

Definitions

Assessed Value is the assessment placed on real property by a county assessment office upon which all real estate taxes shall be calculated.

Market Value is the price which a purchaser, willing but not obligated to pay, would pay an owner, willing but not obligated to sell, taking into consideration all uses to which the property is adapted and might in reason be applied

Arithmetic Mean - The arithmetic mean (aka mean or average) ratio is the average of the ratios. It is calculated by summing the ratios and dividing by the number of ratios.

Established Predetermined Ratio is the ratio of assessed value to market established by the board of county commissioners and uniformly applied in determining assessed value in any year.

Purpose

The State Tax Equalization Board's (STEB) primary function is to determine the aggregate market value of taxable real property in each political subdivision and school district throughout the Commonwealth of Pennsylvania.¹ The market values are certified annually to the Department of Education and the respective school districts on or before July 1 of each year.² These market values are used by the Department of Education for use in a legislative formula that determines the distribution of the state subsidies to each school district.³

Another important function of STEB is to annually establish a common level ratio (CLR) of assessed value to current market value for each county in the Commonwealth⁴ utilizing statistically acceptable techniques, including sales ratio studies. STEB is required to publicly disclose its methodology in computing the ratios and publish this information in the Pennsylvania Bulletin.⁵ Prior to July 1 in every year, STEB must certify the CLR ratio to the chief assessor of each county.⁶

The State Tax Equalization Board (STEB) was initially established as an independent state administrative board by the act of June 27, 1947 (P.L. 1046, No. 447), known as the State Tax Equalization Board Law. In 2013, STEB was formally transferred to the Department of Community and Economic Development (DCED) and by the act of April 18, 2013 (P.L. 4, No. 2); Act 447 was repealed. STEB is governed by the provisions of Chapter 15 of the Community and Economic Development Enhancement Act, the act of June 27, 1996 (P.L. 403, No. 58); 71 P.S. §§ 1709.1501, et seq.

The formula and methodology used by STEB for calculating Common Level Ratio are explained below.

¹ 71 P.S. §§ 1709.1507(1), 1709.1508, 1709.1511 and 1709.1514.

² 71 P.S. §§ 1709.1507(3), 1709.1512, 1709.1514, and 1709.1515.

³ 71 P.S. §1709.1515.

⁴ 71 P.S. §1709.1507(9), 1709.1516a(a).

⁵ 71 P.S. §1709.1516(b).

⁶ 71 P.S. §1709.1516a(b).

Affected Business Process

The **Common Level Ratio** (CLR) is a ratio that measures how a county's Base Year Assessments compare with current Real Estate Market Valuations. The **only** use for this ratio is in the assessment appeal process.

The CLR is applied after the Board of Assessment Appeals/Revisions establishes a fair market value, based on evidence, to calculate a revised assessment value. The CLR is never used for any other purpose.

The Business Process

STEB collects real estate sales records from county assessors on a monthly basis for a calendar year (January 1 to December 31) to establish the Common Level Ratio (CLR). The CLR is based on the **mean** ratio between the assessed value and fair market value of real estate in a county. It is developed by comparing the recent actual selling prices of real property in the county with the assessments of each sold property.

STEB also uses the sales records from the county assessment offices to establish Aggregate Market Values. Market Values in every Pennsylvania school district are established for the use of the Pennsylvania Department of Education in allocating state funding in accordance with statutory formulae.

The CLR Calculation

Calculation:

1. STEB's calculation methodology includes every valid sale to compute the mean.
2. The high and low limits are defined, using a quartile trimming method, 3.0X IQR Procedure. Within these computed limits; only the valid sales are used and reject those sales which exceed the limits.
3. The resulting arithmetic mean ratio is the Common Level Ratio for which is certified.

Example of calculations:

Number of Sale	Assessed Value	Sale Price	A/S Ratio
1	10,000	18,000	.56
2	9,450	21,000	.45
3	7,200	18,000	.40
4	7,700	22,000	.35
5	18,150	60,500	.30
5 sales Total	52,500	139,500	2.06

$$\text{Mean Ratio} = \frac{\text{Sum of Assessment Ratios}}{\text{Number of Sales}} = \frac{2.06}{5} = .412 \text{ or } 41.2\%$$

Outlier Ratios - Outlier ratios are very low or high ratios as compared with other ratios in the sample. The validity of ratio study statistics used to make inferences about population parameters could be compromised by the presence of outliers that distort the statistics computed from the sample. One extreme outlier can have a controlling influence over some statistical measures. STEB has adopted the IAAO outlier trimming procedure

The CLR Calculation

that uses the 3.0X IQR procedure to identify outliers. Once outliers have been identified, the next step is to exclude those ratios from the calculation.

Steps to locate/identify trim boundaries:

- 1) Locate the first quartile point
- 2) Locate the third quartile point
- 3) Compute the interquartile range
- 4) Establish the lower boundary
- 5) Establish the upper boundary

Example of calculation: [*Retrieved from the Standard on Ratio Studies Manual, dated April 2013]

Data set before trimming

Rank of Sale	A/S Ratio
1	0.611
2	0.756
3	0.762
4	0.853
5	0.867
6	0.909
7	0.925
8	0.944
9	1.014
10	1.052
11	1.178
12	1.367
13	1.850
14	2.500

Median Ratio = 0.935 (*even number of sales average two middle sales; sale number 7 and 8)

Steps to locate/identify trim boundaries:

- 1) Locate the first quartile point

Formula to locate the first quartile:

$$(0.25 \times \text{number of ratios}) + 0.25 \quad (0.25 \times 14 \text{ ratios}) + 0.25 = 3.75$$

3.75 is three-quarters between the third and fourth ranked ratios.

$$\text{Ratio 3} = 0.762$$

$$\text{Ratio 4} = 0.853$$

$$\text{Three-quarters between} = (0.853 - 0.762) \times 0.75 = 0.068$$

$$\text{The first quartile point} = 0.762 + 0.068 = 0.830$$

- 2) Locate the third quartile point

Formula to locate the third quartile

$$(0.75 \times \text{number of ratios}) + 0.75$$

The CLR Calculation

$(0.75 \times 14 \text{ ratios}) + 0.75 = 11.25$

11.25 is one-quarter between the eleventh and twelfth ranked ratios.

Ratio 11 = 1.178

Ratio 12 = 1.367

One-quarter between = $(1.367 - 1.178) \times 0.25 = 0.047$

The third quartile point = $1.178 + 0.047 = 1.225$

- 3) Compute the interquartile range

The distance between the first and third quartile = interquartile range

$1.225 - 0.830 = 0.395$

- 4) Establish the lower boundary

Lower trim point = first quartile - (interquartile range x 3.0)

$0.830 - (0.395 \times 3.0) = -0.355$

- 5) Establish the upper boundary

Upper trim point = (interquartile range x 3.0) + third quartile

$(0.395 \times 3.0) + 1.225 = 2.410$

Outliers identified:

2.500 (sale number 14)

Effects of Outlier Trimming Outliers identified and trimmed

Rank	Ratio (A/S)
1	0.611
2	0.756
3	0.762
4	0.853
5	0.867
6	0.909
7	0.925
8	0.944
9	1.014
10	1.052
11	1.178
12	1.367
13	1.850
Median Ratio = 0.925	
Calculated Mean CLR = 1.006769 or 100.68%	

Sample Size

The reliability of ratio studies depends on the representativeness of the sample. When sales samples are not adequate, STEB will consider extending the sampling year to include additional years of sales data or review rejected sales for validity. Existing sampling uses only one year of sales data (January through December); this remedy would allow for multiple years of sales data.

When this alternative has been used in the ratio study, an addendum to the report will outline this method was used to remedy the sample size.

Acquisition and Validation of Sales Data

Sales validations are completed by county staff, these sale transfers are entered into the TEDtrac System monthly. County staff will review all deed transfers and determine the validity of the sale.

Each transfer must contain, Parcel ID, County, Municipality, Year, Month, Sale Price, Assessed Value, Land Use Code, and Validation/Rejection Code.

Land Use Codes

Code	Land Use Type
1000	Residential
1100	Manufactured Home
1500	Seasonal Housing
2000	Lot (Less than 10 Acres)
3000	Industrial
4000	Commercial
5000	Agriculture (10 Acres or more w/ Building)
6000	Oil/Gas/Mineral
9800	Land (More than 10 Acres)

Validation/Rejection Codes

Code	Description
00	Valid Sale
49/50	Valid Clean and Green Sale
01	No Assessed Valuation
02	Family Transfer
03	Corporate Affiliations/Acquisitions or Divestments
04	Government/Public Utility
05	Charitable/Religious/Educational Institutions or other Tax Exempt Agencies
06	Financial Institutions
07	Part Interest

Acquisition and Validation of Sales Data	
08	Forced/Sheriff
09	Multiple-Parcel
10	Estate Sale
11	Land Contract
12	Auction
13	Date of Transfer
14	Time on Market
15	Corporate Relocation Company
16	Sale of Doubtful Title
17	Lease Purchase/Leaseback
18	Partial Assessment
19	Equipment/Personal Property
20	Special or Preferred Assessments (i.e. Clean & Green, Lerta, KOZ, TIF, PILOT, etc.)
21	Duplicate Sale/Deed of Correction
22	Other (Needs Explanation)

A detailed operations manual for use by county staff which includes guideline and procedures on sale validation and submission is based on IAAO standards. Additional training is provided through the Assessor Association of Pennsylvania (AAP) continuing education program. Please refer to the STEB Sales Validation and Submission Operations Manual.