

Chapter 485

Appraisal Ratios (Old Version)

Introduction

An appraisal (or sales) ratio study measures the accuracy and equitability of mass appraisals by local government agencies. It compares the appraised value to the market value—measured by sales price—by creating the ratio of the two. These ratios, computed for each parcel that is sold, are compared across geographic areas (such as neighborhoods) to assess their level (central tendency) and uniformity (variation).

This topic is discussed in detail in Eckert (1990) and we refer you to that text for more details.

Data Structure

At the minimum, two values are necessary to construct a ratio—the numerator and the denominator. In this case, the numerator is the appraised price of the property, and the denominator is the sales price of the property. Other information is usually necessary such as the sales date, a geographic location such as neighborhood, and a property class. Note that the appraised price may be the total of two or more variables such as the price of the land and the price of the structure (home or building).

The SalesRatio data is an example of such a dataset. This dataset contains 360 rows, of which a small portion are displayed here. The sales price of the property is given in dollars. The appraised value of the land is given in Land and that of the structure is given in Building. Three property classes are found on this database: 510, 511, and 512. Several neighborhoods are represented by an identification number.

SalesRatio Dataset (Subset)

SaleDate	SalePrice	PClass	Land	Building	Neighborhood	YearSold
51195	0	512	3110	39200	1720	95
62096	250	512	5910	27370	1720	96
21696	628	511	12630	43710	0	96
41696	1500	512	11000	54740	0	96
52595	1900	512	10890	17830	0	95
32295	2000	511	11000	73710	0	95
90496	2000	512	0	5800	708	96
52595	2100	512	10890	21110	0	95
53195	2500	511	4890	72800	1455	95
12496	3000	511	11540	70250	0	96

Example 1 – Sales Ratio Study

This section presents a tutorial of a sales ratio study conducted on the SalesRatio dataset. The analyst wants to limit the analysis to sales that occurred on or after January 1, 1994, and to property classes 510, 511, and 512.

Setup

To run this example, complete the following steps:

1 Open the SalesRatio example dataset

- From the File menu of the NCSS Data window, select **Open Example Data**.
- Select **SalesRatio** and click **OK**.

2 Specify the Appraisal Ratios (Old Version) procedure options

- Find and open the **Appraisal Ratios (Old Version)** procedure using the menus or the Procedure Navigator.
- The settings for this example are listed below and are stored in the **Example 1** settings file. To load these settings to the procedure window, click **Open Example Settings File** in the Help Center or File menu.

Variables Tab	
<hr/>	
Appraisal Variables.....	Land-Building
Sales Price Variables.....	SalePrice
Break Variable	Neighborhood
Include Variable	PClass
Included Values	510 511 512
Sale Date Tab	
<hr/>	
Sale Date Variable.....	SaleDate
Date Format.....	MMDDYY
Minimum Date Kept	010194

3 Run the procedure

- Click the **Run** button to perform the calculations and generate the output.

Ratio Section

Ratio Section						
Neighborhood	Count	Median	Mean	W Mean	PRD	COD
0	190	83.62	88.96	85.56	1.04	18.00
110	2	59.94	59.94	59.50	1.01	6.84
125	4	63.21	62.50	62.16	1.01	8.60
935	1	135.60	135.60	135.60	1.00	0.00
1115	3	88.14	80.03	79.54	1.01	17.85
1120	1	102.58	102.58	102.58	1.00	0.00
1140	1	94.45	94.45	94.45	1.00	0.00
1155	1	88.75	88.75	88.75	1.00	0.00
1215	2	105.71	105.71	105.81	1.00	2.06
1315	3	66.93	70.78	71.75	0.99	8.61
1400	3	97.49	88.01	88.47	0.99	14.53
1410	3	80.91	84.19	85.89	0.98	5.99
1415	3	88.80	84.52	82.50	1.02	8.45
1420	2	93.53	93.53	92.58	1.01	5.31
1430	18	83.44	92.17	87.35	1.06	20.12
1435	2	107.03	107.03	104.39	1.03	11.10
1440	4	74.54	79.38	79.21	1.00	10.46
1455	8	96.61	91.59	90.00	1.02	14.69
1465	1	66.86	66.86	66.86	1.00	0.00
1710	1	113.40	113.40	113.40	1.00	0.00
1715	6	90.19	93.96	88.39	1.06	16.27
1720	11	82.74	87.17	82.89	1.05	18.81
1805	1	92.94	92.94	92.94	1.00	0.00
2120	2	89.47	89.47	80.40	1.11	17.73
2210	1	102.62	102.62	102.62	1.00	0.00
2225	1	79.28	79.28	79.28	1.00	0.00
Total	275	83.76	88.71	85.39	1.04	18.37

Sales ratios range from 50 to 150.

This report gives various statistical values for each value of the break variable (which was Neighborhood in this example). Note the total line at the bottom of the report. This gives each statistical measure treating the whole database as a single group.

Neighborhood

This gives the value of the break variable. Note the total line at the bottom of the report.

Count

This is the number of rows included in the statistics reported on this line. The main use of this statistic is to be certain that a large enough sample was available to make the other statistics reliable. At a minimum, you would want at least thirty sales ratios included before you could have any faith in the accuracy and repeatability of the statistics.

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Median

This is the median (middle) sales ratio. The individual sales ratios (R) are found using the formula

$$R = \frac{A}{S}$$

where A is the appraised value of the property and S is the sales price of the property. These values are ranked and the middle value is selected as the median.

The median is usually used as the measure of central tendency of sales ratios because of its resistance to distortion by outliers. Since outliers occur frequently in property sales databases, and since outliers often distort statistics that include them, their impact on the statistics must be realized and removed. Using the median is a good way to accomplish this.

The medians are scanned to determine if there are any groups (neighborhoods) that are way undervalued or way overvalued.

LCL and UCL Median

These are the confidence limits of the median sales ratio. These limits make no assumption of normality.

Mean

This is the averaged sales ratio. The individual sales ratios computed and averaged to calculate this value.

Unlike the median, the mean is easily distorted by outliers. For this reason, care should be exercised when using it. One possible use is to compare the mean with the median to determine if there were a lot of outliers present. The difference between the two is partially due to the presence of outliers.

LCL and UCL Mean

These are the confidence limits of the mean sales ratio.

W Mean

The weighted mean is the ratio of the total appraised values for the entire sample and the total sales prices of the entire sample. Hence, the formula is

$$WM = \frac{\sum_{i=1}^n A_i}{\sum_{i=1}^n S_i}$$

The weighted mean weights each ratio by the sales price. Hence, high priced properties carry a larger weight than low priced properties. It is most appropriate for measuring the central tendency when you are most interested in total dollar value of the sample.

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PRD

This is the price related differential. It measures the regressivity or progressivity of the assessments. Regressive appraisals occur when high-value properties are under appraised relative to low-value properties. Progressive appraisals occur when the opposite pattern occurs.

This statistic is the ratio of the mean and the weight mean. It is calculated using the formula

$$PRD = \frac{\sum_{i=1}^n \frac{A_i}{nS_i}}{WM}$$

A PRD greater than 1.0 indicates that high-value properties are under appraised, while a value less than 1.0 indicates that low-value properties are under appraised. As a general rule, except for computations involving small sample sizes, each PRD should be between 0.98 and 1.03.

COD

This is the coefficient of dispersion is usually used as the measure of uniformity in ratio studies. It is calculated using the formula

$$COD = \frac{\frac{100}{n} \sum_{i=1}^n \left| \frac{A_i}{S_i} - \text{Median} \left(\frac{A_i}{S_i} \right) \right|}{\text{Median} \left(\frac{A_i}{S_i} \right)}$$

COD values of 15.0 or less tend to be associated with good appraisal uniformity.

COV

This is the coefficient of variation. See the Descriptive Statistics chapter for details.

Std. Dev.

This is the standard deviation of the sales-ratio values. See the Descriptive Statistics chapter for details.

Normality Prob

This is the probability level of the Shapiro-Wilk test of normality. If this value is less than some cutoff value, often 0.05 or 0.10, the hypothesis that the sales ratios are normally distributed is rejected.