Ratio Study Summary

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1. STUDY METHODOLOGY

1.1 Data Preparation

In accordance with ACD rules, counties and their contractors provided ACD with a file of all real property parcels for 2023. The files, provided in Excel format, contained relevant property characteristics, valuation, and sales data as called for in Rule 4.04.1b. These files were converted to a common SPSS format for analysis, checked for duplicate parcels, and removed exempt and other properties outside the scope of the study. Relevant property types were classified as residential improved (RI), commercial improved (CI), or vacant land (VA).

Based on deed types and validation codes, usable sales were identified for ratio analysis. Only warranty, limited warranty, and special warranty deeds were considered, and all validation codes enumerated in ACD rules other than VS, VA, AP, or UV were excluded. In accordance with ACD rules, the lowest 10% (appraised value) of properties in their class (RI, CI, or VA) were eliminated, as well as any sales with prices that fell below the threshold value for their class, any sales involving new construction, mobile home properties, and any commercial/industrial properties that constituted more than 5% of the total value of commercial/industrial properties in the county. Appraised values for multiple parcel sales were combined. Special analysis was performed of unverified (UV) sales in which the distribution of ratios for these sales was compared with those of validated sales. Extreme ratios for UV sales were removed that both (a) lied outside the distribution of validated sales and (b) fell below 0.25 or above 2.00. Section 1.3 below describes general outlier analysis.

Per ACD rules, one year of residential and vacant land sales and two years of commercial sales were used for analysis in counties with 50,000 or more real property parcels. For other counties, two years of residential and vacant sales and three years of commercial sales were used for analysis.

At the conclusion of exploratory data analysis and sales screening a data file was saved containing both sold and unsold parcels for use in subsequent analyses.

1.2 Time Trend Analysis

Sales were analyzed and adjusted for statistically significant changes in price levels over the relevant study period. Using the sales ratio trend method, a separate analysis was conducted for each property type in each county with adequate sales[1]. The analysis began by plotting sale-to-assessment ratios (SARs) against time and temporarily filtering outlier SARs. Plots were

[1] For a more detailed discussion of the sales ratio trend method of time adjustment, see Robert Gloudemans, *Mass Appraisal or Real Property* (IAAO, 1999), pages 265-268 or Robert Gloudemans and Richard Almy, *Fundamentals for Mass Appraisal* (IAAO, 2011), pages 151-155.

studied to determine whether trends could be approximated with a straight line. If not, "splines" (multiple straight lines) were defined to approximate the indicated pattern.

Regression analysis was used to test for statistical significance and quantify significant trends. The dependent variable in these analyses was the logarithm of SARs and the independent variable was Months (e.g., 1-24 for two years of data) or segments thereof. For example, if the market were flat in the first 15 months and then increase over the remaining 9 months, two splines would be evaluated: Months1 (1-15) and Months2 (0-9). For a sale occurring in month 20, Months1 would be coded as 15 and Months2 as 5, since the sale price would reflect any price changes over all 20 months. If the sale occurred in month10, Month1 would be coded as 10 and Months2 as 0. The logarithm of SAR was used to determine percentage changes. If a time trend was found, sales prices were adjusted to the end of the study period at the indicated rate or rates.

1.3 Outlier Analysis

With sales adjusted for time as necessary, ratios were analyzed for outliers and those that would compromise the validity of ratio statistics were removed. The analysis began by plotting the distribution of sales ratios on both raw and logarithmic format. Ratios were tagged that were more than 1.5 times the inter-quartile range (IQR) below the 25th percentile or above the 75th percentile. However, in no case were ratios trimmed between 0.60 and 1.40. The resulting trim points and distribution of tagged and untagged sales were analyzed, and trim points adjusted as necessary to make logical sense, that is, to ensure that obvious outliers were excluded but that ratios constituting a smooth progression were retained.

A guiding principle in the outlier analysis was, where possible, to remove no more than 5% of ratios for a given property type in each county. However, when samples were small or ratios exhibited wide dispersion, this general rule was relaxed with the caveats that (a) where possible, no more than 10% of ratios in a class were removed and (b) where possible, no more than 5.5% of all ratios were removed.

1.4 Ratio Analysis

Once outliers were removed, key ratio statistics were calculated for each of the three property types. For each property type the following was calculated and reported: number of sales, median ratio, 95% confidence interval for the median, coefficient of dispersion (COD), and price-related differential (PRD). These statistics were also reported by market area, city, school district, dwelling quality grade, land classification groups, and commercial occupancy groups.

Separately, using additional sample data provided, median ratios, 95% confidence interval for the median, and coefficient of dispersion (COD) was calculated and reported for agricultural

and business personal property; median ratios for non-business personal property (autos) was also incorporated into the study.

Using total assessed values calculated for each of the three major study classes, the assessed values were divided by the median ratios to obtain estimated total market values for each class. Similarly, using abstract data provided to ACD by counties or their contractors, the assessed value for agricultural, business personal and non-business personal property was divided by their respective medians (usually 20%) to obtain estimated market values for each of these property classes. Finally, the assessed values and estimated market values for the six property types were summed and divided aggregate assessed value by aggregate market value to obtain an estimated overall assessment ratio. According to ACD standards this ratio must be between 18% and 22%. In addition, the 95% confidence interval for each of the three major classes must overlap 0.18 to 0.22, as must the 95% confidence interval for residential property and vacant land in each market area. CODs must also comply with requirements set out in ACD rules.

1.5 Sold Versus Unsold Parcels

ACD's rules require the agency to "vigilantly monitor whether counties are appraising unsold properties in the same manner as sold properties." To this end the median and average value changes were compared for each of the three property classes and cases were highlighted where differences exceeded 10%. The Mann-Whitney test was also used to determine the statistical reliability of observed differences. These analyses were conducted after removing the lowest 5% and highest 5% of value changes for both sold and unsold properties in each of the three classes. To ensure the true percent increase or decrease between the previous and current appraised values were being analyzed, all parcels containing more than 5% of new construction were also removed from the analysis. Indicated cut points were further adjusted if required to remove unusually substantial changes.

If initial analysis indicated statistically significant changes of more than 10% based on both the median and mean ratio, supplemental analyses was conducted at the market area and/or neighborhood level. Based on these comparisons' instances of systematic differences in value changes between sold and unsold parcels were highlighted.

2. SUMMARY OF FINDINGS

Attachment 1 summarizes results for the 12 counties included in the 2023 study. In all cases the median level of assessment complies with ACD rules. In all cases appraisal uniformity (COD) complies with ACD rules.

Statistically significant time trends were found in seven of the twelve counties (see Attachment 1).

As the final column to the table on Attachment 1 indicates, in all cases the "Sold versus Unsold Parcels" test complies with ACD rules.

Attachment 2 shows the percentage of sales assigned valid and invalid verification codes in each county, the percentage coded "UV" or (less frequently) left blank, as well as the percentage assigned an undefined code (codes not on the approved list of validation codes as listed in Rule 4.04.1c3a&b).

3. RELEVANT ISSUES

Since multiple sales of the same property are now being used in the analysis, the "sale type" field was added to the Extract report to aid in the analysis of these sales. Some counties are coding this field incorrectly or leaving this field blank. It is extremely important that counties utilize this field and code these sales correctly to ensure that the sales are being analyzed correctly. For example, if a sale occurs on a vacant property and then improvements are built on that property, the "sale type" still needs to be coded as 'vacant' so that during the analysis only the appraised land value is compared to the sale price. If the "sale type" field is left blank or coded as 'improved,' the analysis will compare the total appraised value (which includes improvements) to the vacant land sales price, which will artificially inflate the sales ratio for the property. If enough of these sales are coded incorrectly, it could have a detrimental effect on the overall ratio results causing a county to fail the ratio study and fall out of compliance.

Another area in which improper coding has been detected is occurring with sales that involve multiple parcels. Several coding errors have been discovered on these types of sales on both the "sale type" and "sales validation code" fields. If a multi-parcel sale occurs involving both improved and vacant parcels, then all parcels involved in the sale should be coded as 'improved' in the "sale type," even though some of the parcels may have a vacant property type code. For example, if a sale consists of a house and two vacant lots, the "sale type" should be coded as 'improved' on all 3 parcels. The "sale type" strictly refers to type of sale (improved or vacant), not the individual property types. The second area where coding errors have been discovered concerning multi-parcel sales are in the "sales validation code" field, both for valid and invalid sales.

- For valid sales, the "sales validation code" for the primary parcel (which should be the most predominate parcel, or better put – usually the parcel with the highest value) should be coded as 'VA' (primary parcel of a group of parcels that have sold) and the remaining parcels should be coded as 'AP' (additional parcels that are linked to the primary parcel). All parcels in a multi-parcel sale should have the same ownership transfer record (sale price, book, page, grantee, grantor, etc.), but for analysis purposes only one of these parcels should remain in the sample, otherwise you will be analyzing the same sale multiple times. The SPSS syntax takes care of this in the following manner: The parcel coded with the 'VA' sales validation code is tagged as the primary parcel, if none of the parcels are coded 'VA' then the syntax will tag the parcel with the highest total value as the primary parcel. The appraised value fields (current and previous) on the primary parcel are replaced with the aggregated values of all parcels contained in the multi-parcel sale to determine the total appraised value for all parcels involved in the sale. The sale price is not aggregated for all parcels since the sale price listed on the deed is already the total sale price for all parcels involved in the sale. Once the values have been combined or aggregated, the parcels not tagged as the primary parcel are removed from the analysis, leaving only the primary parcel in the sample to be used in

the analysis. Conflicts occur when the primary parcel of a multi-parcel sale is not coded 'VA'. In some instances when a county is working the deed of a multi-parcel sale, the first parcel that they determine is part of the multi-parcel sale is coded as 'VA' and then all additional parcels are coded 'AP', even though the first parcel may have been vacant and one of the additional parcels was improved. In this case the improved parcel should have been coded 'VA' and the vacant parcel coded 'AP'. So, when this multi-parcel sale is analyzed in SPSS, it will be left with a vacant parcel that contains improved values.

- For invalid sales, if a multi-parcel sale is determined to be an invalid sale, then the same invalid "sales validation code" should be coded on all parcels involved in the multi-parcel sale. In some instances, only one parcel of the multi-parcel sale was coded with the proper invalid sales validation code, while the sales validation code on the remaining parcels of the multi-parcel sale was either left blank of coded with the 'UV' (unverified) code. 'UV' codes remain in the analysis, in the above example, some of these parcels that were determined to be invalid could end up being part of the analysis and distorting the overall results of the ratio study.

Rule 4.04.1b directs counties to supply ACD with a list of all deeds for the time frame covered in the ratio study. However, there are no official definitions of deed type codes and counties declare and define these individually. Submitted deed type codes are numerous and sometimes missing, making it difficult to determine whether sales are in fact warranty, corporate warranty, limited warranty, or special warranty deeds. For example, "CP" represents corporate warranty deeds in some counties and contract for purchase sales in others.

While ACD rules provide a list of allowable rejection codes for invalidating sales to be considered in the study, submitted validation codes sometimes deviated from defined approved codes, were simply marked "UV" (unverified), or left blank. Attachment 2 shows the percentage of sales assigned valid and invalid verification codes in each county, as well as the percentage coded "UV" or (less frequently) left blank. The percentage of sales affirmatively assigned valid sales codes (VS, VA, or AP) ranged from 1% to 31%, while the percentage of sales affirmatively assigned invalid sales codes ranged from 10% to 82%. Overall, 39% of sales were assigned "UV" or blank codes, with the percentage ranging from 9% to 59%. While a low percentage of usable sales can be partly explained by the fact that many unusable sales are likely other than warranty, corporate warranty, limited warranty or special warranty deeds, the wide ranges indicate considerable diversity in the way sales are coded in each county.

There is nothing in ACD rules to condone the automatic elimination of "UV" or blank sales and IAAO standards call for retaining sales unless there is a specific reason for rejecting the sale. In any case, the study considers only sales that are warranty, corporate warranty, limited warranty, or special warranty deeds. It retains UV validation codes, which are subject to special outlier analysis as explained previously. However, blank validation codes and validation codes not defined in ACD rules were recoded as unverified sales (UV) and used in the study. All verified (VA, VS, AP) and unverified (UV) sales were subject to routine outlier analysis.

Blank sale prices are quite common in all counties. These reflect deeds that are filed with no revenue stamps. These sales are removed from the study. During the Sales Validation Audit a sample of these “zero sale price” deeds is audited to determine if any do in fact have revenue stamps, or a sales affidavit attached to the deed listing the sale price of the property. These zero sale price deeds will be scrutinized much more closely in the future. These are quite possibly sales that should be used by the counties or contractors in their analysis, as well as being used in the ratio study.

Every county had a small number of duplicate sold parcels that had the same deed references except for differences in the grantee and/or grantor. The duplicate parcels were removed from the study. It appears in most of the instances the counties are inserting additional transfer records for the same deeds to correct or modify the grantee and/or grantor. This should not be occurring; notes should be added to the comment section of the deed’s transfer record.

There are some counties still using the generic Exempt code ‘EX’ on some parcels, they need to utilize the more specific Exempt property type codes which identify the exemption type more clearly (EB, EC, EG, EL, ER, ES).

ACD Rule 4.01.1e(1) states “…In addition, ratio study standards must be achieved for residential properties and vacant land within each market area. Additionally, ACD Rule 4.04.1a(5) defines what constitutes a Market Area. During the ratio study process with the data provided in the Extract submitted to ACD from the counties it is impossible to determine if a county is delineating parcels into the correct number of Market Areas. This is an area that Audit needs to be checking to determine if a County has been delineated into the proper Market Areas. Smaller counties will typically be considered a single Market Area. However, the mid-size and larger counties should typically contain more than one Market Area. Historically this has been achieved in the larger counties but there are several mid-size counties reporting only a single Market Area when there should be multiple or at least two separate Market Areas.

Some counties have an additional field in their CAMA system named INTSTRUMENT NUMBER that is used in conjunction with the BOOK and PAGE fields. In (3) counties in particular this year the deed reference numbers were sometimes entered as BOOK and PAGES and then sometimes combined into an INSTRUMENT NUMBER. It is imperative that counties use either the BOOK & PAGE fields or the INSTRUMENT NUMBER field for their deed reference numbers but they should not use a combination of both fields. If they use a combination of both fields, it makes it exceedingly difficult to import the deed reference data into SPSS correctly and could have a detrimental effect of the final ratio study results.

ATTACHMENT 1

2023 Final Ratio Study

Summary of County Results

County	Property Class	Years	Sales	Median	LCL	UCL	COD	Time Trend	Solds vs Unsolds
Arkansas	Residential	2	166	19.37	19.07	19.52	5.00	None	Pass
	Commercial	3	17	19.98	19.40	20.81	4.40	None	Pass
	Vacant	2	12	19.92	19.55	20.52	3.20	None	Pass
Ashley	Residential	2	177	19.50	19.28	19.65	4.90	None	Pass
	Commercial	3	20	20.11	19.62	20.41	3.30	None	Pass
	Vacant	2	13	20.15	19.28	22.22	5.40	None	Pass
Clay	Residential	2	385	19.81	19.35	20.11	15.10	None	Pass
	Commercial	3	15	20.10	19.50	21.83	7.50	None	Pass
	Vacant	2	27	20.00	20.00	20.00	1.10	None	Pass
Columbia	Residential	2	382	18.36	17.83	18.67	13.30	2.4%	Pass
	Commercial	3	44	19.18	18.18	20.63	17.70	2.4%	Pass
	Vacant	2	27	19.95	18.06	20.00	8.20	None	Pass
Crawford	Residential	2	1453	19.12	18.89	19.25	13.50	8.4%	Pass
	Commercial	3	119	20.74	20.12	21.32	14.80	2.4%	Pass
	Vacant	2	222	20.09	19.45	20.63	16.90	1.2%	Pass
Jefferson	Residential	1	575	19.63	19.32	19.89	11.50	None	Pass
	Commercial	2	50	19.52	18.67	21.16	15.80	None	Pass
	Vacant	1	46	20.00	18.87	21.76	14.50	None	Pass
Lawrence	Residential	2	213	19.14	18.90	19.47	6.80	1.2%	Pass
	Commercial	3	23	19.91	18.85	20.44	4.50	None	Pass
	Vacant	2	29	20.00	19.77	20.00	4.90	None	Pass
Montgomery	Residential	2	138	19.31	18.86	20.01	21.40[1]	2.4%	Pass
	Commercial	3	9	21.40	15.27	23.03	11.50	None	Pass
	Vacant	2	52	20.28	18.79	22.82	25.30[2]	None	Pass
Polk	Residential	2	421	17.79[3]	17.44	18.34	13.80	6.0%	Pass
	Commercial	3	49	19.48	18.63	20.23	13.70	None	Pass
	Vacant	2	45	19.50	18.68	21.21	17.20	None	Pass

ATTACHMENT 1

2023 Final Ratio Study

Summary of County Results

County	Property Class	Years	Sales	Median	LCL	UCL	COD	Time Trend	Solds vs Unsolds
Sharp	Residential	2	649	17.87[4]	17.38	18.32	17.10	6.0%	Pass
	Commercial	3	49	20.33	19.40	21.62	13.40	None	Pass
	Vacant	2	229	20.00	20.00	20.00	18.20	None	Pass
Union	Residential	2	643	18.20	17.78	18.49	13.70	3.6%	Pass
	Commercial	3	59	19.14	18.50	20.20	16.80	None	Pass
	Vacant	2	94	19.44	18.18	20.00	19.00	None	Pass
Washington	Residential	1	3144	19.90	19.80	19.99	9.00	None	Pass
	Commercial	2	341	21.54	21.16	22.32	15.40	None	Pass
	Vacant	1	334	20.00	19.73	20.07	10.90	None	Pass

(1) Montgomery County - Although the COD of 21.40 exceeds the standard of 20 for residential improved properties in counties with less than 50,000 parcels; it is below the critical value of 21.98 required to conclude non-compliance at the 95% confidence level for a sample containing (138) sales.

(2) Montgomery County - Although the COD of 25.30 exceeds the standard of 25 for vacant land properties in counties with less than 50,000 parcels; it is below the critical value of 29.01 required to conclude non-compliance at the 95% confidence level for a sample containing (52) sales.

(3) Polk County - Although the residential improved median ratio of 17.79 falls outside the target range of 18 to 22; the 18.34 Upper Bound for the 95% confidence interval falls within compliance.

(4) Sharp County - Although the residential improved median ratio of 17.87 falls outside the target range of 18 to 22; the 18.32 Upper Bound for the 95% confidence interval falls within compliance.

ATTACHMENT 2

2023 Final Ratio Study

Distribution of Validation Codes

County	Sales Considered	% Valid Usable Codes	% Valid Rejection Codes	% Undefined Codes	% Unverified Codes	Undefined Codes
Arkansas	2,037	8.89%	81.79%	0.05%	9.28%	NM
Ashley	1,619	6.11%	73.32%	0.00%	20.57%	
Clay	2,683	12.00%	68.10%	0.00%	19.90%	
Columbia	2,208	1.18%	57.16%	0.00%	41.67%	
Crawford	5,508	23.67%	33.02%	0.00%	43.30%	
Jefferson	7,242	10.31%	57.86%	0.03%	31.80%	DV, NM
Lawrence	2,929	3.62%	75.69%	0.00%	20.69%	
Montgomery	1,671	11.97%	36.74%	0.00%	51.29%	
Polk	2,546	12.02%	63.20%	0.00%	24.78%	
Sharp	16,072	5.01%	75.41%	0.00%	19.57%	
Union	2,602	14.41%	38.12%	0.00%	47.46%	
Washington	26,463	31.12%	9.96%	0.07%	58.86%	DV, OT
Totals	**73,580**	**17.27%**	**43.68%**	**0.03%**	**39.02%**	

Valid Sale Usable Codes: AP, VA, VS
Valid Sale Rejection Codes: AL, AS, CH, CS, CT, CV, DT, ES, FD, FI, FS, GO, MH, MU, OF, PI, PP, RL, TR
Undefined Validation Codes: DV, NM, OT
Unverified Sale Codes: UV or blank