018
East Helena	37	37	100.27%	*-3.7%;+3.9%*	100.21%	*±2.7%*	100.58%	*±2.8%*	6.274	7.964	7.981	0.996
Great Falls	108	100	99.44%	*-1.9%;+3.4%*	100.64%	*±1.7%*	100.97%	*±1.8%*	7.118	8.680	8.735	0.997
Hamilton	45	41	101.21%	*-2.8%;+2.6%*	101.86%	*±2.7%*	101.31%	*±2.8%*	6.436	8.353	8.509	1.005
Columbia Falls	32	31	96.32%	*-3.7%;+5.0%*	98.00%	*±4.8%*	98.00%	*±5.7%*	9.857	13.385	13.118	1.000
Havre	55	55	102.49%	*-6.9%;+6.7%*	105.66%	*±5.6%*	103.38%	*±4.3%*	15.583	19.471	20.574	1.022
Helena	167	164	101.78%	*-1.8%;+1.4%*	102.36%	*±1.8%*	101.97%	*±2.0%*	8.886	11.309	11.577	1.004
Lewistown	35	33	102.25%	*-6.8%;+3.9%*	105.17%	*±6.2%*	101.93%	*±5.5%*	12.892	16.714	17.578	1.032
Kalispell	205	195	100.76%	*-2.2%;+1.4%*	100.39%	*±1.4%*	99.11%	*±1.5%*	7.622	9.871	9.909	1.013
Livingston	57	51	99.29%	*-3.6%;+2.8%*	97.75%	*±2.2%*	98.27%	*±1.9%*	6.153	7.933	7.755	0.995
Missoula	387	365	96.96%	*-1.0%;+1.0%*	97.09%	*±0.8%*	96.08%	*±0.9%*	6.521	8.191	7.952	1.010
Red Lodge	37	33	102.33%	*-7.6%;+5.6%*	100.54%	*±3.8%*	100.39%	*±3.2%*	8.079	10.611	10.668	1.001
Sidney	44	38	91.51%	*-3.5%;+4.1%*	91.86%	*±3.2%*	91.30%	*±3.1%*	7.985	10.572	9.712	1.006
Whitefish	61	60	100.38%	*-5.7%;+2.3%*	97.69%	*±2.9%*	95.13%	*±4.2%*	8.935	11.629	11.360	1.027
State Wide Total	5,460	5,044	98.80%	*-0.5%;+0.6%*	98.82%	*±0.3%*	98.45%	*±0.8%*	8.010	10.423	10.300	1.004

All areas have median ratios in the recommended range (i.e. between 90 percent and 110 percent) (Gloudemans, 1999). The COD values are also all within the IAAO recommended range except in Havre where the COD is slightly greater than 15 (International Association of Assessing Officers, 2013). The PRD values are within the IAAO recommended range (between 0.98 and 1.03).

Valuation Method-Residential

As an additional check on the quality of the 2025 appraisal, it is helpful to examine sales ratio characteristics based on the method in which properties were appraised. The two primary approaches to valuing residential property are a market-based approach and a cost-based approach.

Residential Sales Ratio Statistics by Valuation Method													
Method	Sample Data		Appraisal Levels						Appraisal Uniformity			
	Count (All Sales)	Count (Non-Outlier)	Median	*Conf. Interval*	Mean	*Conf. Interval*	Weighted Mean	*Conf. Interval*	COD	COV	Std. Dev.	PRD
Market	4,627	4,281	98.84%	*-0.3%;+0.3%*	99.03%	*±0.3%*	98.80%	*±0.8%*	7.518	9.682	9.589	1.002
Cost	795	721	96.02%	*-1.7%;+1.2%*	92.54%	*±1.6%*	95.67%	*±3.3%*	17.455	23.709	21.941	0.967
State Wide Total	5,460	5,030	98.80%	*-0.5%;+0.5%*	98.82%	*±0.3%*	98.45%	*±0.8%*	8.010	10.423	10.300	1.004

As the table shows, the market valuation method meets IAAO standards. The cost approach COD is higher than the IAAO recommendation of 15, which is likely a byproduct of the cost approach being used in less homogenous areas and on rural or unique properties. (International Association of Assessing Officers, 2013). The cost approach method also has a low PRD, indicating that some high value properties are over-assessed relative to low value properties using this method.

Urban/Rural Analysis-Residential

Rural areas are generally less homogenous and have fewer property sales than urban areas, which can make them more difficult to build models and appraise than more homogenous urban areas. The following table displays the statistics for urban and rural sales ratios.

Urban and Rural Residential Sales Ratio Statistics												
Region	Sample Data		Appraisal Levels						Appraisal Uniformity			
	Count (All Sales)	Count	Median	*Conf. Interval*	Mean	*Conf. Interval*	Weighted Mean	*Conf. Interval*	COD	COV	Std. Dev.	PRD
Urban	4,799	4,352	98.78%	*-0.3%;+0.3%*	98.71%	*±0.3%*	98.03%	*±0.7%*	7.863	10.211	10.079	1.007
Rural	633	560	99.09%	*-0.7%;+1.5%*	100.29%	*±1.0%*	100.27%	*±3.4%*	9.504	12.491	12.527	1.000
State Wide Total	5,432	4,921	98.80%	*-0.3%;+0.3%*	98.82%	*±0.3%*	98.45%	*±0.9%*	8.010	10.423	10.300	1.004

The quality of appraisal of residential property in rural areas is similar to urban areas. All measures fall within IAAO standards for both types of property.

Vacant Residential Land

A separate sales ratio analysis was conducted on vacant residential land. During the same observed period, there were 781 sales of vacant land. The median ratio is 95.77 percent, and the mean and weighted mean ratios also fall within IAAO standards. The COD, at 21.48, falls within IAAO's range for vacant rural land of 5 to 25. The PRD is barely outside the expected range at 1.033, indicating that there is some regressivity (higher value land being slightly under-appraised relative to lower value land).

Conclusion-Residential

Based on widely recognized norms and standards, the 2025 residential appraisal is generally of high quality, as evidenced by this study. The goal of having a sample appraisal level within 10 percent of market value is met (International Association of Assessing Officers, 2013). The sample assessment level of 98.8 percent is within 1.2 percentage points of 100 percent of market value.

The reappraisal also meets uniformity standards, as evidenced by the coefficients of dispersion and the price-related differential. The statewide COD of 8.010 is within the accepted range of 5.0 to 15.0. The PRD of 1.004 is also between the IAAO recommended 0.980 and 1.030 standard (International Association of Assessing Officers, 2013).

2025 Appraisal-Commercial

Similar to residential properties, the Department of Revenue must provide assurance that the reason for increases or decreases in appraised values for commercial properties is due to the genuine changes in property value and not due to faulty or poor reappraisal performance.

Commercial sales that occurred were verified by PAD to determine if the sales were usable for valuation purposes. This includes making sure that the sale price is representative of only the market value of real property and ensuring that the sales are arms-length transactions.

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. In this example, 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 may not be a valid indicator of the market value of real property, but instead represents the market value of the entire business, including the personal property.

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 as a result of business interests or personal property, as may be the case in commercial sales.

Another criterion for a sales ratio analysis is for the properties that sell to be representative of all properties being evaluated. In the case of Class 4 commercial properties, the Department of Revenue 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 only be one or two properties of its kind in the state. It is unlikely that these properties sell in any given year, so it can be more difficult to use sales to verify the assessed values on these 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 and other statistical tests can be calculated and used to evaluate appraisal quality. A confidence interval determines the range that the true assessment ratio is between. This acknowledges that there may be some variation between all commercial properties in the state and the sample of properties that sold. The use of confidence intervals can also make up for having fewer sales.

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. The quality of commercial reappraisal includes confidence intervals and hypothesis testing because of fewer commercial sales and a more complex commercial market. Statistical tools and tests can then be used to overcome some of the challenges in validating the quality of commercial mass appraisal.

Lastly, it is important to bear in mind that the results for commercial property are not necessarily directly comparable to the results presented for residential property, however the two are related. In acknowledging the complexity of mass appraisal for commercial property, the IAAO generally has different standards for uniformity for commercial and residential property (International Association of Assessing Officers, 2013). The residential coefficient of dispersion is generally considered good when it is less than 15; for commercial property the standard is less than 20.

Data-Commercial

The sale prices and corresponding assessment values were extracted from the Department of Revenue's property information valuation system and provided the data for this analysis. The data set contained 477 commercial properties sold from January 1, 2024 to June 30, 2024 and that were considered to be valid sales. Standard screening processes were used to determine the validity of sales. This screening is meant to ensure the sales price represents the market value of the real property. The screening eliminated sales where the sales price represents more than the market value of the real property (for example when the sales price includes personal property or the value of an established business).

Outliers were trimmed in the same manner and for the same reasons as residential properties.

Commercial Results

Statewide Commercial Analysis

The following table displays a summary of the ratio statistics using the 2025 appraisal values.

Commercial Ratio Statistics
CY 2024 Sales[1] Relative to TY 2025 Values

Number of Sales	Values
Total Observations	**477**
Used Observations	**413**
Measurement of Appraisal Levels	
Upper Bound Confidence Interval	*95.26%*
Median Ratio	**93.39%**
Lower Bound Confidence Interval	*91.42%*
Upper Bound Confidence Interval	*94.67%*
Mean Ratio	**93.06%**
Lower Bound Confidence Interval	*91.45%*
Upper Bound Confidence Interval	*93.66%*
Weighted Mean	**91.01%**
Lower Bound Confidence Interval	*88.36%*
Measurement of Appraisal Uniformity	
Coefficient of Dispersion	**13.457**
Coefficient of Variation	**17.869**
Standard Deviation	**16.629**
Price Related Differentials	**1.023**
Range (1.5x Inter Quartile Range)	
Maximum Ratio in the Sample	**139.19%**
Minimum Ratio in the Sample	**50.36%**

[1]Sales from 1/1/2024 to 6/30/2024

The statewide overall level of assessment, as measured by the median sales ratio, is 93.4 percent. The mean sales ratio for commercial properties was 93.06 percent while the weighted mean sales ratio was 91.01 percent. Although all three measures are less than 100 percent by a statistically significant margin, they are all within the IAAO standard of being within 10 percent of the target of 100 percent (International Association of Assessing Officers, 2013).

The measures of uniformity show that the coefficient of dispersion is also with in the acceptable IAAO range of 5 to 20, indicating the 2025 appraisal had good uniformity for commercial properties (International Association of Assessing Officers, 2013). The price related differential is 1.023, which meets the IAAO standard of 0.98 to 1.03, indicating that there is no progressive or regressive bias towards higher value properties.

Figure 4 shows the distribution of assessment ratios in the sample. Ideally, the distribution would show a tight, symmetrical distribution centered around 100%. Because the commercial properties have more variation, and there are fewer sales, the distribution of commercial ratios is not as smooth as the distribution of the residential ratios. However, as the graph shows, the distribution of sales ratios does not appear to be dramatically different from a normal distribution.

Figure 4: Commercial Sales Ratio Histogram

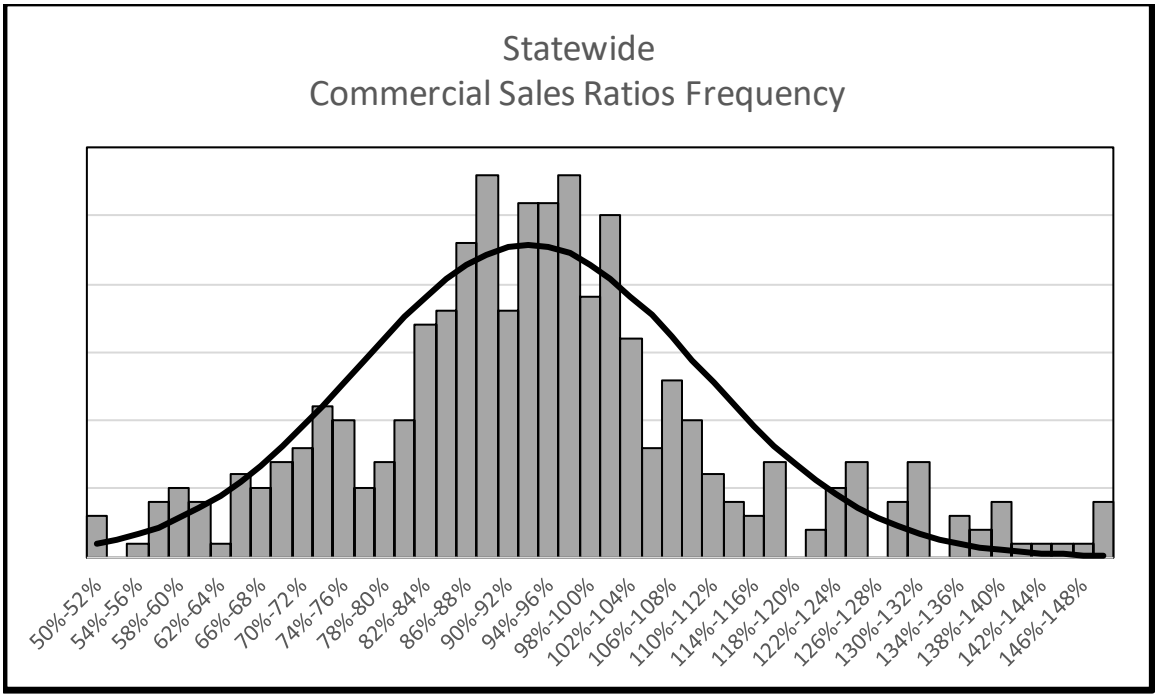
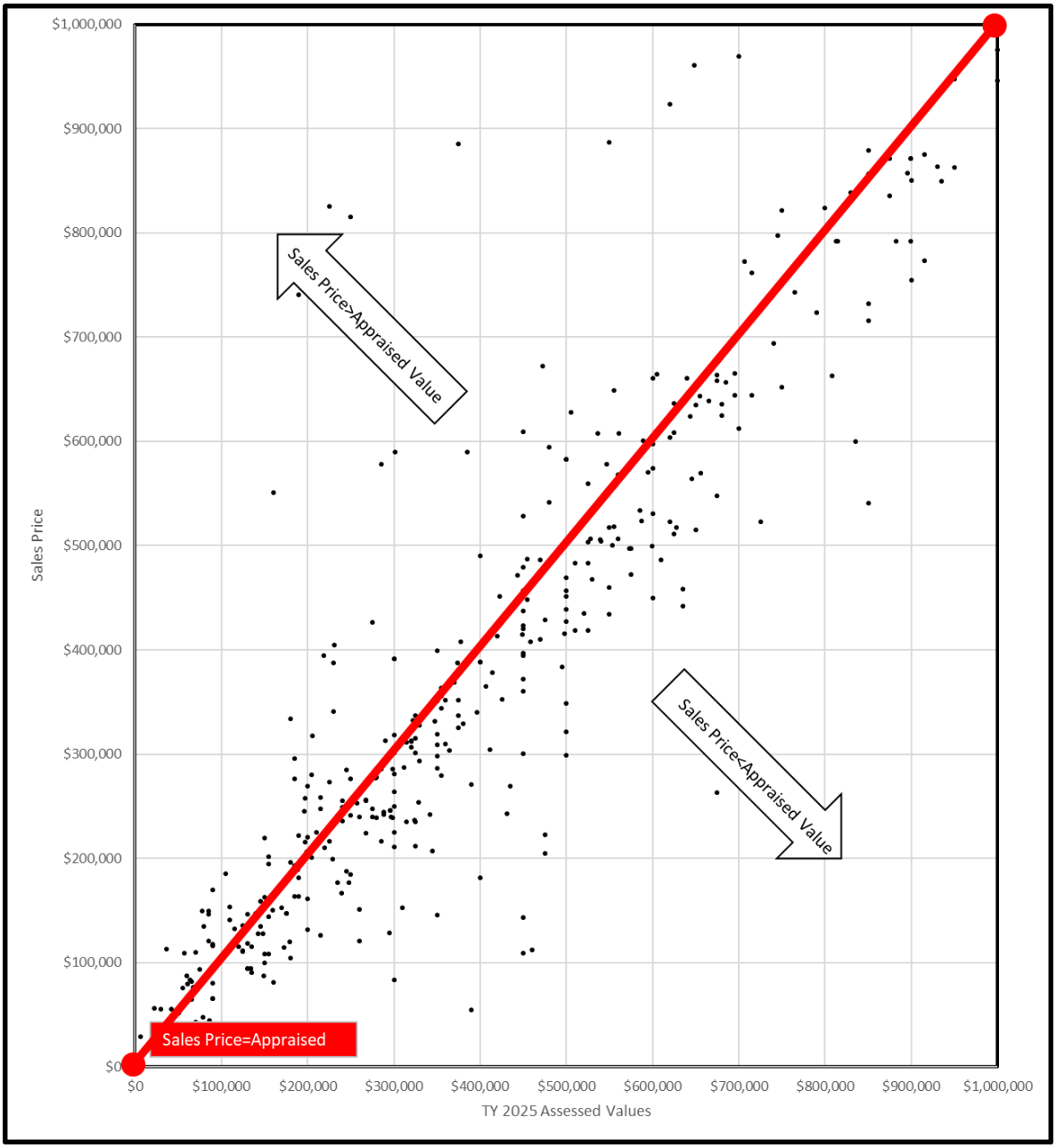


Figure 5 shows a scatter plot of the relationship between sales prices and assessed values. The plot has a line where 100 percent of market value is attained, or where sales price equals the assessed value. Values above the line indicate a sales price greater than the assessed value and values below the line indicate an assessed value greater than the sales price. As the graph shows, there does not appear to be any groupings above or below the line, nor does there appear to be a strong relationship between the value of the property and the sales ratio. Again, these trends would be expected given previous statewide table as the scatter plot is a different representation of the same idea.

Figure 5: Plot of Commercial Sales Price and Assessed Values



Region Analysis-Commercial

As with residential properties, the Department of Revenue calculated the sales ratio statistics for the different administrative regions in the state. The following tables show the number of verified sales, statistics of central tendencies, and statistics concerning the distribution of the sales assessment ratios.

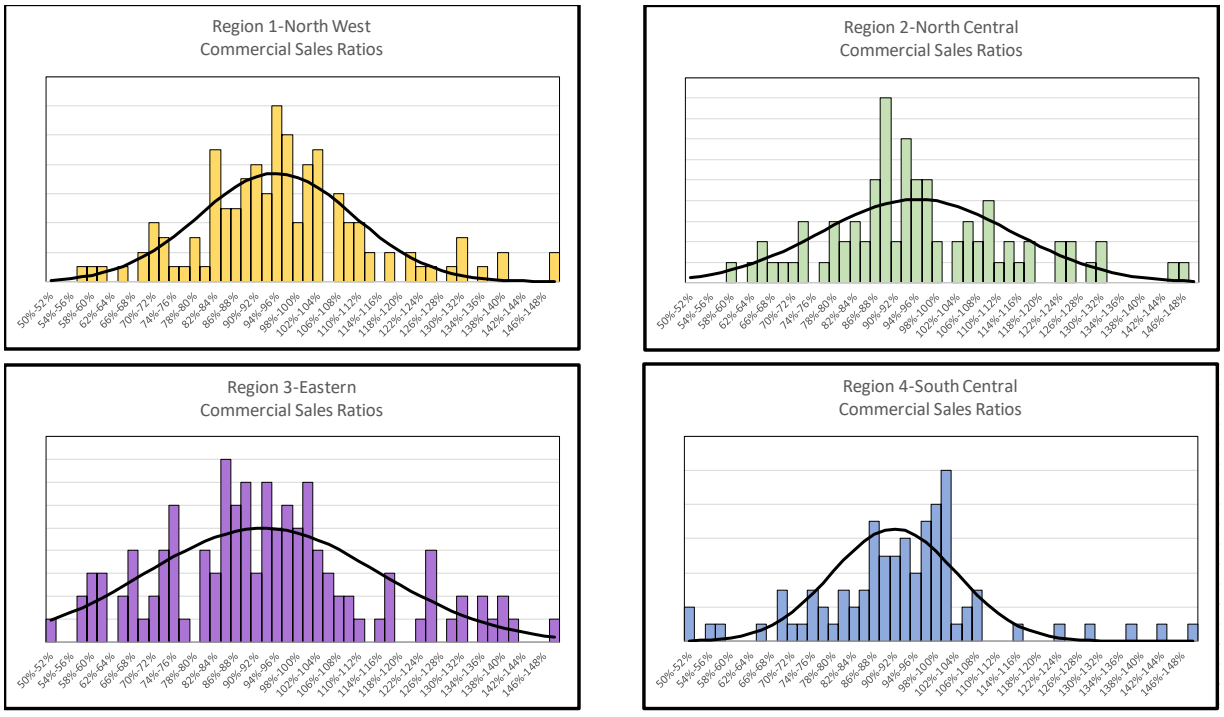
Commercial Sales Ratio Statistics by Management Region

Region	Sample Data		Appraisal Levels						Appraisal Uniformity			
	Count (All Sales)	Count (Non-Outliers)	Median	*Conf. Interval*	Mean	*Conf. Interval*	Weighted Mean	*Conf. Interval*	COD	COV	Std. Dev.	PRD
1-North West	140	129	95.61%	*-3.7%;+1.4%*	94.87%	*±2.6%*	90.27%	*±4.1%*	11.852	15.894	15.079	1.051
2-North Central	95	83	92.86%	*-3.4%;+3.6%*	95.03%	*±4.1%*	93.48%	*±4.1%*	14.973	19.607	18.633	1.017
3-Eastern	142	125	91.28%	*-4.2%;+3.8%*	92.27%	*±4.0%*	91.61%	*±5.3%*	18.719	24.596	22.694	1.007
4-South Central	100	82	93.02%	*-4.2%;+3.9%*	90.87%	*±2.7%*	90.84%	*±5.5%*	10.007	13.347	12.129	1.000
State Wide Total	477	419	93.39%	*-2.1%;+2.1%*	93.06%	*±1.6%*	91.01%	*±2.6%*	13.457	17.869	16.629	1.023

As the table shows, all the ratios measuring the appraisal level are all within the IAAO standards of 90% to 110% (Gloudemans, 1999). The COD values are also all in the acceptable range of 5 to 20. Only the North West region has a PRD outside the IAAO recommendation of 0.98 to 1.03, indicating there could be some regressivity in this area. Again, the PRD statistic is much more sensitive to extreme values and higher priced properties, and because of the nature and complexity of commercial properties, a PRD value outside of the IAAO standard for commercial properties may not be as important as in the case of residential properties (International Association of Assessing Officers, 2013).

Figure 6 shows the distribution analysis of sales ratios for the four regions using the new appraisal values and the prior cycle appraisal values.

Figure 6: Regional Commercial Sales Ratio Histogram



As previously mentioned, the commercial distributions are not as smooth or symmetrical as the residential distributions. However, the majority of the data falls within the center of the distribution close to the assessment level. Regions 3 and 4 appear less normal relative to the others; this is likely a byproduct of the larger variation in commercial property in these areas, especially in the rural regions.

County Analysis-Commercial

There were five counties with at least 30 valid sales between January 1, 2024, and June 30, 2024. The following table shows the number of verified sales, statistics of central tendencies, and statistics concerning the distribution of the sales assessment ratios.

Commercial County Sales Ratio Statistics

County	Sample Data		Appraisal Levels						Appraisal Uniformity			
	Count (All Sales)	Count (Non-Outliers)	Median	*Conf. Interval*	Mean	*Conf. Interval*	Weighted Mean	*Conf. Interval*	COD	COV	Std. Dev.	PRD
Flathead	46	40	96.27%	*-2.7%;+5.2%*	97.19%	*±3.6%*	93.10%	*±7.9%*	8.680	11.488	11.165	1.044
Gallatin	62	56	90.29%	*-4.3%;+4.1%*	84.55%	*±4.7%*	88.72%	*±7.1%*	14.561	20.709	17.509	0.953
Lewis And Clark	44	40	91.78%	*-4.2%;+4.1%*	91.76%	*±3.3%*	94.10%	*±5.7%*	8.950	11.325	10.391	0.975
Missoula	48	42	87.70%	*-4.5%;+7.6%*	88.43%	*±4.7%*	83.49%	*±6.8%*	13.567	17.162	15.176	1.059
Yellowstone	85	73	93.42%	*-3.9%;+3.8%*	95.19%	*±4.1%*	92.53%	*±6.0%*	13.663	18.280	17.402	1.029
State Wide Total	477	428	93.39%	*-2.6%;+2.3%*	93.06%	*±1.6%*	91.01%	*±2.6%*	13.457	17.869	16.629	1.023

The level of assessment was calculated for each of these counties. Four of the five displayed counties have assessment levels (medians) within the recommended range of 90%-110% (Gloudemans, 1999), although the confidence intervals in Missoula County indicate it is not certain an acceptable measure would be statistically different from the values observed in this analysis. The COD was calculated for each county and was inside the 5 to 20 range recommended by IAAO for commercial properties. The PRD calculated for each county falls outside the IAAO recommendation 0.98 to 1.03 except for Yellowstone County. PRD is sensitive to extreme values and shouldn't be of as much concern for commercial properties, especially given the relatively low sample size (International Association of Assessing Officers, 2013).

Valuation Method-Commercial

As a final check on the quality of the 2025 appraisal for commercial properties, it is helpful to examine sales ratio characteristics based on the method in which properties were appraised. The two approaches to valuing commercial property are an income-based approach and a cost-based approach.

Commercial Sales Ratio Statistics by Valuation Method

Region	Sample Data		Appraisal Levels						Appraisal Uniformity			
	Count (All Sales)	Count (Non-Outliers)	Median	*Conf. Interval*	Mean	*Conf. Interval*	Weighted Mean	*Conf. Interval*	COD	COV	Std. Dev.	PRD
Income	320	288	93.25%	*-1.8%;+1.6%*	92.31%	*±1.5%*	92.37%	*±2.8%*	10.316	13.556	0.125	0.999
Cost	157	150	96.07%	*-6.3%;+6.9%*	97.42%	*±6.0%*	86.22%	*±5.5%*	29.896	38.239	0.373	1.130
State Wide Total	477	413	93.39%	*-2.0%;+1.9%*	93.06%	*±1.6%*	91.01%	*±2.6%*	13.457	17.869	0.166	1.023

The median and mean appraisal levels are within the standards set by IAAO for both commercial approaches to value (International Association of Assessing Officers, 2013). However, the weighted mean appraisal level for the cost approach is below the 90% standard due to a low number of relatively high value properties being undervalued using this approach. These properties likely do not represent the typical commercial property in the state. The low weighted mean results in a high PRD, indicating again that higher value properties are under-appraised with this approach. All indicators for the income approach fall within IAAO standards.

Urban/Rural Analysis-Residential

Rural areas are generally less homogenous and have fewer property sales than urban areas, especially regarding commercial properties. It can be challenging to build models for and appraise these often disparate types of properties, especially compared to more homogenous urban areas. The following table displays the statistics for urban and rural sales ratios of commercial properties.

Urban and Rural Commercial Sales Ratio Statistics												
Region	Sample Data		Appraisal Levels						Appraisal Uniformity			
	Count (All Sales)	Count	Median	*Conf. Interval*	Mean	*Conf. Interval*	Weighted Mean	*Conf. Interval*	COD	COV	Std. Dev.	PRD
Urban	414	358	93.40%	*-2.0%;+1.9%*	92.86%	*±1.5%*	91.14%	*±2.7%*	12.037	15.929	14.791	1.019
Rural	38	34	87.62%	*-15.4%;+21.5%*	95.30%	*±14.2%*	79.07%	*±15.7%*	35.566	42.826	40.814	1.205
State Wide Total	477	413	93.39%	*-2.0%;+1.9%*	93.06%	*±1.6%*	91.01%	*±2.6%*	13.457	17.869	16.629	1.023

The median and weighted mean sales ratios of commercial property are less than 90%, but the (relatively large) confidence interval for the median indicates that it is not certain the sales ratio does not fall within acceptable guidelines. The high COD and PRD for rural commercial properties results from a combination of a low number of sales, high heterogeneity, and the likelier use of the cost approach for these disparate properties.

Conclusion-Commercial

Based on widely recognized norms and standards, the 2025 commercial appraisal is generally of high quality, as evidenced by this study. The goal of having a sample appraisal level within 10 percent of market value is met at a statewide level (International Association of Assessing Officers, 2013). The median sample assessment level of 93.4 percent is within 6.6 percentage points of full market value.

The reappraisal also meets uniformity standards, as evidenced by the coefficients of dispersion. The statewide COD of 13.457 is within the recommended range of 5.0 to 20.0 (International Association of Assessing Officers, 2013). The statewide PRD of 1.023 is within the IAAO recommended limit of 1.03.

Finally, the method used to appraise commercial properties does not seem to yield statistically different appraisal levels as measured by the sales ratio (International Association of Assessing Officers, 2013).

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