

Statistics Reported in Sales Ratio and Equalization Tables

Table 1, Assessment Ratios

Column 1— Geographic Area (County, township, and multi-township)

This column lists the geographic area to which the ratios apply. Separate township studies are reported if there were 25 or more usable transfers in that township.

Column 2— Category

The category shown is “urban,” with the exception of Cook County. For Cook County, the major classes, as defined by the county ordinance, are shown. The Total county median shown in this table is an unweighted median. When sufficient usable sales were available, the urban sales were further separated into “unimproved” and “improved” subcategories. For this purpose, “unimproved” property is defined as a property without a building.

Column 3— Adjusted median

The ratio study was conducted using the current year selling price and the prior year assessed value. For example, in the 2007 tables, the 2006 assessments were compared to the 2007 selling price. The ratios are then adjusted according to the percentage changes in assessments made in 2007 by any township or multi-township assessor, CCAO, or board of review. If there was a reassessment in 2007, the adjusted median becomes the level of assessment for that township in 2007. If there were no significant assessment changes in 2007, the median in Column 4 is the 2007 level of assessment.

Column 4— Median

The median is the best measure of the average assessment level for a category and a geographic area since it is not unduly sensitive to extreme ratios (as can be the case with mathematical average or mean). The median is the exact midpoint of all individual assessment ratios for a given property and area category. The median is found by ranking the individual assessment ratios in ascending or descending order and counting downward until the middle value is reached. If an even number of ratios is found, the two middle ratios are averaged to calculate the median.

Column 5— Coefficient of dispersion (COD)

This statistic provides a measure of the variation of individual assessment ratios around the median. The median indicates the average assessment level but does not provide information about how closely the individual ratios are grouped around it. If the individual ratios are clustered closely around the median, the COD will be low, which implies the assessments are relatively uniform. However, if the individual ratios vary widely from the median, the COD will be high, which indicates that the property was not uniformly assessed and the

property tax burden was not fairly distributed among taxpayers in that particular area.

Statistically, the COD expresses the average absolute deviation of the individual ratios from the median ratio as a percentage of that median. The formula for calculating the COD is

$$\frac{\text{Average absolute deviation from the median} \times 100\%}{\text{Median}}$$

The average absolute deviation from the median is the sum of the differences between each individual ratio and the median ratio (disregarding whether the difference is positive or negative) divided by the total number of ratios.

Column 6 — Number of Sales

The number shown is the number of “usable” or “arms length” transactions that were included in the study. This figure represents the total number of property transfers used in the analysis.

Columns 7 and 8 — Quartiles

Just as the median is the ratio that divides the ranking of all individual assessment ratios into two equal parts, quartiles are ratios that divide the ranking into four equal parts. These measures define the distribution in greater detail and indicate any skewness.

Column 9— Ratio Range

The range is the difference between the highest and lowest ratios in a given geographic area or category. This measure indicates the absolute variation in the distribution.

Column 10— Price-Related Differential (PRD)

In addition to the COD, the intra-area price-related differential can be used as an indicator of assessment uniformity. While the COD measures the general scattering of individual ratios around the median ratio, the intra-area price-related differential measures a pattern of inequity in assessments that has a correlation with the value of the property.

If there is a tendency for the higher-valued properties to exhibit lower assessment ratios than lower-valued properties, the price-related differential will be greater than 1.03. If, on the other hand, higher-valued properties have higher assessment ratios than lower-valued properties, the price-related differential will be less than .98. Differentials greater than 1.03 or less than .98 are both indicative of an inequity in assessment.

The formula for calculating the price-related differential is

$$\frac{\text{Mean assessment ratio}}{\text{Sales-based average ratio}}$$

The mean assessment ratio is the sum of all ratios divided by the number of ratios. The sales-based average ratio is computed by adding all assessed values

and sale prices and then dividing the first sum by the second. The intra-area price-related differential, like the COD, is an indicator of a specific type of inequity. It cannot be used to calculate factors that will correct an inequity, nor will it indicate if a particular parcel of property has been assessed fairly. However, it will help locate the source of the inequity so a program can be formulated to correct the inequity.

Column 11 — 95% Confidence Level

The range in which one can predict with 95 percent confidence the true median assessment level. As the

interval widens, the measure of central tendency is less reliable.

Column 12 — Coefficient of Concentration (COC)

The coefficient of concentration (COC) is a measure of uniformity that measures the percentage of ratios that fall within a given percentage of the median. The percentage from the median used in the department's calculations is 10. If 50 percent of the ratios fall within 10 percent (plus or minus) of the median, the COC is 50. A higher COC is an indicator of better assessment equity.

Table 2, Urban-Weighted Median Ratios

Urban-weighted assessment levels are calculated using township aggregate assessment totals in conjunction with the median levels. This process ensures that each township's median level of assessment has an impact on the countywide figure in proportion to the relative market value of its property.

The urban-weighted assessment level is used in the computation of the state equalization factor. Before that factor is calculated, an adjustment is made to the ratio to account for any significant changes in assessments made by local assessing officials since the data was collected.

The steps in the weighting procedure are shown below. The aggregate assessed values for each category or area are obtained from the abstract of assessments, submitted by the county clerk after final action by the board of review, but prior to state equalization. To prevent bias, any parcels having assessments greater than \$999,999 are not included in the weighting process. The remaining assessed values are divided by the corresponding median ratio to obtain an estimated full market value of real estate for each category or area. The assessed values are added to a county urban total and then divided by the sum of the estimated full values. The result is an urban-weighted median that represents the best estimate of the average assessment level for urban property in the county.

Steps in the weighting procedure
(Amounts reported in thousands)

<u>Area</u>	<u>Assessed value</u>	<u>Median ratio</u>	<u>Estimated full value</u>
Urban township 1	\$ 1,648	25.00%	\$ 6,592
Urban township 2	10,450	31.62%	33,049
All other urban townships	<u>3,105</u>	28.75%	<u>10,800</u>
Urban total	\$15,203		\$ 50,441
Urban weighted ratio:	\$15,203 ÷ \$50,441 x 100% = 30.14%		

Table 3, Final Equalization Factors

The department is required to provide an equalization factor for each county that will equalize the level of assessment at the statutory level of 33 1/3 percent of the fair cash value. The level of assessment to be equalized is the mean, or average, of the urban-weighted medians of the three years immediately preceding the assessment year, after adjustment for assessment changes through the current assessment year.

The urban-weighted levels of assessment for the three years involved in the calculation of the equalization factor are shown in Columns 2 through 4. These levels have been adjusted for assessment changes, including those made by any board of review for the current assessment year. Column 5 indicates the mean of the urban-weighted medians for the three years. Column 6 shows the final equalization factor and Column 7 shows the equalized level of assessment.

Formulas for Sales Ratio Studies and Equalization

$$\text{Sales Ratio} = \frac{\text{Prior Year Assessed Value}}{\text{Current Year Sale Price}} \times 100\%$$

$$\text{Coefficient of Dispersion (COD)} = \frac{\text{Average Deviation}}{\text{Median}} \times 100(\%)$$

$$\text{Median Absolute Deviation (MAD)} = \frac{\text{Median Deviation}}{\text{Median of Sales Ratios}} \times 100(\%)$$

$$\text{Coefficient of Concentration (COC)} = \frac{\text{Number of Sales Ratios within 10\% of the median}}{\text{Total Number of Sales Ratios}}$$

Price-Related Differential (PRD)

$$\text{Sales-Based Average Ratio} = \frac{\text{Sum of Assessed Values}}{\text{Sum of Sales Prices}} \times 100\%$$

$$\text{Mean Assessment Ratio} = \frac{\text{Sum of the Sales Ratios}}{\text{Number of Ratios}}$$

$$\text{Price-Related Differential} = \frac{\text{Mean Assessment Ratio}}{\text{Sales-Based Average Ratio}}$$

$$\text{Equalization Factor} = \frac{\text{Desired Level (33.33\%)}}{\text{Prior 3-Year Average Median Level}}$$

Examples of Statistical Calculations

Distribution of sales ratios

	Assessment		Sale price		Sales ratio	Absolute deviation from the median
	\$ 9,000	÷	\$ 45,000	=	20%	15
	6,000	÷	30,000	=	20%	15
	9,000	÷	30,000	=	30%	5
	7,500	÷	25,000	=	30%	5
	7,000	÷	20,000	=	35%	0
	7,000	÷	20,000	=	35%	0
	6,000	÷	15,000	=	40%	5
	4,500	÷	10,000	=	45%	10
	7,500	÷	15,000	=	50%	15
	5,000	÷	10,000	=	50%	35
Total	\$68,500		\$220,000		355%	85

Calculations (derived from above data)

Number of Transfers:	10		
Median:	$\frac{35 + 35}{2} =$	35%	
First Quartile:	30%	Third Quartile:	45%
Lowest ratio:	20%	Highest ratio:	50%
Range: (50% - 20%) =	30%		

Coefficient of Dispersion (COD)

Sum of absolute deviations from the median: 85

Average absolute deviation: $85 \div 10 = 8.5$

COD: $\frac{\text{Average absolute deviation}}{\text{Median}} = 8.5 \div 35\% = 24.3\%$

Price-related Differential

Mean assessment ratio: $\frac{\text{Sum of ratios}}{\text{Number of ratios}} = \frac{355\%}{10} = 35.5\%$

Sales-based average ratio: $\frac{\text{Sum of assessments}}{\text{Sum of sale prices}} = \frac{68,500}{220,000} \times 100\% = 31.1\%$

Price-related differential: $\frac{\text{Mean assessment ratio}}{\text{Sales-based average ratio}} = \frac{35.5\%}{31.1\%} = 1.14$

Coefficient of concentration (COC)

(derived from distribution of sales ratio data)

Median: 35

Department's concentration percentage: 10%

$$35 \times .90 = 31.50$$

$$35 \times 1.10 = 38.50$$

Only 2 of the 10 ratios are in the range of 31.50 to 38.50; therefore, the COC is 20 percent.
