

Chapter 486

Comparables – Sales Price (Old Version)

Introduction

Appraisers often estimate the market value (current sales price) of a *subject* property from a group of *comparable* properties that have recently sold. Since sales data are considered the best evidence of market value, this is the preferred approach to market value estimation when sales data are available. This topic is discussed in detail in Eckert (1990) and we refer you to that text for more details.

This module allows you to select an appropriate subset of your sales database, such as properties in the same area of similar age and size, and specify a set of adjustment variables and their corresponding weights and adjustment values. The selected data are scanned to determine those properties (rows of the database) that are most comparable to the subject property. These comparable properties are then used to create an estimate of the market value (sales price) of the subject property.

Technical Details

The market value of subject property is estimated by adjusting the sales prices of comparable properties so that their attributes match those of the subject property. This adjustment may be a dollar amount, such as \$50 per square foot, or a percentage, such as 1.5% decrease for each year since the property was constructed.

This sales comparison method has three general phases:

1. Select a pool of possible properties from a database of recent sales.
2. Rank these properties according to how close they are to the subject property.
3. Adjust the comparable properties so that their attributes match the subject property.

Phase I – Data Selection

The first step is to select a group of properties to work with from the database of sales data. Usually, this step involves selecting properties of similar age, size, and location. The program limits the search for comparables to properties that meet these selection criteria.

We cannot stress too much the importance of finding comparables that are as similar as possible to the subject. This greatly reduces the need for making many (sometimes controversial) adjustments to the sales prices.

Phase 2 – Rank the Properties

A distance measure is used to quantify how close each comparable property is to the subject property. Suppose there are K attributes X_1, X_2, \dots, X_K on which the distance is to be measured. The value of the i^{th} attribute on the j^{th}

Comparables – Sales Price (Old Version)

comparable property is represented by X_{ij} . The distance between the j^{th} comparable property and the subject property is calculated using the Euclidean Distance formula:

$$D_j = \sqrt{\frac{1}{K} \sum_{i=1}^K w_i \frac{(X_{ij} - X_{is})^2}{S_i^2}}$$

where S_i is the standard deviation of the X_{ij} for a particular attribute and w_i is an attribute importance weight scaled so that they sum to one.

This formula reduces all variables to unit-less index values by dividing each by its standard deviation. This allows us to combine the number of bedrooms (a small number) with the number of square feet (a relatively large number) in one formula. The differences are squared to put negative and positive values on an equal basis.

Note that if all attributes match, the distance will be zero. Typical values will be between zero and five.

Once these distances are calculated, they are sorted from lowest to highest. The properties with the smallest distances are closest to the subject property.

Phase 3 – Adjusting the Sales Price

Finally, an adjusted sales price is computed for each comparable. The magnitude of the adjustment depends on how well the property matches the subject property. There are three steps in this adjustment process:

Step 1 – Sales date adjustment

The sales price of each comparable property is first adjusted to a specified point in time using a monthly percentage adjustment.

For example, suppose the percentage adjustment is set at 0.2% per month, a comparable property sold for \$100,000 in August of 1998, and the property as to be adjusted to August of 2000. The time adjusted sales price would be calculated as:

$$\$100,000(1 + 0.002(24)) = \$104,800$$

Step 2 – Dollar and percentage adjustments

The sales price of each comparable property next adjusted for differences in other attributes. The adjustments are either dollar (lump sum) or percentage adjustments. The adjustments are made in the same order that they are specified. Hence, if you want to make the percentage adjustments first, you should specify them first.

As an example of a dollar adjustment, suppose that a comparable property has 2,500 square feet while the subject property has 3,000 square feet. Obviously, the value of the comparable property must be adjusted up. The appraiser must set a dollar amount of adjustment for each unit difference. In this example, suppose the appraiser decides to add \$50 per square foot. Since the difference in size is 500 square feet, \$25,000 (\$50 x 500) is added to the sales price of the comparable property.

As an example of a percentage adjustment, suppose that a comparable property has a quality rating of one while the subject property has a quality rating of three. Obviously, the value of the comparable property must be adjusted up so that it is on par with the subject property. The appraiser must set a percentage adjustment for each unit difference. In this example, suppose the appraiser decides to increase the property value by 2% per one unit difference in quality. Since the difference in quality is two units, the current adjusted sales price is multiplied by 1.04.

Comparables – Sales Price (Old Version)

Step 3 – Estimate the sales price

Once the adjusted sales prices of the comparables have been calculated, the sales price of the subject property can be calculated. NCSS can calculate four different estimates:

1. **Closest.** The adjusted sales price of the closest comparable (using the Euclidean distance) is used as the estimate of the subject sales price.
2. **Least Absolute Dollar Change.** The adjusted sales price of the property that had the least amount of adjustments in absolute dollar amounts is used as the estimate of the subject sales price.
3. **Simple Average.** The average adjusted sales price of the closest four or five properties is used as the estimate of the subject sales price. It is hoped that averaging will help remove the influence of any anomalies that might occur with a single sale.
4. **Weighted Average.** A weighted average of the adjusted sales price of the closest four or five properties is used to estimate the subject sales price. The weights are based on the distances between the subject property and comparable property. Specifically, the weights are calculated using the formula:

$$W_j = 100 \left(\frac{5 - D_j}{5} \right)$$

with negative weights being reset to zero.

Data Structure

Each column of the spreadsheet (database) represents a variable and each row represents a property. The selection variables can be text or numeric, but the sales adjustment variables must be numeric. You must include a sales price variable and at least one adjustment variable.

Comparables is an example of such a dataset. This dataset contains fifty-one rows, of which only a few are displayed here. There are also other variables that are not displayed here.

Note that the sales date is in the format YYYYMM. Also, the indicator variable, Subject, at the right-side of the database indicates which rows are to be treated as subjects (no-blank) or as comparables (blank).

Comparables dataset (subset)

PropID	Neighborhood	SalePrice	SaleDate	SqFt	LotSize	Subjects
A-1	AAA	71589	199801	1165	4670	
A-2	AAA	50535	199907	735	3805	
A-3	AAA	134644	199902	2488	5249	
A-4	AAA	156865	199903	3149	4394	
.
.
.
Subject1			199906	965	5502	1

Procedure Options

This section describes the options available in this procedure.

Selection Tab

Specify the variables used to select the rows of the database that are to be used as possible comparables.

Indicator Variable

Indicator Variable

This variable indicates which rows from the database are subject properties. A separate comparables report will be generated for each row with a non-blank value. These rows will not be candidates as comparables.

Normally, you would enter the information for each subject property at the bottom of the database, set the value of this variable to '1' in that row, and run the analysis.

Note that this variable **MUST** be specified.

Report Specification

Report Variables

Specify additional variables to be displayed at the beginning of the Comparables Report.

Label Variable

Specify a variable used to label the rows of the reports. If this variable is omitted, the database row numbers are used.

Selection Variables and Ranges

Selection Variables

Specify variables whose values will be used to select specific records (rows or properties) from the database. Only those rows that meet the selection criterion given in the corresponding Selection Range box will be kept.

Only specify one variable per box.

Note that you do not have to specify any variables, in which case, the whole database will be used.

Selection Range

Specify a set of values used to specify which rows from the database are kept in the analysis. Note that all text values are changed to upper case before processing.

You can mixe the following types of entries together:

- **Value**

You can enter a single value, either text or numeric. You do not have to enclose text in quote marks. For example, you might enter:

AAA

or

1

Comparables – Sales Price (Old Version)

- **List**

You can enter one or more values in a comma-separated list. For example, you might enter:

102,104,106

or

ABC,DEF,KJS

- **Minimum to Maximum**

You can enter a minimum value and a maximum value, separated by the word 'TO'. Only those rows whose values fall within the range are kept. The syntax for this command is:

Minimum to Maximum

For example, you might enter:

100 to 500

A TO C

-900 To 1000, 1200, 1500, 1700 to 1900

Adjustment Tab

These options let you specify the attribute variables used to adjust the sales price of the comparable properties. These are the variables used to calculate the distance from a subject to a comparable.

Adjustment Specification

Adjustment Variables

Specify the adjustment variables in these boxes. Two types of adjustment variables may be specified: lump sum and percentage.

These variables are used in two phases of the analysis:

1. Similarity Phase. Calculate an index of how similar each candidate property is to the subject property.
2. Appraisal Phase. Calculate an adjusted sales price based on the difference between the candidate property and the subject property.

During the appraisal phase, the variables are applied in the order in which you have specified them. You should note that the order of these variables does change the estimated sales price because of the percentage variables. Since the percentage adjustment is applied to the current estimated sales price, the position of the variable in the list becomes import. Some schools of thought recommend that all percentage variables should be applied first. Others recommend that they should be applied after the lump sum adjustments are made. NCSS lets you decide. You could even put some at the beginning and some at the end.

Distance Weight

This value specifies the relative importance of this variable in calculating the Euclidean distance between the subject property and the candidate properties. You should specify a positive number for each adjustment variable.

Note that the weights are not used in adjusting the sales prices of the candidate properties.

One way to specify these weights is to set the least important variables weight to one. Then, other weights are specified relative to that. For example, suppose you decide to use three adjustment variables: Size, Age, and Number of Bedrooms. You decide that the least important variable is the Number of Bedrooms and assign that variable a weight of '1.' You decide that Age is three times as important as bedrooms, so you assign Age a weight of '3.' You decide that Size is four and one-half times as important, so you assign Size a weight of '4.5.' NCSS

Comparables – Sales Price (Old Version)

totals these three weights, (which is 8.5) and divides each of your entries by that total. Thus, the actual weight for Number of Bedrooms is $1/8.5 = 0.1176$, for Age is $3/8.5 = 0.3529$, and for Size is 0.5882.

Although the actual weights for all variables must sum to one, you do not need to worry about that. In fact, your numbers can all be greater than one. The program will readjust your weights so that they sum to one.

Amount (\$ or %)

This value specifies the amount that the sales price is changed for each unit change in the Adjustment Variable. You may use a percent sign to indicate a percentage or a dollar sign to indicate a dollar amount. If no sign is included, a dollar amount is assumed.

If you include a percent sign in your value, the adjustment will be applied as a percentage rather than an amount. For example, if you enter 2% here and the difference between the candidate property is 2 units less than the subject property on this variable, the overall sales price is increased by 4%.

As an example of a dollar adjustment, suppose that the Adjustment Variable is Size in square feet. Suppose that this Adjustment Amount is set at 30. That means that each additional square foot in size of the candidate property over that of the subject property will cause the estimated sales price of the candidate property to be decreased by \$30.

Date

Sale Date Variable

This variable contains the date on which the sale took place. These date values are used to adjust the sales prices to the same point in time using a multiplicative adjustment (Date Adjustment).

The date values may be in any one of several date formats. The date format is specified in the Date Format option.

Date Format

Specify the format of the Sale Date Variable. This is the format of the dates that appear on your database.

Note that Y is for year, M is for month, and D is for day. All date values are converted to Julian dates (number of days since January 1, 0000), so there is no year 2000 conversion problem.

Speaking of year 2000 conversion, two-digit year dates are converted to Julian dates using the conversion rule that is set as a system option. If the conversion factor is 30, then year values of 30 or more are converted to 1930 (or more) and year values 29 and less are set to 2029 (or less). For example, the year part of the date 010101 is assumed to be 2001; the year part of the date 010129 is assumed to be 2029; and the year part of the date 010130 is assumed to be 2030.

Date Adjustment

This is the monthly sales price adjustment factor. Each sales price is adjusted using the formula Adjusted Sales Price = (Actual Sales Price) $(1 + (a)(m))$ where m is the number of months between the actual sale date and the adjusted date and a is the number entered here.

Note that this number is NOT a percentage!

For example, suppose that a sales took place in August of 1997 and that you have set the Current Date to 1998-07 and the Adjustment value to 0.001. Since there are twelve months between from August to July, the sales value would be adjusted up using the factor $(1+0.001*12)$ which is 1.012. That is, the sales price would be increased by 1.2 percent.

Current Date

Specify the date to which all sales price values are adjusted. Often this is the current date.

The format is YYYY-MM. For example, you might enter '2001-01' to adjust all sales values to January 1, 2001.

Comparables – Sales Price (Old Version)

Sales Price

Sales Price Variable

Specify the variable that contains the sales prices (in dollars) of the comparable properties. Only those properties that have a positive sales price are used.

Reports Tab

Select Reports

Distance Report - Settings Report

Specify whether to display the report.

Show Dollar Signs

Specify whether to show dollar signs on the reports. The dollar sign may clutter the report, so it is optional.

Show Commas in Dollars

Specify whether to format dollar amounts with a comma. The comma may need to be left out for formatting reasons.

Show Column Separator = |

The report may be formatted with or without the vertical bar. This option lets you decide whether you want to use it or not.

Report Options

Estimation Method

Specify the method to be used to calculate the estimated sales price of the subject property. We recommend that you use the Weighted Average method unless you have a good reason to use one of the other methods. The following methods are available:

- **Closest**
Use the sales price of the comparable property that is closest (has the minimum distance) to the subject property.
- **Min |\$| Change**
Use the sales price of the comparable property that had the smallest absolute dollar value change. That is, this property was adjusted by the smallest dollar amount.
- **Simple Average**
Use the average of the adjusted sales prices of the M comparables that have the smallest distance. The value of M is set on the Reports tab by the Properties in Averages option.
- **Weighted Average**
Use the weighted average of the adjusted sales prices of the M comparables that have the smallest distance to the subject property. The weights are proportional to the distance from the comparable property to the subject property.

Comparables – Sales Price (Old Version)

Report Options – Specify Number of Properties

Per Distance Report

Specify the number of properties (rows) displayed on the Distance report. Note that the database is sorted so that only the candidates closest to the subject are displayed. We recommend that you look at the best ten or twenty candidates.

Per Comparables Report

Specify the number of properties displayed on this report. Usually, three two five are used, but ten are displayed. Note that the database is sorted so that only the candidates closest to the subject are displayed.

Per Page

Specify the number of comparables shown on each page of the comparables report. Each property requires two columns of the report. The maximum is four.

Used in Averages

Specify the number of properties in the averages used to estimate the subject's sales price. The simple average of the most similar properties (determined by the comparability index) is one sales price estimate. A weighted average of these same properties is another sales price estimate.

Report Options – Decimal Places

Dollars - Means

Specify the number of decimal places shown on the report for these items.

Example 1 – Comparables Study

This section presents a tutorial of a comparables study conducted on the Comparables dataset. The appraiser limits the analysis to those properties in neighborhood ‘AAA’ that were constructed from 1970 to 1980.

You may follow along here by making the appropriate entries or load the completed template **Example 1** by clicking on Open Example Template from the File menu of the Comparables – Sales Price (Retired 2016) window.

1 Open the Comparables dataset.

- From the **File** menu of the NCSS Data window, select **Open Example Data**.
- Click on the file **Comparables.NCSS**.
- Click **Open**.

2 Open the Comparables – Sales Price (Retired 2016) window.

- Using the Analysis menu or the Procedure Navigator, find and select the **Comparables – Sales Price (Retired 2016)** procedure.
- On the menus, select **File**, then **New Template**. This will fill the procedure with the default template.

3 Specify the selection variables.

- On the Comparables – Sales Price window, select the **Selection tab**.
- Double-click in the **Indicator Variable** text box. This will bring up the variable selection window.
- Select **Subjects** from the list of variables and then click **Ok**. “Subjects” will appear in this box.
- Double-click in the **Report Variables** text box. This will bring up the variable selection window.
- Select **YearSold** and then click **Ok**. “YearSold” will appear in this box.
- Double-click in the **Label Variable** text box. This will bring up the variable selection window.

Comparables – Sales Price (Old Version)

- Select **PropId** and then click **Ok**. “PropID” will appear in this box.
- Double-click in the first **Selection Variable** text box. This will bring up the variable selection window.
- Select **Neighborhood** and then click **Ok**. “Neighborhood” will appear in this box.
- Double-click in the second **Selection Variable** text box. This will bring up the variable selection window.
- Select **YearBuilt** and then click **Ok**. “YearBuilt” will appear in this box.
- Enter **AAA** in the **first Selection Range** box.
- Enter **1970 to 1980** in the **second Selection Range** box.

4 Specify the adjustment variables.

- On the Comparables – Sales Price window, select the **Adjustment tab**.
- Double-click in the first **Adjustment Variable** text box. This will bring up the variable selection window.
- Select **Quality** and click **Ok**. “Quality” will appear in this box.
- Double-click in the second **Adjustment Variable** text box. This will bring up the variable selection window.
- Select **SqFt** and click **Ok**. “SqFt” will appear in this box.
- Double-click in the third **Adjustment Variable** text box. This will bring up the variable selection window.
- Select **LotSize** and click **Ok**. “LOTSIZE” will appear in this box.
- Double-click in the fourth **Adjustment Variable** text box. This will bring up the variable selection window.
- Select **Bedrooms** and click **Ok**. “BEDROOMS” will appear in this box.
- Set the first **Distance Weight** to **1**.
- Set the second **Distance Weight** to **4**.
- Set the third **Distance Weight** to **2**.
- Set the fourth **Distance Weight** to **1**.
- Set the first **Amount** to **3%**.
- Set the second **Amount** to **\$50**.
- Set the third **Amount** to **\$5**.
- Set the fourth **Amount** to **\$400**.
- Double-click in the **Sale Date Variable** text box. This will bring up the variable selection window.
- Select **SaleDate** and click **Ok**. “SaleDate” will appear in this box.
- Double-click in the **Sales Price Variable** text box. This will bring up the variable selection window.
- Select **SalePrice** and click **Ok**. “SalePrice” will appear in this box.
- Set the **Date Format** to **YYYYMM**.
- Set the **Date Adjustment** to **0.01**.
- Set the **Current Date** to **1999-10**.

5 Specify the reports.

- On the Comparables – Sales Price window, select the **Reports tab**.
- Check **Distance Report**.
- Check **Comparables Report**.
- Check **Settings Report**.
- Uncheck **Show Dollar Signs**.
- Uncheck **Show Commas in Dollars**.
- Check **Show Column Separator = |**.
- Set **Estimation Method** to **Weighted Average**.
- Set **Per Distance Report** to **10**.
- Set **Per Comparables Report** to **8**.
- Set **Per Page** to **4**.
- Set **Used in Averages** to **5**.
- Set **Dollars Decimals** to **0**.

Comparables – Sales Price (Old Version)

- Set **Distances Decimals** to **3**.
- Set **Percents Decimals** to **0**.
- Set **Means Decimals** to **1**.

6 Run the procedure.

- From the Run menu, select **Run Procedure**. Alternatively, just click the green Run button.

Settings Report

Settings Report for Subject = Subject1

Selection Variables	Selection Criterion
Neighborhood	AAA
YearBuilt	1970 to 1980

Adjustment Variables	Adjustment Value	Weight	Mean	Standard Deviation	COV
SaleDate	1%				
Quality	3%	1	2.2	0.7	33
SqFt	\$50	4	1869.2	1001.3	54
LotSize	\$5	2	5018.2	1153.3	23
Bedrooms	\$400	1	2.5	1.2	47

Of the 50 properties on the database, 1 was a subject property and 37 were excluded by the selection variable(s), leaving 12 comparables for consideration.

This report gives the settings you used to create the report. It is provided to let you document how the options where set. It also supplies summary statistics about the adjustment variables used in the analysis. The Mean, Standard Deviation, and Coefficient of Variation are computed on the [rows selected for analysis](#).

Distance Report

Distance Report for Subject = Subject1

PropID	Distance	SalePrice	Quality	SqFt	LotSize	Bedrooms
Subject1			2	965	5502	2
A-14	0.240	88474	2	1309	6484	2
A-8	0.394	78728	2	1181	5350	4
A-1	0.484	71589	1	1165	4670	1
A-2	0.568	50535	2	735	3805	2
A-9	0.579	95660	1	1653	5715	1
A-10	0.597	50902	2	779	3745	2
A-15	1.083	60007	3	963	3506	3
A-3	1.503	134644	3	2488	5249	3
A-7	1.765	127109	3	2419	4086	3
A-13	2.866	168715	2	3202	6720	1

This report displays the values of the adjustment variables for the comparable properties that met the selection criterion. Note that the subject property is displayed first.

Distance

This value is the Euclidean distance, D , between the subject property and the comparable property. Values near zero are close. Values near five are very different.

Comparables – Sales Price (Old Version)

Comparative Sales Price Report

Comparative Sales Price Adjustment Report for Subject = Subject1									
PropID	Subject1	A-14	A-8	A-1	A-2				
	Value	Value	\$Adj	Value	\$Adj	Value	\$Adj	Value	\$Adj
YearSold		1997		1996		1995		1996	
Comparability		92%		87%		84%		81%	
SalePrice		88474	6193	78728	3149	71589	15034	50535	1516
Quality	2	2	0	2	0	1	2599	2	0
SqFt	965	1309	-17200	1181	-10800	1165	-10000	735	11500
LotSize	5502	6484	-4910	5350	760	4670	4160	3805	8485
Bedrooms	2	2	0	4	-800	1	400	2	0
Net \$Adj.			-15917		-7691		12192		21501
Sum \$Adj.			22110		12360		17159		19985
Adj Sales Price	73197		72557		71037		83781		72036

Comparative Sales Price Adjustment Report for Subject = Subject1 (Continued)									
PropID	Subject1	A-9	A-10	A-15	A-3				
	Value	Value	\$Adj	Value	\$Adj	Value	\$Adj	Value	\$Adj
YearSold		1995		1996		1997		1994	
Comparability		81%		80%		64%		50%	
SalePrice		95660	2870	50902	2036	60007	3000	134644	10772
Quality	2	1	2956	2	0	3	-1890	3	-4362
SqFt	965	1653	-34400	779	9300	963	100	2488	-76150
LotSize	5502	5715	-1065	3745	8785	3506	9980	5249	1265
Bedrooms	2	1	400	2	0	3	-400	3	-400
Net \$Adj.			-29239		20121		10790		-68876
Sum \$Adj.			38821		18085		12370		82177
Adj Sales Price	73197		66421		71023		70797		65768

This report displays the values of the adjustment variables for the comparable properties that met the selection criterion. Note that the subject property is displayed first.

Comparability

This is an index that shows how close the comparable is to the subject. It is computed using the formula:

$$W_j = 100 \left(\frac{5 - D_j}{5} \right)$$

When the value is negative, it is reset to zero.

This value is used to compute the weighted average estimate of the sales price.

Net \$Adj

This row gives the net change in the price between the original sales price and the final adjusted sales price.

Sum |\$Adj.|

This row totals the absolute values of the dollar adjustments that are made. It is sometimes used as an indicator of how close the comparable is to the subject property. Unfortunately, its value depends on the order in which the variables are specified.

Adj Sales Price

The adjusted sales price is given in this row. The first column provides the estimated sales price of the subject property.