

Introduction to Vermont's Equalization Study & Certified Sales

**Division of Property Valuation and
Review Vermont Department of Taxes**

2018 Course Training Materials

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II. Ratio Study Basics

All sales to be included in the sales study must meet: sales from the last 3 years, verified “Arms-Length” transactions, and sufficient amount of data to be able to stratify.

The formula used:

$$\text{Assessed Value} / \text{Sales Price} = \text{Calculated Ratio}$$

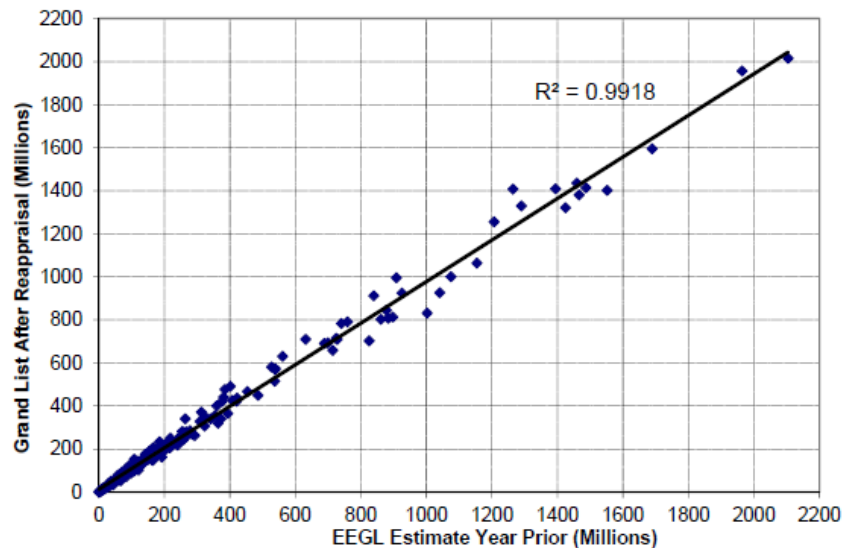
With the Data Set calculate: measures of central tendency, uniformity in the results, and analyze the results for sampling errors.

Assumption 1: same assessment practices for sold and unsold properties

Assumption 2: assessed values and sale prices are independent opinions of value

Study Predicts Market Value

Reappraisal Predictable 2007 - 2012 (N=216)



The following graph represents:

- Each point represents two independent estimates of a town’s grand list value,
- Degree of association measured by R- Squared – a value of 1.0 or 100% would indicate perfect predictability; 0 would mean no relationship,
- The value in excess of 99% suggests an extremely high level of association, and
- Towns can use ratio studies to fine tune CAMA models for individual properties

III. Sales Report

Ratios

Compare listed values to sales price for individual ratios, group ratios and overall Level of Appraisal ratios. This can be entered or exported, arranged, sorted, calculated and maintained using an excel spreadsheet.

Certified Sales Report									
State of Vermont-Property Valuation and Review					****Equalization Study - 2001 ***				
Sampleville 1001					Sales Between: 4/1/98 and 3/31/01				
Sample					Listed				
Doc ID	Grantee	Grantor	Location	Acreage	Property Class	Sale Date	Value	Assess Ratio	Town Class Cat
MHL: Mobile Home/la									
2000070909	WRIGHT CHRISTIE	STAPLE GEORGE	2 MAIN STREET	6.10	Mobile Home	9/02/00	45,000	40,700	90.44
1998040101	ALLEN JOHN	STAPLE GEORGE	12 MAIN STREET	0.85	Mobile Home	3/02/98	12,000	21,200	126.67
TOTAL FOR				MHL: Mobile Home/la			57,000	61,900	
MHL: Mobile Home/la CATEGORY STATISTICS: NO Category Sample Valid: 90% confident that true aggregate ratio is within 10% of sample ratio									
LIMITS ESTABLISHED BY ORIGINAL SALES DATA					RATIOS and CONFIDENCE INTERVALS (Trimmed Data)				
2	Transactions	Average Sales Price	90.44	Low Inter Quartile Value	-48.34	Low 90 Percent Value of Aggregate	255.53	High 90 Percent Value of Aggregate	159.60
		Average Listed Value	176.67	Hi Inter Quartile Value		Aggregate Ratio		Number of Low Outliers	0
		Average Ratio	86.27	Inter Quartile Value	-38.89	Number of Hi Outliers	0	Number of Low Extremes	0
		Median Ratio	305	Value of Outlier Low Limit	168.22	Number of Hi Extremes	0	Number of Hi Extremes	0
		Low Ratio	176.67	Value of Extreme Low Limit	483.39	Value of Extreme High Limit			
		High Ratio	1.23	Value of Extreme High Limit					
		Price Related Differential (Regression Index)	32.28						
		Number of Transactions with Assessment Ratio = 1.00	0						

**** Extremes are not used in the final calculation if it is an extreme for the grouping that the ratio is derived**

ie. Class, Category or Town

**** Outliers are sent verification forms**

Friday, July 20, 2001

Certified Final Computation Sheet

State of Vermont-Property Valuation and Review

***Sampleville 1001

***Equalization Study - 2001

$(75,000 / .9203) + (33,000 / .8913) = 118,520$

Category	Property Count	ED Form 911 Listed Value	CUSE Value	Education Listed Value Excl. CUSE	Non-Approved Exemptions	Municipal Listed Value Excl. CUSE	Applied Ratio	Education Equalized Value	Municipal Equalized Value	Average LV Incl. Exemption
1	R1	1	42,000	0	42,000	0	92.03	45,637	45,637	0
2	R2	2	108,000	33,000	75,000	0	92.03	118,520	118,520	0
3	MHIU	1	20,000	0	20,000	0	92.03	21,732	21,732	0
4	MPL	0	0	0	0	0	0	0	0	0
5	V1	1	79,000	0	79,000	0	92.03	85,842	85,842	0
6	V2	0	0	0	0	0	0	0	0	0
7	COMM	1	159,000	0	159,000	0	92.03	172,770	172,770	0
8	CHA	0	0	0	0	0	0	0	0	0
9	IND	1	160,000	0	160,000	0	92.03	173,856	173,856	0
10	UE	1	125,000	0	125,000	0	92.24	135,516	135,516	0
11	UO	0	0	0	0	0	0	0	0	0
12	FRM	1	137,000	0	137,000	0	92.03	148,865	148,865	0
13	OTH	1	20,000	0	20,000	0	92.03	21,732	21,732	0
14	WOOD	0	0	0	0	0	0	0	0	0
15	MISC	0	0	0	0	0	0	0	0	0
PERSONAL PROPERTY:		9	830,000	33,000	797,000	0		900,569	900,669	
Cables:				119,000			100.00	119,000		
Inventory:							100.00			
Machinery and Equip:							100.00			
TOTAL PERSONAL PROPERTY:				119,000						
REAL and PERSONAL PROPERTY:				916,000		797,000		1,019,569	900,669	
Exemptions (Voted before June 30, 1997)										
Stabilization Agreements (Voted before June 30, 1997)										
Exemptions (Voted after June 30, 1997)										
Stabilization Agreements (Voted after June 30, 1997)										

GRAND TOTALS				916,000		797,000	92.07	1,019,569	900,669	2.77 Townwide COD
EFFECTIVE TAX RATES (EQUALIZED):										
Municipal Tax Rate:		0.4968			1,876,150				1,019,700	
School Tax Rate:		1.8403			4,474,52				1,019,700	

$830,000 + 119,000 = 949,000 / 1,019,669 =$

Sales Analysis

LEVEL OF APPRAISAL / ASSESSMENT CALCULATION

CATEGORY	PARCEL	SALE DATE	SALE PRICE	LISTED VALUE	ASSESS RATIO	ABS DEV FROM MEDIAN
R1	30306	06/18/2008	\$300,000	\$229,500	76.50%	22.85
R1	20201	11/09/2008	\$99,500	\$95,300	95.78%	3.57
R1	20202	10/24/2009	\$90,900	\$96,300	105.94%	6.59
R1	30307	08/20/2009	\$125,000	\$57,700	46.16%	53.19
R2	45674	04/22/2009	\$230,000	\$228,500	99.35%	00.00
R2	54321	03/27/2009	\$189,000	\$165,200	87.41%	11.94
R2	42413	08/03/2009	\$220,000	\$180,200	81.91%	17.44
R2	45679	09/09/2008	\$110,000	\$87,000	79.09%	20.26
R2	45453	05/19/2009	\$215,000	\$140,700	65.44%	33.91
R2	12121	04/01/2009	\$190,000	\$190,600	100.32%	.97
R2	89806	06/16/2008	\$354,000	\$355,600	100.45%	1.10
R2	45671	06/29/2009	\$471,000	\$472,300	100.28%	.93
MHL	45673	08/13/2009	\$60,000	\$63,200	105.33%	5.99
V1	11113	08/01/2009	\$152,000	\$148,000	97.37%	1.98
V1	23232	08/21/2009	\$150,000	\$127,800	85.20%	14.15
V2	11116	06/12/2009	\$64,000	\$66,400	103.75%	4.40
V2	12128	08/31/2009	\$145,000	\$144,800	99.86%	.51
V2	23269	06/12/2009	\$209,000	\$131,200	62.78%	36.57
WOOD	11115	08/31/2008	\$59,500	\$50,700	85.21%	14.14
MISC	29287	04/29/2009	\$25,000	\$40,800	163.20%	63.85
MISC	64632	02/13/2009	\$25,000	\$33,700	134.80%	35.45
MISC	90967	05/01/2009	\$30,000	\$30,900	103.00%	3.65
MISC	78790	07/08/2008	\$49,900	\$57,600	115.43%	16.08
		SUM	\$3,563,800	\$3,194,000	57,600/49,900= Individual Ratio	
	**	LOA		89.62%	3,194,000/3,563,800 =89.62 LOA	
		MEDIAN		99.35%	Total Listed Value / Total Sale Price = LOA	
		COUNT		23		
		TOTAL DEV		369.52		
		AVG DEV		16.07		
		COD		16.17		

*Individual Ratio= Listed Value/Sales Price = highlight cell/highlight cell (then copy command down entire column)

*Level of Appraisal = Total Listed Value/Total Sales Price

for each column (listed value and sales price) type in =sum(highlight all columns)

*Copy categories to individual worksheets (pages in spreadsheet) by clicking on Insert and then Worksheet, then go to the bottom tabs and right click to rename the tab.

*Then highlight all sales info for that category and copy to the second worksheet (page).

*Then set up your calculations for that page of information similar to this.

*Median- type in =Median (highlight ratio cells).

*Count- type in =Count (highlight any column with values)

*Add a column for Absolute Deviation from the Median- in first cell of this column type in =ABS (highlight your ratio cell- Median cell)

*Put a dollar sign in between the letter of the cell and the number (for Median) to tell it to repeat this cell.

*Then you can copy this formula using copy and paste all the way down the column.

*Calculate a Sum of absolute deviations =SUM (highlight cells) for deviation.

*Calculate an Average Deviation =sum of deviations/count

*COD =Average Absolute Deviation/Median*100

State of Vermont - Division of Property Valuation and Review
 Winhall 2771

Certified Sales Report - REPRINT
 Teri Calderstone

*** Equalization Study - 2013 ***
 Sales Between: 4/1/2010 and 3/31/2013

This summary report is also present for each category and class.

Sales Town Summary Report

Town Sample Valid? YES (90% confident that true aggregate ratio is within 10% of sample ratio. See Sampling Error.)

136 Transactions (Includes Outliers/Extremes/Influentials)
 390.744 Average Sales Price
 381.349 Average Listed Value
 100.13 Average Ratio
 100.00 Median Ratio
 50.06 Low Ratio
 166.67 High Ratio
 1.03 Price Related Differential (Regression Index)
 13.33 COD

Original Data (All Valid Sales Transactions)

89.40 Low InterQuartile Value
 110.26 HI InterQuartile Value
 20.86 Inter-Quartile Range
 58.11 Value of Outlier Low Limit
 141.55 Value of Outlier High Limit
 26.82 Value of Extreme Low Limit

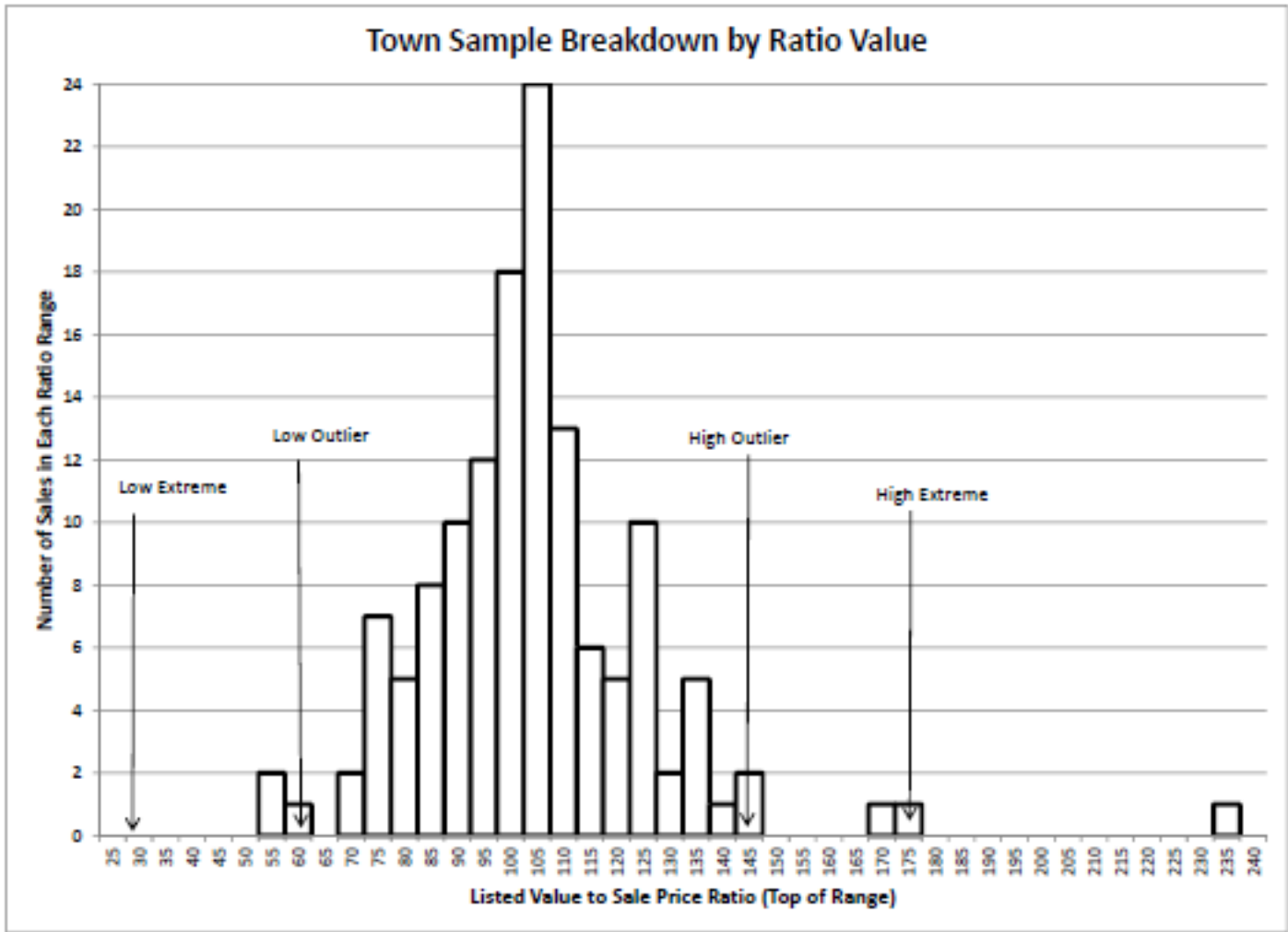
3 Number of Low Outliers
 2 Number of HI Outliers
 0 Number of Low Extremes/Influentials

**RATIOS and CONFIDENCE INTERVALS
 (Trimmed Data)**

94.71 Low 90 Percent Value of Aggregate
 100.48 HI 90 Percent Value of Aggregate
 97.60 Aggregate Ratio
 2.95% Sampling Error
 20.88 Weighted Standard Deviation

Normalized Data Range

Evaluating Your Grand List For Equity



Explanation of the Sales Summary Report

Top Center of Page - Reliable Estimator		
Town Sample Valid?	YES	(90% confident that true aggregate ratio is within 10% of sample ratio.*)

Left Third of Page - Descriptive Statistics	
136	Transactions (Includes Outliers/Extremes)
390,744	Average Sales Price
381,349	Average Listed Value
100.13	Average Ratio
100.00	Median Ratio
50.06	Low Ratio
166.67	High Ratio
1.03	Price Related Differential (Regression Index)
13.53	COD
19	Number of Transactions with Assessment Ratio Between .98 and 1.02
14%	Percent of Transactions with Assessment Ratio Between .98 and 1.02

Middle Third of Page - Trimming			
Original Data (All Valid Sales Transactions)			
89.40	Low InterQuartile Value		
110.26	Hi InterQuartile Value		
20.86	InterQuartile Range		
58.11	Value of Outlier Low Limit		Number of Low Outliers
141.55	Value of Outlier High Limit		Number of Hi Outliers
26.82	Value of Extreme Low Limit		Number of Low Extremes
172.84	Value of Extreme High Limit		Number of Hi Extremes

Right Third of Report - Estimator	
RATIOS and CONFIDENCE INTERVALS	
(Trimmed Data)	
94.71	Low 90 Percent Value of Aggregate
100.48	Hi 90 Percent Value of Aggregate
97.60	Aggregate Ratio
2.95%	(*)Sampling Error
20.88	Weighted Standard Deviation

Example of Calculating InterQuartile Ranges

104.73 Low InterQuartile Value (1σ)

130.40 High InterQuartile Value (1σ)

25.67 InterQuartile Range

$$\begin{array}{r} 130.40 \text{ High InterQuartile Value} \\ - \underline{104.73 \text{ Low InterQuartile Value}} \\ 25.67 \end{array}$$

66.23 Value of **Outlier** Low Limit

$$\begin{array}{r} 104.73 \text{ Low InterQuartile Value} \\ - \underline{38.51 \text{ InterQuartile Value Times 1.5 (number above in red x 1.5)}} \\ 66.23 \text{ Value of Outlier Low Limit} \end{array}$$

168.91 Value of **Outlier** High Limit

$$\begin{array}{r} 130.40 \text{ High InterQuartile Value} \\ + \underline{38.51 \text{ InterQuartile Value Times 1.5 (number above in red x 1.5)}} \\ 168.91 \text{ Value of Outlier High Limit} \end{array}$$

27.72 Value of **Extreme** Low

$$\begin{array}{r} 104.73 \text{ Low InterQuartile Value} \\ - \underline{77.01 \text{ InterQuartile Value Times 3 (number above in red x 3)}} \\ 27.72 \text{ Value of Extreme Low (anything lower will not be used in study)} \end{array}$$

207.41 Value of **Extreme** High Limit

$$\begin{array}{r} 130.40 \text{ High InterQuartile Value} \\ + \underline{77.01 \text{ InterQuartile Value Times 3 (number above in red x 3)}} \\ 207.41 \text{ Value of Extreme High Limit (anything higher will not be used in study)} \end{array}$$

IV. Coefficient of Dispersion

- The coefficient of dispersion is a measurement of uniformity of appraised values and can be a measure of the quality of the assessment process.
- The steps in the computation of the coefficient of dispersion are:
 - Find the difference, or absolute deviation (disregarding the plus or minus), between each individual assessment ratio (sales ratio) measured against the median ratio. Sum these differences for total absolute deviation.
 - Divide the sum of the deviation, or differences, by the total number of properties sold to locate the average absolute deviation.
 - Divide the average absolute deviation by the median ratio and multiply this result by 100.
- The resultant coefficient of dispersion, also known as the “index of assessment inequality,” is the percentage by which the various individual assessment sales ratios differ, on the average, from the median ratio.

Illustration:

<u>Ratio</u>	<u>Median Ratio</u>	<u>Absolute Deviation from Median</u>	
46.16%		53.19	(Expression as an absolute value)
62.78%		36.57	
65.44%		33.91	
76.50%		22.85	
79.09%		20.26	
81.91%		17.44	
85.20%		14.15	
85.21%		14.14	
87.41%		11.94	
95.78%		3.57	
97.37%		1.98	
99.35%	Median	.00	
99.86%		.51	
100.28%		.93	
100.32%		.97	
100.45%		1.10	
103.00%		3.65	
103.75%		4.40	
105.33%		5.99	
105.94%		6.59	
115.43%		16.08	
134.80%		35.45	
163.20%		63.85	
		Total 369.52	

23 sales

$$(369.52 / 23) = 16.07$$

Total Deviation / Count = Average Deviation: $(16.07 / 99.35) = .1617 \times 100 = 16.17$

(Average Deviation / Median) X 100 = Coefficient of Dispersion (COD)

Coefficient of Dispersion

0.00 - 9.90%
10.00 - 19.90%
20.00% and above

Uniformity of Assessment

Excellent
Reasonable (closer to 20 should be monitored by town)
Exceeds statutory benchmarks & triggers Reappraisal Order

The relative difficulty of the assessment problem is an important factor to be considered in the comparison of coefficients of dispersion between areas and among classes of property. It is reasonable to expect a higher degree of equality in those areas with homogeneous properties to be assessed. Conversely, a lesser degree of uniformity is to be anticipated in those areas with a greater variety of properties. Land is a good example of this and an absence of market criteria.

Statistical Extremes are not used to calculate Coefficient of Dispersion (COD).

Common Level of Assessment / Appraisal Calculation

<u>CATEGORY</u> Col A	<u>SALE PRICE</u> Col B	<u>LISTED VAL</u> Col C	<u>ASSESS RATIO</u> Col D	<u>ABS DEV FROM MEDIAN</u> Col E	Row
R1	108000	97200	90.00%	10.00	3
R1	300000	229500	77.00%	23.00	4
R1	99500	95300	96.00%	4.00	5
R2	183250	163300	89.00%	11.00	6
R2	250000	250000	100.00%	0.00	7
R2	471000	472300	100.00%	0.00	8
MHL	60000	63200	105.00%	5.00	9
V1	152000	148000	97.00%	3.00	10
V2	64000	66400	104.00%	4.00	11
MISC	35000	38900	111.00%	11.00	12
MISC	49900	57600	115.00%	15.00	13
	1772650	1681700	Total Deviation	86.00	16

CLA 94.87% 0.08 Average Deviation 17

Median Ratio 100.00% 7.82 COD 18

Count 11 19

CLA= Total Listed Value/Total Sale Price (=C16/B16) 1681700 / 1772650 = 94.87

Column D= Listed Value divided by Sale Price (=C3/B3, C4/B4, C5/B5, etc) (enter this calculation and then copy down)

B16= Total of all Sale Prices (=sum(B3:B13)) **1,772,650**

C16= Total of all Listed Values (=sum(C3:C13)) **1,681,700**

Median Ratio= Median of all Ratios **100%**
(=Median(D3:D13))

Count= Total number of samples (=Count(B3:B13))*

*any column will work as long as you only include those with data for a correct count) = **11**

Column E= Absolute deviation from the Median (=ABS(D3-C\$18) (enter this calculation and then copy down)

Total Deviation= Total of all deviations (=sum (E3:E13)) **86.00**

Average Deviation= Average of all deviations **7.82**
(=E16/C19)

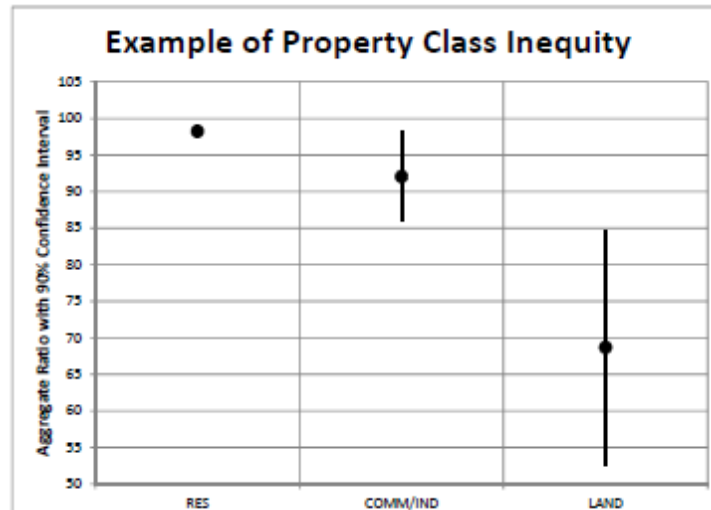
COD=	Average Deviation/Median Ratio (=E17/C18) x 100	(7.82 / 100) x 100	= 7.82
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What Does a COD Tell Me?

- If the COD of less than 5% is an indicator of Sales Chasing.
- If it's too high there is a high degree of inequity in your town.
- 20% = 100 points spread for 95% of the ratios (i.e. 50 to 150 points)
- A reasonable range 7% to 17% +/-
- Not only the Town Level can be useful also look at individual categories and classes

V. Identify Internal Inequity

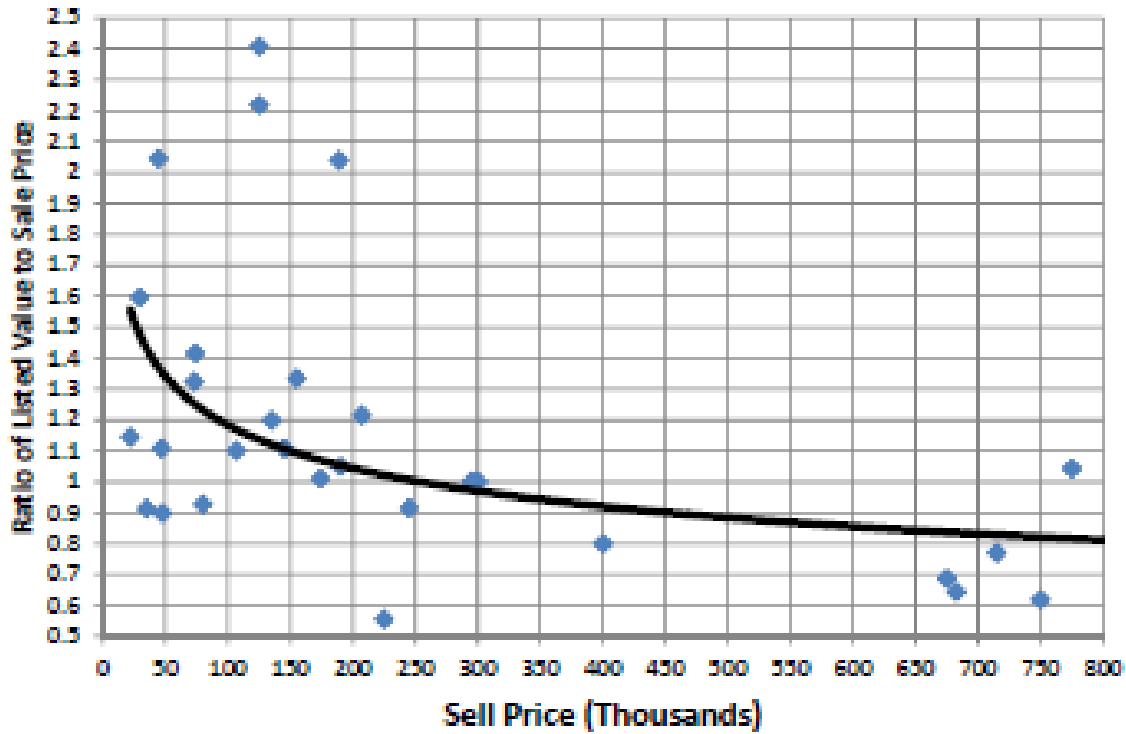
- Use the categories and classes
- Recent reappraisal or “good” CLA /
- COD no guarantee of equity
- Compare mean, median and aggregate ratios
- Investigate further if more than ten points difference
- Caution: difference may not be significant if small sample size and /or high variability
- Particular attention if on opposite sides of split grand list (i.e., nonresidential open land versus residences)
- Internally equitable grand lists equalize well



	Residential	Comm / Ind	Open Land
Transactions	378	21	19
Average Sales Price	305519	523624	199402
Average Listed Value	300230	482098	136985
Average Ratio	98.55	98.24	78.85
Median Ratio	98.28	97.38	81.13
Low Ratio	72.18	57.16	27.17
High Ratio	135.72	152.49	158.32
PRD	1.00	1.07	1.15
COD	7.08	15.72	25.96
Aggregate Ratio	98.27	92.07	68.70

- Measure = PRD (Price-Related Differential)
- Ratio of mean to weighted mean
- Regressive (PRD > 1.03) = Higher value properties are assessed proportionally lower than lower value properties.
- Progressive (PRD < 0.98) = Lower value properties are assessed proportionally lower than higher value properties.
- In Vermont, most samples are slightly to severely regressive. A scatterplot of ratios versus sale price shows a downward slope – higher value sales have lower ratios.
- Problem if over 110

Example of Value Inequity (High PRD)



- PRD is 125
- Parcels selling under \$50,000 assessed around 130% of market value
- Parcels selling over \$350,000 assessed around 70% of market value
- Tax burden almost double on lower value parcels

Glossary of Terms

Accuracy - it is a description of systematic errors, a measure of statistical bias; as these cause a difference between a result and a "true" value, International Organization for Standardization (ISO) calls this *trueness*.

Aggregate Ratio - In the equalization study, the figure you get when the sum of the assessments is divided by the sum of the sale prices. May also be called the weighted mean or the weighted average ratio.

Category (see also use class) – All taxable properties in Vermont are classified into 15 categories based on their use. For example, R1 refers to small acreage residential and UE to utility electric. The goal is to group properties with similar uses together.

Class (see also use class) – There are 4 classes of property that are formed by the aggregation of the 15 categories into like-use groups. They are residential (R1, R2, MHU, MHL, V1 and V2), commercial / industrial (COMM, CMA and IND), utilities (UE and UO), and open land (Farm, Wood and MSC).

Coefficient of Dispersion (COD) - The COD is a measure of uniformity of appraisals for all properties on the grand list. If, for example, a town has valued every single property at 100% of fair market value (that is, every property has an assessment to fair market value ratio of 100%), then there is zero dispersion, hence 0.00 percent COD. Similarly, if every single property is assessed at 80% of fair market value, there is zero dispersion. If, however, the town median assessment to sales ratio is 80%, but individual assessments vary markedly, either above or below the median, then the disparity of assessments will reflect in a COD greater than 0%. As the disparity increases, the COD correspondingly increases.

Zero is a perfect score as a coefficient of dispersion. It indicates absolute fairness insofar as every taxpayer is appraised at exactly the same percentage of fair market value. The higher the number, the greater the dispersion, or disparity, in how properties are assessed in that town. Because of fluctuations in the market, and because properties are constantly being improved or changed, a perfect score is close to impossible. A coefficient of dispersion of 10 or lower is excellent. Statistically, it is the average deviation of a group of RATIOS from the TOWN-WIDE MEDIAN expressed as a percentage of the MEDIAN.

The statutory definition is in 32 VSA, § 5401(1). Vermont municipalities will be required to reappraise when the COD falls above 20%. 32 VSA, § 4041a.

Common Level of Appraisal (CLA) - In Vermont law, "the ratio of the aggregate value of local education property tax grand list to the aggregate value of the equalized education property tax grand list." 32 VSA, § 5401(3). It is essentially a measure of how close a town or city's local appraisals are to fair market value. Vermont municipalities are required to reappraise when the CLA falls below 80%. 32 VSA, section 4041a.

Confidence Interval (see also confidence level) – An interval calculated around the aggregate ratio. The high and low values in the interval form a range within which one can predict (within the limits of the confidence level) that the true ratio for the grand list exists. Vermont's study required that the interval not exceed a range of plus and minus 10% around the aggregate ratio. This is the maximum range of the interval. The actual range is generally considerably less but will depend on the size of the sales sample and its variability.

Confidence Level (see also confidence interval) – The required level of confidence to achieve a pre-established level of statistical reliability. Vermont’s study is based on a 90% confidence level. This means that if we were to repeatedly select sales samples from a grand list, the resulting equalization ratios would be within the calculated confidence interval 9 out of 10 times. Ratios used for equalization are calculated at the lowest level of sales aggregation (see also category, class, town-wide and use class) that achieves the 90% level.

Extreme Ratios (see also outlier ratios and interquartile range) – Extreme ratios are those identified as being markedly higher or lower than the aggregate ratio. If a ratio is identified as being extreme, its inclusion in the study would distort the results. Extreme ratios are therefore not used to calculate study results at any level of aggregation where they are identified.

Level of Appraisal (LOA) – Either a smaller sample of properties &/or lesser timeframe than the State Standards and doesn’t include Current Use & Utility adjustments.

International Association of Assessing Officers (IAAO) - A non-profit educational association whose mission is to promote innovation and excellence in property appraisal and property tax policy and administration through professional development, education, research, and technical assistance.

Interquartile Values/Range (see also outlier and extreme ratios)- The values that divide a set of ratios into 4 equidistant parts with the lowest observation equal to 0% and the highest equal to 100%. The interquartile range is the distance from the 25th percentile to the 75th percentile. These statistics are used to identify outlier and extreme observations. An outlier is defined as a ratio that is beyond 1.5 times the interquartile range from either the 25th or the 75th percentiles. An extreme is defined as a ratio that is beyond 3 times the interquartile range from the same percentiles.

Mean - The result of adding all the values and dividing by the number of values. For instance, the mean of 3, 5 and 10 is 6. ($3+5+10 = 18$; $18/3 = 6$.) Also called the arithmetic mean or the average.

Median Ratio - The midpoint or middle value when a set of values is ranked in order of magnitude; if the number of values is even, the midpoint or average of the two middle values.

Mode - the most frequent value in the data set. This is the only central tendency measure that can be used with nominal data, which have purely qualitative category assignments.

Outlier Ratio (see also extreme ratio and interquartile range) – Ratios that are found to be statistically different from other sales ratios in a given sample. Outliers may deserve special attention depending on the variability of other sales ratios in the sample.

Precision - is a description of *random errors*, a measure of statistical variability.

Price-Related Differential (PRD) - The mean ratio divided by the aggregate ratio. Also called the regressivity index. This statistic is used to determine whether assessment practices are progressive or regressive. A PRD above 1.03 tends to indicate assessment regressivity (lower valued properties are assessed at a higher ratios). A PRD below .98 tends to indicate assessment progressivity (higher valued properties are assessed at a higher ratios).

Regressivity Index - See price-related differential.

Reliable Ratio (see also confidence level and confidence interval) - A ratio which is statistically accurate within a margin of error of plus or minus 10% at a 90% confidence level. The sale report indicates if this guideline was met at each level of sales aggregation.

Townwide (see also use class) - The highest level of sales sample aggregation in which all sales across all categories are included for a city or town.

Trimmed Data (see also extreme ratios) – This refers to the data used to calculate the equalization ratio (i.e., the aggregate or weighted mean) and its confidence interval after any extreme ratios have been eliminated.

Use Class – The classification of properties into groups based on their use. For example, residential, commercial, utility etc. All properties in Vermont are grouped into 15 categories. In conducting the equalization study, listed value to sale price ratios are calculated at the lowest level of aggregation that achieves a reliable ratio (see also reliable ratio). If a reliable ratio cannot be achieved at the category level, then the next higher level of aggregation (class) is used. If a reliable ratio is not achieved at this level, then the townwide ratio is used for equalization.



State of Vermont
 Department of Taxes
 133 State Street
 Montpelier, VT 05633-1401

Agency of Administration

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December 18, 2017

Town Clerk
 Town of Andover
 953 Weston-Andover
 Andover, VT 05143

2017 Equalization Study Results

This letter serves as notification of the results of Property Valuation and Review (PVR)'s 2017 equalization study. Every year we are required to certify the equalized education property value (EEPV or EEGL) and coefficient of dispersion (COD) for each Vermont town. 32 V.S.A § 5406. This letter also communicates the Common Level of Appraisal (CLA) for your town and explains how it will impact your homestead and nonresidential education tax rates.

Education Grand List (from 411):	\$166,896,400
Equalized Education Grand List (EEGL):	\$139,111,020
Common Level of Appraisal (CLA):	119.97 % or 1.1997
Coefficient of Dispersion (COD):	9.67 %

The **education grand list** listed here is what was reported by your town to the state on the 411 form with your town's cable (if applicable) and tax increment financing (TIF) amounts (if any) included. This number represents the town's total property value that is subject to the education property tax (from the most recent grand list available) and serves as the numerator in the computation of the CLA. Please note: tax revenue from any TIF property value is subject to allocation. 32 V.S.A. § 5404a.

The **equalized education grand list (EEGL)** represents PVR's statutorily-mandated estimate of total fair market value of the education grand list in your town and serves as the denominator in the computation of the CLA. To find out more about how the equalization study is conducted, how to read the certified sales report, and additional instructions on how to appeal your results, please see the "Introduction to Vermont's Equalization Study" document at:

tax.vermont.gov/research-and-reports/reports/equalization-study

The **common level of appraisal (CLA)** is determined by dividing the education grand list by the equalized education grand list. 32 V.S.A. § 5401. A number over 100% indicates that property in your town is generally listed for more than its fair market value. A number less than 100% indicates that property is generally listed for less than its fair market value. A CLA below 80% necessitates a reappraisal. 32 V.S.A § 4041a. The homestead and nonresidential tax rates in your town will be adjusted by your town's CLA. 32 V.S.A § 5402. The nonresidential rate in your town will be the statewide

nonresidential rate divided by your CLA. The homestead rate will be the town homestead rate (which is determined by the per-pupil spending of any school district(s) to which your town belongs) divided by the CLA. A CLA greater than 100% will result in a downward adjustment of tax rates, and a CLA less than 100% will result in upward adjustment.

To get answers to many common questions about tax rates and how they are determined, please see: tax.vermont.gov/research-and-reports/tax-rates-and-charts/education-tax-rates/faqs

To see how the per-pupil spending of the district(s) to which your town belongs is calculated and how that, along with your town's CLA, makes the tax rates, please see the tax rate calculations link at: tax.vermont.gov/property-owners/understanding-property-taxes/education-tax-rates

The **coefficient of dispersion (COD)** is a measure of how fairly distributed the property tax is within your town. It is calculated as the average of the (absolute) difference of each sales ratio (list price divided by sales price) in the study from the median ratio. That result is then divided by the median ratio to get the COD, which is expressed as a percent. 32 V.S.A. § 5401. A high COD means that within your town many taxpayers are paying more than their fair share and many are paying less than their fair share. A COD over 20% necessitates a reappraisal. 32 V.S.A. § 4041a.

Appeals: A municipality may petition the director of Property Valuation and Review for a redetermination of its EEPV and/or COD. 32 V.S.A § 5408. All petitions must be in writing and signed by the chair of the municipality's legislative body. Petitions should contain a plain statement of matters being appealed and a statement of the remedy being sought. **Petitions must be received by PVR by the close of business on the 35th day after mailing of this letter.** Additional instructions on appeals can be found in the "Introduction to Vermont's Equalization Study" document at:

tax.vermont.gov/research-and-reports/reports/equalization-study

If you have any questions, please contact your district advisor or call 802-828-5860. For a copy of your town final computation sheet and certified sales report, please see:

tax.vermont.gov/research-and-reports/reports/equalization-study

Sincerely,



Jill Remick, Acting Director
Property Valuation and Review

cc: Chair, Board of Listers
Chair, School Board
Chair, Select Board
Superintendent of Schools