Measuring the Quality of Reappraisal

Residential and Commercial Property – 2023 Reappraisal

September 2023

MONTANA
DEPARTMENT OF
REVENUE

Executive Summary

This report demonstrates that the 2023 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. The median sample assessment level was 95.4 percent for residential properties and 92.6 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 believed as evidence 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 2023 appraisal. The first section discusses commonly used sales ratio statistics, followed by a section examining the residential sales ratios for the 2023 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.

Measuring the Quality of the 2023 Reappraisal

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 2023 appraisal.

The reappraisal cycle ending December 31, 2022, 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, 2022 (42.18.121 ARM).

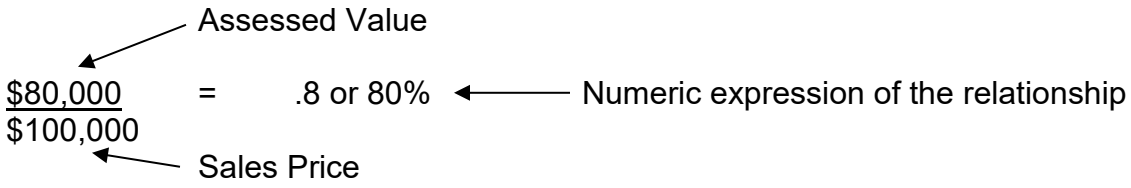
A vast majority of properties saw an appreciation in value since the last reappraisal; however, significant variation in appreciation levels exists in more narrowly defined areas. For these reasons, the Department of Revenue must provide assurance that the reason for changes in appraised values and the 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 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 are generally assumed to represent true market values in ratio studies (International Association of Assessing Officers, 2013). Therefore, a 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.



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. 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:

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

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 Dispersion: The coefficient of dispersion (COD) is the one of the most used measures 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 Standards

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

2023 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), and for the valuation method used to appraise the property.

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. The data set contained 4,683 residential properties that sold from December 1, 2021 to March 31, 2022 and were considered to be valid sales using standard screening practices. In quality of reappraisal analyses from prior cycles, sales from the first six months of the calendar year would be used in the sales ratio analysis. To account for continued market appreciation after the lien date of January 1, 2022, the month of December, 2021 and the first quarter of 2022 were used in the 2023 reappraisal analysis.

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. However, the data in the sample was extracted before most informal reviews were submitted. Therefore, these reviews should not 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 95.42 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 10.149 for this sample. This value is below 15, and above 5, the recommended level IAAO, and indicates good appraisal uniformity (Gloudemans, 1999).

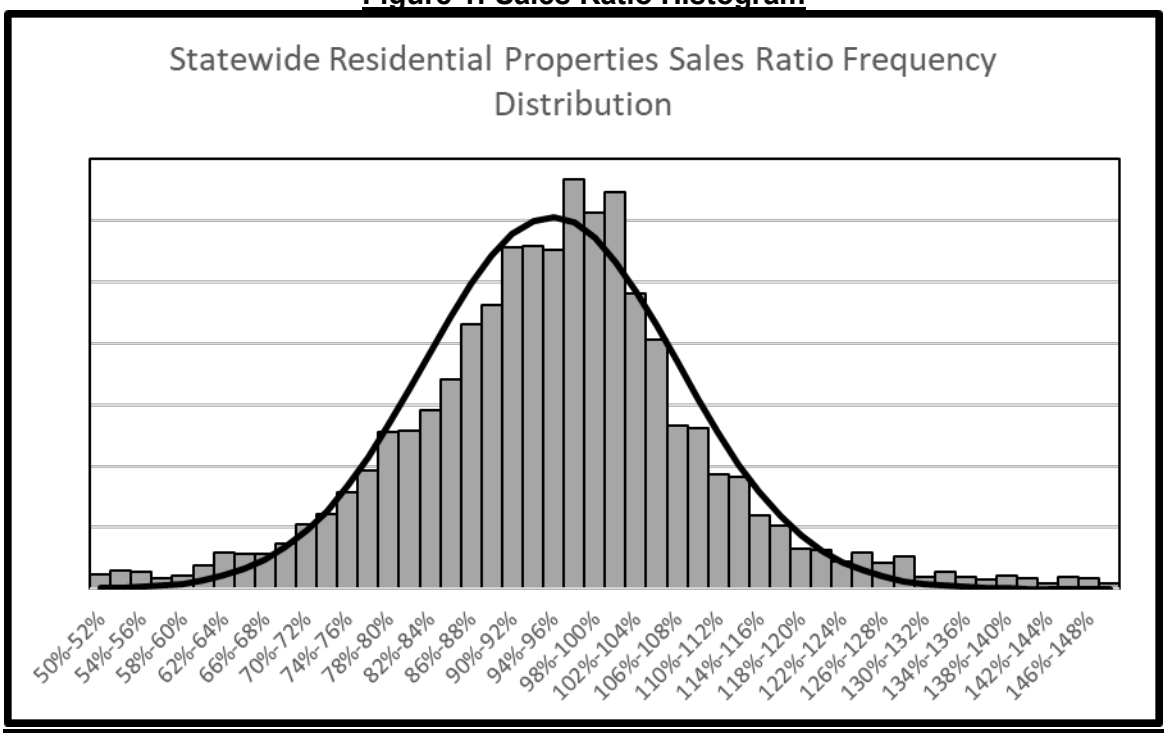
The following table displays a summary of the ratio statistics using the 2023 appraisal values.

Residential Ratio Statistics CY 2022[1] Sales Relative to TY 2023 Values	
Number of Sales	**Values**
Total Observations	**4,683**
Used Observations	**4,375**
Measurement of Appraisal Levels	
Upper Bound Confidence Interval	*95.89%*
Median Ratio	**95.42%**
Lower Bound Confidence Interval	*94.89%*
Upper Bound Confidence Interval	*95.12%*
Mean Ratio	**94.76%**
Lower Bound Confidence Interval	*94.39%*
Upper Bound Confidence Interval	*93.28%*
Weighted Mean	**92.01%**
Lower Bound Confidence Interval	*90.74%*
Measurement of Appraisal Uniformity	
Coefficient of Dispersion	**10.149**
Coefficient of Variation	**13.009**
Standard Deviation	**0.123**
Price Related Differentials	**1.030**
Range (1.5x Inter Quartile Range)	
Maximum Ratio in the Sample	**128.5%**
Minimum Ratio in the Sample	**61.6%**
[1]Sales from 12/1/2021 to 3/31/2022	

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 1.030, which is within the 0.98 to 1.03 range suggested by the IAAO (Gloudemans, 1999).

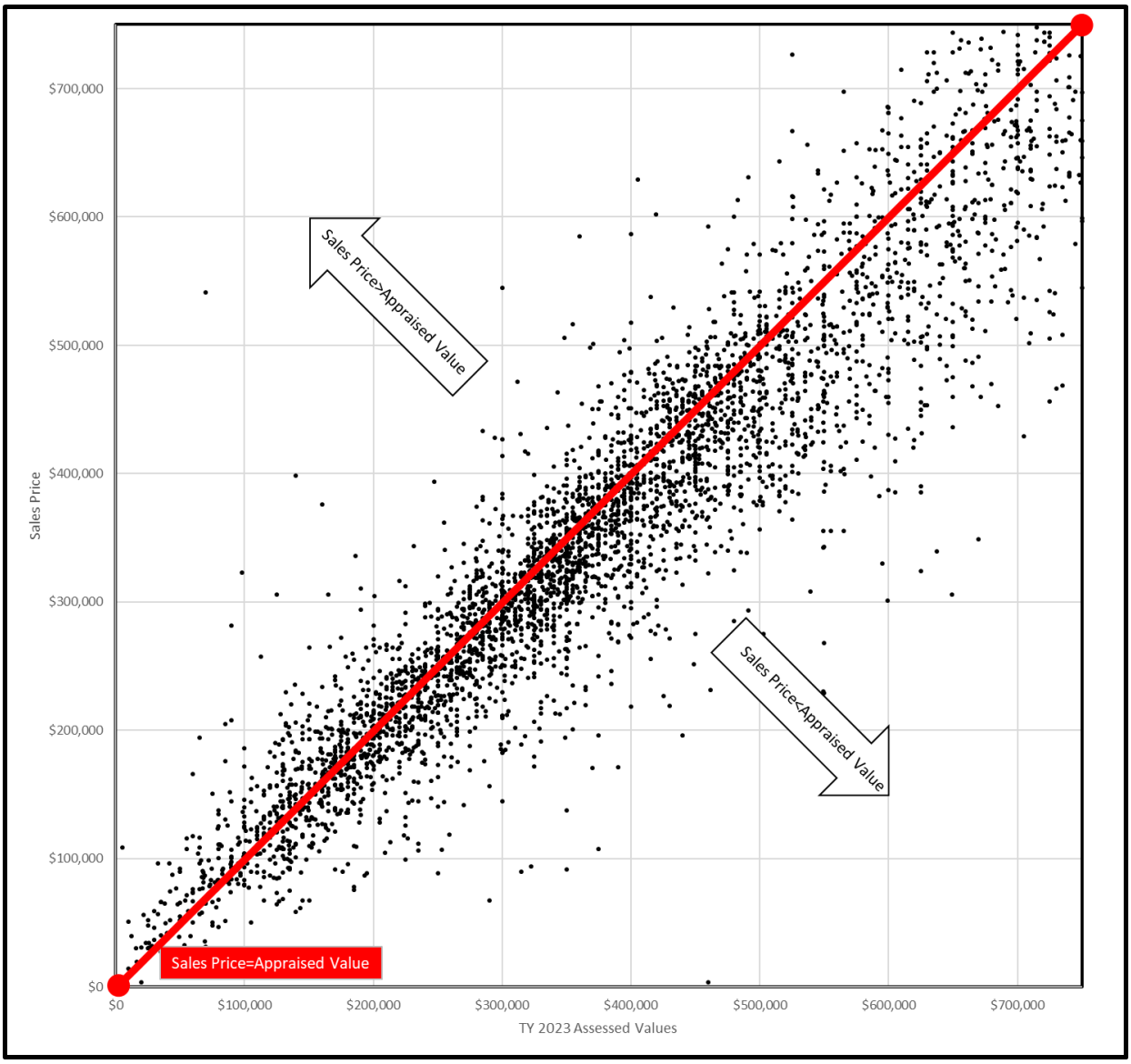
The frequency distribution of the sales ratios is displayed in Figure 1. The distribution is a tight, symmetrically curved, and centered about the assessment level of 95.42 percent. These characteristics are evidence of good appraisal uniformity and is further supported by a low standard deviation of 0.123.

Figure 1: Sales Ratio Histogram



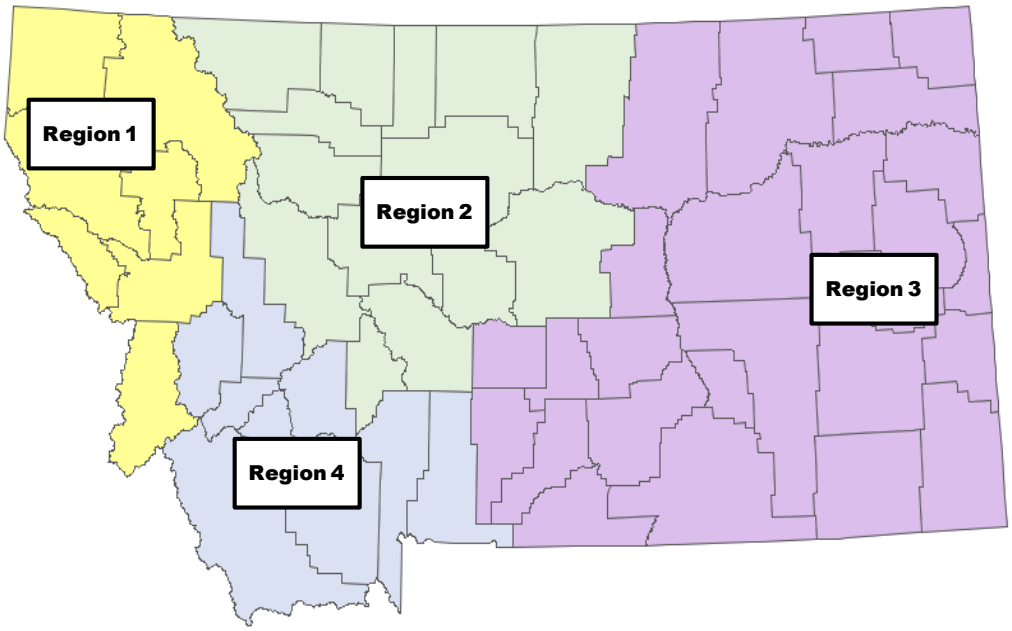
The following graph shows a scatter plot of the relationship between sales prices and assessed values. The plot has a line where 100 percent of market value is attained, or where sales price equals the assessed value. Values above the line indicate a sales price greater than the assessed value. Similarly, 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.

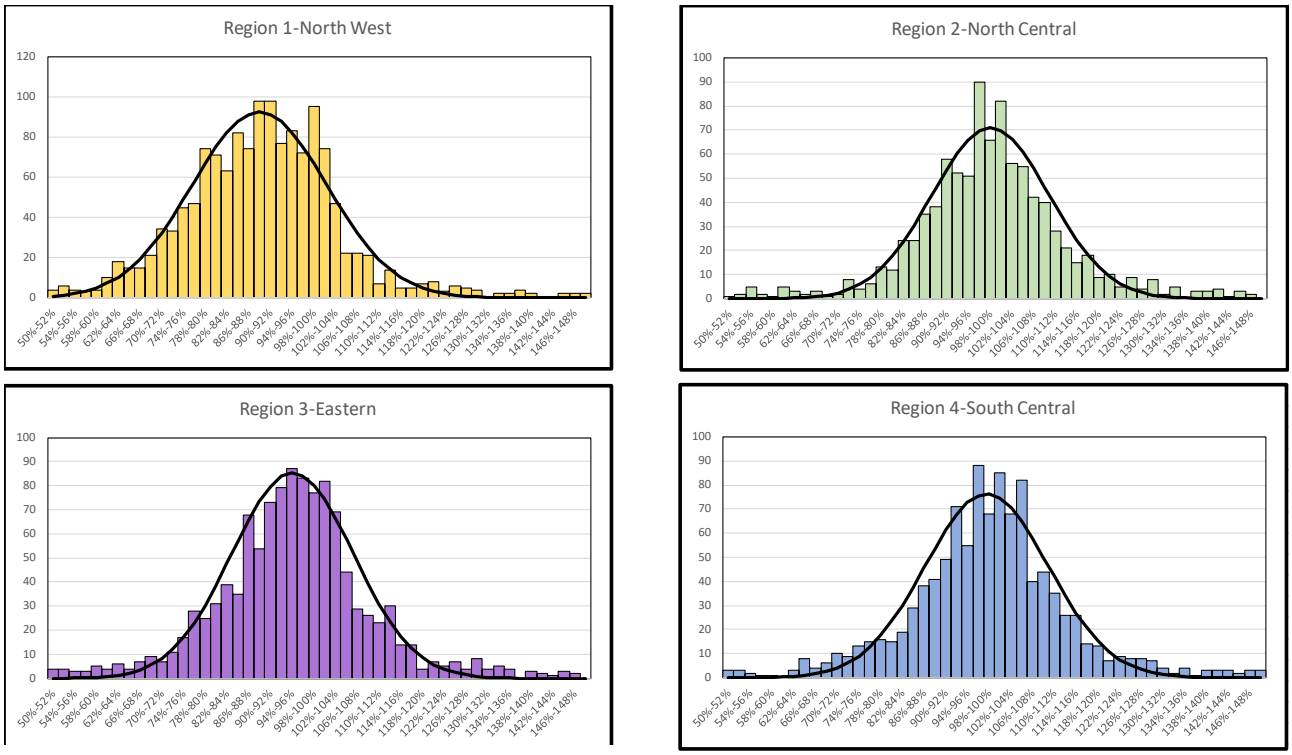


The following tables show the number of verified sales, statistics of central tendencies, and statistics concerning the distribution of the sales assessment ratios for each region. Region 1 is the only region with a median assessment ratio outside of the IAAO recommendation of 90-110 percent; however, because the confidence interval for the median ratio includes 90%, we cannot say there is a statistical difference between this value and a value that would be within the standards outlined by IAAO (DeGrouot & Schervish, 2002). All four regions have a COD within the IAAO recommendation for a quality appraisal. The PRDs for regions 1 and 4 are slightly outside of the IAAO standard of 0.98-1.03. The calculation for the PRD metric is naturally biased upwards and can be skewed in areas with widely varying sale prices; both of these regions have a diverse mix of urban, rural, and recreational residential property and is likely the reason the PRD being slightly outside the IAAO standard range (International Association of Assessing Officers, 2013).

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	1,437	1,377	89.65%	*-1.0%;+0.7%*	89.01%	*±0.7%*	86.35%	*±1.0%*	10.968	13.922	0.124	1.031
2-North Central	962	886	98.94%	*-1.0%;+0.9%*	99.08%	*±0.7%*	97.89%	*±0.7%*	8.469	10.915	0.108	1.012
3-Eastern	1,195	1,086	95.26%	*-0.7%;+0.9%*	95.09%	*±0.7%*	94.02%	*±0.7%*	9.189	11.728	0.112	1.011
4-South Central	1,089	1,008	99.10%	*-1.1%;+0.8%*	98.57%	*±0.7%*	94.99%	*±2.0%*	8.958	11.529	0.114	1.038
State Wide Total	4,683	4,375	95.42%	*-0.5%;+0.5%*	94.76%	*±0.4%*	92.01%	*±1.3%*	10.149	13.009	0.123	1.030

The following graphs show 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 24 counties with at least 30 valid sales between December 1, 2021 and March 31, 2022. 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	36	31	100.90%	*-3.4%;+2.7%*	101.03%	*±2.9%*	100.71%	*±2.8%*	5.748	7.944	0.080	1.003
Broadwater	59	56	100.06%	*-3.5%;+0.9%*	98.34%	*±2.4%*	97.23%	*±2.3%*	6.936	9.114	0.090	1.011
Carbon	74	72	91.20%	*-3.8%;+4.1%*	90.61%	*±3.7%*	89.65%	*±3.4%*	13.463	17.554	0.159	1.011
Cascade	369	349	98.57%	*-1.2%;+1.9%*	99.65%	*±1.1%*	98.56%	*±1.1%*	8.397	10.657	0.106	1.011
Custer	48	45	97.67%	*-7.8%;+4.2%*	98.36%	*±3.9%*	96.80%	*±3.4%*	10.237	13.135	0.129	1.016
Dawson	45	42	94.14%	*-5.1%;+7.9%*	97.79%	*±6.1%*	94.71%	*±5.4%*	15.919	19.922	0.195	1.033
Deer Lodge	43	40	93.29%	*-6.0%;+5.6%*	94.06%	*±5.5%*	93.62%	*±5.8%*	14.183	18.149	0.171	1.005
Fergus	34	30	98.14%	*-4.4%;+3.1%*	97.70%	*±3.6%*	96.18%	*±4.7%*	7.683	9.933	0.097	1.016
Flathead	575	553	87.75%	*-1.6%;+1.3%*	87.00%	*±1.0%*	83.88%	*±1.7%*	10.650	13.359	0.116	1.037
Gallatin	575	555	100.56%	*-0.8%;+1.0%*	100.36%	*±0.8%*	98.05%	*±1.4%*	7.971	10.118	0.102	1.024
Hill	62	56	99.51%	*-4.9%;+2.2%*	98.34%	*±3.1%*	97.27%	*±2.9%*	8.988	11.663	0.115	1.011
Jefferson	47	43	96.40%	*-6.3%;+6.1%*	93.18%	*±5.0%*	93.29%	*±4.1%*	12.606	17.507	0.163	0.999
Lake	112	97	92.92%	*-2.1%;+3.7%*	94.61%	*±2.8%*	92.25%	*±2.6%*	10.960	14.831	0.140	1.026
Lewis And Clark	313	289	99.08%	*-1.1%;+0.9%*	98.66%	*±1.1%*	97.83%	*±1.1%*	7.586	9.858	0.097	1.009
Lincoln	85	81	87.00%	*-3.8%;+6.7%*	89.12%	*±3.8%*	85.22%	*±3.5%*	15.610	19.258	0.172	1.046
Madison	119	112	93.37%	*-4.4%;+4.6%*	93.30%	*±3.0%*	86.36%	*±6.3%*	13.799	17.229	0.161	1.080
Missoula	385	373	90.37%	*-1.7%;+1.4%*	89.82%	*±1.1%*	89.48%	*±1.2%*	9.959	12.479	0.112	1.004
Park	107	93	96.57%	*-2.2%;+1.0%*	95.62%	*±1.6%*	95.70%	*±1.9%*	6.229	8.349	0.080	0.999
Ravalli	217	212	91.94%	*-2.9%;+1.8%*	90.76%	*±1.6%*	88.50%	*±1.7%*	10.577	13.271	0.120	1.026
Richland	35	32	100.16%	*-10.6%;+3.3%*	97.42%	*±4.0%*	97.40%	*±3.6%*	9.212	11.529	0.112	1.000
Sanders	37	35	93.45%	*-6.9%;+6.9%*	93.81%	*±5.1%*	91.24%	*±4.3%*	12.309	15.744	0.148	1.028
Silver Bow	147	133	99.93%	*-2.6%;+1.2%*	100.04%	*±2.2%*	98.17%	*±2.9%*	9.860	12.838	0.128	1.019
Stillwater	48	45	96.67%	*-4.0%;+2.7%*	96.27%	*±3.1%*	95.24%	*±3.8%*	8.209	10.709	0.103	1.011
Yellowstone	759	714	95.78%	*-0.8%;+0.8%*	95.74%	*±0.7%*	94.61%	*±0.8%*	7.756	9.862	0.094	1.012
State Wide Total	4,683	4,375	95.42%	*-0.5%;+0.5%*	94.76%	*±0.4%*	92.01%	*±1.3%*	10.149	13.009	0.123	1.030

The level of assessment was calculated for each of these counties. All counties except for Flathead County and Lincoln County have median assessment levels that fall within the IAAO recommended range of 90%-110% (Gloudemans, 1999). For Lincoln County, the confidence intervals indicate we cannot say an acceptable measure would be statistically different form the values observed in this analysis. In Flathead County, continued appreciation after the lien date is likely the reason for the lower median ratio. The COD is just slightly above the IAAO recommendation of 15 in Dawson and Lincoln County. Dawson, Flathead, Lincoln, and Madison Counties have PRD above the IAAO recommendation of 0.98 to 1.03; though the PRD calculation can be skewed upwards in areas with the widely varying sale prices in these counties. 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 14 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	94	92	101.46%	*-1.9%;+1.9%*	101.12%	*±1.4%*	100.82%	*±1.3%*	5.195	6.452	0.065	1.003
Billings	603	573	96.26%	*-0.9%;+0.8%*	96.55%	*±0.7%*	95.72%	*±0.8%*	7.275	9.228	0.089	1.009
Bozeman	225	225	101.92%	*-2.0%;+1.9%*	101.46%	*±1.3%*	99.79%	*±1.5%*	8.079	10.086	0.102	1.017
Glendive	33	30	97.21%	*-12.0%;+7.6%*	96.68%	*±7.2%*	95.37%	*±6.3%*	15.298	19.937	0.193	1.014
Great Falls	292	276	98.52%	*-1.1%;+2.0%*	99.55%	*±1.2%*	98.79%	*±1.2%*	8.286	10.565	0.105	1.008
Hamilton	42	42	100.38%	*-3.5%;+2.3%*	100.32%	*±3.1%*	99.27%	*±3.2%*	7.428	9.847	0.099	1.011
Havre	45	43	99.24%	*-4.6%;+2.6%*	99.53%	*±3.2%*	98.49%	*±3.0%*	8.232	10.480	0.104	1.011
Helena	121	117	98.90%	*-1.9%;+1.5%*	97.86%	*±1.9%*	96.91%	*±1.8%*	8.006	10.455	0.102	1.010
Kalispell	163	158	88.36%	*-2.9%;+2.0%*	88.11%	*±1.7%*	87.33%	*±1.7%*	9.638	12.101	0.107	1.009
Livingston	83	71	96.32%	*-2.4%;+1.5%*	95.55%	*±1.6%*	95.35%	*±1.9%*	5.439	7.001	0.067	1.002
Miles City	38	37	93.97%	*-6.0%;+7.9%*	97.92%	*±4.6%*	96.57%	*±4.1%*	11.443	14.116	0.138	1.014
Missoula	245	240	89.34%	*-1.9%;+2.0%*	89.16%	*±1.4%*	88.68%	*±1.5%*	9.971	12.252	0.109	1.005
Red Lodge	33	30	95.05%	*-6.1%;+2.9%*	94.51%	*±3.6%*	94.50%	*±3.5%*	8.092	10.263	0.097	1.000
Whitefish	97	97	87.19%	*-3.8%;+4.3%*	87.53%	*±3.1%*	81.83%	*±4.7%*	13.660	17.303	0.151	1.070
State Wide Total	4,683	4,375	95.42%	*-0.5%;+0.5%*	94.76%	*±0.4%*	92.01%	*±1.3%*	10.149	13.009	0.123	1.030

All areas have median ratios in the recommended range (i.e. between 90 percent and 110 percent) (Gloudemans, 1999) except Kalispell, Missoula, and Whitefish; however the confidence intervals for these cities indicate we cannot say an acceptable measure would be statistically different form the values observed in this analysis. The COD values are also all within the IAAO recommended range of 5-15 except in Glendive, 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) except for the city of Whitefish, which is likely influenced by a wide variety of sale prices.

Valuation Method-Residential

As an additional check on the quality of the 2023 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

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
Market	4,237	4,001	95.69%	*-0.4%;+0.5%*	95.20%	*±0.4%*	93.04%	*±1.0%*	9.678	12.345	0.118	1.023
Cost	431	410	86.92%	*-3.3%;+2.7%*	85.06%	*±2.1%*	83.89%	*±2.8%*	20.244	25.997	0.221	1.014
State Wide Total	4,683	4,375	95.42%	*-0.5%;+0.5%*	94.76%	*±0.4%*	92.01%	*±1.3%*	10.149	13.009	0.123	1.030

As the table shows, the market valuation method meets IAAO standards. The median appraisal level of 86.9 percent for the cost valuation method indicates that properties valued using the cost approach are typically underappraised. The cost approach COD is also 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). Both valuation methods have acceptable PRDs, indicating that there is not an abnormal level of regressivity as a result of the valuation method.

Conclusion-Residential

Based on widely recognized norms and standards, the 2023 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 95.42 percent is within 4.58 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 10.149 is within the accepted range of 5.0 to 15.0, with the lower number reflecting greater accuracy. The PRD of 1.030 is also between the IAAO recommended 0.980 and 1.030 standard (International Association of Assessing Officers, 2013).

2023 Appraisal-Commercial

Similar to residential properties, the Department of Revenue must provide assurance that the reason for increases or decrease 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 assessment level and uniformity for commercial and residential property (International Association of Assessing Officers, 2013).

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 850 commercial properties sold from December 1, 2021 to June 30th, 2022 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).

Observations that had a sales ratio outside 1.5 times the inter-quartile ranges from the 25th and 75th percentile were dropped in any sales ratio calculation. This trimming of sales is standard in these types of studies (International Association of Assessing Officers, 2013). As with the residential sales, the 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 (Gloudemans, 1999):

- 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. However, the data in the sample was extracted before most informal reviews were submitted. Therefore, these reviews should not affect the overall quality of reappraisal this report is trying to determine.

Commercial Results
Statewide Commercial Analysis

The following table displays a summary of the ratio statistics using the 2023 appraisal values.

Commercial Ratio Statistics
Sales[1] Relative to TY 2023 Values

Number of Sales	Values
Total Observations	**850**
Used Observations	**776**
Measurement of Appraisal Levels	
Upper Bound Confidence Interval	*93.75%*
Median Ratio	**92.58%**
Lower Bound Confidence Interval	*91.36%*
Upper Bound Confidence Interval	*92.52%*
Mean Ratio	**91.37%**
Lower Bound Confidence Interval	*90.21%*
Upper Bound Confidence Interval	*90.63%*
Weighted Mean	**87.80%**
Lower Bound Confidence Interval	*84.97%*
Measurement of Appraisal Uniformity	
Coefficient of Dispersion	**13.686**
Coefficient of Variation	**17.972**
Standard Deviation	**0.164**
Price Related Differentials	**1.041**
Range (1.5x Inter Quartile Range)	
Maximum Ratio in the Sample	**134.80%**
Minimum Ratio in the Sample	**47.88%**

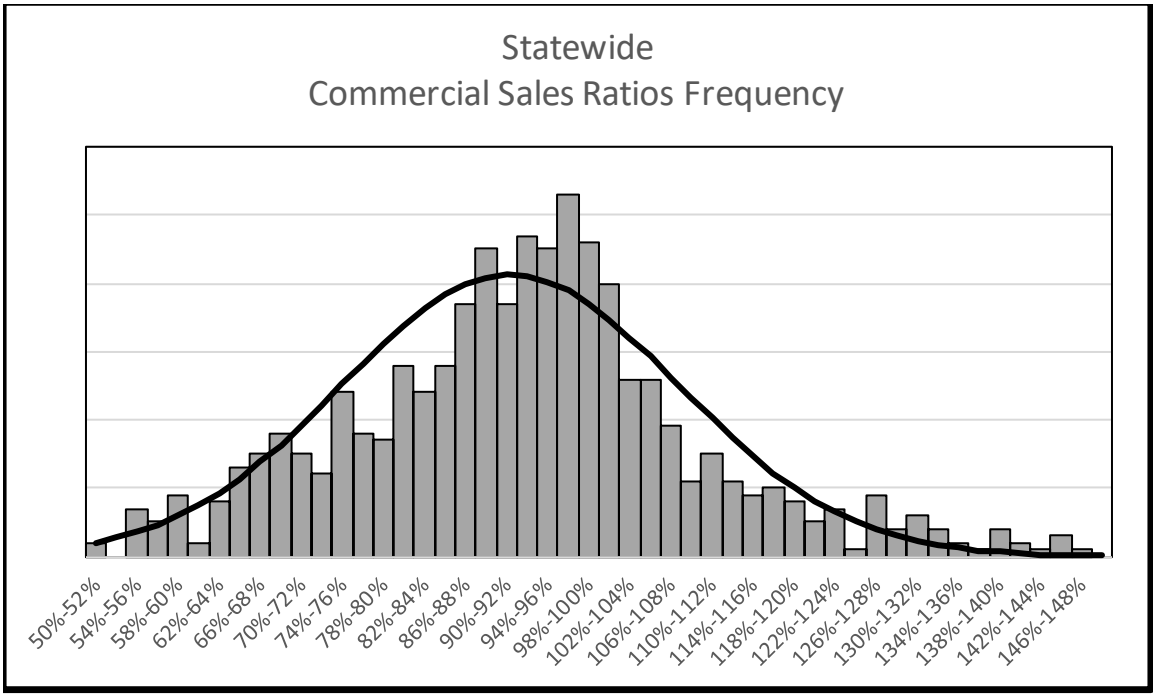
[1]Sales from 12/1/2021 to 6/30/2022

The statewide overall level of assessment, as measured by the median sales ratio, is 92.58 percent. The mean sales ratio for commercial properties in 2023 was 91.37 percent while the weighted mean sales ratio was 87.80 percent. Although all three measures are less than 100 percent by a statistically significant margin, the median and mean are within the IAAO standard of being within 10 percent of the target of 100 percent (International Association of Assessing Officers, 2013). The weighted mean is below the IAAO standard of 90 to 110 percent; however, the confidence intervals for this statistic show that we cannot say there is a statistical difference between this value and a value that would be within the standards set by IAAO.

The measures of uniformity show that the coefficient of dispersion is also with in the acceptable IAAO range of 5 to 20, indicating the 2023 appraisal had good uniformity for commercial properties (International Association of Assessing Officers, 2013). The price related differential is 1.041, which is slightly above the IAAO standard of 0.98 to 1.03. 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 my not be as important as in the case of residential properties (International Association of Assessing Officers, 2013). An additional measure of vertical equity is the coefficient of price-related bias (PRB). For the commercial sales in the sample, the PRB did not show evidence of vertical inequity, and therefore the single PRD slightly higher than 1.03 for commercial sales is likely not concerning (International Association of Assessing Officers, 2013).

The following graph shows the distribution of assessment ratios in the sample. Ideally, the distribution would show a tight, symmetrical distribution centered around 1.0. Because the commercial properties have more variation, and there are fewer overall sales, the distribution of commercial ratios is not as smooth relative to the distribution of the residential ratios. However, as the graph shows, the distribution of sales ratios may not be perfectly normal, but it also does not appear to be dramatically different from a normal distribution.

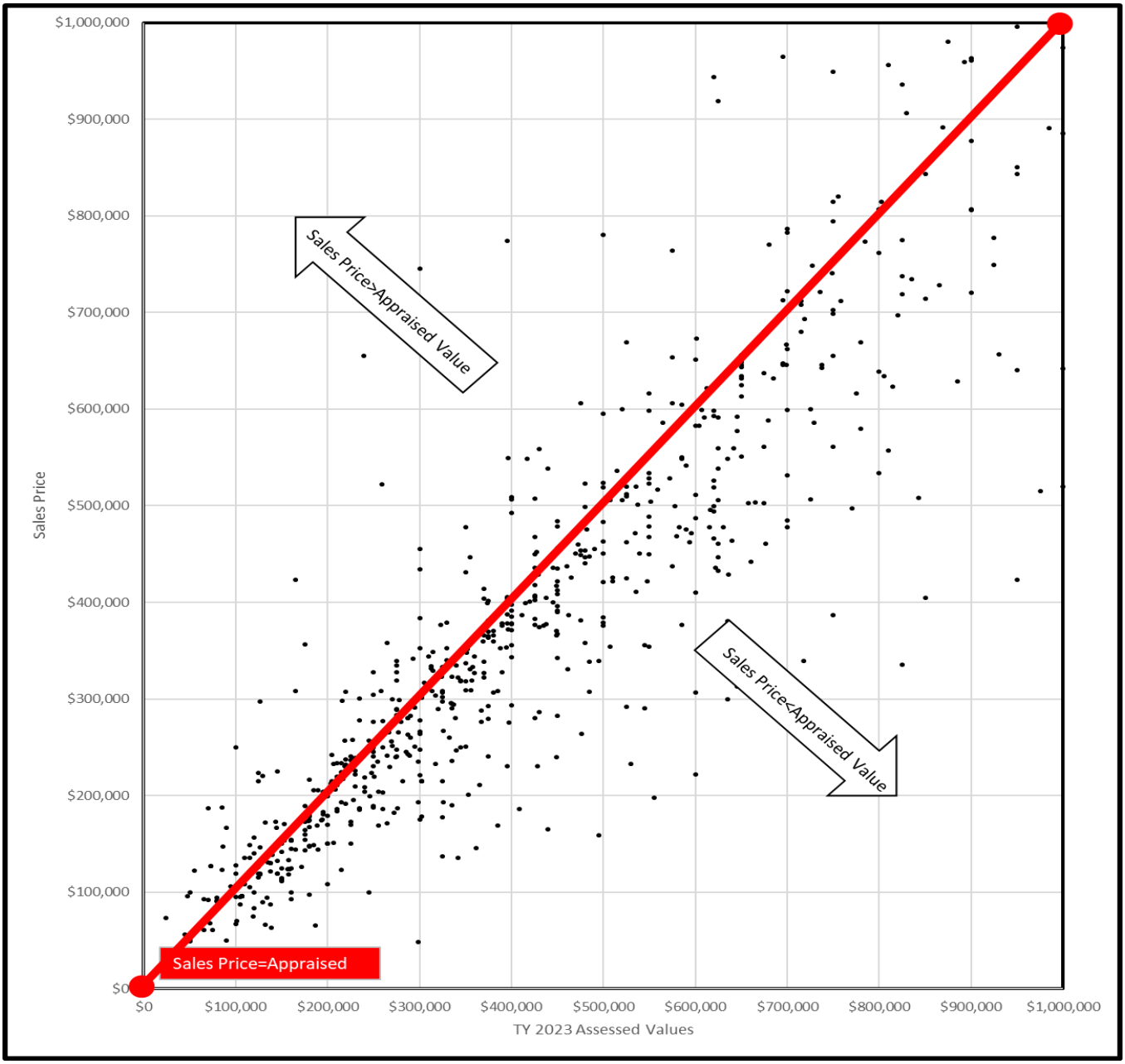
Figure 4: Commercial Sales Ratio Histogram



The following graph 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.

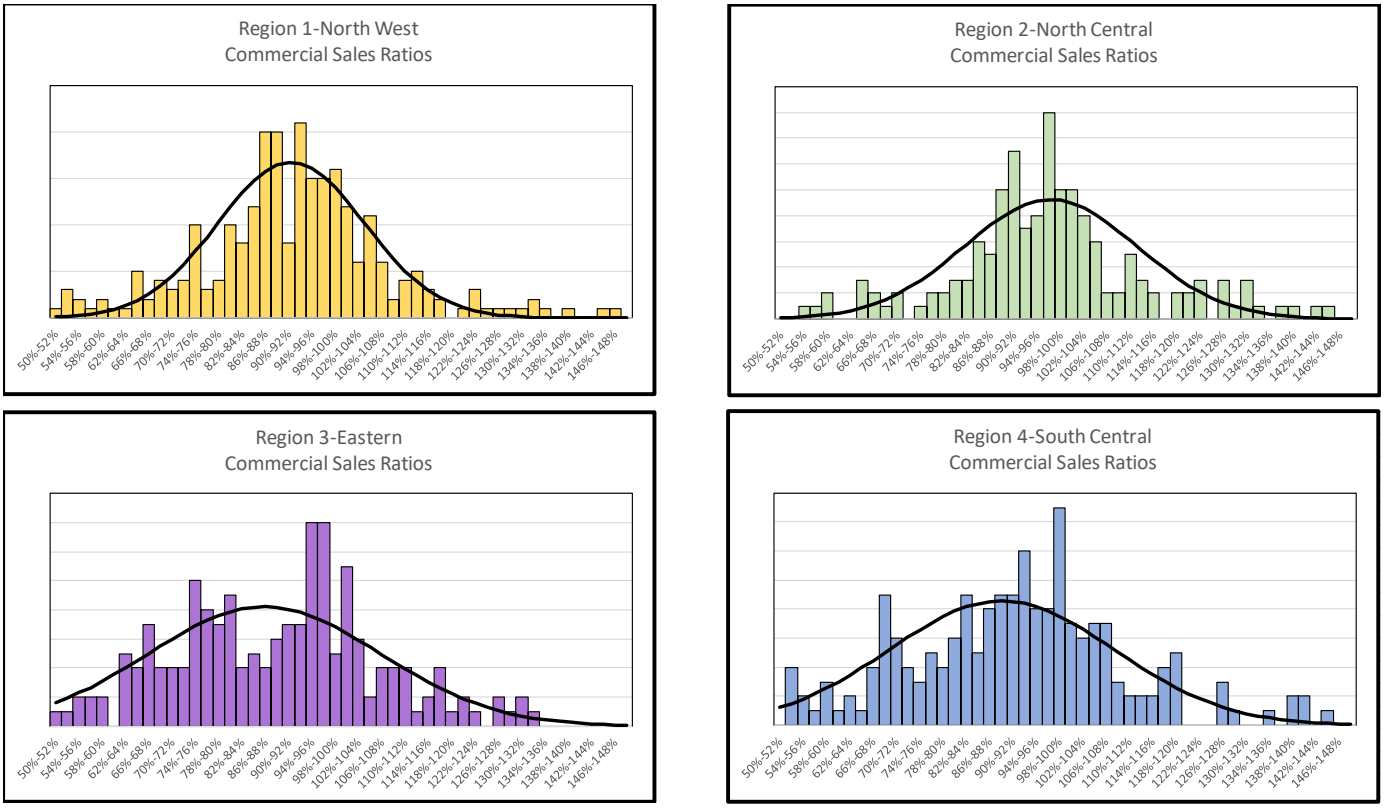
Commercial Sales Ratio Statistics by Management Region

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	265	239	92.33%	*-2.6%;+1.4%*	91.44%	*±1.6%*	89.51%	*±3.1%*	10.622	13.791	0.126	1.022
2-North Central	172	149	96.64%	*-2.3%;+1.9%*	97.31%	*±2.4%*	93.63%	*±4.6%*	11.239	15.256	0.148	1.039
3-Eastern	205	194	89.62%	*-6.3%;+4.1%*	86.85%	*±2.8%*	80.49%	*±8.1%*	17.841	22.903	0.199	1.079
4-South Central	208	197	91.64%	*-3.7%;+2.1%*	89.13%	*±2.7%*	85.94%	*±3.1%*	16.410	21.719	0.194	1.037
State Wide Total	850	776	92.58%	*-1.2%;+1.2%*	91.37%	*±1.2%*	87.80%	*±2.8%*	13.686	17.972	0.164	1.041

As the table shows, almost all the median ratios measuring the appraisal level are all within the IAAO standards of 90% to 110% (Gloudemans, 1999). The one possible exception to this would be the median ratio for region 3 in eastern Montana. However, the confidence intervals for this statistic show that we cannot say there is a statistical difference between this value and a value that would be within the standards set by IAAO (DeGrouot & Schervish, 2002). The COD values are in the acceptable range of 5 to 20 in all four regions. Regions 2, 3, and 4 have PRDs outside the IAAO recommendation of 0.98 to 1.03, indicating there could be some regressivity in these areas. 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 my not be as important as in the case of residential properties (International Association of Assessing Officers, 2013).

The following graphs show 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. Region 3 appears less normal relative to the others; this is likely a byproduct of the larger variation in commercial property in that area, especially in the rural areas of the region.

County Analysis-Commercial

There were eight counties with at least 30 valid sales between December 1, 2021 and June 30, 2022. 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
Cascade	64	57	98.56%	*-2.7%;+1.6%*	98.19%	*±3.1%*	94.12%	*±6.7%*	8.879	11.935	0.117	1.043
Flathead	80	71	90.82%	*-1.1%;+5.0%*	93.17%	*±2.2%*	92.69%	*±5.7%*	8.249	10.133	0.094	1.005
Gallatin	96	89	87.69%	*-5.7%;+4.2%*	86.04%	*±4.1%*	85.12%	*±3.7%*	17.561	22.533	0.194	1.011
Lewis And Clark	46	39	94.57%	*-3.2%;+2.7%*	93.97%	*±3.1%*	92.20%	*±8.9%*	7.514	10.099	0.095	1.019
Missoula	85	80	86.86%	*-5.7%;+5.3%*	86.55%	*±3.7%*	85.29%	*±4.8%*	15.413	19.355	0.168	1.015
Ravalli	44	38	94.95%	*-5.4%;+1.4%*	94.26%	*±2.4%*	92.59%	*±2.8%*	6.006	7.656	0.072	1.018
Silver Bow	44	40	97.09%	*-3.6%;+2.9%*	97.46%	*±2.9%*	96.46%	*±2.2%*	7.231	9.362	0.091	1.010
Yellowstone	110	105	91.81%	*-5.7%;+2.8%*	88.75%	*±2.7%*	80.71%	*±10.4%*	12.359	15.737	0.140	1.100
State Wide Total	850	776	92.58%	*-1.2%;+1.2%*	91.37%	*±1.2%*	87.80%	*±2.8%*	13.686	17.972	0.164	1.041

The level of assessment was calculated for each of these counties. Six of the eight displayed counties have assessment levels (medians) within the recommended range of 90%-110% (Gloudemans, 1999). The two counties outside of this range are Gallatin County and Missoula County; although the confidence intervals indicate we cannot say an acceptable measure would be statistically different form 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 within the IAAO recommendation 0.98 to 1.03 except for Cascade and Yellowstone Counties. PRD is sensitive to extreme values and higher priced properties and higher valued PRD shouldn't be of as much concern for commercial properties (International Association of Assessing Officers, 2013).

Valuation Method-Commercial

As a final check on the quality of the 2023 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	681	630	92.37%	*-1.7%;+1.3%*	91.02%	*±1.2%*	87.05%	*±3.1%*	13.177	17.386	0.158	1.046
Cost	169	152	93.80%	*-3.2%;+2.6%*	91.69%	*±3.4%*	90.27%	*±5.1%*	17.466	23.373	0.214	1.016
State Wide Total	850	776	92.58%	*-1.2%;+1.2%*	91.37%	*±1.2%*	87.80%	*±2.8%*	13.686	17.972	0.164	1.041

The median appraisal levels and COD are within the standards set by IAAO for both commercial approaches to value (International Association of Assessing Officers, 2013). The PRD for the income approach is outside the IAAO recommended range of 0.98 to 1.03; however the PRB, an additional measure of vertical equity, did not show evidence of vertical inequity, so the PRD slightly higher than 1.03 for commercial properties valued using the income approach is likely not concerning (International Association of Assessing Officers, 2013).

Conclusion-Commercial

Based on widely recognized norms and standards, the 2023 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 (International Association of Assessing Officers, 2013). The median sample assessment level of 97.45 percent is within three percent of market value.

The reappraisal also meets uniformity standards, as evidenced by the coefficients of dispersion. The statewide COD of 13.7 is within the recommended range of 5.0 to 20.0 (International Association of Assessing Officers, 2013). The statewide PRD of 1.041 is slightly outside the IAAO recommended limit of 1.03, indicating the possibility of some appraisal regressivity, but most likely the result of a small sample size and less important in commercial sales ratio analysis relative to residential studies (International Association of Assessing Officers, 2013).

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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