

Chapter 601

Comparables Appraisal

Introduction

Without the sale of the property itself, it is widely considered that the best estimate of market value of a property is the recent sale price of highly similar properties in close proximity to the subject property. This procedure is used to estimate the market value of a subject property from comparable properties based on the sales comparison approach.

The Comparables Appraisal procedure in NCSS contains tools and reports for all steps of the sales comparison approach. First, it allows you to select an appropriate subset of your sales database, such as properties in the same area of similar age, size, and sale date. Then the comparability (or distance) of each of the candidate subset properties to the subject property is measured based on specified attributes. The investigator may then select specific properties as comparables, or use those that are most similar to the subject property. Next, the comparable property sales prices are adjusted to the subject property based on specified amounts or percentages, for each unit of difference from the subject property. Finally, an average or weighted average of the adjusted sale prices of the comparable properties can be used to estimate the subject property market value.

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The sales comparison approach to property value estimation has five steps:

1. Select a pool of candidate properties from a database of recent sales.
2. Rank these properties according to similarity to the subject property.
3. Select the desired comparable properties.
4. Adjust the comparable property values according to differences in attributes from the subject property.
5. Estimate the subject market value based on the average of the adjusted values of the comparables.

Step I – Subset of Candidate Properties

The first step is to select a group of candidate comparable properties from the sales database. Usually, this step involves selecting properties of similar age, size, and location. Selecting a proper subset of properties for consideration greatly reduces the need for making significant (sometimes controversial) adjustments to the sale prices.

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Step 2 – Rank the Properties

A distance measure is used to quantify the similarity of each candidate property to the subject property. Three measures of distance are available for consideration in this procedure. Once the distance is calculated for each candidate property, they are sorted from lowest to highest. The properties with the smallest distances (or largest comparability) are closest to the subject property.

Suppose there are K attributes measured for each property to be used to determine distance from the subject property. The value of the i^{th} attribute on the j^{th} property is represented by X_{ij} .

Euclidean Distance

The Euclidean distance between the j^{th} candidate property and the subject property, based on K similarity attributes, may be calculated using the formula:

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

where s_i is the standard deviation of all the candidate properties for the i^{th} attribute, and w_i is an attribute importance weight. If s_i is 0, it is replaced with 1. Technically, D_j is the weighted standardized Euclidean distance. In theory, the Euclidean distance formula puts all attributes on the same scale by dividing the difference by the attribute standard deviation. For example, a difference of 2 bedrooms and a difference of 980 square feet may be put on the same scale by dividing each difference by the standard deviation of the respective attribute. The differences are squared to put negative and positive differences on equal basis.

Note that if all attributes of the subject property and candidate property match exactly, the distance will be zero. Typical distance values will be between zero and three.

This measure of distance relies on having a large enough number of candidate properties to reliably estimate the standard deviation of each attribute.

The Euclidean distance may be roughly interpreted as the average number of standard deviations of the candidate property from the subject property.

Minkowski Distance

The Minkowski distance between the j^{th} candidate property and the subject property, based on K similarity attributes, may be calculated using the formula:

$$D_j = 100 \times \frac{\sum_{i=1}^K w_i |X_{ij} - X_{iS}|}{\sum_{i=1}^K w_i X_{iS}}$$

where w_i is an attribute importance weight. Technically, D_j is the weighted Minkowski distance. If X_{iS} is 0, it is replaced with 1. Like the Euclidean distance, the Minkowski distance formula puts all attributes on the same scale, but does so by using percent difference rather than by dividing the difference by the attribute standard deviation. The absolute value of differences is taken to put negative and positive differences on equal basis.

As with the Euclidean distance, if all attributes of the subject property and candidate property match exactly, the distance will be zero.

The Minkowski distance may be interpreted as the average percent difference of the candidate property from the subject property.

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Comparability (Euclidean)

The Euclidean distance may be converted to a 100-point Comparability scale using

$$\text{Comparability}_j = 100 \times \frac{\text{Base Value} - D_j}{D_j}$$

where D_j is the Euclidean distance and the *Base Value* is a pre-specified number, usually 3 or greater. The Comparability is simply a re-characterization of the Euclidean distance to a 100-point scale. Euclidean distances close to zero give Comparability values that are close to 100. Large Euclidean distances produce Comparability values at or near 0. If all attributes of the subject property and candidate property match exactly, the Comparability will be 100.

One drawback of the Comparability metric is that it depends upon the arbitrary choice of the *Base Value*. The ranking of the properties using this metric is identical to the ranking given by the Euclidean distance, regardless of the choice of *Base Value*.

Step 3 – Select Comparables

Once the candidate subset of properties has been ranked, the comparable properties to be used in subject property market value estimation should be chosen. Typically, the 4 or 5 candidate properties with the lowest distances are used. Otherwise, justification should be provided for choosing other comparables with larger distances.

Step 4 – Comparable Property Value Adjustment

To bring the sale price values of the comparable properties into conformity with the subject property, value adjustments (hopefully small) are made to the comparable properties according to the differences in the comparable and subject properties.

Sale date adjustment

If overall changes in property values across the market have occurred over time (since the comparable sale date), an initial date-based sale price adjustment may be advisable. This adjustment is based on the amount of time between the sale date of the comparable property and the desired basis date of the subject property valuation. A monthly price adjustment factor (A) is used to produce sale prices adjusted to the basis date as follows

$$S_{j,adj} = (1 + A \times M)S_j$$

where $S_{i,adj}$ is the adjusted sale price, S_i is the original sale price, A is the adjustment factor, and M is the difference in months from the basis date. Positive A values indicate increasing sale prices, while negative A values indicate decreasing sale prices. Dates previous to the basis date result in positive M values, while dates after the basis date result in negative M values.

For example, suppose the basis date is January 1. Further suppose that a property is sold 4 months before the basis date for \$100,000. Also suppose that properties values in general increased about 6% during the year previous to the basis date. Increasing 6% per year, or 0.06, is comparable to 0.005 per month (if not compounding). The value for A in this example would be 0.005. The adjusted sale price of the comparable property would be

$$S_{j,adj} = (1 + 0.005 \times 4)\$100,000 = \$102,000$$

This is the estimated sale price for the property if the property had been sold 4 months later on January 1.

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Dollar and percentage adjustments based on attribute differences

The sale price of each comparable property is then adjusted for differences in other attributes. The adjustments are either dollar (lump sum) or percentage adjustments. Dollar adjustments are made by multiplying the specified dollar adjustment amount by the difference in units for the particular attribute. Then this amount is added to (or subtracted from) the running adjusted sale price. Similarly for percentage adjustments, the specified percentage adjustment is multiplied by the difference in units for the attribute. The percentage of the current adjusted sale price is taken, and the amount is added to (or subtracted from) the running adjusted sale price. The adjustments are made in the same order that they are specified. If there are only dollar adjustments, the order doesn't matter, but if there are percentage adjustments the order does matter, since the percentage adjustment is made on the adjusted price to that point.

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. In this case, the value of the comparable property should be adjusted up by 500 square feet to make it 'equivalent' to the subject property. Suppose the appraiser determines an appropriate dollar amount of adjustment for each unit difference to be \$50 per square foot. Since the difference in size is 500 square feet, \$25,000 ($\50×500) is added to the sale price of the comparable property.

As an example of a percentage adjustment, suppose that a comparable property has a quality rating of '1' while the subject property has a quality rating of '3'. The value of the comparable property should be adjusted up, as if it had a quality rating of '3' also. If the appraiser sets a percentage adjustment of 2% for each unit difference in rating, the current adjusted sale price is multiplied by $1 + 2 \times 2\% = 1 + 2 \times 0.02 = 1.04$. For a \$200,000 property, this would be equivalent to adding \$8,000 to the comparable property running value.

Step 5 – Subject Property Value Estimation

After each comparable property has been adjusted to bring its value in conformity with the attributes of the subject property, an estimate of the value of the subject property may be calculated. Four different estimates are available in NCSS:

1. **Closest.** The adjusted sale price of the closest comparable (using the chosen distance metric) is used as the estimate of the subject property market value.
2. **Least Absolute Dollar Change.** The adjusted sale price of the property that had the least amount of adjustments in absolute dollar amounts (of all candidate properties) is used as the estimate of the subject property market value.
3. **Simple Average.** The average adjusted sale price of the specified comparable properties is used to estimate the subject property market value.
4. **Weighted Average.** A weighted average of the adjusted sale prices of the specified comparable properties is used to estimate the subject property market value. The weights are based on the distances between the subject property and comparable property and the user-specified *Base Value*. Weights are calculated using the formula:

$$W_j = 100 \times \frac{\text{Base Value} - D_j}{D_j}$$

where D_j is the Euclidean or Minkowski distance. Negative weights are reset to zero. The subject property value is estimated by

$$\sum_{j=1}^C \frac{W_j}{\sum W_j} S_{j,adj}$$

where C is the number of comparable properties and $S_{j,adj}$ is the adjusted sale price of the j^{th} comparable property.

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Data Structure

Each column of the spreadsheet (database) represents a property attribute and each row represents a property. A sale price column is required. The sale price column gives the sale prices for all properties except the subject property. Several other attribute columns will likely be needed, but not required, to run the Comparables procedure. These include

- Sale Date column – used to determine differences in sale date from the specified basis date
- Selection column(s) – used to identify a subset of all properties to be considered for comparison, may be text or numeric
- Similarity column(s) – used to determine the distance between the subject and candidate properties
- Adjustment column(s) – used to determine differences between subject and comparable properties in order to determine comparable property price adjustment; at least one adjustment column is needed in order to make adjustment to comparable properties
- ID column – used to identify properties used in the analysis
- Report column(s) – these are not necessarily used in calculations, but included in the adjustment report
- Subject Indicator column – may be used to identify the subject property, although other means are available
- Comparable Indicator column – may be used to identify the comparable properties, although other means are available

The following dataset of residential property sales gives an example of what a (simpler) comparables appraisal dataset may look like. In this particular dataset, the last row represents the subject property.

Property Sales dataset (subset)

Prop_ID	Sale_Date	Sale_Price	BS_SF_Fin	Main_SF	Qual	Gar_Cnt	Style	Bath_Cnt	Lot_SF
389-1525-487	8/8/2013	245000	800	2415	64	3	Single	3.5	9827
389-1525-584	12/29/2011	173000	0	2348	98	2	Single	2.5	9347
389-1528-570	12/26/2013	221000	0	2404	71	2	Single	2.5	9587
389-1528-618	9/9/2012	183597	0	2908	92	2	Single	2.5	12421
389-1529-518	11/23/2012	212000	736	2280	77	2	Single	3.5	14324
389-1530-434	10/21/2011	257500	621	2572	65	2	Single	2.5	10553
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389-1547-562	8/19/2009	212000	0	2546	75	2	Single	2.5	11211
389-1547-650	9/30/2014	262500	1300	2526	81	2	Single	2.5	12369
389-1549-608	12/19/2009	189477	0	2530	67	2	Single	2.5	16713
389-1551-554	4/9/2014	202000	796	2606	80	2	Single	2.5	11249
389-1551-637	2/3/2011	200200	0	3344	87	2	Single	3.5	11235
389-1553-553	3/12/2013	174913	0	2522	82	2	Apt	2.5	9587
389-1539-521			580	2764	83	2	Single	2.5	11061

Property Sales dataset column definitions

Prop_ID: Property identification number

Sale_Date: Date of property sale

Sale_Price: Purchase price

BS_SF_Fin: Finished basement square feet

Main_SF: Non-basement square feet

Qual: Property and structure quality score

Gar_Cnt: Number of garage spaces

Style: Type of home (Single is single-family home)

Bath_Cnt: Number of (finished) bathrooms

Lot_SF: Size of lot in square feet

Procedure Options

This section describes the options available in this procedure.

Price, Date, Subject Tab

Specify the sale price and date columns as well as the subject property details.

Sale Price

Sale Price Column

Specify the column that contains the sale prices of the (non-subject) properties. You may type the column name or number directly, or you may use the column selection tool by clicking the column selection button to the right.

Sale Date

Sale Date Column

This column contains the property sale date. These date values may be used for candidate exclusion, similarity, or to adjust the sale prices to a given (basis) date. If dates will not be used for any of these cases, the Sale Date Column may be left empty. You may type the column name or number directly, or you may use the column selection tool by clicking the column selection button to the right.

Basis Date

For both similarity and adjustment (if dates are used in either), the Basis Date is compared to the date values of the Sale Date Column to determine the number of days or months the sale was made before or after the Basis Date. Essentially, the Basis Date is the date used for the subject property.

Subject Property Specification

Subject Specification

Specify here one of three ways to identify which row (or rows) contain the subject property.

Column with Subject Indicator

A Subject Indicator Column identifies the row(s) of the subject property.

Specify Subject(s) from an ID Column

An ID Column is specified and then a specified value (or values) of the ID Column identify the subject property.

Specify Subject Row Number(s)

The row (or rows) of the subject property is entered directly.

Subject Indicator Column

This column is used to indicate which row(s) from the dataset identifies the subject property (or subject properties). A separate analysis and report will be generated for each row with a non-blank value. These rows will not be considered as candidates for comparable properties. A common use here would be to enter the information for each subject property at the bottom of the dataset, set the Subject Indicator Column value for each subject row to "1", and run the analysis. You may type the column name or number directly, or you may use the column selection tool by clicking the column selection button to the right.

ID Column

Enter the name or number of the column containing the property ID values or labels. The values in this column will be compared to the specified subject ID values to identify the subject properties. Commonly this is the same

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column specified as the Label (ID) Column under Report Specification. You may type the column name or number directly, or you may use the column selection tool by clicking the column selection button to the right.

Subject ID Specification

Specify whether the subject property (or properties) will be entered directly or listed in a column.

Subject ID(s)

Enter the property ID value of each property that is to be considered a subject property.

Subject ID Column

Enter the name or number of the column containing a list of desired subject properties. This list will be compared to the values of the ID Column to determine the subject properties. You may type the column name or number directly, or you may use the column selection tool by clicking the column selection button to the right.

Subject Row(s)

Enter the row number of each property that is to be considered a subject property.

Subject Property Value Estimation

Estimation Method

Specify the method to be used to calculate the estimated sale price of the subject property from the adjusted sale prices of the comparable properties. The following methods are available:

Closest

Use the sale price of the comparable property that is closest (has the minimum distance) to the subject property. If comparable properties are specified directly (rather than by similarity), this method uses the first comparable listed.

Min \$| Change

Use the sale price of the comparable property that had the smallest absolute dollar value adjustment (adjusted the least).

Simple Average

When comparables are determined based on similarity, this method uses the average of the adjusted sale prices of the nearest M comparables. The value of M is set on the Select Comparables tab as 'Number Used in Averages'. When comparables are specified directly, this method uses the average of the adjusted sale prices of all specified comparables.

Weighted Average

When comparables are determined based on similarity, this method uses the weighted average of the adjusted sale prices of the nearest M comparables. The value of M is set on the Select Comparables tab as 'Number Used in Averages'. When comparables are specified directly, this method uses the weighted average of the adjusted sale prices of all specified comparables. Each weight is proportional to the distance from the comparable property to the subject property, based on the Base Value.

Base Value

The Base Value is used with the calculated distance (of the subject property to the comparable property) to determine the weight value for each comparable.

Weights are calculated using the formula:

$$(\text{Base Value} - \text{Distance}) / \text{Base Value}$$

In the rare case that the distance is greater than the Base Value, the weight is set to 0."

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Report Specification

Report Columns

List the columns that you want displayed on the Comparable Adjustment and Appraisal Report. The values of these columns are not used in any calculations unless they are also specified in the Similarity or Adjustment Specification.

Label (ID) Column

Specify a column used to label the properties (subject, candidate, and comparables) throughout the reports. If no Label (ID) Column is specified here, the row numbers will be used as labels.

Candidate Subset Tab

Selection (Filtering) Columns and Ranges

Selection Column

Select a column to be used with the corresponding Selection Range to identify the desired candidate property subset. Those rows that meet the selection criterion will become the candidate subset. If no Selection Columns are specified, all rows will be used. Comparables that are excluded based on entries of this tab remain excluded from consideration even when they are expressly specified on the Select Comparables tab.

Selection Range

Specify a set of values identifying the values from the Selection Column to specify the rows to be considered as candidate properties. Three types of entries may be used:

Value

You can enter a single value, either text or numeric. You do not need to enclose text in quotes or double-quotes.

List

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

102,104,106

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

Note that all text values are changed to upper case before processing.

Selection by Date

Exclude if Date is before

Rows may be excluded by date if a Sale Date Column has been specified on the Price, Date, Subject tab. Check this box to remove from consideration all rows where the Sale Date Column has a date previous to the specified date to the right.

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Minimum Date Kept

Specify the date such that the rows for all dates in the Sale Date Column previous to this date will be removed from the candidate subset of comparable properties.

Exclude if Date is after

Rows may be excluded by date if a Sale Date Column has been specified on the Price, Date, Subject tab. Check this box to remove from consideration all rows where the Sale Date Column has a date after the specified date to the right.

Maximum Date Kept

Specify the date such that the rows for all dates in the Sale Date Column after this date will be removed from the candidate subset of comparable properties.

Similarity Tab

Distance Metric

Distance Metric

Specify the measure that will be used to calculate the distance of each comparable property to the subject property, based on the Similarity Column values and specified weights. The formulaic details of each metric are given in the documentation.

Euclidean Distance

The Euclidean distance uses the (weighted) difference of the comparable property value and the subject property value, divided by the standard deviation of all comparable property values.

Minkowski Distance

The Minkowski distance is the (weighted) average absolute percent difference of the comparable property values and the subject property values.

Comparability (Euclidean)

The Comparability metric is a conversion of the Euclidean distance to a 100% scale, using $100 * (\text{Base Value} - \text{Distance}) / \text{Base Value}$.

Base Value

The base value is used to convert the Euclidean distance to a 100% scale (comparability), using $100 * (\text{Base Value} - \text{Distance}) / \text{Base Value}$.

Similarity Specification

Similarity Column

Select a column containing an attribute of the candidate comparables and the subject property by which similarity (distance) can be measured. The distance between the subject and candidate comparable is defined by the chosen Distance Metric.

Distance Weight

This value specifies the relative importance of this similarity measure in calculating the distance between the subject property and the candidate properties. Weights may be entered using any scale desired. The software will calculate the relative weights. For example, if weights of 1, 3, and 1 are entered (for three Similarity Columns), the software will recalculate the weights to be 0.2, 0.6, and 0.2. Formulas describing the use of weights in the distance calculations are given in the documentation.

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Use Similarity to Basis Date

When this box is checked, the dates of the Sale Date Column on the Price, Date, Subject tab are used to as an additional measure of distance of the comparable properties to the subject property. The dates of the comparable properties are compared to the Basis Date specified on the Price, Date, Subject tab. If a date is entered in the Sale Date Column for the subject property, this date is ignored. The Basis Date is used for the subject property.

Select Comparables Tab

Comparable Property Specification

Comparable Specification

The comparable properties to be displayed in reports and to be used in subject property value estimation may be specified in one of four ways:

Most Similar Based On Distance

With this choice, the most similar (least distance) properties are used as comparables. The similarity (distance) of each candidate property is based on the specifications made on the Similarity tab.

Column with Comparable Indicator

A Comparable Indicator Column identifies the row(s) of the subject property.

Specify Comparables from an ID Column

An ID Column is specified and then specified values of the ID Column identify the comparable properties.

Enter Comparable Row Numbers

The row numbers of the desired comparable properties are entered directly. Comparables that are excluded based on entries on the Candidate Subset tab are excluded from consideration, even when they are expressly specified using one of the last three options here.

Number Shown

Specify the number of (most similar) properties displayed on the Comparable Adjustment and Appraisal Report. This number is only used if the Comparable Specification is set to Most Similar Based on Distance.

Number Used in Averages

When the subject property value is to be estimated using the average or weighted average of the adjusted values of the most similar comparable properties, this entry identifies the number of comparables used in the calculation.

Comparable Indicator Column

This column is used to indicate which rows from the dataset identify the comparable properties. A row to be used as a comparable property is indicated by a non-blank value in this column.

ID Column

Enter the name or number of the column containing the property ID values or labels. The values in this column will be compared to the specified subject ID values to identify the comparable properties. Commonly, this is the same column specified as the Label (ID) Column under Report Specification on the Price, Date, Subject tab. You may type the column name or number directly, or you may use the column selection tool by clicking the column selection button to the right.

Comparable ID Specification

Specify whether the comparable properties will be entered directly or listed in a column.

Comparable ID(s)

Enter the property ID value of each property that is to be considered a comparable property.

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Comparable ID Column

Enter the name or number of the column containing a list of desired comparable properties. This list will be compared to the values of the ID Column to determine the comparable properties. You may type the column name or number directly, or you may use the column selection tool by clicking the column selection button to the right.

Comparable Row(s)

Enter the row number of each property that is to be considered a comparable property.

Adjustment Tab

Adjustment by Date

Adjust Prices to Basis Date

Check this checkbox to (linearly) adjust each sale price value to a single date (the Basis Date specified on the Price, Date, Subject tab). This option uses the Basis Date and the Monthly Price Adjustment Factor in connection with the dates of the Sale Date Column (Price, Date, Subject tab) to form the price adjustment.

Price Adjustment Formula:

$$\text{Adjustment} = A * M * \text{Sale Price}$$

$$\text{Adjusted Price} = (1 + A * M) * \text{Sale Price}$$

where

A is the Monthly Price Adjustment Factor

M is the number of months from the Basis Date to the sale date.

Dates previous to the Basis Date result in a positive M value, while dates after the Basis Date result in a negative M value. For example, suppose the basis date is January 1. Further suppose that a comparable property is sold 4 months before the basis date for \$100,000. Also suppose that property values in general increased 6% during the year previous to the basis date. Increasing 6% per year, or 0.06, is comparable to 0.005 per month (if not compounding).

The value for A in this example would be 0.005. The adjusted sale price for the comparable would be

$$(1 + 0.005 * 4) * \$100,000 = \$102,000$$

with an adjustment of $0.005 * 4 * \$100,000 = \$2,000$.

Sale prices for comparables for which there is no date in the Sale Date Column do not receive an adjustment for date.

Monthly Price Adjustment Factor

This value determines the amount per month that each sale price is adjusted. Positive values for the Monthly Price Adjustment Factor result in decreasing sale price values of comparables that are after the basis date. Positive Monthly Price Adjustment Factor values should be used when mean or median sale prices increased after the basis date. Negative values for the Monthly Price Adjustment Factor result in increasing sale price values of comparables that are after the basis date. Negative Monthly Price Adjustment Factor values should be used when mean or median sale prices decreased after the basis date. For example, suppose the basis date is January 1. Further suppose that a comparable property is sold 4 months before the basis date for \$100,000. Also suppose that property values in general increased 6% during the year previous to the basis date. Increasing 6% per year, or 0.06, is comparable to 0.005 per month (if not compounding). The value entered here in this example would be 0.005. The adjusted sale price for the comparable would be

$$(1 + 0.005 * 4) * \$100,000 = \$102,000$$

with an adjustment of $0.005 * 4 * \$100,000 = \$2,000$.

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Adjustment Specification

Adjustment Column

Select a column containing an attribute of the comparable properties and the subject property for which value adjustment is to be made. The difference between each comparable property value and the subject property value determines the number of units of adjustment. The number of units different is multiplied by the corresponding percentage or dollar amount to determine the adjustment amount.

Amount (\$ or %)

This value specifies the percentage or dollar amount that the comparable sale price is adjusted for each unit difference of the comparable property from the subject property for the corresponding Adjustment Column attribute. For example, suppose that the Adjustment Column is Size (in square feet). Suppose that the Adjustment Amount is set to 30. The result would be that each additional square foot in size of the comparable property over that of the subject property will cause the estimated (adjusted) sale price of the comparable property to be decreased by \$30. If a percent sign is included with the value, the adjustment will be applied as a percentage (of the sale price) rather than a direct amount. For example, if 2% is entered here and the difference between the subject and comparable properties is 2 units (in favor of the subject property), the estimated (adjusted) sale price is increased by 4%. When percents are used, the order of the adjustment affects the adjustments made.

Reports Tab

Select Reports

Candidate Subset Report

Check this box to include a report with a summary of the entries of the Candidate Subset tab. Additionally, this report includes a summary of the total number of properties, the number of subject properties, the number of excluded properties, and the number of candidate properties.

Similarity Settings Report

Check this box to include a report with a summary of the entries of the Similarity tab. Additionally, this report gives the mean, standard deviation, and coefficient of variation of the all candidate subset properties for each Similarity Column. The subject property value for each of the similarity columns is given also.

Distance Report

The distance report gives the distance (or comparability) of the nearest (or directly specified) comparable properties. The value for each comparable property, for all specified similarity columns, is also given.

Number of Properties Reported

Specify the number of comparable subset properties displayed on the Distance Report.

Adjustment Settings Report

Check this box to include a report with a summary of the entries of the Adjustment tab. Additionally, this report gives the mean, standard deviation, and coefficient of variation of the all candidate subset properties for each Adjustment Column. The subject property value for each of the adjustment columns is given also.

Comparable Adjustment and Appraisal Report

After giving the subject property value for each adjustment column, this report shows the comparable property value and corresponding value adjustment for each adjustment column.

The adjusted sale price (or value) for each comparable is given at the bottom. The net and gross percentage and dollar adjustments are given. The estimated value of the subject property, based on the estimation method specified on the Price, Date, Subject tab, is also given. Values for the specified Report Columns (Price, Date, Subject tab) are also shown here for each comparable property.

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Number Across Page

Specify the number of comparables shown across each page of the Comparable Adjustment and Appraisal Report. The maximum is three.

Report Details

Show Definitions

Check this box to show definitions and explanations of the reports, where applicable.

Show Dollar Signs

If checked, a dollar sign is added to dollar amounts in the reports.

Show Commas in Dollars

If checked, dollar amounts are shown with commas at the thousands and millions places, where applicable.

Show Column Separator = |

Check this box to show the vertical column separator lines in the Comparable Adjustment and Appraisal Report.

Show Horizontal Separator

Check this box to show the horizontal section separator lines in the Comparable Adjustment and Appraisal Report.

Date Format

Specify the format (order of days, months, and years) for the dates reported in all reports.

Report Details – Decimal Places

Decimal Places

Set the number of decimal places to be displayed for this item throughout the reports. For example, selecting "2" here instructs the software to display the value 1.2362142 as 1.24. The number of decimal places does not affect the internal calculations, only the number of decimal places displayed.

Report Details – ID Label Trimming

Trim Long ID Labels in Distance Report

Often ID labels for property identification are quite long. Check this box to truncate the ID labels in the Distance Report to a specified number of remaining characters.

Direction

Specify whether ID labels are trimmed from the left or from the right.

Characters Kept

Specify the number of characters remaining in the label after trimming.

Show ID Label Key

Check this box to show a list of the full length ID labels in a simple report after the Distance Report.

Trim Long ID Labels in Comparables Report

Often ID labels for property identification are quite long. Check this box to truncate the ID labels in the Comparable Adjustment and Appraisal Report to a specified number of remaining characters.

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Direction

Specify whether ID labels are trimmed from the left or from the right.

Characters Kept (Comparable Properties)

Specify the number of characters remaining in the label after trimming.

Show ID Label Key

Check this box to show a list of the full length ID labels in a simple report after the Comparable Adjustment and Appraisal Report.

Characters Kept (Subject Property)

Specify the number of characters remaining in the label after trimming.

Storage Tab

Storage Columns

Store Distances (or Comparabilities) in Column

If you wish to store the distances (or comparabilities, if specified) back to the dataset, enter the desired (usually empty) result column here. Only distances of candidate properties are stored. The distances will not be saved with the dataset until the dataset is saved. You may type the column name or number directly, or you may use the column selection tool by clicking the column selection button to the right.

Store Subject Estimated Market Value(s) in Column

If you wish to store the estimated market value for each subject property back to the dataset, enter the desired (usually empty) result column here. The values will not be saved with the dataset until the dataset is saved. You may type the column name or number directly, or you may use the column selection tool by clicking the column selection button to the right.

Store Candidate Adjusted Sale Prices in Column

If you wish to store the adjusted sale prices for all candidate properties back to the dataset, enter the desired (usually empty) result column here. The prices will not be saved with the dataset until the dataset is saved. You may type the column name or number directly, or you may use the column selection tool by clicking the column selection button to the right.

Store Comparable Adjusted Sale Prices in Column

If you wish to store the adjusted sale prices for only the comparable properties (as specified on the Select Comparables tab) back to the dataset, enter the desired (usually empty) result column here. The prices will not be saved with the dataset until the dataset is saved. You may type the column name or number directly, or you may use the column selection tool by clicking the column selection button to the right.

Example 1 – Comparables Appraisal Study

This section presents an example of selecting 5 comparable properties from the dataset and using the adjusted prices of the 5 comparables to estimate the market value of the subject property. Although a single run will be used, this example will follow the 5 steps outlined earlier. The example uses the Property Sales dataset, which contains 101 properties.

The appraiser limits the analysis to single-family dwelling properties that are sold after January 1, 2010. The Euclidean distance metric is to be used for measuring distances between the candidate properties and the subject property. The subject property is the last row of the dataset, with ID number 389-1539-521. Unit adjustment amounts are determined based on previous experience (in particular, with hybrid appraisal model results for properties in the same area). A monthly price adjustment of 0.2% per month will be applied. The specified appraisal date will be January 1, 2016.

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 Appraisal window.

1 Open the Property Sales dataset.

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

2 Open the Comparables Appraisal window.

- Using the Analysis menu or the Procedure Navigator, find and select the **Comparables Appraisal** procedure.
- On the menus, select **File**, then **New Template**. This will fill the procedure with the default template.

3 Specify the sale prices.

- On the Price, Date, Subject tab, double-click in the **Sale Price Column** box. This will bring up the variable selection window. Select **Sale_Price** from the list of columns and then click **OK**. “Sale_Price” will appear in this box.

4 Specify the sale dates.

- On the Price, Date, Subject tab, select **Sale_Date** for the **Sale Date Column**.
- Select **January 1, 2016** for the **Basis Date**.

5 Specify the subject property.

- On the Price, Date, Subject tab, for **Subject Specification**, select **Specify Subject(s) from an ID Column**.
- Select **Prop_ID** for the **ID Column**.
- For **Subject ID Specification**, select **Enter Subject IDs Directly**.
- For **Subject ID(s)**, enter **389-1539-521**.

6 Specify the subject property value estimation method.

- On the Price, Date, Subject tab, for **Estimation Method**, select **Weighted Average**.
- For **Base Value**, enter **3**.

7 Specify the extra report columns.

- On the Price, Date, Subject tab, for **Report Columns**, select **Style**.

8 Specify the label column.

- On the Price, Date, Subject tab, for **Label (ID) Column**, select **Prop_ID**.

Comparables Appraisal

9 Specify the selection (filtering) of the dataset.

- On the **Candidate Subset** tab, for the first **Selection Column**, select **Style**.
- For the corresponding **Selection Range**, enter **Single**.
- Check the box **Exclude if Date is before**, and enter **January 1, 2010** in the **Minimum Date Kept** box.

10 Specify the Distance (Similarity) details.

- On the **Similarity** tab, for the first **Distance Metric**, select **Euclidean**.
- For the first **Similarity Column**, select **Main_SF**.
- For the corresponding **Distance Weight**, enter **4**.
- For the second **Similarity Column**, select **Lot_SF**.
- For the corresponding **Distance Weight**, enter **2**.
- For the third **Similarity Column**, select **Gar_Cnt**.
- For the corresponding **Distance Weight**, enter **1**.

11 Specify the selection of comparable properties.

- On the **Select Comparables** tab, for the first **Comparable Specification**, select **Most Similar Based on Distance**.
- For **Number Shown**, enter **5**.
- For **Number Used in Averages**, enter **5**.

12 Specify the comparable price adjustment details.

- On the **Adjustment** tab, check the box next to **Adjust Prices to Basis Date**.
- For the **Monthly Price Adjustment Factor**, enter **0.002**.
- For the first **Adjustment Column**, select **Main_SF**.
- For the corresponding **Amount**, enter **\$40**.
- For the second **Adjustment Column**, select **Qual**.
- For the corresponding **Amount**, enter **1%**.
- For the third **Adjustment Column**, select **Lot_SF**.
- For the corresponding **Amount**, enter **\$4**.
- For the fourth **Adjustment Column**, select **Gar_Cnt**.
- For the corresponding **Amount**, enter **\$5100**.
- For the fifth **Adjustment Column**, select **BS_SF_Fin**.
- For the corresponding **Amount**, enter **\$20**.
- For the sixth **Adjustment Column**, select **Bath_Cnt**.
- For the corresponding **Amount**, enter **\$4200**.

13 Specify the reports.

- On the **Reports** tab, check **Candidate Subset Report**.
- Check **Similarity Settings Report**.
- Check **Distance Report**.
- For **Number of Properties Reported**, enter **10**.
- Check **Adjustment Settings Report**.
- Check **Comparables Report**.
- For **Number Across Page**, select **3**.
- Check **Show Definitions**.
- Uncheck **Show Dollar Signs**.
- Uncheck **Show Commas in Dollars**.
- Check **Show Column Separator = |**.
- Check **Show Horizontal Separator (-----)**.
- For **Column Names**, select **Labels**.

Comparables Appraisal

14 Run the procedure.

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

Settings Report

Subject Property 389-1539-521

Candidate Subset Report

Selection Column	Selection Criterion
Style	Single

Properties with dates before 1/1/10, were excluded from the candidate subset of properties.

Total Number of Properties:	101
Number of Subject Properties:	1
Number Excluded by Selection:	28
Number of Candidate Properties:	72

This report summarizes the entries of the Candidate Subset tab, as well as the number of candidate properties.

Similarity Settings Report

Similarity Settings Report

Similarity Columns	Weight	Mean	Standard Deviation	COV	Subject Property
Main SF	4	2645.0	294.7	11.1	2764
Lot Size	2	11766.7	2456.0	20.9	11061
Garages	1	2.1	0.4	18.1	2

This report displays a summary of the entries of the Similarity tab. Notice that the column names have been replaced by the column labels. Additionally, this report gives the mean, standard deviation, and coefficient of variation of all the candidate subset properties for each similarity column. The subject property value for each of the similarity columns is given also.

Distance Report

Distance Report

Property ID	Euclidean Distance	(Unadjusted) Sale Price	Main SF	Lot Size	Garages
389-1539-521			2764	11061	2
389-1537-588	0.16	210500	2807	10552	2
389-1534-554	0.17	165803	2813	10553	2
389-1533-469	0.19	182500	2691	10969	2
389-1539-655	0.24	217000	2848	10547	2
389-1531-572	0.28	181000	2679	11836	2
389-1534-421	0.32	173000	2876	11672	2
389-1541-539	0.32	213000	2765	9593	2
389-1539-559	0.32	293500	2742	9593	2
389-1532-545	0.37	176500	2626	10547	2
389-1551-554	0.41	202000	2606	11249	2

The first row corresponds to the subject property. The next ten rows show the most similar properties to the subject property, based on Euclidean distance (for the three attributes specified). The first five candidate properties become the comparable properties for the Comparable Adjustment and Appraisal Report, since the Comparable Specification was set to Most Similar Based on Distance.

Comparables Appraisal

The Euclidean distance is defined toward the beginning of this chapter of the documentation.

Adjustment Settings Report

Adjustment Settings Report					
Sale Date Column:	Sale Date				
Basis Date:	1/1/16 (Prices are adjusted to be as if they were sold on this date.)				
Monthly Price Adjustment Factor:	0.002 (0.2% per month)				
Price Adjustment Formula:	Adjusted Price = (1 + 0.002 * M) * Sale Price				
M is the number of months from the Basis Date to the sale date. Dates previous to the Basis Date result in a positive M value, while dates after the Basis Date result in a negative M value.					
Adjustment Columns	Adjustment Value	Mean	Standard Deviation	COV	Subject Property
Main SF	\$40	2645.0	294.7	11.1	2764
Quality	1%	78.4	10.7	13.7	83
Lot Size	\$4	11766.7	2456.0	20.9	11061
Garages	\$5100	2.1	0.4	18.1	2
Base SF	\$20	364.2	535.5	147.0	580
Bathrooms	\$4200	2.7	0.4	14.7	2.5

This report describes the process of adjustment for each comparable property. Notice that the column names have been replaced by the column labels. First, the adjustment for the difference in sale date from the basis date is applied. This is followed by the adjustment for each of the Adjustment Columns, in the listed order. Additionally, this report gives the mean, standard deviation, and coefficient of variation of all the candidate subset properties for each adjustment column. The subject property value for each of the adjustment columns is given also.

Comparable Adjustment and Appraisal Report

Comparable Adjustment and Appraisal Report								
Property ID:	Unit Adj.	Subject 389-1539-521 Value	Comparable 1 389-1537-588 Value	Comparable 2 389-1534-554 \$Adj	Comparable 3 389-1533-469 Value	Comparable 3 389-1533-469 \$Adj		
Euclid. Distance			0.16		0.17		0.19	
Sale Price			210500		165803		182500	
Style		Single	Single		Single		Single	
Sale Date Adj.	0.2%/mo	1/1/16	8/29/15	1729	4/15/12	14773	12/1/12	13503
Main SF	\$40	2764	2807	-1720	2813	-1960	2691	2920
Quality	1%	83	61	46312	63	35723	95	-23871
Lot Size	\$4	11061	10552	2036	10553	2032	10969	368
Garages	\$5100	2	2	0	2	0	2	0
Base SF	\$20	580	0	11600	0	11600	700	-2400
Bathrooms	\$4200	2.5	3.5	-4200	2.5	0	2.5	0
Net (%Adj \$Adj)			26.5%	55757	37.5%	62168	-5.2%	-9480
Gross (%Adj \$Adj)			32.1%	67597	39.9%	66088	23.6%	43061
Adj. Sale Price*		220815		266257		227971		173020

* The subject property appraised value (220815) is the weighted average of the adjusted sale prices of the 5 nearest comparable properties based on the Euclidean distance metric. The weights are based on the Euclidean Distance with base value 3. That is, Weight = (3 - Dist) / 3.

Comparables Appraisal

Comparable Adjustment and Appraisal Report (Continued)

Property ID:	Subject 389-1539-521		Comparable 4 389-1539-655		Comparable 5 389-1531-572	
	Unit Adj.	Value	Value	\$Adj	Value	\$Adj
Euclid. Distance			0.24		0.28	
Sale Price			217000		181000	
Style		Single	Single		Single	
Sale Date Adj.	0.2%/mo	1/1/16	1/25/15	4862	12/20/11	17519
Main SF	\$40	2764	2848	-3360	2679	3400
Quality	1%	83	94	-24035	68	30288
Lot Size	\$4	11061	10547	2056	11836	-3100
Garages	\$5100	2	2	0	2	0
Base SF	\$20	580	0	11600	417	3260
Bathrooms	\$4200	2.5	3.5	-4200	2.5	0
Net (%Adj \$Adj)			-6.0%	-13077	28.4%	51367
Gross (%Adj \$Adj)			23.1%	50113	31.8%	57567
Adj. Sale Price*		220815		203923		232367

* The subject property appraised value (220815) is the weighted average of the adjusted sale prices of the 5 nearest comparable properties based on the Euclidean distance metric. The weights are based on the Euclidean Distance with base value 3. That is, Weight = (3 - Dist) / 3.

This report displays the adjustments that are made to each comparable property to arrive at the adjusted sale price. The first column gives the user-specified per unit difference adjustment values. The second column shows the attributes of the subject property. The remaining columns pertain to the comparable properties.

The Sale Date Adj. row and the six adjustment attribute rows give the subject property value, the comparable property value, and corresponding dollar adjustment that is made due to the difference from the subject value.

Net (%Adj \$Adj)

On the left is the percent change from the sale price to the adjusted sale price. On the right is dollar amount change from the sale price to the adjusted sale price.

Gross (%Adj \$Adj)

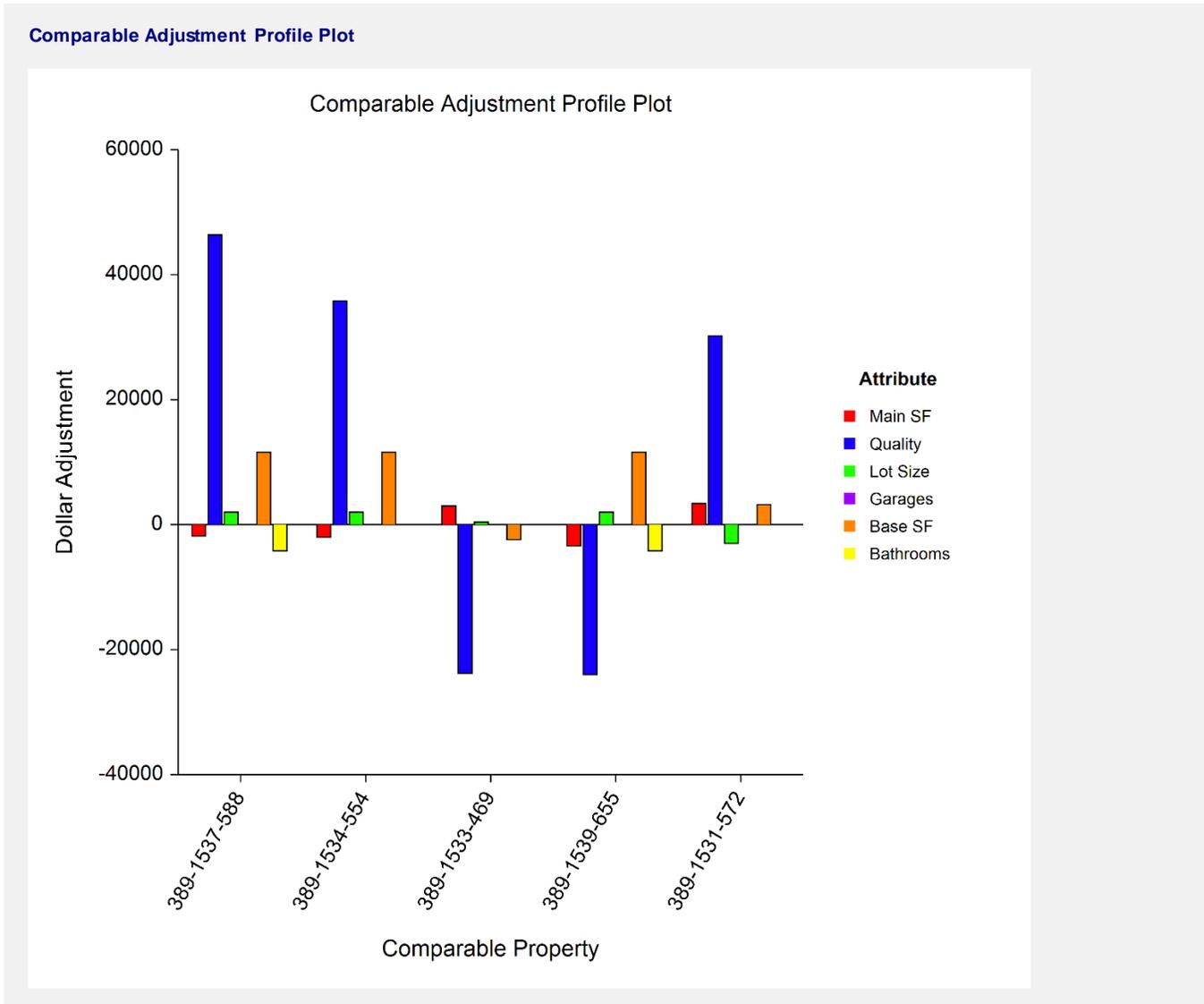
On the left is sum of the absolute values of all adjustments (dollar and percent) in percent form. On the right is sum of the absolute values of all adjustments (dollar and percent) in dollar form.

Adj. Sale Price*

For the comparables, this is the sale price after all adjustment have been made to bring the property into conformity with the subject property.

For the subject column, this is the estimated market value of the subject property based on the weighted average of the five comparable properties. This estimate is in bold.

Comparable Adjustment Profile Plot

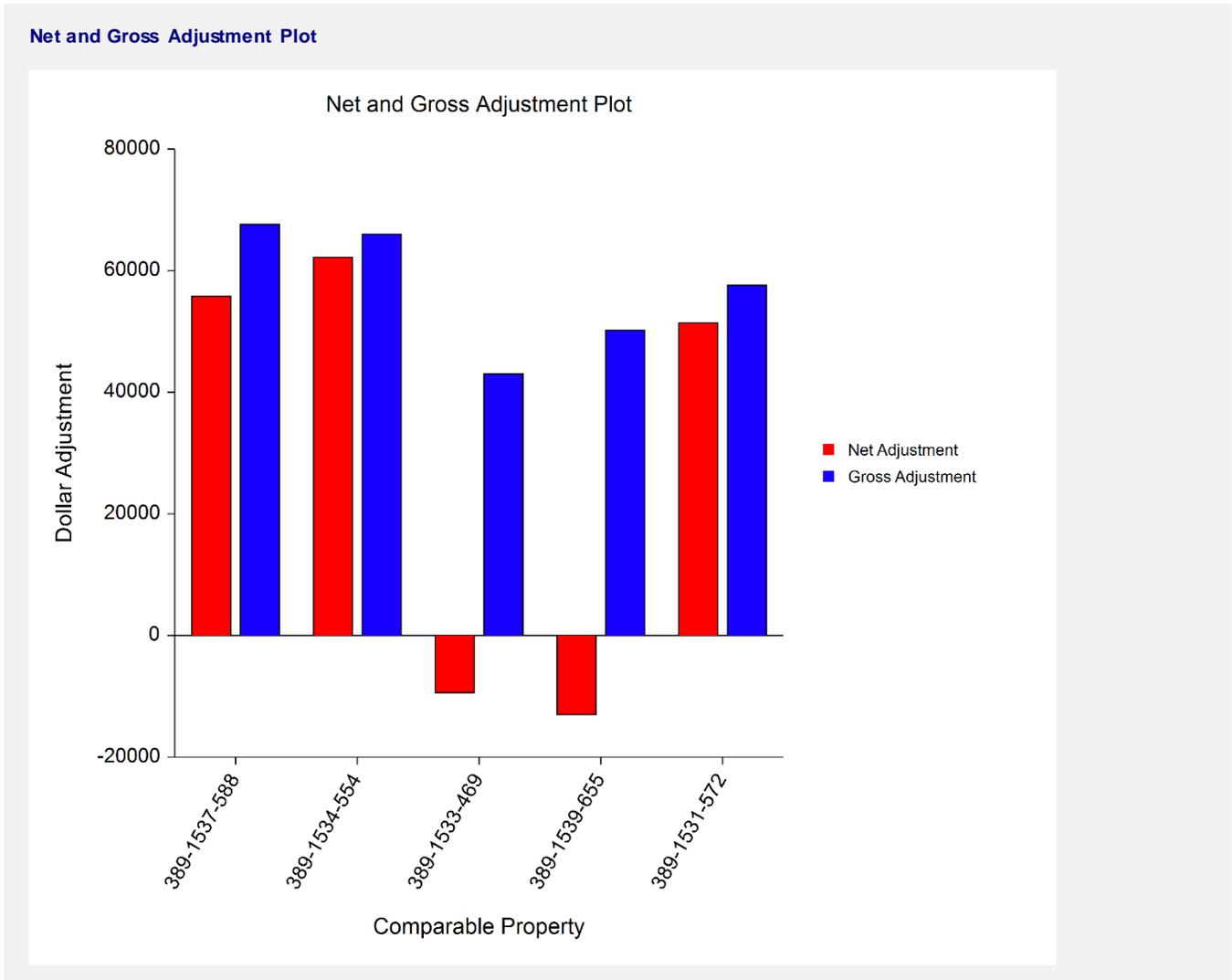


This plot displays the adjustments that are made to each comparable property. It might be noted that the two attributes with the largest adjustments are Quality and Basement Finished Square Feet. Likely this is due to these two attributes not being included in the similarity assessment (they don't contribute to the distance measure).

One visual adjustment has been made to these plots for the comparable property labels to keep them from overlapping. The default label is horizontal. These labels are adjusted by clicking on the Plot Format button (on the Plots tab), selecting the Group Axis sub-tab, and clicking the Layout button to the right of Lower Axis Labels. The Alignment is changed to Right, the Rotation Angle is changed to 60, and the Margin Above the Text is changed to 10.

Comparables Appraisal

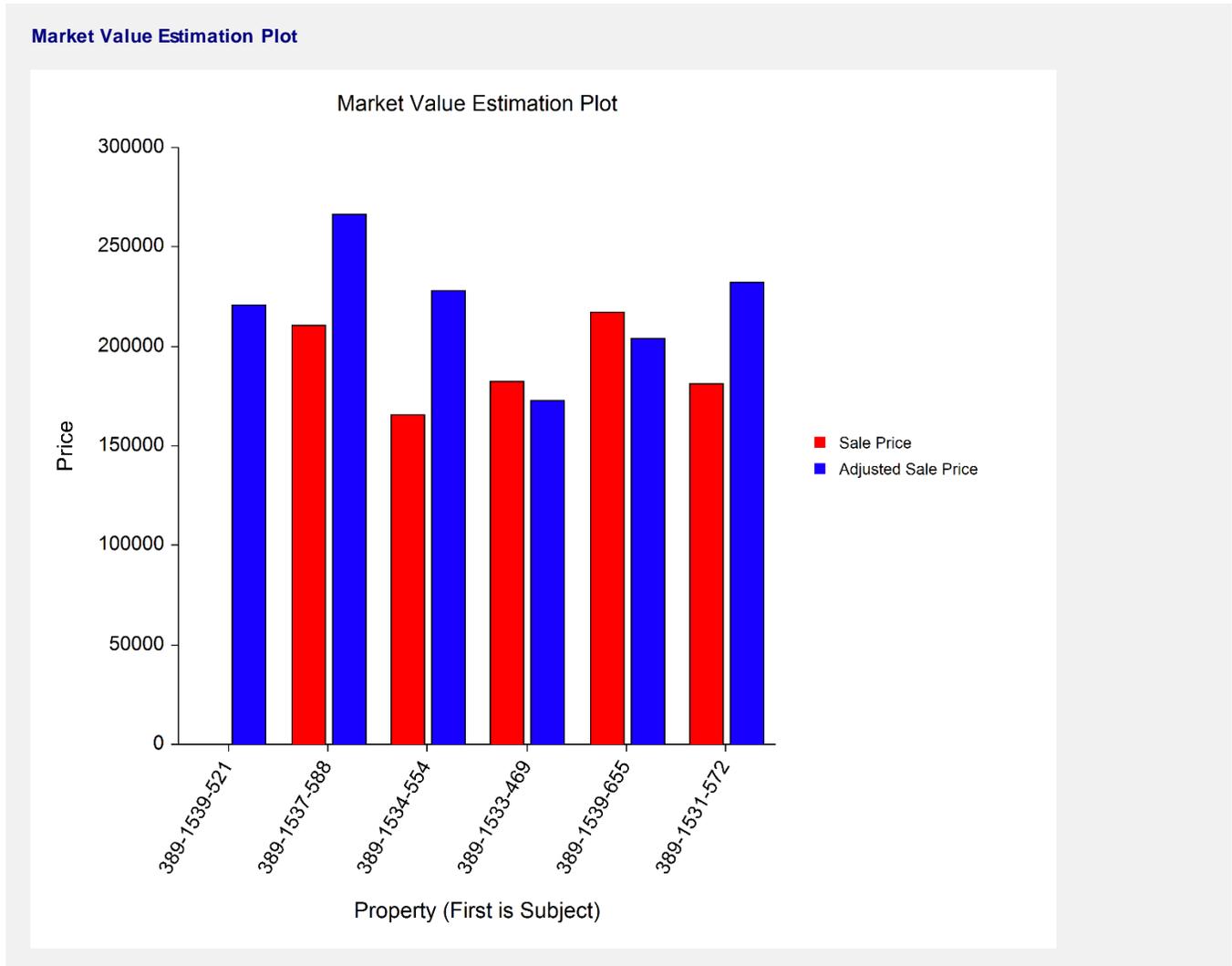
Net and Gross Adjustment Plot



This plot displays the net and gross adjustments that are made to each comparable property. The net adjustment is the sum of all adjustments, including adjustment to the basis date, if applicable. The net adjustment is also the difference between the original sale price and the adjusted sale price. The gross adjustment is the sum of the absolute values of all adjustments, including adjustment to the basis date, if applicable.

Comparables Appraisal

Market Value Estimation Plot



This plot displays the estimated market value of the subject property (on the left), followed by the original sale price and the adjusted sale price for each of the comparable properties.