A Review of the Quality of the 2016 Blair County Property Reassessment

Study Conducted by
Alan S. Dornfest, AAS

Final Ratio Study Results and Conclusions

July 5, 2016
The goal of this project has been to review the proposed new 2016 assessed values developed for properties throughout Blair County with respect to objective tests of the quality of the reassessment. The review is designed specifically to make observations regarding whether the results of the reassessment conform to nationally recognized standards used to test the quality of such programs. The primary materials used are the Standards and Textbooks of the International Association of Assessing Officers (IAAO), the largest and most recognized professional association for assessors in the United States. IAAO Standards are intended to reflect best practices and are a consensus of professional opinion. They do not have the force of law, so if state statutes conflict, state law prevails in terms of providing direction.

The review reflected in this report consists primarily of a comparison between national standards and statistical analysis of the mathematical ratios between assessed values and sale prices for properties sold during the three year period beginning January 1, 2013 and ending December 31, 2015 in Blair County. Ratio studies conducted in this matter are universally used for this purpose when market value is the goal, the achievement of which is to be tested and confirmed. In addition, assessed value changes on both selling and non-selling properties (or those with older sales activity) and other aspects of the underlying property data were reviewed to confirm, to the extent practical, that the ratio study results are representative of the underlying population of all properties in the categories studied. Among other factors, I independently determined time adjustments so that sale prices reflect probable price as of the January 1, 2016 assessment date. In addition to sales noted as valid, sales invalidated by appraisers for reasons related to assessment model building, rather than specific factors related to the sales, were included initially. To avoid potential distortions, and in keeping with IAAO guidance, ratio outlier trimming processes were then employed. I did not personally investigate or attempt to verify any sale, but relied on the data submitted to me by Evaluator Services and Technology, Inc. (EST), the reassessment contractor. This report was requested by and is performed on behalf of Blair County.

In addition to doing ratio studies using the new assessed values, comparative studies were performed using the original 1958 base year assessed values. These are submitted to analyze the equity of assessed values as they existed prior to the reassessment and to determine if the new assessments substantially improve underlying level and uniformity, thereby enhancing taxpayer equity. Similar analytic procedures have been employed and the sales data base is the same, except that a somewhat different set of outliers to be trimmed often was identified because of the different distribution of ratios; this in turn lead to somewhat different numbers of sales in the studies based on original vs. those based on proposed new assessments.

Conclusions

My major conclusion is that, to the extent measurable by ratio studies based on the available assessment and sales information provided to me, the current reassessment meets the goal of establishing current (2016) market value as the level of assessment on an overall basis for properties throughout Blair County. This does not mean that every assessment necessarily is market value, as ratio study results are statistical in nature and provide measurements that apply to groups of properties rather than individual
properties. However, it does mean that the overall quality standards for assessment level, as measured by the available sales, have been achieved. In addition, assessment equity, in terms of disparity between categories has generally been improved, with original assessments showing up to a 9 fold (900%) disparity between median levels of the different categories, while post-reassessment results show no more than 1% difference between category medians. In other words, there are much smaller differences in level of assessment between properties in different categories than was true with the original assessments. The new assessments meet IAAO standards for level of assessment in each category tested and overall.

Uniformity within categories measures the variability between the ratios, with lower variability indicating better uniformity and being preferred. There are two types of uniformity measures – between properties in general (horizontal equity) and between high and low priced properties (vertical equity).

In comparison to uniformity measures using original 1958 base year assessments, at the category level, general (horizontal) uniformity as measured by the Coefficient of Dispersion (COD) is much better for each category. Using 1958 base year assessments, no category meets general uniformity standards. In contrast, each category meets uniformity standards using new assessments.

The second type of uniformity, vertical equity, is also substantially improved given the new assessments, with only the Vacant lots over 10 acres category (V) failing by a slight margin using one statistical measure that is not corroborated with alternate, more precise statistics. Using the original 1958 base year assessments, Commercial / Industrial (C/I), Agricultural (A), Vacant lots over 10 acres (V), and Land (vacant lots under 10 acres) (L) categories all fail vertical equity standards; all but the Agricultural category by large margins.

There are two remaining issues, both of which are related to verifying that ratio analysis on sales is likely to be representative of the underlying population of all properties in the tested categories:

1. Many of the final analysis results on the new assessments show extremely good general uniformity. These extremely good results are called to the analyst’s attention by use of the term “questionable” on the statistical reports. This is because the results may indicate admirable performance in terms of the reassessment, but are highly unusual and call for additional tests to determine whether sales samples truly represent underlying populations. One of the main verification tests is to review proposed new assessments on all properties (not just the sales). I did that and am satisfied that adjustments have quite properly been applied broadly.

Additional sales occurring after January 1, 2016 corroborate findings regarding assessment level overall and for each category. However, analysis of just these newer 2016 sales shows slightly worse uniformity. Regardless, even using this more limited sample of newer sales, for all categories except vacant lots under 10 acres (L), uniformity is still well within standard. Even in this category (L), and again, using only the limited sample consisting exclusively of 2016 sales, general uniformity cannot be proven to be out of compliance and is much improved in comparison to uniformity given the original base year assessments. If based exclusively on the small number of available valid post January 1, 2016 sales, vertical equity in category L appears to be below standard, indicating a possibility that low priced properties are somewhat undervalued with respect to high priced properties in this category.
This could also mean that the reassessment process has recognized market trends through December 31, 2015, but that a new trend, at least for this category (L) has emerged since that date. Only limited conclusions are possible, given the short additional time frame and small number of sales. Therefore, I stand by my general conclusion that general uniformity achieved by the reassessment is well within IAAO standards, even if the uniformity in the underlying population of properties being reassessed (not just those with recent valid sales) may not be quite as extremely good as shown by the sales in the main analysis.

2. In reviewing assessed value changes on the three years of sales used in the analysis and on the population of all other properties subject to reassessment, I found that the assessed values on the recent (last three years) sales increased somewhat less than did the assessed values on the general population of all parcels subject to reassessment. The main reason for this review was to determine if adjustments to recent sales exceeded those to the general population. That was not the case, but, had it been, it could have seriously compromised the representativeness of the samples.
A Review of the Quality of the 2016 Blair County Property Reassessment – Preliminary Ratio Study Results

Introduction

The goal of this project is to review the proposed new 2016 assessed values developed for properties throughout Blair County with respect to objective tests of the quality of the reassessment. The review is designed specifically to make observations regarding whether the results of the reassessment conform to nationally recognized standards used to test the quality of such programs. The primary materials used are the Standards and Textbooks of the International Association of Assessing Officers (IAAO), the largest and most recognized professional association for assessors in the United States.

The primary means for establishing the underlying equity in the assessments is by a statistical comparison of assessed values and sale prices. This comparison is known as a ratio study, the basis for which is the mathematical ratio between each assessed value and that property’s corresponding sale price, provided timely sales have taken place and provided that the sale is considered an “arm’s length transaction” in which the selling price is expected to reflect the market value of the real property. Such studies are the pre-eminent tools of the trade to be used in evaluating the quality and equity achieved by any assessment of large numbers of properties for which adequate and representative sales data is available. For this project, ratio studies were reviewed for several categories of property throughout Blair County.

In order to use ratio studies to evaluate assessment performance, it is important to review and understand the representativeness of the sales used in the study. To the extent that ratio studies are based on arm’s length transactions in which physical characteristics have not changed dramatically since the sale, such studies should provide valid indicators of the quality of the reassessment. Representativeness also requires that the appraisal or reassessment methods used are consistent between selling and non-selling parcels. For this reason, a secondary goal is to verify the validity of the ratio study used to test the 2016 assessments by determining whether assessments on selling and non-selling parcels were determined independently or whether possible distortion due to “sales chasing” exists. Finally, to the extent practical, an additional ratio study has been conducted using otherwise valid sales occurring subsequent to the assessment date and not used in developing the appraisal models. Although limited, these sales add a corroborative element to the analysis.

All statistical measures and sales chasing tests used in this study are based on the IAAO 2013 Standard on Ratio Studies, the most current edition available at the time of this report. Throughout this report, the terms “reassessment” and “reappraisal” are used interchangeably.

Scope of Project

To accomplish this project, it has been necessary to analyze changes in assessments on selling and non-selling parcels throughout Blair County. In addition to reviewing the new assessments, I reviewed the pre-existing (base year 1958) assessments to determine whether selling and non-selling parcels were treated similarly in the reassessment. I also reviewed ratio studies prepared using the same sales data base, but with statistics based alternately on original (pre-reassessment) assessed values and new (post-reassessment) assessed values. This is an important step in evaluating whether the reassessment
produced better equity and results more in compliance with IAAO standards. Accordingly, the appraisal company provided the following information:

1) Real property sales occurring between 2013 and December, 2015 by category for the following categories of property in Blair County:
   i) (A) Agricultural – generally 10 acres or more with residential buildings present;
   ii) (C / I) Commercial and Industrial;
   iii) (L) Vacant lots under 10 acres in size;
   iv) (V) Vacant lots over 10 acres in size;
   v) (R) Residential.

2) Listings of both selling and non-selling property parcels from throughout the county. These listings included the original assessments and post-reassessment proposed market values for 2016. Except as provided in Appendix A3 (January, 2016 through May 31, 2016 sales), assessed values of sales occurring after December 31, 2015 were not used.

3) Validity codes, counts, and explanations for the sales considered invalid for ratio study purposes (ie: not arm’s length, market value indicators).

4) It should be noted that data files that were reviewed have been summarized in various tables and discussions throughout this report. In many cases representative examples of analyses have been reproduced and are provided in appendices for illustration. However, the universe of all actual files that I received has not been included.

In reviewing the data, I discussed information needs with and received data, explanations, and assistance from Tim Barr with EST.

Analysis consisted of the following:

1.) Compare assessment changes for non-selling property against changes indicated on selling parcels. This was done to check for sales chasing, a situation in which non-selling parcels have far lower assessment adjustments than selling parcels.

2.) Calculate and review ratio study results for valid sales in each category. Results are shown in Appendix A1 using original base year assessments and Appendix A2 using new assessments that reflect January 1, 2016 market value. In addition, sales not clearly invalid, but with alternate, atypical validation codes, were reviewed to help further corroborate results based on sales used directly in developing the reassessment model.

3.) Analysis was conducted for each indicated grouping, provided that there were at least 5 usable valid sales following application of trimming procedures. Trimming generally followed the recommendations in the IAAO *Standard on Ratio Studies* and relied on 1.5 or 3 times the interquartile range (IQR). The application of the trim resulted in elimination of more than 10% of the sales sample in only in one case, the Agricultural category (A), in which a very small sample of 15 was available. In this case, two outliers were removed; this amount of adjustment is permitted by the IAAO *Standard* “…in the most extreme cases…” and was considered applicable in this sample.

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4.) Compare results on ratio studies to quality indicators in the IAAO *Standard on Ratio Studies* and other recognized assessment literature and provide a general analysis of assessment conditions as indicated by the ratio studies. Much descriptive and explanatory material on the meaning of ratio study statistics has been extracted from professional sources and is provided in Appendix B to illustrate the principles discussed.

5.) Review before and after results using original 1958 base year, as well as proposed 2016, assessed values. This report is based on proposed new assessments established as of June 22, 2016 and does not purport to reflect any changes subsequent to that date. The author’s understanding is that this data reflects the assessed values shown on the notices mailed on or before July 1, 2016.

**Inherent Assumptions**

To facilitate analysis, I am assuming the following:

1.) With the exception of sales eliminated appropriately as invalid or probably non-market value type transactions, all timely sales (1,761 were retained and analyzed in the main study and 247 were analyzed in the post 1/1/2016 study) in the categories being studied have been included as provided by EST, with the following exceptions and notes:

- 4 sales originally marked valid were eliminated after I requested additional review by EST; this reflected determinations that these sales should have been considered invalid.
- 108 sales considered invalid by EST in developing its appraisal models, but otherwise meeting validation criteria, were included.
- Sales with prices of $1,000 or less were excluded.
- Sales occurring prior to January 1, 2013 were excluded.

2.) The database of non-selling parcels is complete.

3.) Valuation information provided are accurate and complete.

4.) The goal of the reassessment was to have all properties’ assessed values as close to January 1, 2016 market value as possible. No attempt has been made to adjust for or further analyze properties for which market value may not have been sought. (Many states employ use value and other specialized valuation techniques for a variety of property categories, including agricultural and timber land. In these cases, resulting assessed values are not designed to be market value and can not be tested using traditional ratio studies. It is my understanding that this is not a consideration with regard to any of the properties subject to this review.)

**Analysis and Findings**

**Background**

Pennsylvania is one of only six to eight states without a statutorily specified reappraisal cycle. Some discrepancies exist, for instance, some states annually reassess public utilities and railroads at the state level, but have no such requirement for locally assessed properties of the type being reassessed in Blair County. See: Dornfest, Alan S., Steve Van Sant, Rick Anderson, and Ronald Brown. *State and Provincial Property Tax Policies and Administrative*
of assessed values and sale prices on similarly situated properties in 18 of Pennsylvania’s 67 counties, none of which had conducted comprehensive reassessments for at least the past 20 years. Similarly, Blair County, Pennsylvania, had not previously reappraised since 1958 and prior values reflected that level of assessment. My understanding is that the goal of this reappraisal is to assess properties at market value as of January 1, 2016.

Determining whether market value has been achieved

The primary tool in use throughout the assessment profession for determining whether groups of properties have been assessed at market value is the ratio study. For such a study, sales of arm’s length transactions for which sale prices are deemed to reflect market value are compared with (have sale prices divided into) assessed values. The resulting mathematical ratio is subjected to statistical analysis and the results of that analysis may be compared with national or state standards as an objective means for evaluating the quality of any reappraisal. Because assessments are intended to reflect market value as of a particular date, while sales occur over a period of time, often it is necessary to adjust sale prices to properly reflect what the selling price would have been had the sale taken place on the assessment date. I reviewed the linear relationship between the ratios and time over the three year period from which sales were used for the main analysis and independently determined whether time adjustments were necessary on a case by case (category by category) basis. When linearity appeared to be skewed by unusual concentrations of high or low ratios toward the beginning or end of the sales period, time adjustments were not applied. Separate time adjustments were developed for each analysis, including those based on original assessments. An example of a time adjustment analysis graph is included in Appendix C. Actual time adjustments applied are found on each ratio study reported in Appendix A.

General findings and conclusions

Based on the ratio studies I conducted and the lack of any evidence of sales chasing (see section on representativeness), the current reassessment in Blair County achieved the goal of moving assessments to January 1, 2015 market value, as indicated by measures of assessment level, in every category tested and overall. Specific category results are shown in Table 1. Results also show uniformity statistics that meet IAAO quality standards for horizontal equity (as measured by the Coefficient of Dispersion (COD)). One category, Vacant lots over 10 acres (V), shows results that marginally fail to meet vertical equity standards, indicating the possibility of slightly lower assessments on higher value property in this category. Similarly, although not indicated in the general analysis, analysis of subsequent 2016 sales shows the possibility of slightly lower assessments on lower value property (the opposite case) for the Vacant lots under 10 acres (L) category. Both of these results are indicated by the PRD, an accepted but often distorted measuring statistic, especially suspect given the small sample sizes for both of these studies. The more technical PRB (also found in the IAAO Standard…) did not corroborate the existence of vertical inequity. Regardless, results show improved level of assessment and decreased differences in level of assessment between categories. Uniformity statistics are considerably better than those based on original (pre-reappraisal) assessments. Indicators used to develop this determination will


4 Note: Part 1, Section 9.2.7 of the IAAO Standard on Ratio Studies comments: “When samples are small…the PRD may not provide an accurate indication of assessment regressivity or progressivity. When relying on the PRD…it is good practice to perform an appropriate statistical test for price-related biases before concluding that they exist....”
be presented throughout this report, which will also provide general information derived from IAAO textbooks and standards to explain the nature and meaning of these indicators.

**Conclusion 1:** Overall and at the category level, results indicate that the new assessments satisfy the IAAO Standard for level of assessment, requiring level of assessment to be within ±10% of the goal (market value) and requiring each category to be assessed within ±5% of each other category. As recommended in the IAAO *Standard on Ratio Studies*, the median was the primary measure of level used for this determination. Neither of these criteria would be met if the original values were retained.

**Conclusion 2:** Both overall and at the category level, horizontal equity (general uniformity) standards have been met based on the proposed new assessments. Using original assessed values, no category meets typically recommended horizontal equity standards based on a COD of 20% or less.

**Conclusion 3:** Vertical equity standards based on the PRD were met everywhere except for the vacant lots over 10 acres (V) category based on a very small number of sales. Although subsequent 2016 sales show a questionable vertical equity result for the L category, this may be an indication of market direction since January 1, 2016 and therefore is not pertinent to a conclusion regarding equity as of January 1, 2016. Regardless, in both cases PRB guidelines were met and this statistic is considered less prone to false positives than the PRD.

**Conclusion 4:** Assessment equity, in terms of disparity of level of assessment between categories has generally improved, with original assessments showing a 9 fold (900%) disparity between median levels of the different categories, while post-reassessment results show no more than 1% difference between category medians, well within IAAO standards.

**Analysis and Specific Results**

I developed ratio study statistics for each category based primarily on sales occurring between January 1, 2013 and December 31, 2015, with sale prices time adjusted as necessary to reflect price as of January 1, 2016. Categories studied were:

1. (A) Agricultural property, usually with residential buildings;
2. (C / I) Commercial and Industrial property;
3. (V) Vacant lots over 10 acres;
4. (L) Lots under 10 acres;
5. (R) Residential property – generally with improvements.

In addition, I used sales previously found to be valid, but appraiser trimmed during the development of reassessment models, and performed before and after reassessment ratio studies for all property categories and overall. As indicated previously, level using proposed new assessments is acceptable in each case as is general (horizontal) uniformity. Table 1 shows summary level statistics, while Table 2 shows general uniformity statistics before and after reassessment for each category and overall. For level and uniformity, **bold** indicates results in relation to new assessments that may not be in compliance with IAAO Standards. However, there were no level results out of compliance. In the case of non-compliance based on PRB advisory standards, confidence intervals provided in detailed analysis in the appendices must be reviewed to draw conclusions. Confidence intervals around CODs should also be reviewed before drawing definitive conclusions about compliance with general (horizontal equity)
uniformity standards. However, there were no CODs that were out of compliance based on proposed new assessments, using either point estimates or confidence intervals. Very low CODs often are indicators of sales chasing; however, an examination of assessment changes on all parcels in the county eliminates that possibility, so notations of “questionable” CODs found on detailed statistical analysis reports should be disregarded. That is reflected by the comment “verified ok” found following the “questionable” notation on the statistical analysis pages found in Appendix A.

When PRBs were outside of a ±.05 range, these results were placed in **bold** to signify point estimates that appeared in questionable ranges. Such designation should be reviewed by observing whether confidence intervals around the PRB also fell outside this range. **Bold** emphasis was not used to designate original assessments that were questionable or did not meet standards, as this was the case for most original assessment based ratio study results.

Detailed statistical results and information about outlier trims used, including specific numbers of sales trimmed using statistical techniques can be found on detailed analysis reports found in Appendix A.

There were insufficient industrial property category sales to analyze this category separately. However, industrial property sales were included in the analysis of the commercial property category, so results are reported under the category heading “Commercial and Industrial” or “C / I.”

Table 1 – Level of Assessment Measured by the Sample Median

<table>
<thead>
<tr>
<th>Category</th>
<th>Area studied</th>
<th>Pre-reassessment Median (%)</th>
<th>Post-reassessment Median (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>All</td>
<td>8.89</td>
<td>100.26</td>
</tr>
<tr>
<td>All</td>
<td>All – Post 1/1/2016 sales</td>
<td>8.88</td>
<td>100.57</td>
</tr>
<tr>
<td>Residential (R)</td>
<td>All</td>
<td>8.95</td>
<td>100.28</td>
</tr>
<tr>
<td>Commercial and Industrial (C / I)</td>
<td>All</td>
<td>10.13</td>
<td>99.81</td>
</tr>
<tr>
<td>Agricultural (A)</td>
<td>All</td>
<td>5.19</td>
<td>99.72</td>
</tr>
<tr>
<td>Vacant (V)</td>
<td>All</td>
<td>1.12</td>
<td>99.77</td>
</tr>
<tr>
<td>Land (L)</td>
<td>All</td>
<td>3.25</td>
<td>99.47</td>
</tr>
</tbody>
</table>

Table 2 - Uniformity of Assessments

<table>
<thead>
<tr>
<th>Category</th>
<th>Area studied</th>
<th>Pre-reassessment COD (%)</th>
<th>Post-reassessment COD (%)</th>
<th>Pre-reassessment PRD / PRB</th>
<th>Post-reassessment PRD/PRB</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>All</td>
<td>25.39</td>
<td>4.10</td>
<td>1.02/.078</td>
<td>1.01/- .004</td>
</tr>
<tr>
<td>All</td>
<td>All – Post 1/1/2016 sales</td>
<td>24.60</td>
<td>4.90</td>
<td>1.01/.083</td>
<td>1.00/- .007</td>
</tr>
<tr>
<td>Residential (R)</td>
<td>All</td>
<td>23.63</td>
<td>4.11</td>
<td>1.00/.086</td>
<td>1.00/- .006</td>
</tr>
</tbody>
</table>

Note: Although the median confidence interval, not the sample median should be used for determining compliance with standards, sample medians between 90% and 110% will invariably be in compliance. In these cases, the confidence interval is more useful in determining whether any groupings vary by more than 5%.
Table 2 (continued)

<table>
<thead>
<tr>
<th>Category</th>
<th>Area studied</th>
<th>Pre-reassessment COD (%)</th>
<th>Post-reassessment COD (%)</th>
<th>Pre-reassessment PRD / PRB</th>
<th>Post-reassessment PRD/PRB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial and Industrial (C/I)</td>
<td>All</td>
<td>43.94</td>
<td>2.31</td>
<td>1.12/.061</td>
<td>1.01/.0001</td>
</tr>
<tr>
<td>Agricultural (A)</td>
<td>All</td>
<td>39.47</td>
<td>6.20</td>
<td>1.04/.183</td>
<td>1.02/-0.026</td>
</tr>
<tr>
<td>Vacant (V)</td>
<td>All</td>
<td>53.02</td>
<td>7.71</td>
<td>1.12/.172</td>
<td><strong>1.05/.014</strong></td>
</tr>
<tr>
<td>Land (L)</td>
<td>All</td>
<td>79.79</td>
<td>7.86</td>
<td>1.12/.069</td>
<td>1.02/-0.009</td>
</tr>
</tbody>
</table>

Comments on Analytical Techniques

Representativeness

A major concern is developing ratio studies that are representative of the area or category being analyzed. Nominally this is achieved when types of property: “…appear with approximately the same relative frequency in both the sample and the population.”

This principle is further elaborated in the IAAO Standard on Ratio Studies, which comments:

“A ratio study sample is considered sufficiently representative for direct equalization and mass appraisal performance evaluation when the distribution of ratios of properties in the sample reflects the distribution of ratios of properties in the population.”

The Standard further comments:

“…representativeness is improved when the follow occur:

1. Appraisal procedures used to value the sample parcels are similar to procedures used to value the corresponding population
2. Accuracy of recorded property characteristics data for sold property does not differ substantially from that of unsold property,
3. Sample properties are not unduly concentrated in certain areas of types of property whose appraisal levels differ from the general level of appraisal in the population
4. Sales have been appropriately screened and validated….”

While I did not test the representativeness of the ratio study samples or independently validate any of the sales, I was assured that proper validation techniques were used. EST submitted a list of validation codes and numbers of sales found to be invalid under each code. The main reasons for invalidating sales are shown in Table 3 (following page):

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6 IAAO. *Property Appraisal and Assessment Administration.* P. 526. Chicago, IL. 1990
7 IAAO. *Standard on Ratio Studies.* Part 2, Section 4.2. April, 2013.
8 IAAO. *Standard on Ratio Studies.* Part 1, Section 4.5. April, 2013
Table 3: Major Reasons for invalidating sales

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number of Sales Found to be Invalid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple parcel sale</td>
<td>649</td>
</tr>
<tr>
<td>Atypical time on market</td>
<td>582</td>
</tr>
<tr>
<td>Estate Sale</td>
<td>511</td>
</tr>
<tr>
<td>Building or improvement added since sale</td>
<td>440</td>
</tr>
<tr>
<td>Forced Sale – adverse pressure</td>
<td>278</td>
</tr>
<tr>
<td>Family Transfer</td>
<td>257</td>
</tr>
<tr>
<td>Sale involving financial institution</td>
<td>257</td>
</tr>
<tr>
<td>Corporate transfer</td>
<td>192</td>
</tr>
<tr>
<td>Forced sale such as foreclosure related sale</td>
<td>160</td>
</tr>
<tr>
<td>Purchase of adjacent land</td>
<td>118</td>
</tr>
</tbody>
</table>

Similar validation issues and reasons for invalidating sales are addressed in the IAAO Standard on Ratio Studies and the IAAO Standard on Verification and Adjustment of Sales.\(^9\)

I did conduct a review of assessment changes on selling and non-selling parcels to understand whether both groups received similar treatment. If this were not true, it could indicate sales-chasing, a practice in which selling parcels are adjusted to a greater extent, hence distorting representativeness of results. However, I found no indication of any sales-chasing. Instead, I found the following:

- 56,848 parcels with no sale, a sale price of $1,000 or less, or a sale with a date older than 1/1/2013 had an average assessed value increase of 1,293%.
- 4,391 parcels with sales prices greater than $1,000, some of which were considered invalid sales, but all of which sold on or after 1/1/2013, had an average assessed value increase of 1,221%.
- The 1,761 valid sales during 2013 – 2015 used in the main ratio studies had an average assessed value increase of 1,147%.

The goal of any ratio study is to analyze representative samples that, by inference, provide a window into the probable quality of assessments throughout the underlying population of properties; hence, the importance of representativeness in these sales samples. While sales chasing could damage representativeness, it clearly is not a factor with respect to the Blair County reassessment. The additional increases in assessments of parcels other than recent valid sales is unusual, but could be explained if, for example, physical characteristics of selling parcels were reviewed and their assessments updated periodically to reflect remodeling and other physical changes, regardless of the base year used for these values. In that case, lower reassessment increases on recent sales would be expected. Similarly, if such changes have been made, improving the accuracy of property characteristics for recent sales, reassessment models would be more likely to produce low CODs, as shown in the studies. In such a case, if older sales and parcels without sales have not been scrutinized to the same degree, there would be some representativeness issues and the probable population uniformity statistics would be somewhat worse than those shown using the 2013 – 2015 sales. Such a likelihood is borne out, to an extent, by the slightly higher COD in the overall ratio study based on sales occurring on or after January 1, 2016. Similar slippage of uniformity statistics is demonstrated when sales deemed invalid by reason of atypical time on market are included in the analysis. Although these additional sales are suspect with respect to being arm’s length transactions, they do tend to corroborate these overall findings.


\(^10\) See additional discussion of low CODs in the section of the report on uniformity of assessments.
Outliers, Trimming, and Data Distributions

Related to the problem of ensuring representativeness of the ratio study samples, is the issue of when to trim samples based on unusual ratios that may be occurring with greater frequency in the sample than their likely frequency in the population. Such outliers may reflect data or reporting errors, mismatch between the property sold and the property appraised, unusual market variability, and other unidentified issues. If retained for analysis, outliers may distort level and uniformity statistics in a disproportionate way. The optimal approach is to use statistical techniques to identify possible outliers. This would be followed by additional review and verification. In the Blair County analysis, I reviewed 10 sales with ratios greater than 260% and 2 sales with ratios less than 20% with EST. Physical changes appeared to be the cause in some of these sales and 5 were deleted prior to completing analysis. Other sales with extremely high ratios were retained for initial analysis. However, trimming techniques outlined in Appendix B of the IAAO Standard on Ratio Studies\(^\text{11}\), based on the interquartile range (IQR), were employed and tended to flag these unusual ratios for trimming.

The IQR method is recommended primarily because it develops trim points without regard to the underlying distribution of the ratios. In other words, many texts report that ratio distributions most likely do not follow a standardized “normal” or bell-shaped distribution.\(^\text{12}\) This in turn leads to the conclusion that the most pertinent ratio study statistics are “distribution-free” or “non-parametric” statistics.\(^\text{13}\) In fact, many of the ratio studies conducted as part of this report do not conform to a normal distribution. This conclusion in no way criticizes the reassessment; it merely guides the user to the most applicable statistical measures. If there were a normal distribution, increased meaning and precision could be ascribed to the mean based statistics, including the standard deviation and coefficient of variation. Median based statistics are recommended by the IAAO Standard and, regardless, in any case when the underlying distribution of the data (ie: expected ratios in the population, based on the sample) does not match the normal curve.

The IAAO Standard does provide a cautionary note regarding the use of the IQR (and other trimming procedures).

> “It is appropriate to set maximum trimming limits. For small samples, no more than 10 percent (20 percent in the most extreme cases) of the ratios should be removed. For larger samples, this threshold can be lowered to 5 to 10 percent depending on the distribution of the ratios and the degree to which sales have been screened or validated. Trim limits should be developed in consideration of the extent of sales verification.”\(^\text{14}\)

I was informed that the sales data for Blair County was reviewed to ensure validity. However, atypical values were often excluded in the process of developing the appraisal model, without necessarily reflecting invalid sales. After discussion with EST, these sales were included for my analysis, but may later have been trimmed, depending on outlier review outcomes. All trimming is noted in the reports in Appendix A. The only case in which the IQR based trim exceeded the 10% guideline was with regard to the very small Agricultural category (A) sample of 15 sales, from which 2 were trimmed using the 3 X IQR procedure. The IQR multiplier used in each case and number of sales trimmed is also reported.

\(^{11}\) Ibid. Appendix B, p. 53.


\(^{13}\) IAAO. Property Appraisal and Assessment Administration. Appendix 20-7. P. 617. Chicago, IL. 1990

\(^{14}\) IAAO. Standard on Ratio Studies. Appendix B.5. April, 2013
Comment on trimming, range of ratios in data, and possible effects

After eliminating the 5 questionable sales and those with prices of $1,000 or less, the remaining data base consisted of 1,761 sales presumed valid. Ratios on these sales, using new assessments, ranged from 71% to 2,395%. On the new assessed value based studies, a maximum of 61 sales (3.5%) were trimmed in the overall combined category study. Had no sales been trimmed, the COD would have changed from 4.10% to 9.22%. Other statistical measures, such as the median, would have been minimally affected. My conclusion is that, while it is possible that some of the very low CODs are a result of trimming, this process does not provide a complete explanation of the low CODs. The main concern with low CODs, however, is that they may be an indication of sales chasing. This possibility has been examined and is not occurring.

Sales Time Period

The main ratio studies included three years of sales. The period began January 2, 2013 and ended with sales occurring as late as December 31, 2015. This period is somewhat longer than is typically recommended in the IAAO Standard. However, it is acceptable, provided proper adjustments are made to sales prices for time, if necessary. The use of a longer sales period also helps ensure more representative samples for the categories other than residential, for which limited samples are available due to fewer sales occurring.

I analyzed the ratios in each category and overall to determine whether the change in ratios over time warranted use of a time adjustment. Many times I did use a linear adjustment based on regression analysis of the ratios over time. If it appeared however, that the results were distorted by a few high or low ratios occurring early or late in the period, I rejected the time adjustment. Also, if application of the time adjustment increased the COD, the adjustment was not used.

An additional sales period extended through May 31, 2016 and the results of ratio studies using these additional sales are included in Appendix A3 and labeled accordingly.

Statistical Measurements

In general, all standard ratio study statistical measurements were calculated and are reported in Appendix A for each analysis conducted. These include measurements of level, uniformity, reliability, and normality of the data distribution, as well as general information about the samples, such as average sale price, category studied, number of sales in the study, type of trim used, and number of ratios trimmed.

Level of Assessment

Four measures of level of assessment are calculated and reported. These are:

- Mean
- Median
- Weighted Mean
- Geometric Mean

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For evaluation of appraisal performance (at issue here), the median is recommended. See the following table found in the IAAO Standard.  

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<tr>
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* Caution should be exercised when the sample contains value outliers or indicates value bias based on the PRD

For demonstrations and illustrations of the other measures of level and general discussion of ratio studies, see Appendix B. (Note that the illustrations and examples provided in Appendix B are generic and do not reflect any analysis using data from Blair County or the reassessment.)

Level of assessment meets IAAO standards when it complies with the following rule:

1. For any category of property, the median must be between 90% and 110%, assuming 100% of market value is the goal.
2. Each “class” of property should be within ±5% “…of the overall level of appraisal of the jurisdiction….”

Using proposed new assessed values, Blair County assessments comport with these standards in every ratio study testing overall and category assessment level.

**Uniformity of Assessment**

Uniformity statistics measure the variability of the ratios and are important in determining whether similarly situated properties are assessed similarly with respect to market value (or some alternate goal). The IAAO Standard comments about measuring uniformity with the Coefficient of Dispersion (COD):

“The most generally useful measure of variability or uniformity is the COD.”

See the following table found in the IAAO Standard:

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16 Ibid. Part 2. Section 6.2. (Note: table is numbered as found in the IAAO Standard.)
17 Ibid. Part 2. Section 11.1.2
18 Ibid. Part 1. Section 5.4.1.
19 Adapted from Part 2. Page 34 of the 2013 Standard on Ratio Studies. Specifically found as Table 2-3 in the 2007 edition; the only substantive modification in the 2013 edition is to include a cautionary note about using the PRB to verify vertical inequity indications based solely on the PRD. There is further discussion of this table in Appendix B.
As a rule of thumb, since I do not have sufficient information to evaluate the homogeneity of the properties being analyzed, I would suggest, and have employed, application of a 20% COD standard for all except vacant lots over 10 acres (V), for which 25% would be acceptable. Lower CODs generally indicate better general uniformity. However, there is a caveat. Although analysis of non-selling properties convinces me that there is no sales chasing or any reassessment process similar to sales chasing, several of the CODs are below 5%, a result that is considered highly unlikely except in:

“...(1) subdivisions in which lot prices are strictly controlled by the developer; (2) extremely homogeneous property groups, such as condominium units all located in the same complex; (3) appraisal ratio studies in which the assessor’s values and the independent appraisals reflect the same appraisal manuals and procedures; or (4) appraisals that have been adjusted to match sales prices.”

The same low COD result can also be attributed to over-trimming. Additional analyses using later sales and sales ruled invalid because of time on market issues show findings of higher CODs, as anticipated given the probable invalid nature of many of these sales.

While the COD is effective in measuring general uniformity, it does not measure whether high and low priced properties are being treated similarly (ie: have similar ratios). For this it is necessary to measure vertical equity, for which there are two measures presented in the IAAO Standard and computed in the ratio studies done for this report. These measures are the Price-related Differential (PRD) and the Price-related Bias (PRB). To be considered in compliance with the IAAO Standard, the PRD must be

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between 0.98 and 1.03. More typical higher PRDs ostensibly indicate lower ratios (level of assessment) on higher priced properties; however, a caution is indicated based on recent analytical studies. The PRD has been shown to provide a significant number of false “positive” conclusions of non-compliance. It is therefore suggested that such pre-conclusions be confirmed by using the more precise PRB. The advisory guidelines provided with regard to the PRB suggest caution (meaning possible vertical inequity) beyond ±0.05 and “unacceptable inequity” beyond ±0.01. For reference, a PRB of -0.10 indicates that, as values double, assessment ratios tend to fall by 10%. The opposite is true of positive PRB results, unusual, but noted widely in the ratio studies based on the original 1958 base value assessments. A caution with respect to the PRB is that one should not conclude that there is vertical inequity unless the confidence interval around this statistic fails to include ±0.05 or ±0.10 (or the negative counterparts). For example, in the ratio study of vacant lots under 10 acres (L) category, using sales occurring after January 1, 2016, the PRB was 0.135. However, the confidence interval around this statistic had a lower limit of 0.0017. This indicates that, although the positive direction (i.e., since the first of this year, assessment ratios tend to rise as values rise) holds true, the results are not provably in the IAAO recommended caution range, based on the PRB. Further, due to small sample size for this category, results cannot be corroborated with other statistical tests, such as the Mann-Whitney test that looks for differences between the ranks of ratios of properties above or below the mean sale price.

In many cases, it is possible to corroborate vertical equity issues using the Mann-Whitney test, even though this test does not have an IAAO recognized specified standard. It is a recognized technique for looking for differences between two groups. In large samples, however, the test recognizes small differences as significant and this significance is noted on statistical analysis reports, such as the overall report based on the new assessments and found in Appendix A2. When, as in that case, the Mann-Whitney result is not supported by vertical inequity findings using either the PRD or the PRB, the Mann-Whitney test conclusion should be disregarded. This has been noted throughout Appendix A on the analysis pages with regard to the overall new assessment statistical analysis and in other appropriate cases.

In the analysis of the new assessments, no category failed standards based on the COD. Only the vacant lots over 10 acres category (V) failed the PRD standard for vertical equity and this result was refuted by the PRB. That means that, while there may be a slight tendency in this category to undervalue higher priced properties, this result cannot be proven and is suspect given the small sample size.

### Reliability Measures

Statistics calculated from samples are considered point estimates, meaning that they are presumed accurate for that sample, but are not necessarily indicative of population measurements. Samples have innate error, known as sampling error, which must first be taken into account. For that reason, IAAO standards for level and uniformity are predicated on understanding the likely ranges for level and uniformity of the population. In other words, the standards advise taking into account sampling error. While there are various ways of doing this, statistical analyses accompanying this report include confidence intervals around three of the four measures of level provided and around the COD and PRB. Conclusions of non-compliance should be based on confidence intervals that fail to include the goal. For example, if 100% ±10% is the goal and accepted range for level of assessment, then a sample median of 87% with a confidence interval from 85% to 89% would be considered out of compliance, while a sample with the same median, but a less reliable result with a wider confidence interval

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21 Ibid. Part 1. Section 9.2.7.
extending from 82% to 94% could not be found out of compliance with the indicated level of assessment standard.

Similar tests and results are provided for the COD and PRB, both of which often have large margins of error.

**Follow up Analysis**

Although there are no known additional valid sales during the period used to develop and then test the initial assessments, sales have occurred subsequent to this period during 2016. Use of these sales to develop an additional ratio study provides good corroboration of results, at least at the overall jurisdiction level and, to an extent, mitigates representativeness concerns related to low CODs. Accordingly, additional sales from January, 2016 through May 31, 2016 were also analyzed to corroborate results based on older sales. Ratio study results based on this additional information are labeled accordingly and included in Appendix A3. Overall, Residential category (R), and Commercial category (C) results show excellent level of assessment and excellent uniformity. The very small additional sample for the vacant lots under 10 acres (L) category shows adequate assessment level with some slippage in general assessment uniformity based on the COD and slightly low, but questionable, PRD, with a slightly high, but not conclusive, PRB.

In analyzing the results of appraisal models, it is important both to review before and after ratio study statistics and to develop additional ratio studies based on sales not included in the appraisal model.

IAAO comments:

“Modeling procedures that use sales data will probably produce biased statistics if the sales used in making the measurement were included in the analysis. Many modelers will set aside some sales as a control group, excluding them from the modeling process so they are available as an unbiased measurement of model performance.”

By including sales originally excluded by appraisers developing the appraisal models, this condition has been partly met with respect to analyzing results of the reassessment. Analysis of just these sales, with alternate validation codes, but no finding of clear invalidity supports the general overall conclusion that the final level of assessment is probably well within standards for assessment level with expected somewhat poorer uniformity. Uniformity measures using these alternate and somewhat questionable sales cannot be viewed in isolation as they are not expected to be an independent representative sample; they were reviewed only to test overall premises about the reassessment and add some independent data to the general database. A similar additional test was conducted by including sales deemed invalid because of atypical time on market. Given widely disparate ratios on some of these sales, inclusion may be more distortive than informative. Nevertheless, larger categories, such as R (residential) and C / I (commercial and industrial) show little change in level or general uniformity. Level and uniformity shown is worse in the other categories, but this reflects the large number of atypical time on market sales added, especially to the L (vacant lots under 10 acres in size) category, where sample size more than doubled due to inclusion of these questionable sales. Such a result should not be taken as refutation of the original results as sample representativeness is in doubt.

Additional testing could have been done, possibly without the previously mentioned outlier effect, had “holdout” samples of clearly valid sales been removed from the database of sales actually used in

23 IAAO. 1990. *Property Appraisal and Assessment Administration.* P. 553. Chicago, IL
developing the appraisal models. Regardless, I am satisfied that adjustments to assessments of non-selling properties were of similar magnitude to those made with respect to selling properties. Furthermore, the additional samples incorporating some sales previously considered invalid and therefore not used in the appraisal model, serve to strengthen the likelihood that the overall results are representative of the population of properties. I would recommend additional testing as new sales become available (these should be time adjusted backward to January 1, 2016) and I would further recommend that “holdout” samples be considered in future reappraisals. Another IAAO source describes such a procedure as the “…preeminent method employed to review values when sales data are adequate….\textsuperscript{24}

In addition to concerns about the application of the reassessment model to all properties, it is important to recognize that it is difficult in any model based on sales to ensure that the model completely represents all property types and geo-economic influences that affect the value of property throughout any jurisdiction. For this reason, it is important to review cases of unusual magnitude assessed value adjustments resulting from the application of the model. The Quality Control chapter of the IAAO textbook, Assessment Administration contains a section entitled “Valuation Review” which includes the following commentary:

“\textbf{\textit{Scanning a list for unusual or unexpected values (outliers) seems to be second nature for assessors. This process first is performed as part of the valuation review by analysts, usually with some initial guidance from appraisers, and is accomplished as a matter of course by using a variety of data. Lists of properties with estimated market values, their addresses, and other identifying information are commonly reviewed. ...Lists that prioritize properties for review by characterizing them as having small, medium, or large changes from prior value estimates, in terms of both percentage changes and dollar changes...are useful as well.”}\textsuperscript{25}

Such a step is beyond the direct scope of this project, but worthy of note.

**Overall Conclusions**

My major conclusion is that, to the extent measurable by ratio studies based on the assessment and sales information provided to me, the reassessment values established for 2016 meet the goal of establishing market value as of January 1, 2016 as the level of assessment on an overall basis for properties throughout Blair County. This does not mean that every assessment necessarily is market value, as ratio study results are statistical in nature and provide measurements that apply to groups of properties rather than individual properties. However, it does mean that the overall industry accepted quality standards for assessment level, as measured by these sales, have been achieved. In addition, assessment equity, in terms of disparity between categories is markedly improved and is far better than if the original 1958 base year assessments were to be retained. IAAO standards for level of assessment have been met for each category tested.

Uniformity within categories measures the variability between the ratios, with lower variability indicating better uniformity and being preferred. There are two types of uniformity measures – between properties in general (horizontal equity) and between high and low priced properties (vertical equity).

\textsuperscript{24} IAAO. 2003. Assessment Administration. Pp. 343-344. Chicago, IL.
In comparison to uniformity measures using original 1958 base year assessments, overall and at the
category level, general (horizontal) uniformity as measured by the Coefficient of Dispersion (COD) is
much better. Using 1958 base year assessments, no category meets general uniformity standards. In
contrast, each category meets uniformity standards using new assessments.

The second type of uniformity, vertical equity, is also substantially improved given the new
assessments, with only the Vacant lots over 10 acres category (V) failing by a slight margin using one
statistical measure that is not corroborated with alternate, more precise statistics. Using the original
assessments, Commercial / Industrial, Agricultural, Vacant lots over 10 acres, and Land (vacant lots
under 10 acres) categories all fail vertical equity standards by larger margins.

Caution is advised when interpreting the PRD as an indicator of vertical equity because of a tendency to
produce false “positives” (indicating vertical inequity when there is none), particularly when sample
sizes are small, as in the Vacant lots over 10 acres category (V).

National standards suggest that ratio studies and similar analyses based on sales used to develop an
appraisal model need to be supplemented by additional sales that were not used in developing the
assessed values. This provides verification proving to a greater extent that the model is applicable to the
non-selling properties, which are the main focus of any reassessment. To the extent that otherwise
valid sales not used for the assessment model based on appraiser discretion were included in the
analyses developed for this report, this condition has been satisfied. Additional sales from January,
2016 through May 31, 2016 were also analyzed and, at least regarding the final level of assessment,
corroborate results based on older sales.

Finally, in comparison to the generally disparate levels of assessment between categories and generally
poor to very poor uniformity (both horizontal and vertical) evidenced by the ratio studies conducted
using the same sales, but the original 1958 base year assessed values, the reassessment shows results that
are vastly better – much less disparate in level, much more uniform, and meeting nearly all IAAO
standards for assessment quality.
Appendices
Notes on Interpretation of Comments Found on Statistical Analysis Pages in Appendices

Many of the statistical analysis pages have certain measurements highlighted or have added verbiage commenting on the quality of the calculated results. In many cases, there are numerous statistical measures designed to look at various aspects of level and uniformity. Specific measurements may be more or less applicable to individual category or other results and, when multiple measurements are presented, they must be taken in conjunction with other results. Common examples include:

- Level measurements showing one measure that appears out of line with others
- General uniformity measurements showing the term “questionable”
- Vertical equity measurements showing the term “inequity”

The usefulness of these indicators is in providing cautionary notes to the analyst or reviewer. Each of the above issues is discussed in detail throughout the narrative portion of the report. However, in summary, the following notes apply:

- Although multiple level measurements assist in determining the influence and presence of outliers and other distortions, the median is the most useful measure of assessment level.

- When uniformity is deemed “questionable,” this advises that there is a risk of sales chasing or other similar processes that call the representativeness of the samples and the applicability of the results to the population of properties as a whole in question. This issue is dealt with throughout the report and there is no sales chasing. The term does not otherwise comment on the quality of the assessments.

- Although several vertical equity measures are calculated, the most widely used are the PRD and the PRB. In a few cases, an alternate test, the Mann-Whitney test, shows possible vertical inequity, with the incumbent label. This result is considered applicable only if it corroborates similar indications by both the PRD and PRB. In addition, the PRD has been shown to be prone to “false positives,” in which it indicates vertical inequity that cannot be substantiated.
Appendix A

Ratio Study Reports Related to Evaluation of Original Base Value Assessments and Proposed January 1, 2016 Market Value Reassessments in Blair County
Appendix A1
Before Reassessment
Ratio Studies for Blair County
Overall and by Category
These ratio studies use current “original” 1958 Base assessed values
### SIMPLIFIED RATIO STUDY

**Using Original Assessed Values**

| Assessment Date: 01/01/2016 |
| From: 01/01/2013 |
| To: 12/31/2015 |

**Sales Price is Time Adjusted**

| Linear Trend Selected - Mo. rate: -0.105% |

**SAMPLE STATISTICS**

- **Sample size (n):** 1,683
- **Total Assessed Value:** $25,192,060
- **Total Adjusted Sales Price:** $290,566,552
- **Mean Assessed Value:** $14,969
- **Mean Adjusted Sales Price:** $172,648
- **Standard Deviation AV:** $19,403
- **Standard Deviation SP:** $271,407
- **Median Assessed Value:** $11,820
- **Median Sales Price:** $135,652

**ASSESSMENT LEVEL**

- **Arithmetic Mean Ratio:** 8.87%
- **Median Ratio:** 8.89%
- **Weighted Mean Ratio:** 8.67%
- **Geometric Mean Ratio:** 8.34%

**UNIFORMITY**

- **<Extreme> Lowest Ratio:** 1.27%
- **Highest Ratio:** 16.37%
- **Coefficient of Dispersion:** 25.39%
- **Standard Deviation:** 2.86%
- **Coefficient of Variation:** 32.24%

**Price Related Bias:** 0.0783

**PRB T Score:** 9.737

**PRB is SIGNIFICANT @ 90%**

**Price-Related Differential:** 1.02

**RELIABILITY**

- **90% Confidence Intervals:**
  - **Lower:**
    - Around the Mean: 8.76%
    - Around the Median: 8.71%
    - Around the Weighted Mean: 8.50%
    - Around the COD: 24.43%
    - Around the PRB: 0.0625%
  - **Upper:**
    - 8.99%
    - 9.01%
    - 8.84%
    - 26.60%
    - 0.0941%

- **Uniformity:**
  - COD: Poor
  - COV: Poor
  - PRD: No Observed Bias

**80% Confidence Intervals:**

- **Lower:**
  - Around the Mean: 8.78%
  - Around the Median: 8.74%
  - Around the Weighted Mean: 8.54%

- **Upper:**
  - 8.96%
  - 8.98%
  - 8.80%

**Probability True Mean 0.9 - 1.1:** 0.00%

**Category (ies):** All

**Mann-Whitney Test:** 2.46974

**Significance of Value Related Inequity - Strong**

**D'Agostino-Pearson Test Results:** Non-Normal

**Shapiro-Wilk Test:** N/A

**Kurtosis:** 2.90, Acceptable

**Skew:** 0.25, Acceptable

**Probability True Mean 0.9 - 1.1:** 0.00%

**Category (ies):** All

**Chi Square Test:** Non-Normal

**Binomial Test:** N/A

**Neighborhoods:**

- All

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**Sample Statistics:**

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**Diagram:**

- Observed
- Expected

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**Legend:**

- Observed
- Expected

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**Figure:**

- Linear Trend Selected - Mo. rate: -0.105%
Sales Price is Time Adjusted

Sample size (n) 1,548

Total Assessed Value $22,176,470

Total Adjusted Sales Price $246,769,996

Mean Assessed Value $14,326

Mean Adjusted Sales Price $159,412

Standard Deviation AV $9,390

Standard Deviation SP $93,804

Median Assessed Value $11,990

Median Sales Price $135,681

Mean Adjusted Sales Price $159,412

Standard Deviation SP $93,804

Median Assessed Value $11,990

Median Sales Price $135,681

Sample size (n) 1,548

Total Assessed Value $22,176,470

Total Adjusted Sales Price $246,769,996

Mean Assessed Value $14,326

Mean Adjusted Sales Price $159,412

Standard Deviation AV $9,390

Standard Deviation SP $93,804

Median Assessed Value $11,990

Median Sales Price $135,681

Mean Adjusted Sales Price $159,412

Standard Deviation SP $93,804

Median Assessed Value $11,990

Median Sales Price $135,681

ASSESSMENT LEVEL

Arithmetic Mean Ratio 8.99%

Median Ratio 8.99%

Weighted Mean Ratio 8.99%

Geometric Mean Ratio 8.57%

UNIFORMITY

<Extreme> Lowest Ratio 2.74%

Highest Ratio 16.06%

Coefficient of Dispersion 23.63%

Standard Deviation 2.66%

Coefficient of Variation 29.59%

Price Related Bias 0.0858 PRB T Score: 9.3085 PRB is SIGNIFICANT @ 90%

Price-Related Differential 1.00

90% Confidence Intervals: Lower Upper

Around the Mean 8.88% 9.11%

Around the Median 8.82% 9.08%

Around the Weighted Mean 8.88% 9.09%

Around the PRB 0.0678 0.1039

80% Confidence Intervals: Lower Upper

Around the Mean 8.91% 9.08%

Around the Median 8.85% 9.05%

Around the Weighted Mean 8.90% 9.07%

Uniformity: COD: Somewhat Poor

COV: Somewhat Poor

PRB: Some Bias towards Low Priced

Outlier Method:

Inner Quartile Fence: 48 Sale(s) Lost to Trimming

Please enter the category (ies) and neighborhood(s) used in the study.

Probability True Mean 0.9 - 1.1 90.00%

Category (ies): R

Neighborhoods: All

Chi Square Test Non-Normal

Binomial Test N/A

Mann-Whitney Test 3.26230

Significance of Value Related Inequity - Strong

D'Agostino-Pearson Non-Normal

Shapiro-Wilk W N/A

Kurtosis 2.80

Skew 0.34

Acceptable

Acceptable

0.50
SIMPLIFIED RATIO STUDY
Using Original Assessed Values

Assessment Date: 01/01/2016
From: 01/01/2013
To: 12/31/2015

Sales Price is Time Adjusted

Sample size (n) 95

Total Assessed Value $3,759,960
Total Adjusted Sales Price $38,775,659
Mean Assessed Value $39,579
Mean Adjusted Sales Price $408,165
Standard Deviation AV $104,663
Standard Deviation SP $1,052,850
Median Assessed Value $14,600
Median Sales Price $151,178

Mean Adjusted Sales Price $408,165

Median Sales Price $151,178

ASSESSMENT LEVEL

Arithmetic Mean Ratio 10.85%
Median Ratio 10.13%
Weighted Mean Ratio 9.70%
Geometric Mean Ratio 8.76%

<Extreme> Lowest Ratio 0.10%
Highest Ratio 26.37%
Coefficient of Dispersion 43.94%
Standard Deviation 5.69%
Coefficient of Variation 52.40%

Price Related Bias 0.0607 PRB T Score: 1.794 PRB is inconclusive
Price-Related Differential

90% Confidence Intervals:
Around the Mean 9.89% 11.81%
Around the Median 9.27% 11.59%
Around the Weighted Mean 7.17% 12.23%
Around the COD 35.66% 51.96%
Around the PRB -0.0056 0.1271

80% Confidence Intervals:
Around the Mean 10.10% 11.60%
Around the Median 9.58% 11.39%
Around the Weighted Mean 7.72% 11.67%

Probability True Mean 0.9 - 1.1 0.00%
Category (ies): C/I
Neighborhoods: All

NORMALITY Test Results: Non-Normal
Chi Square Test N/A
Binomial Test Non-Normal
Mann-Whitney Test -2.12289
D’Agostino-Pearson Normal
Shapiro-Wilk W N/A
Kurtosis 2.64
Skew 2.00
-0.50
Acceptable

Reliability

Uniformity:
COD: Very Poor
COV: Very Poor
PRB: Meets IAAO Standard, No Significant Bias

Outlier Method:
Inner Quartile Fence: 2 Sale(s) Lost to Trimming
Please enter the category (ies) and neighborhood(s) used in the study.

Levy Curve: Observed
Expected

Count
Ratio
0.000 0.015 0.029 0.044 0.059 0.073 0.107 0.117 0.127 0.146 0.176 0.205 0.234 0.254 0.273 0.293 0.308 0.329 0.350

Price Related Bias 0.0607 PRB T Score: 1.794 PRB is inconclusive

90% Confidence Intervals:
Around the Mean 9.89% 11.81%
Around the Median 9.27% 11.59%
Around the Weighted Mean 7.17% 12.23%
Around the COD 35.66% 51.96%
Around the PRB -0.0056 0.1271

80% Confidence Intervals:
Around the Mean 10.10% 11.60%
Around the Median 9.58% 11.39%
Around the Weighted Mean 7.72% 11.67%

Probability True Mean 0.9 - 1.1 0.00%
Category (ies): C/I
Neighborhoods: All

NORMALITY Test Results: Non-Normal
Chi Square Test N/A
Binomial Test Non-Normal
Mann-Whitney Test -2.12289
D’Agostino-Pearson Normal
Shapiro-Wilk W N/A
Kurtosis 2.64
Skew 2.00
-0.50
Acceptable
<table>
<thead>
<tr>
<th>Sales Price is Not Time Adjusted</th>
<th>Time Adj. Not Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>From:</strong> 01/01/2013</td>
<td><strong>To:</strong> 12/31/2015</td>
</tr>
</tbody>
</table>

**SAMPLE STATISTICS**

- Sample size (n): 14
- Total Assessed Value: $229,500
- Total Adjusted Sales Price: $5,070,449
- Mean Assessed Value: $16,393
- Mean Adjusted Sales Price: $362,175
- Standard Deviation AV: $11,319
- Standard Deviation SP: $245,313
- Median Assessed Value: $16,050
- Median Sales Price: $277,000

**ASSESSMENT LEVEL**

- Arithmetic Mean Ratio: 4.69%
- Median Ratio: 5.19%
- Weighted Mean Ratio: 4.53%
- Geometric Mean Ratio: 3.78%
- <Extreme> Lowest Ratio: 0.65%
- Highest Ratio: 8.81%
- Coefficient of Dispersion: 39.47%
- Standard Deviation: 2.56%
- Coefficient of Variation: 54.45%

**Price Related Bias:** 0.1831

**Price-Related Differential:** 1.04

**90% Confidence Intervals:**
- **Uniformity:**
  - Around the Mean: 3.48% - 5.90%
  - Around the Median: 2.71% - 6.18%
  - Around the Weighted Mean: 2.99% - 6.06%
  - Around the COD: 30.89% - 93.67%

**80% Confidence Intervals:**
- **Outlier Method:**
  - Inner Quartile Fence: 1 Sale(s) Lost to Trimming

**Probability True Mean 0.9 - 1.1:** 0.00%

**NORMALITY Test Results:**
- Chi Square Test: N/A
- Binomial Test: Non-Normal
- Mann-Whitney Test: N/A
- D'Agostino-Pearson: Normal
- Shapiro-Wilk W: Normal
- Kurtosis: 1.92
- Skew: 0.91

**Category (ies):** A

**Neighborhoods:** All

---

**RELIABILITY**

- Price Related Differential: 1.04
- PRB T Score: 1.2373
- PRB is inconclusive
- Price-Related Differential:
  - 90% Confidence Intervals:
    - Lower: 0.000
    - Upper: 0.088
  - 80% Confidence Intervals:
    - Lower: 0.000
    - Upper: 0.103

**COD:** Very Poor

**COV:** Very Poor

**PRB:** Meets IAAO Standard, No Significant Bias

**PRD:** Favors High Priced

---

**Uniformity:**

- COD: Very Poor
- COV: Very Poor
- PRB: Meets IAAO Standard, No Significant Bias
- PRD: Favors High Priced

**Outlier Method:**

Inner Quartile Fence: 1 Sale(s) Lost to Trimming

Please enter the category (ies) and neighborhood(s) used in the study.
**SIMPLIFIED RATIO STUDY**

<table>
<thead>
<tr>
<th>Sample size (n)</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Assessed Value</td>
<td>$26,460</td>
</tr>
<tr>
<td>Total Adjusted Sales Price</td>
<td>$2,598,901</td>
</tr>
<tr>
<td>Mean Assessed Value</td>
<td>$2,205</td>
</tr>
<tr>
<td>Mean Adjusted Sales Price</td>
<td>$216,575</td>
</tr>
<tr>
<td>Standard Deviation AV</td>
<td>$2,323</td>
</tr>
<tr>
<td>Standard Deviation SP</td>
<td>$160,888</td>
</tr>
<tr>
<td>Median Assessed Value</td>
<td>$1,475</td>
</tr>
<tr>
<td>Median Sales Price</td>
<td>$182,500</td>
</tr>
</tbody>
</table>

**ASSESSMENT LEVEL**

<table>
<thead>
<tr>
<th>Arithmetic Mean Ratio</th>
<th>1.14%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Ratio</td>
<td>1.12%</td>
</tr>
<tr>
<td>Weighted Mean Ratio</td>
<td>1.02%</td>
</tr>
<tr>
<td>Geometric Mean Ratio</td>
<td>0.85%</td>
</tr>
</tbody>
</table>

**RELIABILITY**

<table>
<thead>
<tr>
<th>90% Confidence Intervals:</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Around the Mean</td>
<td>0.74%</td>
<td>1.56%</td>
</tr>
<tr>
<td>Around the Median</td>
<td>0.56%</td>
<td>1.49%</td>
</tr>
<tr>
<td>Around the Weighted Mean</td>
<td>0.61%</td>
<td>1.42%</td>
</tr>
<tr>
<td>Around the COD</td>
<td>32.14%</td>
<td>118.84%</td>
</tr>
<tr>
<td>Around the PRB</td>
<td>-0.2840</td>
<td>0.6287</td>
</tr>
</tbody>
</table>

**Price-Related Differential** | 0.1724 |

**Uniformity:**

- COD: Very Poor
- CV: Very Poor
- PRD: Favors High Priced

**Probability True Mean 0.9 - 1.1** | 0.00% |

**NORMALITY Test Results:**

- Chi Square Test: N/A
- Binomial Test: Non-Normal
- D'Agostino-Pearson: Normal
- Shapiro-Wilk: Normal
- Kurtosis: 2.39
- Skew: 0.54

**PrB T Score:** 0.8233

**Outlier Method:**

- Inner Quartile Fence: 1 Sale(s) Lost to Trimming
- Please enter the category (ies) and neighborhood(s) used in the study.

**Category (ies):** V

**Neighborhoods:** All

---

**From:** 01/01/2013  
**To:** 12/31/2015

**Sales Price is Not Time Adjusted**

**Total Assessed Value**

<table>
<thead>
<tr>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

**Observed vs Expected**

---

**ASSESSMENT LEVEL**

- Meets IAAO Standard, No Significant Bias

**Observations:**

- Unable to calculate
### Sales Price is Not Time Adjusted

**Sample size (n)**: 37  
**Total Assessed Value**: $46,660  
**Total Adjusted Sales Price**: $1,241,535  
**Mean Assessed Value**: $1,261  
**Mean Adjusted Sales Price**: $33,555  
**Standard Deviation AV**: $1,427  
**Standard Deviation SP**: $28,931  
**Median Assessed Value**: $630  
**Median Sales Price**: $27,450  
**Arithmetic Mean Ratio**: 4.21%  
**Median Ratio**: 3.25%  
**Weighted Mean Ratio**: 3.76%  
**Geometric Mean Ratio**: 2.78%  
**Price-Related Bias**: 0.0691  
**Probability True Mean 0.9 - 1.1**: 0.00%  
**Category (ies)**: L  
**Neighborhoods**: All  

**ASSESSMENT LEVEL**  
- **Arithmetic Mean Ratio**: 4.21%  
- **Median Ratio**: 3.25%  
- **Weighted Mean Ratio**: 3.76%  
- **Geometric Mean Ratio**: 2.78%  
- **Price-Related Bias**: 0.0691  
- **Probability True Mean 0.9 - 1.1**: 0.00%  

**UNIFORMITY**  
- **<Extreme> Lowest Ratio**: 0.14%  
- **Highest Ratio**: 14.00%  
- **Coefficient of Dispersion (COD)**: Meets IAAO Standard, No Significant Bias  
- **Coefficient of Variation (COV)**: Very Poor  
- **Coefficient of Variation (COV)**: Very Poor  
- **PRD**: Favors High Priced  
- **PRB**: Meets IAAO Standard, No Significant Bias  

**Price-Related Differential**  
- **90% Confidence Intervals**: Lower 3.21%, Upper 5.22%  
- **80% Confidence Intervals**: Lower 3.43%, Upper 5.00%  
- **80% Confidence Intervals**: Lower 3.43%, Upper 5.00%  

**OUTLIER METHOD**  
- **Inner Quartile Fence**: 3 Sale(s) Lost to Trimming  
- **Please enter the category (ies) and neighborhood(ies) used in the study.**  

**RELIABILITY**  
- **Uniformity**: COD: Very Poor  
- **Uniformity**: COV: Very Poor  
- **Uniformity**: PRD: Favors High Priced  

**NORMALITY TEST RESULTS**  
- **Chi Square Test**: N/A  
- **Binomial Test**: Non-Normal  
- **Mann-Whitney Test**: -1.85606  
- **Significance of Value Related Inequity - Weak**  
- **D'Agostino-Pearson**: Non-Normal  
- **Shapiro-Wilk Test**: Normal  
- **Kurtosis**: 3.78  
- **Skew**: 1.31  
- **Possible Outliers**: -0.50, 1.00
Appendix A2
After Reassessment

Ratio Studies for Blair County

Overall and by Category

These ratio studies use new proposed assessed values as of June 22, 2016, based on January 1, 2016 market value

### SIMPLIFIED RATIO STUDY
**Assessment Date:**
*From:* 01/01/2016
*To:* 01/01/2015

**Sales Price is Time Adjusted**

### SAMPLE STATISTICS
- **Sample size (n):** 1,700
- **Total Assessed Value:** $296,956,300
- **Total Adjusted Sales Price:** $295,698,533
- **Mean Assessed Value:** $174,680
- **Mean Adjusted Sales Price:** $173,940
- **Standard Deviation AV:** $281,632
- **Standard Deviation SP:** $274,816
- **Median Assessed Value:** $136,250
- **Median Sales Price:** $135,641

### ASSESSMENT LEVEL
- **Arithmetic Mean Ratio:** 100.95%
- **Median Ratio:** 100.26%
- **Weighted Mean Ratio:** 100.43%
- **Geometric Mean Ratio:** 100.79%
- **Lowest Ratio:** 76.53%
- **Highest Ratio:** 125.86%
- **Coefficient of Dispersion:** 4.10%
- **Coefficient of Variation:** 5.79%
- **Price Related Bias:** -0.0044
- **PRB T Score:** -3.5601
- **PRB is SIGNIFICANT @ 90%**
- **Price-Related Differential:** 1.01

#### 90% Confidence Intervals:
- **Around the Mean:**
  - Lower: 100.72%
  - Upper: 101.18%
- **Around the Median:**
  - 100.00%
  - 100.43%
- **Around the Weighted Mean:**
  - 100.09%
  - 100.76%
- **Around the PRB:**
  - -0.0069
  - -0.0020

#### Uniformity:
- **COD:** Questionable
- **COV:** Excellent
- **PRD:** No Observed Bias

#### Outlier Method:
- **Outer Quartile Fence:** 61 Sale(s) Lost to Trimming
- **Outer Quartile:** 3.91%
- **Inner Quartile:** 4.30%

### Normality Test Results:
- **Mann-Whitney Test:** -4.37250
- **Shapiro-Wilk Test:** N/A
- **Kurtosis:** 5.36
- **Skew:** 1.43

### Significance of Value Related Inequity:
- Strong

### RELIABILITY
- **Category (ies):** All
- **Neighborhoods:** all
- **Probability True Mean 0.9 - 1.1:** Approx 100%
- **Chi Square Test:** Non-Normal
- **Binomial Test:** N/A

### Uniformity:
- **PRB:** Meets IAAO Standard, No Significant Bias
- **Price Related Bias:** -0.0044
- **PRB T Score:** -3.5601
- **PRB is SIGNIFICANT @ 90%**

### 80% Confidence Intervals:
- **Around the Mean:**
  - Lower: 100.77%
  - Upper: 101.13%
- **Around the Median:**
  - 100.06%
  - 100.38%
- **Around the Weighted Mean:**
  - 100.16%
  - 100.69%

**Categories:**

**Parameters Sheet for Category Details:**

**See Parameters Sheet for Category Details**

**Time Period Studied**

**Using Proposed Assessed Values**

**Assessment Date:**
*From:* 01/01/2013
*To:* 12/31/2015

**Linear Trend Selected - Mo. rate**

**-0.128%**

**Coefficients of Dispersion:**
- **4.10%**
- **5.79%**

**Price Related Bias:**
- **-0.0044**

**PRB is SIGNIFICANT @ 90%**

**90% Confidence Intervals:**
- **Lower:**
  - 100.77%
  - 100.06%
  - 100.16%
- **Upper:**
  - 101.13%
  - 100.38%
  - 100.69%

**Category (ies):**
- **All**

**Neighborhoods:**
- **all**

**Probability True Mean 0.9 - 1.1:** Approx 100%

**Chi Square Test:**
- **Non-Normal**

**Binomial Test:**
- **N/A**

**Mann-Whitney Test:**
- **-4.37250**

**Shapiro-Wilk Test:**
- **N/A**

**Kurtosis:**
- **5.36**

**Skew:**
- **1.43**

**Possible Outliers:**
- **-0.50**
- **1.00**
<table>
<thead>
<tr>
<th>STUDY</th>
<th>Sample size (n)</th>
<th>Total Assessed Value</th>
<th>Total Adjusted Sales Price</th>
<th>Mean Assessed Value</th>
<th>Mean Adjusted Sales Price</th>
<th>Standard Deviation AV</th>
<th>Standard Deviation SP</th>
<th>Median Assessed Value</th>
<th>Median Sales Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIMPLIFIED RATIO</td>
<td>1,547</td>
<td>$248,394,000</td>
<td>$246,822,635</td>
<td>$160,565</td>
<td>$159,549</td>
<td>$96,999</td>
<td>$93,874</td>
<td>$136,700</td>
<td>$136,054</td>
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</tbody>
</table>

**ASSESSMENT LEVEL**

<p>| | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Arithmetic Mean Ratio</td>
<td>100.99%</td>
<td>Median Ratio</td>
<td>100.28%</td>
<td>Weighted Mean Ratio</td>
<td>100.64%</td>
<td>Geometric Mean Ratio</td>
<td>100.82%</td>
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</tr>
</tbody>
</table>

**UNIFORMITY**

<p>| | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowest Ratio</td>
<td>76.52%</td>
<td>Highest Ratio</td>
<td>125.86%</td>
<td>Coefficient of Dispersion</td>
<td>4.11%</td>
<td>Coefficient of Variation</td>
<td>5.73%</td>
<td></td>
</tr>
</tbody>
</table>

**Price Related Bias**

<table>
<thead>
<tr>
<th></th>
<th>-0.0065</th>
<th>PRB T Score:</th>
<th>-4.1767</th>
<th>PRB is Significant @ 90%</th>
</tr>
</thead>
</table>

**Price-Related Differential**

|                     | 1.00          |                     |                             |                          |                        |                        |                     |

**RELIABILITY**

90% Confidence Intervals:

<table>
<thead>
<tr>
<th></th>
<th>Lower</th>
<th>Upper</th>
<th>Uniformity:</th>
<th>PRB:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Around the Mean</td>
<td>100.74%</td>
<td>101.23%</td>
<td>COD: Questionable</td>
<td>PRB: Meets IAAO Standard, No Significant Bias</td>
</tr>
<tr>
<td>Around the Median</td>
<td>100.01%</td>
<td>100.46%</td>
<td>COV: Excellent</td>
<td></td>
</tr>
<tr>
<td>Around the Weighted Mean</td>
<td>100.32%</td>
<td>100.96%</td>
<td>PRD: No Observed Bias</td>
<td></td>
</tr>
<tr>
<td>Around the COD</td>
<td>3.91%</td>
<td>4.32%</td>
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<td></td>
</tr>
<tr>
<td>Around the PRB</td>
<td>-0.0096</td>
<td>-0.0035</td>
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</tr>
</tbody>
</table>

80% Confidence Intervals:

<table>
<thead>
<tr>
<th></th>
<th>Lower</th>
<th>Upper</th>
<th>Outer Quartile Fence: 49 Sale(s) Lost to Trimming</th>
</tr>
</thead>
<tbody>
<tr>
<td>Around the Mean</td>
<td>100.80%</td>
<td>101.17%</td>
<td></td>
</tr>
<tr>
<td>Around the Median</td>
<td>100.09%</td>
<td>100.42%</td>
<td></td>
</tr>
<tr>
<td>Around the Weighted Mean</td>
<td>100.39%</td>
<td>100.89%</td>
<td></td>
</tr>
</tbody>
</table>

Normality Test Results:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Category (ies):</th>
<th>Neighbourhoods:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi Square Test</td>
<td>Non-Normal</td>
<td>R</td>
<td>all</td>
</tr>
<tr>
<td>Binomial Test</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mann-Whitney Test

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-4.84225</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Significance of Value Related Inequity: Strong

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D΄Agostino-Pearson</td>
<td>Non-Normal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shapiro-Wilk</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kurtosis</td>
<td>5.45</td>
<td></td>
<td>Not Trimmed?</td>
</tr>
<tr>
<td>2.50</td>
<td>4.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skew</td>
<td>1.45</td>
<td>Possible Outliers</td>
<td></td>
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<tr>
<td>-0.50</td>
<td>1.00</td>
<td></td>
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</tr>
</tbody>
</table>
From: To:
01/01/2013 12/31/2015
Sales Price is
Time Adjusted

Sample size (n) 90
Total Assessed Value $39,762,700
Total Adjusted Sales Price $39,910,808
Mean Assessed Value $441,808
Mean Adjusted Sales Price $443,453
Standard Deviation AV $1,117,561
Standard Deviation SP $1,090,126
Median Assessed Value $166,100
Median Sales Price $160,589

ASSESSMENT LEVEL
Arithmetic Mean Ratio 100.13%
Median Ratio 99.81%
Weighted Mean Ratio 99.63%
Geometric Mean Ratio 100.08%

UNIFORMITY
Lowest Ratio 92.11%
Highest Ratio 109.12%
Coefficient of Dispersion 2.31%
Coefficient of Variation 3.05%

Price Related Bias 0.0001 PRB T Score: 0.0632 PRB is inconclusive
Price-Related Differential 1.01

RELIABILITY
90% Confidence Intervals:
Around the Mean 99.60% - 100.66%
Coefficient of Dispersion 2.31%
Coefficient of Variation 3.05%
Uniformity:
COD: Questionable verified OK
PRD: Meets IAAO Standard, No Significant Bias

Outlier Method:
Outer Quartile Fence: 7 Sale(s) Lost to Trimming
Please enter the category (ies) and neighborhood(s) used in the study.

Chi Square Test N/A
Binomial Test N/A
Mann-Whitney Test -0.64095

D’Agostino-Pearson Non-Normal
Shapiro-Wilk W N/A
Kurtosis 4.55 Acceptable

Skew 1.67 Possible Outliers

Probability True Mean 0.9 - 1.1 Approx. 100%
Chi Square Test N/A
Binomial Test N/A
Mann-Whitney Test -0.64095
D’Agostino-Pearson Non-Normal
Shapiro-Wilk W N/A
Kurtosis 4.55 Acceptable
Skew 1.67 Possible Outliers

There are/is 6 category(ies) currently selected
Significance of Value Related Inequity - Weak
Category (ies): C / I
Neighborhoods: all
From: 01/01/2013
To: 12/31/2015

Sales Price is Not Time Adjusted

**Sample Statistics**

<table>
<thead>
<tr>
<th>Sample size (n)</th>
<th>13</th>
</tr>
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<tbody>
<tr>
<td>Total Assessed Value</td>
<td>$4,892,900</td>
</tr>
<tr>
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<td>$4,931,400</td>
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<tr>
<td>Mean Assessed Value</td>
<td>$376,377</td>
</tr>
<tr>
<td>Mean Adjusted Sales Price</td>
<td>$379,338</td>
</tr>
<tr>
<td>Standard Deviation AV</td>
<td>$237,782</td>
</tr>
<tr>
<td>Standard Deviation SP</td>
<td>$255,488</td>
</tr>
<tr>
<td>Median Assessed Value</td>
<td>$315,100</td>
</tr>
<tr>
<td>Median Sales Price</td>
<td>$277,000</td>
</tr>
</tbody>
</table>

**Assessment Level**

| Arithmetic Mean Ratio | 101.13% |
| Median Ratio | 99.72% |
| Weighted Mean Ratio | 99.22% |
| Geometric Mean Ratio | 100.80% |

**Uniformity**

| Lowest Ratio | 83.28% |
| Highest Ratio | 114.69% |
| Coefficient of Dispersion | 6.20% |
| Standard Deviation | 9.36% |
| Coefficient of Variation | 8.27% |

**Price Related Bias**

-0.0255

**Price-Related Differential**

1.02

**Reliability**

90% Confidence Intervals:

| Around the Mean | 97.00% | 105.27% |
| Around the Median | 97.80% | 106.72% |
| Around the Weighted Mean | 94.26% | 104.17% |
| Around the COD | 4.00% | 10.77% |
| Around the PRB | -0.0869 | 0.0359 |

80% Confidence Intervals:

| Around the Mean | 97.99% | 104.28% |
| Around the Median | 98.77% | 105.57% |
| Around the Weighted Mean | 95.65% | 102.78% |

**Probability True Mean 0.9 - 1.1**

99.86%

**Category (ies):**

A

**Neighborhoods:**

All

**Normality Test Results:**

- Chi Square Test: N/A
- Binomial Test: Non-Normal
- *i.e., Insufficient evidence of Non-Normality
- Mann-Whitney Test: N/A
- Unable to calculate
- D’Agostino-Pearson: Normal
- Shapiro-Wilk W: Normal
- Kurtosis: 2.97 Acceptable
- 1.00 6.00
- Skew: -0.50 Acceptable
- -1.50 1.50

**Outlier Method:**

Outer Quartile Fence: 2 Sale(s) Lost to Trimming

**PRB:** Meets IAAO Standard, No Significant Bias

**PRB T Score:** -0.8969

PRB is inconclusive

**90% Confidence Intervals:**

<table>
<thead>
<tr>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000</td>
<td>0.100</td>
</tr>
<tr>
<td>0.200</td>
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<tr>
<td>1.800</td>
<td>1.900</td>
</tr>
<tr>
<td>2.000</td>
<td>2.100</td>
</tr>
</tbody>
</table>

**COD:** Excellent

Ms. Smith
### SIMPLIFIED RATIO STUDY

**Assessment Date:**
- From: 01/01/2013
- To: 12/31/2015

**Sales Price is Time Adjusted**

**Sample Statistics**

<table>
<thead>
<tr>
<th>Sample Size (n)</th>
<th>12</th>
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</table>

<table>
<thead>
<tr>
<th><strong>Total Assessed Value</strong></th>
<th>$2,691,900</th>
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<tbody>
<tr>
<td><strong>Total Adjusted Sales Price</strong></td>
<td>$2,739,875</td>
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<tr>
<td><strong>Mean Assessed Value</strong></td>
<td>$224,325</td>
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<tr>
<td><strong>Mean Adjusted Sales Price</strong></td>
<td>$228,323</td>
</tr>
<tr>
<td><strong>Standard Deviation AV</strong></td>
<td>$159,812</td>
</tr>
<tr>
<td><strong>Standard Deviation SP</strong></td>
<td>$167,830</td>
</tr>
<tr>
<td><strong>Median Assessed Value</strong></td>
<td>$183,650</td>
</tr>
<tr>
<td><strong>Median Sales Price</strong></td>
<td>$160,229</td>
</tr>
</tbody>
</table>

**Mean Assessed Value:**
- $224,325

**Mean Adjusted Sales Price:**
- $228,323

**Standard Deviation AV:**
- $159,812

**Standard Deviation SP:**
- $167,830

**Median Assessed Value:**
- $183,650

**Median Sales Price:**
- $160,229

**Arithmetic Mean Ratio:**
- 102.91%

**Median Ratio:**
- 99.77%

**Weighted Mean Ratio:**
- 98.25%

**Geometric Mean Ratio:**
- 102.32%

**Lowest Ratio:**
- 91.36%

**Highest Ratio:**
- 126.09%

**Coefficient of Dispersion:**
- 7.71%

**Standard Deviation:**
- 11.98%

**Coefficient of Variation:**
- 11.64%

**Price Related Bias:**
- -0.0144

**PRB T Score:**
- -0.8592

**PRB is inconclusive**

**Price-Related Differential:**
- 1.05

**90% Confidence Intervals:**

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Around the Mean</td>
<td>98.70%</td>
<td>103.12%</td>
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<tr>
<td>Around the Median</td>
<td>94.35%</td>
<td>103.75%</td>
</tr>
<tr>
<td>Around the Weighted Mean</td>
<td>94.25%</td>
<td>102.25%</td>
</tr>
<tr>
<td>Around the COD</td>
<td>4.16%</td>
<td>17.05%</td>
</tr>
<tr>
<td>Around the PRB</td>
<td>-0.0509</td>
<td>0.0221</td>
</tr>
</tbody>
</table>

**80% Confidence Intervals:**

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Around the Mean</td>
<td>98.19%</td>
<td>107.62%</td>
</tr>
<tr>
<td>Around the Median</td>
<td>95.57%</td>
<td>102.15%</td>
</tr>
<tr>
<td>Around the Weighted Mean</td>
<td>95.39%</td>
<td>101.11%</td>
</tr>
</tbody>
</table>

**Probability True Mean 0.9 - 1.1:**
- 96.58%

**Category (ies):**
- V

**Neighborhoods:**
- all

**Chi Square Test:**
- N/A

**Binomial Test:**
- Non-Normal

**Mann-Whitney Test:**
- N/A

**D'Agostino-Pearson:**
- Non-Normal

**Shapiro-Wilk W:**
- Normal

**Kurtosis:**
- 4.65

**Skew:**
- 2.01

**Possible Outliers:**
- -1.50

**Uniformity:**
- COD: Excellent
- COV: Very Good
- PRD: Favors High Priced

**Outlier Method:**
- Outer Quartile Fence: 1 Sale(s) Lost to Trimming

Please enter the category (ies) and neighborhood(s) used in the study.

**Assessment Date:**
- 01/01/2016

**Using Proposed Assessed Values**

**Time Adjusted - Mo. rate**

- -0.238%

### Uniformity

**Around the Mean:**
- 96.58%

**Around the Median:**
- 95.15%

**Around the Weighted Mean:**
- 94.85%

**Probability 0.9 - 1.1:**
- 96.58%

**Category:**
- V

**Neighborhoods:**
- all

**Chi Square Test:**
- N/A

**Binomial Test:**
- Non-Normal

**Mann-Whitney Test:**
- N/A

**D'Agostino-Pearson:**
- Non-Normal

**Shapiro-Wilk W:**
- Normal

**Kurtosis:**
- 4.65

**Skew:**
- 2.01

**Possible Outliers:**
- -1.50
**Simplified Ratio Study**

Using Proposed Assessed Values

**Assessment Date:** 01/01/2016  
**Time Period Studied:** 01/01/2013 - 12/31/2015

**Sales Price is Time Adjusted**

<table>
<thead>
<tr>
<th>Sample Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size (n)</td>
</tr>
<tr>
<td>Total Assessed Value</td>
</tr>
<tr>
<td>Total Adjusted Sales Price</td>
</tr>
<tr>
<td>Mean Assessed Value</td>
</tr>
<tr>
<td>Mean Adjusted Sales Price</td>
</tr>
<tr>
<td>Standard Deviation AV</td>
</tr>
<tr>
<td>Standard Deviation SP</td>
</tr>
<tr>
<td>Median Assessed Value</td>
</tr>
<tr>
<td>Median Sales Price</td>
</tr>
</tbody>
</table>

**Assessment Level**

- **Arithmetic Mean Ratio:** 102.51%
- **Median Ratio:** 99.47%
- **Weighted Mean Ratio:** 100.92%
- **Geometric Mean Ratio:** 101.97%

**Uniformity**

- **Lowest Ratio:** 84.85%
- **Highest Ratio:** 143.02%
- **Coefficient of Dispersion:** 7.86%
- **Coefficient of Variation:** 11.02%
- **Price Related Bias:** -0.0094
- **PRB T Score:** -0.876 PRB is inconclusive
- **Price-Related Differential:** 1.02

**Reliability**

- 90% Confidence Intervals:
  - **Lower:** 99.64%
  - **Upper:** 105.37%
  - **Uniformity:** COD: Excellent, PRD: No Observed Bias

- 80% Confidence Intervals:
  - **Lower:** 100.27%
  - **Upper:** 104.74%
  - **Uniformity:** COD: Excellent, PRD: No Observed Bias

**Normality Test Results:**

- **Chi Square Test:** NA
- **Binomial Test:** Non-Normal
- **Mann-Whitney Test:** -2.05399 Not applicable based on other indicators of vertical equity

**Significance of Value Related Inequity:** Strong

**Possible Outliers:**

- **Count:** 1
- **Ratio:** 2.00

**Asessment Date:** 01/01/2016

**Using Proposed Assessed Values**

**Category (ies):** L

**Neighborhoods:**

- **Outer Quartile Fence:** 0 Sale(s) Lost to Trimming
- **Probability True Mean 0.9 - 1.1:** Approx. 100%
- **Category (ies):** L
- **Neighborhoods:** all

**Not Trimmed?**

- **Kurtosis:** 5.73
- **Skew:** 1.67
  - **Possible Outliers:** -0.50 1.00
Appendix A3
Before and After Reassessment

Ratio Studies

Original 1958 Base Assessed Values

Simplified Ratio Study

Using Original Assessed Values

Assessment Date: 01/01/2016

From: 01/01/2016

To: 05/31/2016

Sales Price is Not Time Adjusted

Time Adj. Not Applied

Sample Statistics

<table>
<thead>
<tr>
<th>Sample size (n)</th>
<th>231</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Assessed Value</td>
<td>$3,174,340</td>
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<tr>
<td>Total Adjusted Sales Price</td>
<td>$36,310,570</td>
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<tr>
<td>Mean Assessed Value</td>
<td>$13,742</td>
</tr>
<tr>
<td>Mean Adjusted Sales Price</td>
<td>$157,189</td>
</tr>
<tr>
<td>Standard Deviation AV</td>
<td>$10,602</td>
</tr>
<tr>
<td>Standard Deviation SP</td>
<td>$142,053</td>
</tr>
<tr>
<td>Median Assessed Value</td>
<td>$11,570</td>
</tr>
<tr>
<td>Median Sales Price</td>
<td>$129,000</td>
</tr>
</tbody>
</table>

Assessment Level

| Arithmetic Mean Ratio | 8.85% |
| Median Ratio | 8.88% |
| Weighted Mean Ratio | 8.74% |
| Geometric Mean Ratio | 8.31% |

Uniformity

| <Extreme> Lowest Ratio | 1.44% |
| Highest Ratio | 15.90% |
| Coefficient of Dispersion | 24.60% |
| Coefficient of Variation | 31.52% |

Price Related Bias 0.0831

PRB T Score: 4.1501

PRB is SIGNIFICANT @ 90%

Price-Related Differential 1.01

Reliability

90% Confidence Intervals:

| Around the Mean | 8.55% - 9.15% |
| Around the Median | 8.51% - 9.34% |
| Around the Weighted Mean | 8.25% - 9.24% |
| Around the COD | 21.94% - 27.75% |
| Around the PRB | 0.0436 - 0.1223 |

80% Confidence Intervals:

| Around the Mean | 8.61% - 9.08% |
| Around the Median | 8.60% - 9.18% |
| Around the Weighted Mean | 8.36% - 9.13% |

Probability True Mean 0.0 - 1.1 0.00%

Normality Test Results:

| Mann-Whitney Test | 1.31806 |
| Shapiro-Wilk W | N/A |
| D'Agostino-Pearson Normal |

Kurtosis

| 3.01 | Acceptable |
| 2.50 | 4.00 |
| Skew | -0.11 | Acceptable |

Note: Study based on sales from 2016 only.
**SIMPLIFIED RATIO STUDY**  
Using Original Assessed Values  

<table>
<thead>
<tr>
<th>Assessment Date:</th>
<th>01/01/2016</th>
<th>01/01/2016</th>
</tr>
</thead>
</table>

Sales Price is Time Adjusted  

**Time Period Studied**  
Linear Trend Selected - Mo. rate  

-0.731%  

**SAMPLE STATISTICS**  
Sample size (n) 197  
Total Assessed Value $2,563,650  
Total Adjusted Sales Price $27,551,562  
Mean Assessed Value $13,013  
Mean Adjusted Sales Price $139,856  
Standard Deviation AV $7,747  
Standard Deviation SP $73,687  
Median Assessed Value $11,710  
Median Sales Price $129,049  

**MECHANICAL LEVEL**  
Arithmetic Mean Ratio $9.32%  
Median Ratio $9.32%  
Weighted Mean Ratio $9.30%  
Geometric Mean Ratio $8.94%  

**UNIFORMITY**  
<Extreme> Lowest Ratio 2.91%  
Highest Ratio 16.14%  
Coefficient of Dispersion 21.51%  
Standard Deviation 2.55%  
Coefficient of Variation 27.36%  

**Price Related Bias** 0.0726  

**Price-Related Differential** 1.00  

**RELIABILITY**  
90% Confidence Intervals:  
Around the Mean 9.02% 9.62%  
Around the Median 8.80% 9.68%  
Around the Weighted Mean 9.01% 9.60%  
Around the COD 19.21% 24.71%  
Around the PRB 0.0251 0.1201  

**80% Confidence Intervals:**  
Around the Mean 9.09% 9.55%  
Around the Median 8.93% 9.63%  
Around the Weighted Mean 9.08% 9.53%  

**Probability True Mean 0.9 - 1.1** 0.00%  

**NORMALITY Test Results:**  
Chi Square Test Normal*  
Kurtosis 3.10  
Skew 2.50  
Shapiro-Wilk W N/A  
Mann-Whitney Test -0.47059  
D'Agostino-Pearson Normal  
Significance of Value Related Inequity - Weak  

**Price-Related Bias (PRB) T Score:** 2.9967  
PRB is SIGNIFICANT @ 90%  

**Probability True Mean 0.9 - 1.1** 0.00%  

**Category (ies):** R  
**Neighborhoods:** all  

**Note:** Study based on sales from 2016 only.
<table>
<thead>
<tr>
<th>From: 01/01/2016</th>
<th>To: 05/31/2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SIMPLIFIED RATIO STUDY</strong></td>
<td>Using Original Assessed Values</td>
</tr>
<tr>
<td><strong>Time Period Studied</strong></td>
<td>Assessment Date:</td>
</tr>
<tr>
<td><strong>Sample size (n)</strong></td>
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</tr>
<tr>
<td><strong>Total Adjusted Sales Price</strong></td>
<td>$11,250,602</td>
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<tr>
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<tr>
<td><strong>Standard Deviation AV</strong></td>
<td>$29,167</td>
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<tr>
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<td>$19,415</td>
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<td><strong>ASSESSMENT LEVEL</strong></td>
<td><strong>Arithmetic Mean Ratio</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Median Ratio</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Weighted Mean Ratio</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Geometric Mean Ratio</strong></td>
</tr>
<tr>
<td><strong>&lt;Extreme&gt; Lowest Ratio</strong></td>
<td>0.89%</td>
</tr>
<tr>
<td><strong>Coefficient of Dispersion</strong></td>
<td>38.91%</td>
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<tr>
<td></td>
<td><strong>Coefficient of Variation</strong></td>
</tr>
<tr>
<td><strong>Price Related Bias</strong></td>
<td>0.1996</td>
</tr>
<tr>
<td><strong>Price-Related Differential</strong></td>
<td>1.04</td>
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</table>

**RELIABILITY**

90% Confidence Intervals:

<table>
<thead>
<tr>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.90%</td>
<td>6.93%</td>
</tr>
<tr>
<td>4.36%</td>
<td>7.39%</td>
</tr>
<tr>
<td>3.94%</td>
<td>7.48%</td>
</tr>
<tr>
<td>26.57%</td>
<td>65.78%</td>
</tr>
<tr>
<td>-0.0743</td>
<td>0.4736</td>
</tr>
</tbody>
</table>

Outlier Method:

- **Inner Quartile Fence**: 2 Sale(s) Lost to Trimming
- Please enter the category (ies) and neighborhood(s) used in the study.

**NORMALLY Test Results**

- Chi Square Test: N/A
- Binomial Test: Non-Normal

Possible Outliers

D'Agostino-Pearson Test: Non-Normal
Shapiro-Wilk Test: Normal
Kurtosis: 4.06
Skew: 1.80

Notes:
- Study based on sales from 2016 only.
- No industrial sales available.
Sales Price is Not Time Adjusted
From: To: 01/01/2016 05/31/2016

<table>
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<tr>
<th>Sample Statistics</th>
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<tbody>
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<tr>
<td>Mean Adjusted Sales Price</td>
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<td>Standard Deviation AV</td>
<td>$1,624</td>
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<td>Standard Deviation SP</td>
<td>$28,032</td>
</tr>
<tr>
<td>Median Sales Price</td>
<td>$39,000</td>
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</table>

<table>
<thead>
<tr>
<th>Assessment Level</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Arithmetic Mean Ratio</td>
<td>3.72%</td>
</tr>
<tr>
<td>Median Ratio</td>
<td>3.66%</td>
</tr>
<tr>
<td>Weighted Mean Ratio</td>
<td>3.72%</td>
</tr>
<tr>
<td>Geometric Mean Ratio</td>
<td>2.88%</td>
</tr>
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</table>

| Price-Related Bias          | 0.1539 |
| Price-Related Differential  | 1.00  |

<table>
<thead>
<tr>
<th>Uniformity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>90% Confidence Intervals:</td>
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</tr>
<tr>
<td>Around the Mean</td>
<td>2.52%</td>
</tr>
<tr>
<td>Around the Median</td>
<td>1.56%</td>
</tr>
<tr>
<td>Around the Weighted Mean</td>
<td>2.73%</td>
</tr>
<tr>
<td>Around the COD</td>
<td>32.41%</td>
</tr>
<tr>
<td>Around the PRB</td>
<td>-0.2246</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Relevance</th>
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<tbody>
<tr>
<td>80% Confidence Intervals:</td>
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</tr>
<tr>
<td>Around the Mean</td>
<td>2.80%</td>
</tr>
<tr>
<td>Around the Median</td>
<td>2.28%</td>
</tr>
<tr>
<td>Around the Weighted Mean</td>
<td>3.00%</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Normality Test Results:</th>
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</thead>
<tbody>
<tr>
<td>Chi Square Test</td>
<td>N/A</td>
</tr>
<tr>
<td>Binomial Test</td>
<td>Non-Normal</td>
</tr>
<tr>
<td>Mann-Whitney Test</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D'Agostino-Pearson</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skew</td>
<td>Acceptable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Kurtosis</th>
<th>Acceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability True Mean</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neighborhoods:</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Category (ies):</td>
<td>L</td>
</tr>
<tr>
<td>Neighborships:</td>
<td>all</td>
</tr>
</tbody>
</table>

| Note: Study based on sales from 2016 only. |       |
New Proposed January 1, 2016 Assessed Values

**SIMPLIFIED RATIO STUDY**

**Using Proposed Assessed Values**

**Assessment Date:**

01/01/2016

**From:** 01/01/2016

**To:** 05/30/2016

**Sales Price is Time Adjusted**

**Linear Trend Selected - Mo. rate**

-0.562%

**SAMPLE STATISTICS**

- **Sample size (n):** 225
- **Total Assessed Value:** $36,639,100
- **Total Adjusted Sales Price:** $36,207,740
- **Mean Assessed Value:** $162,840
- **Mean Adjusted Sales Price:** $160,923
- **Standard Deviation AV:** $145,056
- **Standard Deviation SP:** $144,576
- **Median Assessed Value:** $132,200
- **Median Sales Price:** $132,724

**ASSESSMENT LEVEL**

- **Arithmetic Mean Ratio:** 101.69%
- **Median Ratio:** 100.57%
- **Weighted Mean Ratio:** 101.19%
- **Geometric Mean Ratio:** 101.44%

**UNIFORMITY**

- **Lowest Ratio:** 81.90%
- **Highest Ratio:** 127.46%
- **Coefficient of Dispersion:** 4.90%
- **Standard Deviation:** 7.30%
- **Coefficient of Variation:** 7.18%

**Price Related Bias:** -0.0068

**PRB T Score:** -1.733

**PRB is inconclusive**

**Price-Related Differential:** 1.00

**RELIABILITY**

**90% Confidence Intervals:**

- **Lower:**
  - Around the Mean: 100.89%
  - Around the Median: 99.94%
  - Around the Weighted Mean: 100.36%
  - Around the COD: -4.26%
  - Around the PRB: -0.0145

- **Upper:**
  - Around the Mean: 102.49%
  - Around the Median: 101.21%
  - Around the Weighted Mean: 102.02%
  - Around the COD: 5.69%
  - Around the PRB: 0.0009

**Uniformity:**

- **COD:** Questionable verified ok
- **COV:** Excellent
- **PRD:** No Observed Bias

**90% Confidence Intervals:**

- **Lower:**
  - Around the Mean: 101.06%
  - Around the Median: 100.03%
  - Around the Weighted Mean: 100.54%

- **Upper:**
  - Around the Mean: 102.31%
  - Around the Median: 100.96%
  - Around the Weighted Mean: 101.84%

**Probability True Mean 0.9 - 1.1:** Approx.100%

**NORMALITY Test Results:**

- **Chi Square Test:** Non-Normal
- **Binomial Test:** N/A
- **Mann-Whitney Test:** -1.51693

**Significance of Value Related Inequity - Weak**

**D'Agostino-Pearson Test:** Non-Normal

**Shapiro-Wilk Test:** N/A

**Kurtosis:** 4.64

**Skew:** 0.49

**Price Related Bias:**

- **PRB T Score:** -1.733

**PRB is inconclusive**

**Outlier Method:**

**Outer Quartile Fence: 22 Sale(s) Lost to Trimming**

Please enter the category (ies) and neighborhood(s) used in the study.

**Category (ies):** All

**Neighborhoods:** All

**Probability True Mean 0.9 - 1.1:** Approx.100%

**NORMALITY Test Results:**

- **Chi Square Test:** Non-Normal
- **Binomial Test:** N/A

**Mann-Whitney Test:** -1.51693

**Significance of Value Related Inequity - Weak**

**D'Agostino-Pearson Test:** Non-Normal

**Shapiro-Wilk Test:** N/A

**Kurtosis:** 4.64

**Skew:** 0.49

**Price Related Bias:**

- **PRB T Score:** -1.733

**PRB is inconclusive**

**Coefficient of Dispersion:** 4.90%

**Standard Deviation:** 7.30%

**Coefficient of Variation:** 7.18%

**Price Related Bias:**

- **PRB T Score:** -1.733

**PRB is inconclusive**

**Coefficient of Dispersion:** 4.90%

**Standard Deviation:** 7.30%

**Coefficient of Variation:** 7.18%

**Price Related Bias:**

- **PRB T Score:** -1.733

**PRB is inconclusive**

**Note:** This analysis uses sales from January 1, 2016 to the present
Sales Price is Time Adjusted

Sample size (n) 189
Total Assessed Value $27,471,000
Total Adjusted Sales Price $27,014,343
Mean Assessed Value $145,349
Mean Adjusted Sales Price $142,933
Standard Deviation AV $72,148
Mean Adjusted Sales Price $73,331
Median Assessed Value $132,200
Median Sales Price $132,552

Mean Assessed Value $145,349
Mean Adjusted Sales Price $142,933
Standard Deviation AV $72,148
Standard Deviation SP $73,331
Median Assessed Value $132,200
Median Sales Price $132,552

Arithmetic Mean Ratio 102.34%
Median Ratio 100.85%
Weighted Mean Ratio 101.69%
Geometric Mean Ratio 102.12%

Lowest Ratio 82.86%
Highest Ratio 126.23%
Coefficient of Dispersion 4.75%
Standard Deviation $72,148
Coefficient of Variation 6.77%

Price Related Bias -0.0126
Price-Related Differential 1.01

90% Confidence Intervals:  
Around the Mean 101.51% - 103.17%
Around the Median 100.23% - 101.89%
Around the Weighted Mean 100.80% - 102.58%
Around the COD 4.09% - 5.56%
Around the PRB -0.0236 -0.0017

Uniformity: COD: Questionable  verified ok
PRD: No Observed Bias

80% Confidence Intervals:  
Around the Mean 101.69% - 102.99%
Around the Median 100.42% - 101.79%
Around the Weighted Mean 100.99% - 102.39%

Probability True Mean 0.9 - 1.1
Chi Square Test Normal
Binomial Test N/A

Mann-Whitney Test -1.70191
Significance of Value Related Inequity - Weak
D'Agostino-Pearson Normal
Shapiro-Wilk W N/A
Kurtosis 3.96 Acceptable
Skew 0.08 Acceptable

Note: This analysis uses sales from January 1, 2016 to the present.
From: 01/01/2016  To: 05/30/2016
Sales Price is Time Adjusted

<table>
<thead>
<tr>
<th>Sample Statistics</th>
<th>Sample size (n)</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Assessed Value</td>
<td>$6,826,400</td>
<td></td>
</tr>
<tr>
<td>Total Adjusted Sales Price</td>
<td>$6,897,292</td>
<td></td>
</tr>
<tr>
<td>Mean Assessed Value</td>
<td>$310,291</td>
<td></td>
</tr>
<tr>
<td>Mean Adjusted Sales Price</td>
<td>$313,513</td>
<td></td>
</tr>
<tr>
<td>Standard Deviation AV</td>
<td>$308,865</td>
<td></td>
</tr>
<tr>
<td>Standard Deviation SP</td>
<td>$315,027</td>
<td></td>
</tr>
<tr>
<td>Median Assessed Value</td>
<td>$197,900</td>
<td></td>
</tr>
<tr>
<td>Median Sales Price</td>
<td>$207,025</td>
<td></td>
</tr>
</tbody>
</table>

**ASSESSMENT LEVEL**

- **Arithmetic Mean Ratio**: 99.31%
- **Median Ratio**: 99.93%
- **Weighted Mean Ratio**: 98.97%
- **Geometric Mean Ratio**: 99.26%

**UNIFORMITY**

- **Lowest Ratio**: 90.84%
- **Highest Ratio**: 104.30%
- **Coefficient of Dispersion**: 2.34%
- **Coefficient of Variation**: 3.23%

**Price Related Bias**: -0.0032

**PRB T Score**: -0.6816  PRB is inconclusive

**Price-Related Differential**: 1.00

**RELIABILITY**

- **90% Confidence Intervals:**
  - **Uniformity:**
  - **COD**: Questionable, verified ok
  - **PRD**: No Observed Bias

- **80% Confidence Intervals:**
  - **Outer Quartile Fence**: 2 Sale(s) Lost to Trimming
  - Please enter the category(ies) and neighborhood(s) used in the study.

<table>
<thead>
<tr>
<th>Probability True Mean</th>
<th>0.9 - 1.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approx. 100%</td>
<td></td>
</tr>
</tbody>
</table>

**NORMALITY Test Results:**

- **Chi Square Test**: N/A
- **Binomial Test**: Non-Normal
- **Mann-Whitney Test**: N/A

**D'Agostino-Pearson**: Normal

**Shapiro-Wilk**: Normal

- **Kurtosis**: 3.73  Acceptable
- **Skew**: -0.95  Acceptable

Note: This analysis uses sales from January 1, 2016 to the present.
### SIMPLIFIED RATIO STUDY

**Using Proposed Assessed Values**

<table>
<thead>
<tr>
<th>Category</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>01/01/2016</td>
<td>05/30/2016</td>
</tr>
</tbody>
</table>

**Sales Price is Not Time Adjusted**

**Time Adj. Not Applied**

### SAMPLE STATISTICS

<table>
<thead>
<tr>
<th>Sample size (n)</th>
<th>Sample size (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Assessed Value</th>
<th>$574,400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Adjusted Sales Price</td>
<td>$625,100</td>
</tr>
<tr>
<td>Mean Assessed Value</td>
<td>$41,029</td>
</tr>
<tr>
<td>Mean Adjusted Sales Price</td>
<td>$44,650</td>
</tr>
<tr>
<td>Standard Deviation AV</td>
<td>$30,627</td>
</tr>
<tr>
<td>Standard Deviation SP</td>
<td>$28,032</td>
</tr>
<tr>
<td>Median Assessed Value</td>
<td>$43,000</td>
</tr>
<tr>
<td>Median Sales Price</td>
<td>$39,000</td>
</tr>
</tbody>
</table>

### ASSESSMENT LEVEL

- Arithmetic Mean Ratio: 85.89%
- Median Ratio: 92.67%
- Weighted Mean Ratio: 91.89%
- Geometric Mean Ratio: 81.06%

### UNIFORMITY

- Lowest Ratio: 37.50%
- Highest Ratio: 124.75%
- Coefficient of Dispersion: 22.69%
- Standard Deviation: 27.59%
- Coefficient of Variation: 32.12%

### Price Related Bias

- Price-Related Differential: 0.93

### RELIABILITY

- 90% Confidence Intervals:
  - Around the Mean: 72.83% to 98.95%
  - Around the Median: 63.96% to 103.02%
  - Around the Weighted Mean: 82.18% to 101.60%
  - Around the COD: 16.90% to 36.25%
- Around the PRB: 0.0017 to 0.2691

**Uniformity:**

- COD: Somewhat Poor
- COV: Poor
- PRD: Favors Low Priced

**Price-Related Differential:**

- PRB T Score: 2.1774
- PRB is SIGNIFICANT @ 90%

### OUTLIER METHOD

- **None:** NO Sale(s) Lost to Trimming

### Normality Test Results

- Chi Square Test: N/A
- Binomial Test: Non-Normal
- Shapiro-Wilk Test: Normal
- Kurtosis: 2.04
- Skew: -0.36
- Mann-Whitney Test: N/A

### Note

- This analysis uses sales from January 1, 2016 to the present
- There are/is 6 category(ies) currently selected
- See Parameters Sheet for Category Details
Appendix B: Evaluating Assessment Systems – The IAAO Perspective

Introduction

The information in this Appendix reflects general IAAO commentary on evaluating the quality of assessment and reassessment systems. Although it reflects upon the principle of frequent reappraisal to better capture current market influences and physical property changes, it is intended to provide perspective and background. As such, both commentary and supportive examples and illustrations are not based on analysis of data within Blair County. Examples are generic and are provided for illustration of principles only.

The IAAO and Reappraisal

The International Association of Assessing Officers (IAAO) is an internationally recognized association of assessment professionals which provides, among other things, educational materials, reference publications and standards that are widely recognized throughout the assessment community. The express mission of the IAAO is to provide leadership in mass appraisal, assessment administration, and property tax policy.

IAAO supports the concept of frequent reappraisal or updating of values. Property Appraisal and Assessment Administration\(^\text{25}\) states:

“In an ideal system, a reappraisal, an updating of values for all properties in a jurisdiction, would be done annually. Frequent reappraisal, especially where property values are changing rapidly, may be essential to fair distribution of the property tax.”

Recognizing that more frequent reappraisals produce better quality assessments, but that jurisdictions generally do not have the resources to permit complete physical inspection and reappraisal each year, the IAAO Standard on the Mass Appraisal of Real Property\(^\text{26}\) recommends “...physical reviews and individual reappraisals, which are required to correct lack of uniformity within strata.” This Standard goes on to state: “…properties should be physically reviewed and individually reappraised at least every four to six years.”

In addition, IAAO supports using current market value as a basis for property tax to:

“...maximize fairness and understandability in a property tax system....”\(^\text{27}\)

Because there is a risk that increases in assessed value will translate directly into increases in property taxes, IAAO further recommends tax systems in which “higher values force rates downward and offset rising assessments.”\(^\text{28}\) My understanding is that such a system is in place in Pennsylvania during reassessment periods.

\(^{25}\) IAAO. 1990. Property Appraisal and Assessment Administration. P. 9. Chicago, IL


\(^{28}\) Ibid. Section 5.2, p. 16.
The following table illustrates the effect of reassessment on properties given budget based systems that force rates to adjust and rate based systems that do not. The dates and information shown are for illustration only and are not intended to reflect actual tax rates in Blair County.

<table>
<thead>
<tr>
<th>Parcel</th>
<th>2007 Assessed Value ($)</th>
<th>2008 Assessed Value ($)</th>
<th>2007 Property Tax ($)</th>
<th>2008 Property Tax $— rate-driven</th>
<th>2008 Property Tax $— budget-driven</th>
<th>Change in property tax $ related to rate-driven budget system</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100,000</td>
<td>200,000</td>
<td>1,250</td>
<td>2,500</td>
<td>2,222</td>
<td>+ 278</td>
</tr>
<tr>
<td>B</td>
<td>100,000</td>
<td>100,000</td>
<td>1,250</td>
<td>1,250</td>
<td>1,111</td>
<td>+ 139</td>
</tr>
<tr>
<td>C</td>
<td>100,000</td>
<td>100,000</td>
<td>1,250</td>
<td>1,250</td>
<td>1,111</td>
<td>+ 139</td>
</tr>
<tr>
<td>D</td>
<td>100,000</td>
<td>50,000</td>
<td>1,250</td>
<td>625</td>
<td>556</td>
<td>+ 69</td>
</tr>
<tr>
<td>Totals:</td>
<td>400,000</td>
<td>450,000</td>
<td>5,000</td>
<td>5,625</td>
<td>5,000</td>
<td>+ 625</td>
</tr>
</tbody>
</table>

**Ratio Studies**

One of the most important tools available for evaluating the accuracy of appraisals and assessments is the ratio study. In such a study, sales prices are compared with (appraised or) assessed values, by dividing the assessed value of each selling parcel by its sale price. Provided sales are properly screened to identify arm’s length transactions, sale prices are considered to: “…provide the most objective estimates of market values and under normal circumstances should provide good surrogates of market value.”

Ratio studies are statistical tests and, as such, rely on sufficient numbers of market value sales to produce meaningful results. “While a single sale may provide an indication of the market value of the property in question, it cannot form the basis for a ratio study, which provides information about the market values of groups of properties.”

The ratio study provides information about the level of assessments, by allowing determination of how close to or far from market value a neighborhood or county is on an overall basis. The goal of “market value” is achieved on an overall basis when a representative ratio study indicates a mean or median ratio (these statistics indicate assessment level) of about 100%. The IAAO Standard on Ratio Studies suggests that a range of ±10% around this measure should be considered acceptable. This is widely misunderstood as it does not mean that every individual property ratios in a sample may differ from the median by no more than 10%. Instead, the range given is to be applied to the statistical measures of level, such as the median. The occurrence of a small number of ratios that differ significantly from the median is not conclusive, unless these sales represented a particular neighborhood or other stratum under review.

In addition, ratio studies provide valuable information about taxpayer equity within a neighborhood or jurisdiction by providing statistical measures of uniformity or variation. If uniformity is good, few parcels will be found to differ widely from indicated measures of level and taxpayer equity within the tested area will be good. Depending on the homogeneity of properties in a given neighborhood, the

---


31 Ibid.
IAAO *Standard on Ratio Studies* suggests that good uniformity exists when there is a Coefficient of Dispersion (COD) of 10% or less (for the most homogeneous areas), 15% or less (less homogeneous areas), 20% or less (vacant land and most income producing properties), and sometimes higher amounts for unusual properties or market conditions. A further caveat in the Standard notes that CODs less than 5% indicate unexpectedly good uniformity and may not be representative.

Part of measuring uniformity is determining whether high and low priced properties within a given neighborhood or jurisdiction are being treated similarly, with respect to level of assessment. Vertical inequity is said to exist if, for example, $200,000 homes were assessed at $150,000 (75%), while $80,000 homes were assessed at $80,000 (100%). In this sample case, if $2,000 in property taxes were levied by a particular taxing district, and these two properties were the only ones within the boundaries of that taxing district, the more expensive home would pay $1,304 and the less expensive would pay $696. If both had been assessed at the same ratio with respect to full value (even if it were not 100%), the more expensive one would have paid $1,428 and the less expensive one $571. The degree of this type of inequity is measured in ratio studies with a statistic known as the Price Related Differential (PRD). When the PRD is between 0.98 and 1.03 vertical inequity is considered minimal. More recently, the IAAO *Standard* includes guidelines based on the PRB as well as the PRD. The PRB is considered by many researchers to be more precise and less susceptible to producing false “positive” findings of non-compliance, a troublesome feature of the PRD.

Level and uniformity statistics are illustrated by the following hypothetical examples (not derived from or representing any actual data or conditions within Blair County).

Table B1: Level of assessment

<table>
<thead>
<tr>
<th>Sale #</th>
<th>Assessed Value</th>
<th>Sale Price</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$20,000</td>
<td>$50,000</td>
<td>40.00%</td>
</tr>
<tr>
<td>2</td>
<td>30,000</td>
<td>50,000</td>
<td>60.00%</td>
</tr>
<tr>
<td>3</td>
<td>40,000</td>
<td>50,000</td>
<td>80.00%</td>
</tr>
<tr>
<td>4</td>
<td>50,000</td>
<td>50,000</td>
<td>100.00%</td>
</tr>
<tr>
<td>5</td>
<td>60,000</td>
<td>50,000</td>
<td>120.00%</td>
</tr>
<tr>
<td>6</td>
<td>70,000</td>
<td>50,000</td>
<td>140.00%</td>
</tr>
<tr>
<td>7</td>
<td>80,000</td>
<td>50,000</td>
<td>160.00%</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td><strong>350,000</strong></td>
<td><strong>350,000</strong></td>
<td><strong>700.00%</strong></td>
</tr>
</tbody>
</table>

Mean = 100.00%
Median = 100.00%
WTD. Mean = 100.00%

In Table B1, all measures of assessment level equal 100% of market value. This does not require each individual ratio to be 100% or even within any specified range of 100%.
Table B2: Level of assessment may be affected by asymmetrical distribution of ratios.

<table>
<thead>
<tr>
<th>Sale #</th>
<th>Assessed Value</th>
<th>Sale Price</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$80,000</td>
<td>$50,000</td>
<td>160.00%</td>
</tr>
<tr>
<td>2</td>
<td>75,000</td>
<td>60,000</td>
<td>125.00%</td>
</tr>
<tr>
<td>3</td>
<td>70,000</td>
<td>70,000</td>
<td>100.00%</td>
</tr>
<tr>
<td>4</td>
<td>65,000</td>
<td>80,000</td>
<td>81.25%</td>
</tr>
<tr>
<td>5</td>
<td>60,000</td>
<td>90,000</td>
<td>66.67%</td>
</tr>
<tr>
<td>6</td>
<td>55,000</td>
<td>100,000</td>
<td>55.00%</td>
</tr>
<tr>
<td>7</td>
<td>50,000</td>
<td>110,000</td>
<td>45.45%</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td><strong>455,000</strong></td>
<td><strong>560,000</strong></td>
<td><strong>633.37%</strong></td>
</tr>
</tbody>
</table>

\[
\text{MEAN} = 90.48\% \\
\text{MEDIAN} = 81.25\% \\
\text{WTD. MEAN} = 81.25\%
\]

Because it is common for ratio study statistics to be influenced by high ratios to a greater extent than low ratios, the median is considered the most appropriate measure of assessment level for general purposes.

Table B3 provides a ratio study that indicates good level of assessment, but poor uniformity. Table B4 shows similar assessment level with good uniformity and both results are shown graphically in Table B5.

Table B3: Good level, poor uniformity

<table>
<thead>
<tr>
<th>Sale #</th>
<th>Assessed Value</th>
<th>Sale Price</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$10,000</td>
<td>$25,000</td>
<td>40.00%</td>
</tr>
<tr>
<td>2</td>
<td>30,000</td>
<td>50,000</td>
<td>60.00%</td>
</tr>
<tr>
<td>3</td>
<td>22,500</td>
<td>30,000</td>
<td>75.00%</td>
</tr>
<tr>
<td>4</td>
<td>60,000</td>
<td>60,000</td>
<td>100.00%</td>
</tr>
<tr>
<td>5</td>
<td>37,500</td>
<td>30,000</td>
<td>125.00%</td>
</tr>
<tr>
<td>6</td>
<td>70,000</td>
<td>50,000</td>
<td>140.00%</td>
</tr>
<tr>
<td>7</td>
<td>40,000</td>
<td>25,000</td>
<td>160.00%</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td><strong>270,000</strong></td>
<td><strong>270,000</strong></td>
<td><strong>700.00%</strong></td>
</tr>
</tbody>
</table>

\[
\text{MEAN} = 100.00\% \\
\text{MEDIAN} = 100.00\% \\
\text{WTD. MEAN} = 100.00\%
\]

\[
\text{(COD) COEFFICIENT OF DISPERSION} = 35.71\% \\
\text{(COV) COEFFICIENT OF VARIATION} = 44.06\%
\]
Table B4: Good level, good uniformity

<table>
<thead>
<tr>
<th>Sale #</th>
<th>Assessed Value</th>
<th>Sale Price</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$ 21,000</td>
<td>$ 25,000</td>
<td>84.00%</td>
</tr>
<tr>
<td>2</td>
<td>44,000</td>
<td>50,000</td>
<td>88.00%</td>
</tr>
<tr>
<td>3</td>
<td>28,000</td>
<td>30,000</td>
<td>93.33%</td>
</tr>
<tr>
<td>4</td>
<td>60,000</td>
<td>60,000</td>
<td>100.00%</td>
</tr>
<tr>
<td>5</td>
<td>32,000</td>
<td>30,000</td>
<td>106.67%</td>
</tr>
<tr>
<td>6</td>
<td>56,000</td>
<td>50,000</td>
<td>112.00%</td>
</tr>
<tr>
<td>7</td>
<td>29,000</td>
<td>25,000</td>
<td>116.00%</td>
</tr>
<tr>
<td><strong>Totals:</strong></td>
<td><strong>$ 270,000</strong></td>
<td><strong>$ 270,000</strong></td>
<td><strong>700.00%</strong></td>
</tr>
</tbody>
</table>

MEAN = 100.00% * MEASURES

MEDIAN = 100.00% * OF ASSESSMENT

WTD. MEAN = 100.00% * LEVEL

GEOMETRIC MEAN = 99.36% *

(COD) COEFFICIENT OF DISPERSION = 9.90% * MEASURES

(COV) COEFFICIENT OF VARIATION = 12.17% * UNIFORMITY
Chart B1: Graphic depiction of uniformity as measured by the hypothetical CODs in tables B3 and B4.

Level vs. Uniformity
Deviation from Median

![Graph showing deviation from median for two groups with CODs 36% and 9%]

Comparisons of 2 groups of 7 sales
If Deviation = 0, uniformity is perfect

Tables B5 and B6 provide examples of good vertical equity (Table B5), in which there is no discernable difference in the ratio of assessment of high and low priced properties, and assessment regressivity, in which high priced properties are under-assessed relative to low priced properties (Table B6).

Table B5: Good vertical equity

<table>
<thead>
<tr>
<th>Sale #</th>
<th>Assessed Value</th>
<th>Sale Price</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$ 25,000</td>
<td>$ 20,000</td>
<td>125.00%</td>
</tr>
<tr>
<td>2</td>
<td>24,000</td>
<td>30,000</td>
<td>80.00%</td>
</tr>
<tr>
<td>3</td>
<td>31,000</td>
<td>40,000</td>
<td>80.00%</td>
</tr>
<tr>
<td>4</td>
<td>40,000</td>
<td>50,000</td>
<td>100.00%</td>
</tr>
<tr>
<td>5</td>
<td>60,000</td>
<td>60,000</td>
<td>100.00%</td>
</tr>
<tr>
<td>6</td>
<td>79,000</td>
<td>70,000</td>
<td>112.86%</td>
</tr>
<tr>
<td>Totals:</td>
<td>259,000</td>
<td>270,000</td>
<td>575.36%</td>
</tr>
</tbody>
</table>

- WEIGHTED MEAN = 95.93%
- MEAN = 95.89%
- PRD = 1.00*
  *DOES NOT FAVOR LOW OR HIGH PRICED
Table B6: Higher ratios on low priced properties

<table>
<thead>
<tr>
<th>Sale #</th>
<th>Assessed Value</th>
<th>Sale Price</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$30,000</td>
<td>$20,000</td>
<td>150.00%</td>
</tr>
<tr>
<td>2</td>
<td>40,000</td>
<td>30,000</td>
<td>133.33%</td>
</tr>
<tr>
<td>3</td>
<td>45,000</td>
<td>40,000</td>
<td>112.50%</td>
</tr>
<tr>
<td>4</td>
<td>50,000</td>
<td>50,000</td>
<td>100.00%</td>
</tr>
<tr>
<td>5</td>
<td>40,000</td>
<td>60,000</td>
<td>66.67%</td>
</tr>
<tr>
<td>6</td>
<td>45,000</td>
<td>70,000</td>
<td>64.29%</td>
</tr>
<tr>
<td>Totals:</td>
<td>250,000</td>
<td>270,000</td>
<td>626.79%</td>
</tr>
</tbody>
</table>

WEIGHTED MEAN = 92.59%
MEAN = 104.46%
PRD = 1.13**

**FAVORS HIGH PRICED

The IAAO Standard on Ratio Studies has established varying standards for level and uniformity, depending partly on the type of property. Larger CODs mean worse uniformity, but it is difficult to achieve better uniformity when property is in heterogenous areas or of heterogenous types. General uniformity standards are found in Table 2-3 of the IAAO Standard on Ratio Studies: This same table also footnotes the IAAO standards for vertical equity (using the PRD) and for appraisal level.

---

32 IAAO. Standard on Ratio Studies. 2013. p. 34. (adapted from)
## Ratio study uniformity standards indicating acceptable general quality

<table>
<thead>
<tr>
<th>General Property Class</th>
<th>Jurisdiction Size /Profile /Market Activity</th>
<th>COD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential improved (single family dwellings,</td>
<td>Very large jurisdictions / densely populated / newer properties / active markets</td>
<td>10.0</td>
</tr>
<tr>
<td>condominiums, manuf. housing, 2-4 family units)</td>
<td>Large to mid-sized jurisdictions / older &amp; newer properties / less active markets</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>Rural or small jurisdictions / older properties / depressed market areas</td>
<td>20.0</td>
</tr>
<tr>
<td>Income-producing properties (commercial, industrial, apartments,)</td>
<td>Very large jurisdictions / densely populated / newer properties / active markets</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>Large to mid-sized jurisdictions / older &amp; newer properties / less active markets</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td>Rural or small jurisdictions / older properties / depressed market areas</td>
<td>25.0</td>
</tr>
<tr>
<td>Residential vacant land</td>
<td>Very large jurisdictions / rapid developing / active markets</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>Large to mid-sized jurisdictions / slower development / less active markets</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td>Rural or small jurisdictions / little development / depressed markets</td>
<td>25.0</td>
</tr>
<tr>
<td>Other (non-agricultural) vacant land</td>
<td>Very large jurisdictions / rapid development / active markets</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td>Large to mid-sized jurisdictions / slower development / less active markets</td>
<td>25.0</td>
</tr>
<tr>
<td></td>
<td>Rural or small jurisdictions / little development / depressed markets</td>
<td>30.0</td>
</tr>
</tbody>
</table>

*These types of property are provided for general guidance only and may not represent jurisdictional requirements.*

*The COD performance recommendations are based upon representative and adequate sample sizes, with outliers trimmed and a 95% level of confidence.*

*Appraisal level recommendation for each type of property shown should be between 0.90 and 1.10.*

*PRD’s for each type of property should be between 0.98 and 1.03 to demonstrate vertical equity.

*PRD standards are not absolute and may be less meaningful when samples are small or when wide variation in prices exist. In such cases, statistical tests of vertical equity hypotheses should be substituted.*

*CODs lower than 5.0 may indicate sales chasing or non-representative samples.*
Appendix C
Sample Time Adjustment

Example of Linear Time Adjustment based on Blair County Ratio Study Data

The following chart is an example of a time adjustment chart, taken from the Category R ratio study analysis of the reassessment value.

The time adjustment for this sample shows on the analysis page found in Appendix A2 as:

| Linear Trend Selected - Mo. rate | -0.129% |

This reduction in ratios reflects a corresponding increase in sale prices through the period. Sale prices were adjusted accordingly to reflect price as of January 1, 2016 and the ratio study was run on the adjusted sale prices.