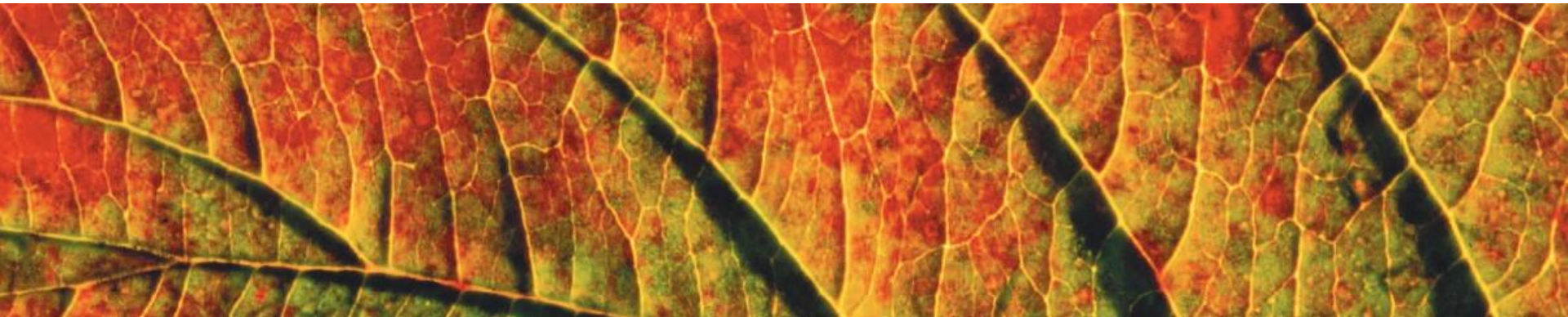


Excel Tutorial 4: Enhancing a Workbook with Charts and Graphs

Microsoft® Office 2010



Objectives

- Create an embedded chart
- Create and format a pie chart
- Work with chart titles and legends
- Create and format a column chart

Objectives

- Create and format a line chart
- Modify a chart data source
- Create and format a combined chart
- Create a 3-D chart
- Create and format sparklines and data bars
- Create a chart sheet

Visual Overview

Chart layouts provide different options for organizing chart elements.

A **chart**, or **graph**, is a visual representation of a set of data values. Charts show trends or relationships that may not be readily apparent from numbers alone.

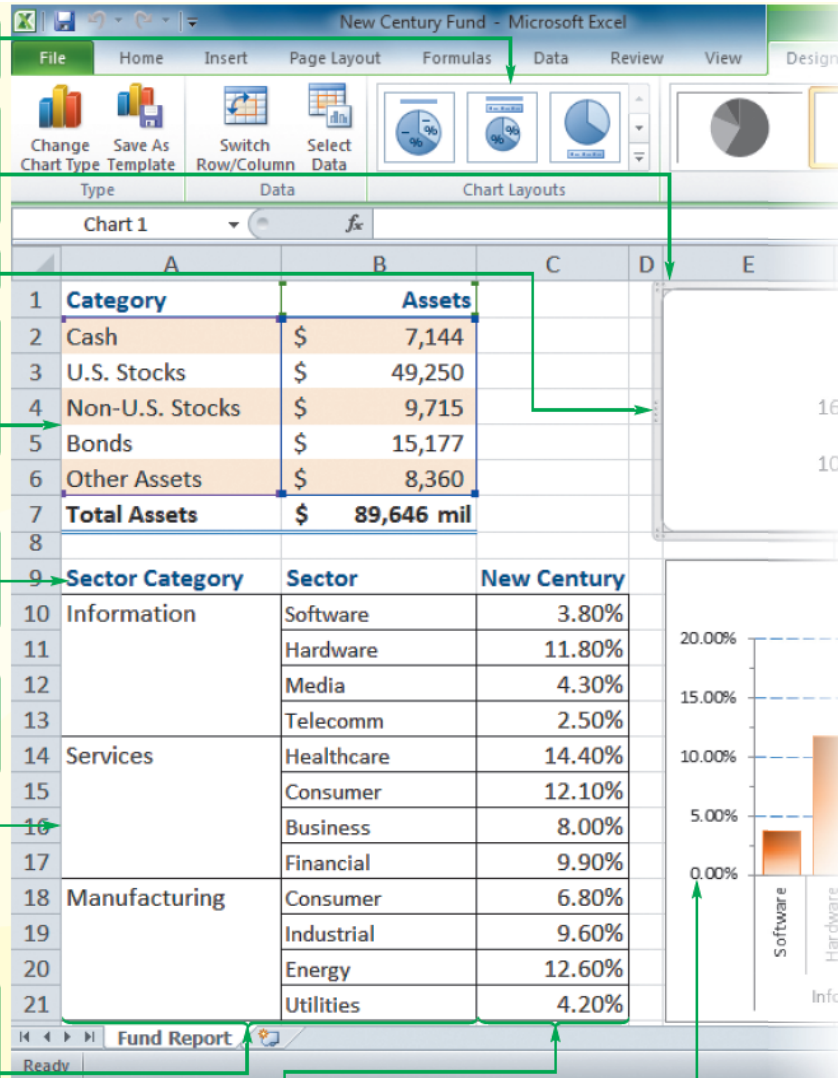
An **embedded chart** is an object in a worksheet.

Each chart has a **data source**, which is the range that contains the data to display in the chart. The data source for the Fund Assets pie chart is the range A2:B6.

The **series name**, the first row of the data range, identifies the data series. In this case, the series name is row 9.

A data source is a collection of one or more **data series**, which is a range of values that is plotted as a single unit on the chart.

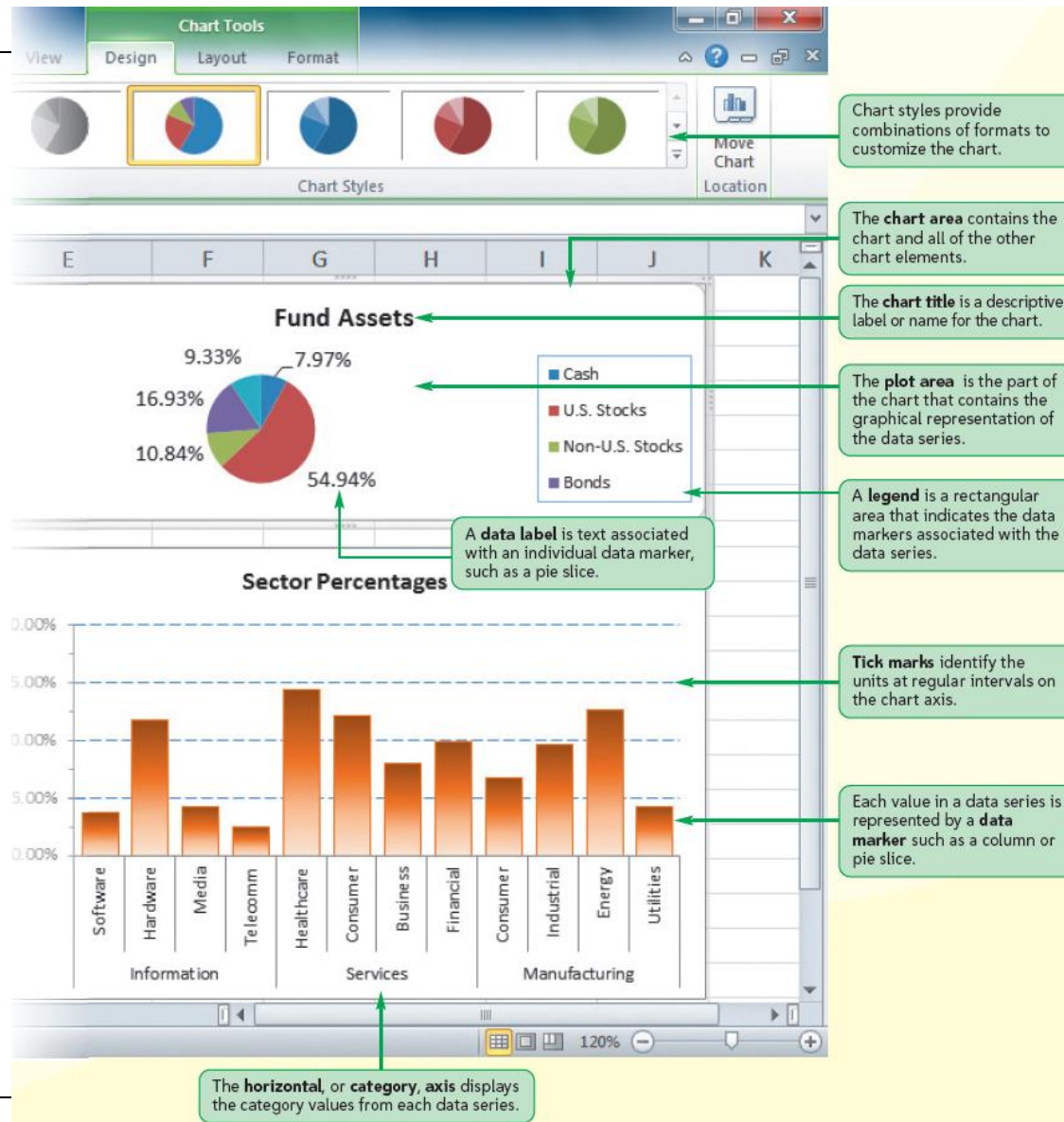
The first column of the data range is the **category values**, which are the groups or categories that the series values belong to. These categories each include three subcategories in the range A10:B21.



The **series values** are the data displayed in the chart. These series values are in the range C10:C21.

The **vertical**, or **value**, **axis** displays the series values from the data series.

Chart Elements



Creating an Excel Chart

- Charts show trends or relationships in data that are difficult to show with numbers
- Select a range to use as chart's data source

The image shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G
1	New Century Fund						
2	Assets (as of 12-31-13)						
3	Investment Category	Assets					
4	Cash	\$ 7,144					
5	U.S. Stocks	\$ 49,250					
6	Non-U.S. Stocks	\$ 9,715					
7	Bonds	\$ 15,177					
8	Other	\$ 3,360					
9	Total Assets	\$ 84,646 mil					

Annotations in the image:

- series name:** Points to the text "Assets (as of 12-31-13)" in cell B2.
- series categories:** Points to the "Investment Category" header in cell A3.
- series values:** Points to the numerical values in the "Assets" column (B4:B8).

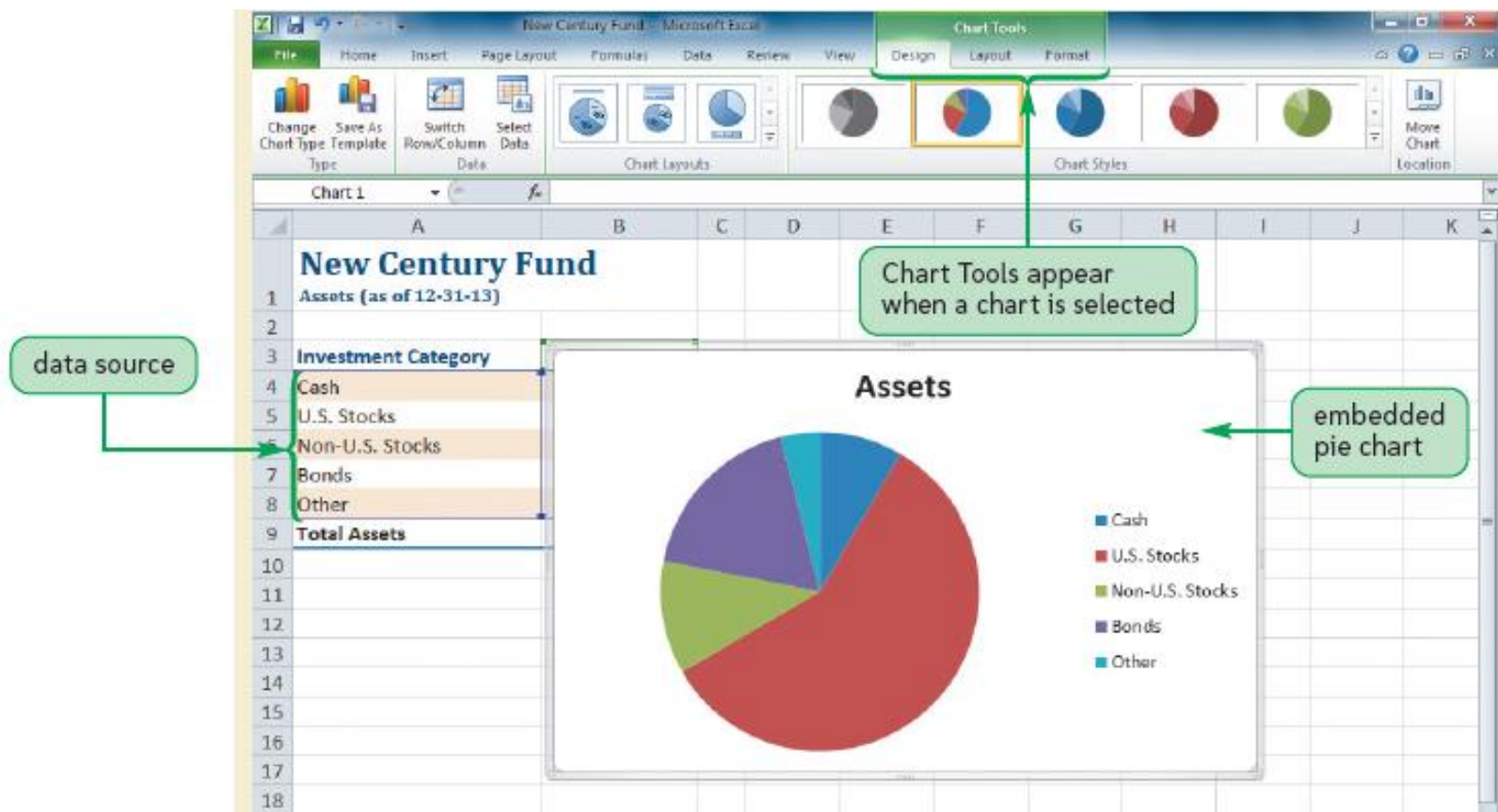
Creating an Excel Chart

- Select chart type that best represents the data
 - Use one of 73 built-in charts organized into 11 categories, or...
 - Create custom chart types based on built-ins

Chart Type	Description
Column	Compares values from different categories. Values are indicated by the height of the columns.
Line	Compares values from different categories. Values are indicated by the height of the line. Often used to show trends and changes over time.
Pie	Compares relative values of different categories to the whole. Values are indicated by the areas of the pie slices.
Bar	Compares values from different categories. Values are indicated by the length of the bars.
Area	Compares values from different categories. Similar to the line chart except that areas under the lines contain a fill color.
Scatter	Shows the patterns or relationship between two or more sets of values. Often used in scientific studies and statistical analyses.
Stock	Displays stock market data, including the high, low, opening, and closing prices of a stock.
Surface	Compares three sets of values in a three-dimensional chart.
Doughnut	Compares relative values of different categories to the whole. Similar to the pie chart except that it can display multiple sets of data.
Bubble	Shows the patterns or relationship between two or more sets of values. Similar to the XY (Scatter) chart except the size of the data marker is determined by a third value.
Radar	Compares a collection of values from several different data sets.

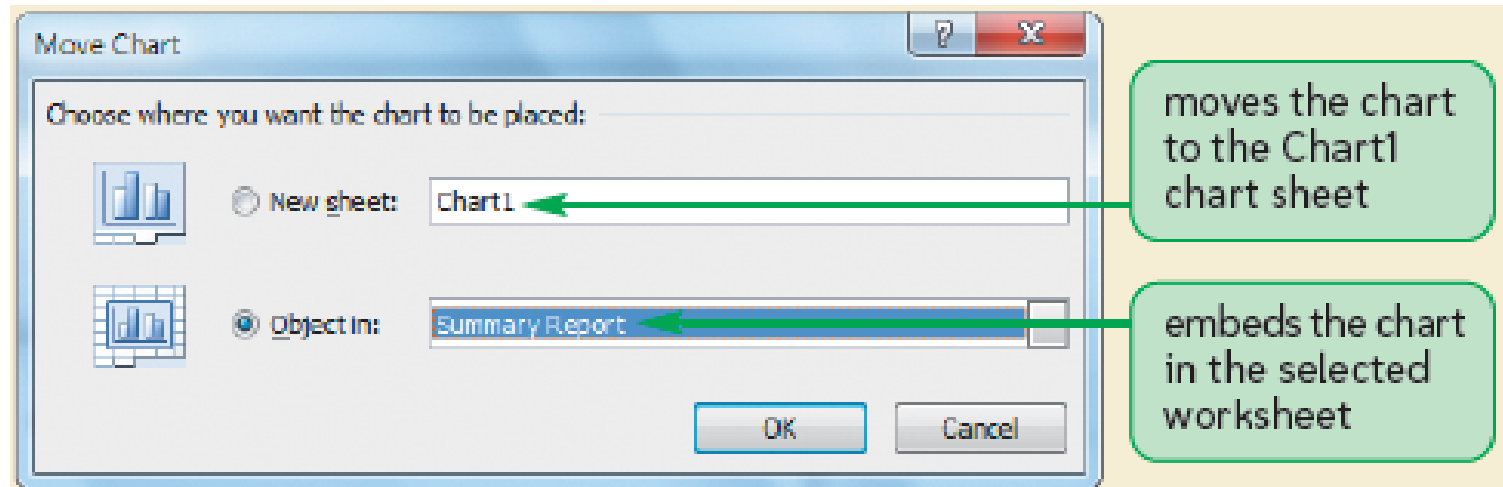
Creating an Excel Chart

- Three Chart Tools tabs appear on the Ribbon: Design, Layout, and Format



Moving a Chart to a Different Worksheet

- Move Chart dialog box provides options for moving charts



Moving and Resizing Charts

- Selecting the chart displays a **selection box** (used to move or resize the object)
 - To move the chart, drag selection box to new location in worksheet
 - To resize the chart, drag a **sizing handle**

The screenshot shows the Microsoft Excel 2010 interface. The 'Chart Tools' contextual tabs are visible at the top, including 'Design', 'Layout', and 'Format'. A pie chart titled 'Assets' is displayed in the worksheet, with a legend showing categories: Cash, U.S. Stocks, Non-U.S. Stocks, Bonds, and Other. To the right of the chart is a table with fees and expenses. Annotations with green boxes and arrows point to specific features:

- Chart Tools contextual tabs**: Points to the 'Design', 'Layout', and 'Format' tabs.
- click to move a chart to a different sheet**: Points to the 'Move Chart Location' button in the 'Format' tab.
- selection box**: Points to the small square handle at the top-right corner of the chart.
- sizing handle**: Points to the small square handle at the bottom-right corner of the chart.

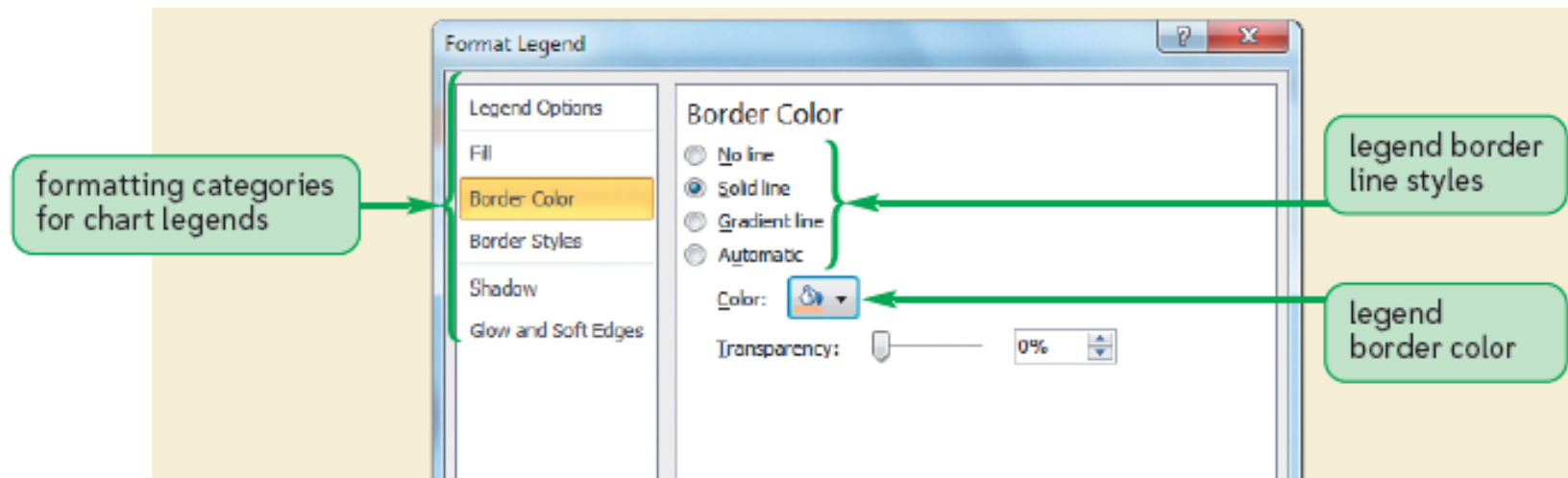
Fees & Expenses	
Sales Charges	
Front-End Load	5.75%
Deferred Load	NA
Fund Expenses	
Management Fees	0.29%
12b1 Expense	0.25%
Net Expense Ratio	0.62%
Gross Expense Ratio	0.68%
Risk and Return Profile	

Designing a Pie Chart

- Charts include individual elements that can be formatted (chart area, chart title, plot area, data markers, legend)
- Make changes using a built-in style that formats the entire chart or by selecting and formatting an individual element
- Use a chart style to apply several formats to the chart at one time

Designing a Pie Chart

- Choose location of the legend, and format it using tools on Chart Tools Layout tab



Formatting Data Labels on a Pie Chart

options to define the number format of the data label

options to define the fill and border styles of the data label

options to define the alignment of the label text

displays the data values as percentages

shows leader lines next to the labels if necessary

places labels at the outer edge of each slice

data labels appear as percentages outside of each slice

Format Data Labels

Label Options

Label Contains

- ☐ Series Name
- ☐ Category Name
- ☐ Value
- ☒ Percentage
- ☒ Show Leader Lines

Reset Label Text

Label Position

- ☐ Center
- ☐ Inside End
- ☒ Outside End
- ☐ Best Fit

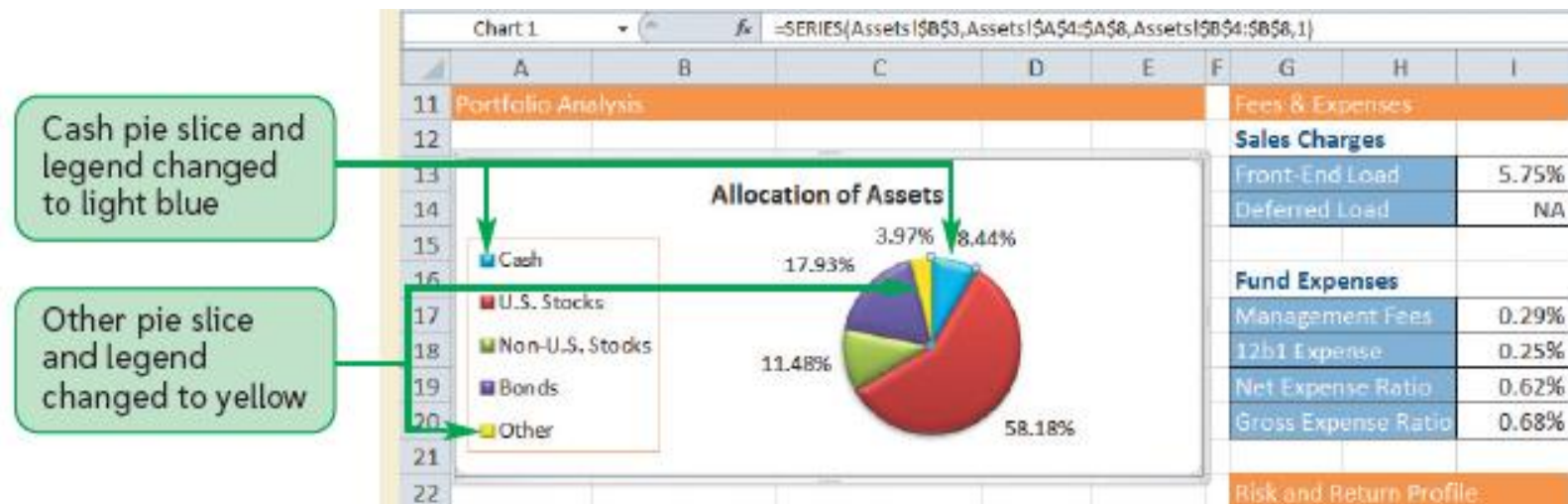
☐ Include legend key in label

Separator: ,



Changing Pie Slice Colors

- Use distinct colors to avoid confusion, especially for adjacent slides
- Format each slice rather than entire data series (each slice represents a different value in the series)



Designing a Pie Chart

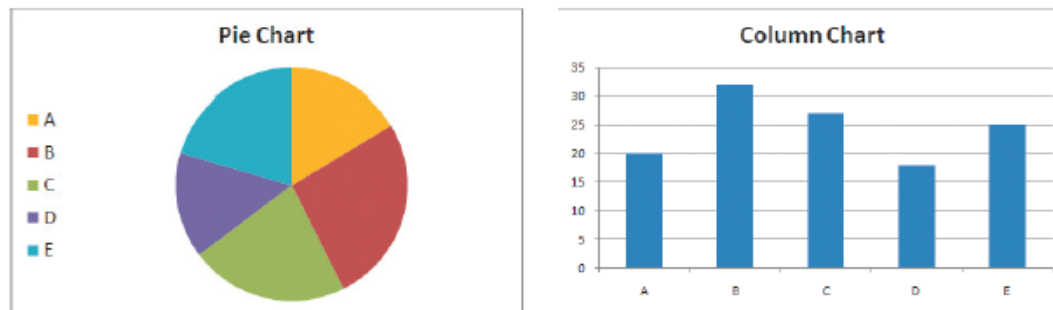
- **Exploded pie charts**
 - Move one slice away from the others
 - Useful for emphasizing one category above all of the others

Creating a Column Chart

- **Column chart**
 - Displays values in different categories as columns
 - Height of each column is based on its value
- **Bar chart**
 - Column chart turned on its side
 - Length of each bar is based on its value

Column/Bar Charts vs Pie Charts

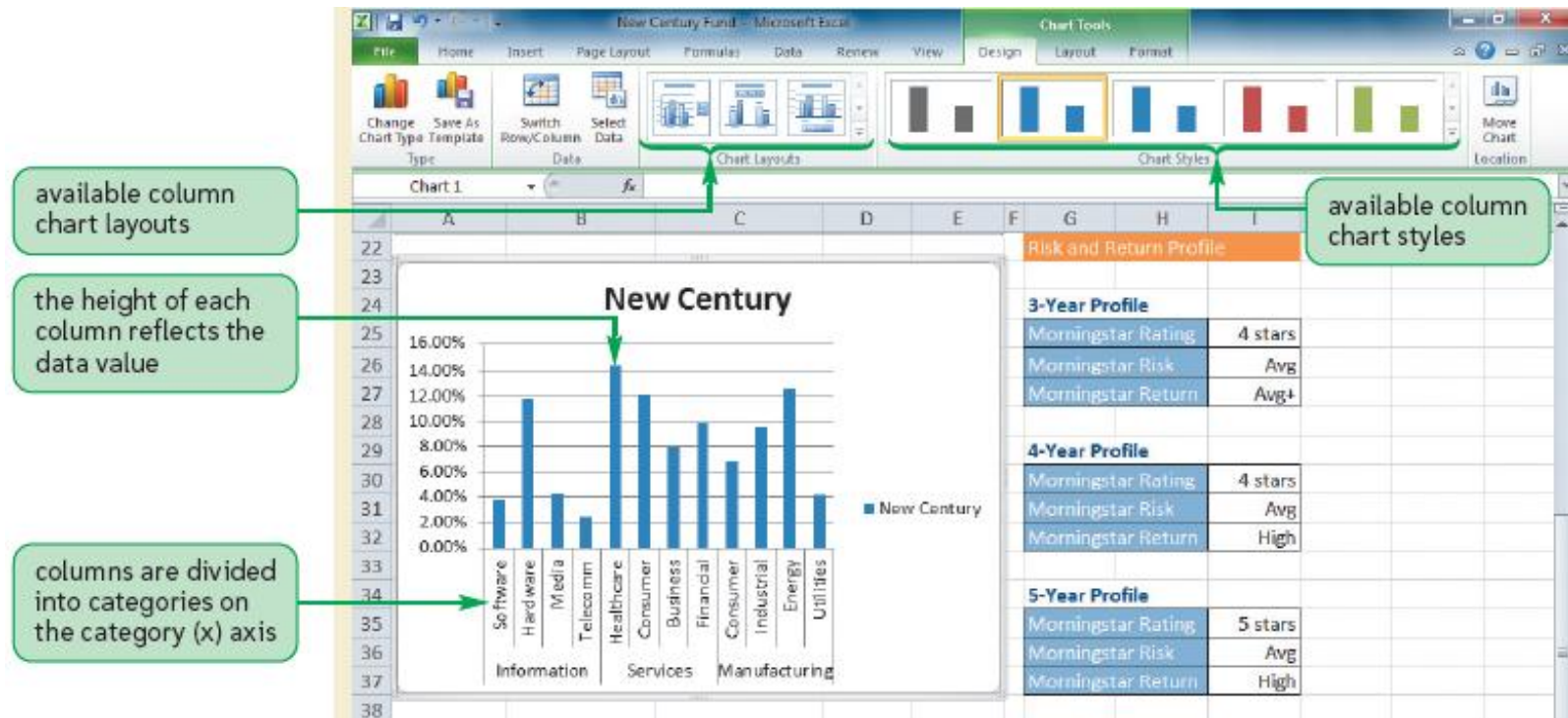
- Column/bar charts are superior to pie charts
 - For large number of categories or categories close in value
 - Easier to compare height or length than area
 - Can be applied to wider range of data
 - Can include several data series (pie charts usually show only one data series)



Inserting a Column Chart

- Select data source
- Select type of chart to create
- Move and resize the chart
- Change chart's design, layout, and format by:
 - Selecting one of the chart styles, or
 - Formatting individual chart elements

Inserting a Column Chart



Editing the Axis Scale and Text

- Range of values (**scale**) of an axis is based on values in data source
- Vertical (value) axis: range of series values
- Horizontal (category) axis: category values
- **Primary** and **secondary axes** can use different scales and labels
- Add descriptive axis titles if axis labels are not self-explanatory (default is no titles)

Editing the Axis Scale and Text

The screenshot shows the 'Format Axis' dialog box with the 'Axis Options' tab selected. The left sidebar contains the following options: Number, Fill, Line Color, Line Style, Shadow, Glow and Soft Edges, 3-D Format, and Alignment. The main area is divided into sections for 'Axis Options', 'Logarithmic scale', 'Display units', 'Major tick mark type', 'Minor tick mark type', 'Axis labels', and 'Horizontal axis crosses'. Annotations with green arrows point to specific settings:

- click to set the number format of the tick mark values** points to the 'Number' option in the left sidebar.
- click to define the appearance of the tick mark values** points to the 'Line Style' option in the left sidebar.
- click to set the alignment of the tick mark values** points to the 'Alignment' option in the left sidebar.
- placement of the horizontal (category) axis** points to the 'Automatic' option under 'Horizontal axis crosses'.
- axis scale ranges from 0% to 25% in 5% increments** points to the 'Minimum' (0.0), 'Maximum' (0.25), and 'Major unit' (0.05) settings.
- tick marks appear next to the axis on the outside** points to the 'Major tick mark type' (Outside) and 'Axis labels' (Next to Axis) settings.

The 'Format Axis' dialog box includes the following settings:

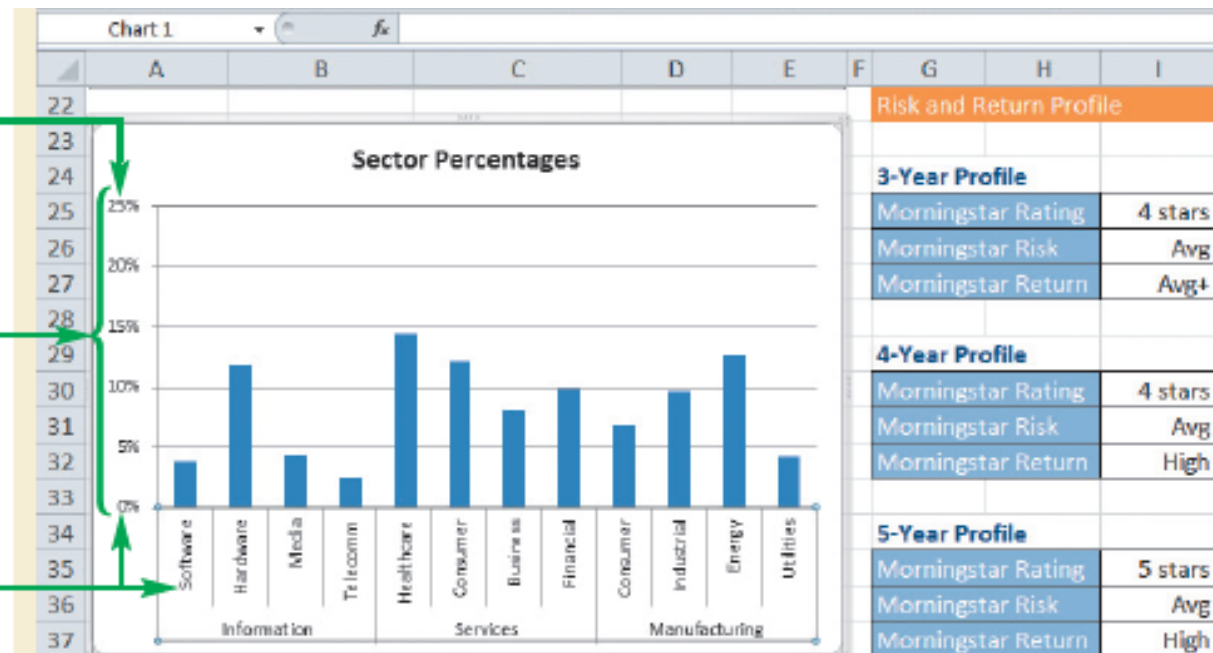
- Axis Options:** Minimum: ☒ Auto ☐ Fixed 0.0; Maximum: ☐ Auto ☒ Fixed 0.25; Major unit: ☐ Auto ☒ Fixed 0.05; Minor unit: ☒ Auto ☐ Fixed 0.004.
- ☐ Values in reverse order
- ☐ Logarithmic scale Base: 10
- Display units: None
- ☐ Show display units label on chart
- Major tick mark type: Outside
- Minor tick mark type: None
- Axis labels: Next to Axis
- Horizontal axis crosses: ☒ Automatic ☐ Axis value: 0.0 ☐ Maximum axis value

Editing the Axis Scale and Text

major tick mark values are percentages with no decimal places

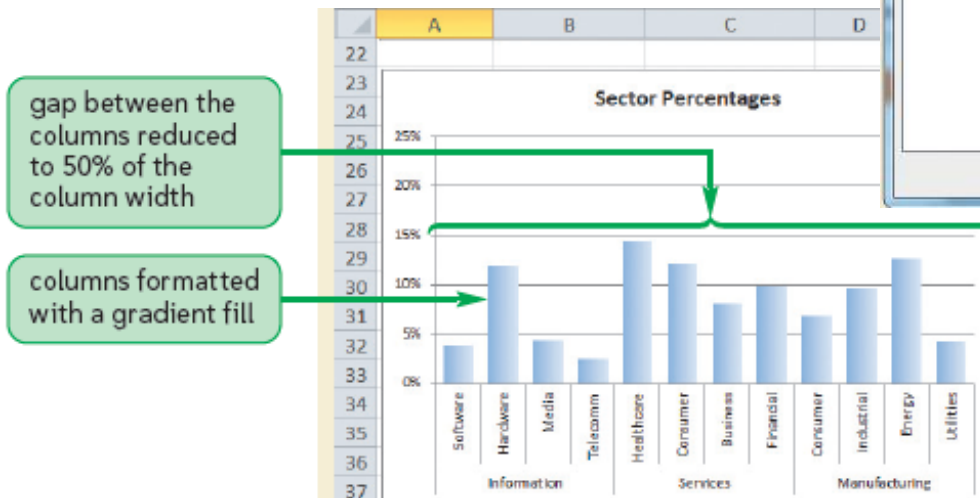
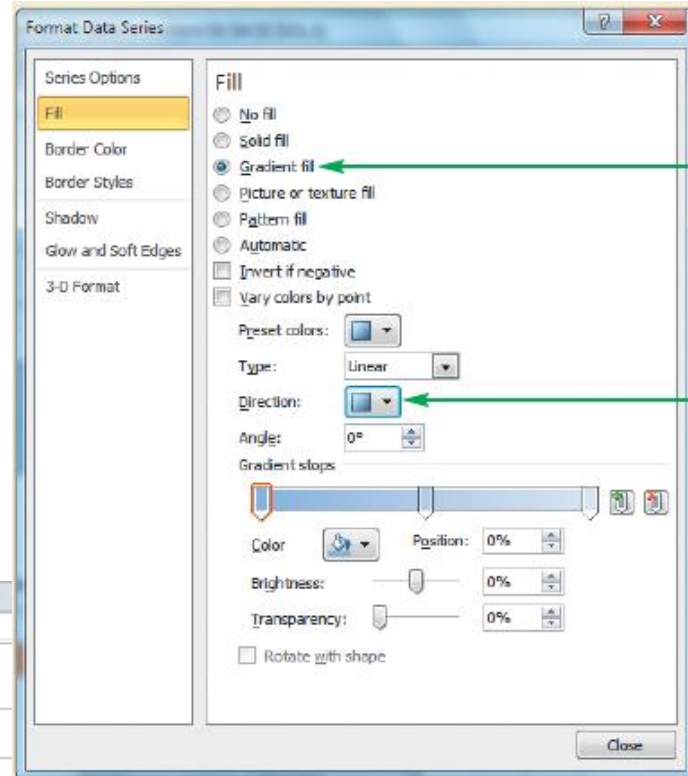
vertical axis scale ranges from 0% to 25% in 5% increments

both axes have a smaller font size



Formatting the Chart Columns

- Columns usually have a common format – distinguished by height, not color



Communicating Effectively with Charts

- Keep it simple
- Focus on the message
- Limit the number of data series
- Use gridlines in moderation
- Choose colors carefully
- Limit chart to a few text styles

Visual Overview

A **sparkline** is a graph that is displayed within a cell. You can create line, column, and win/loss sparklines.

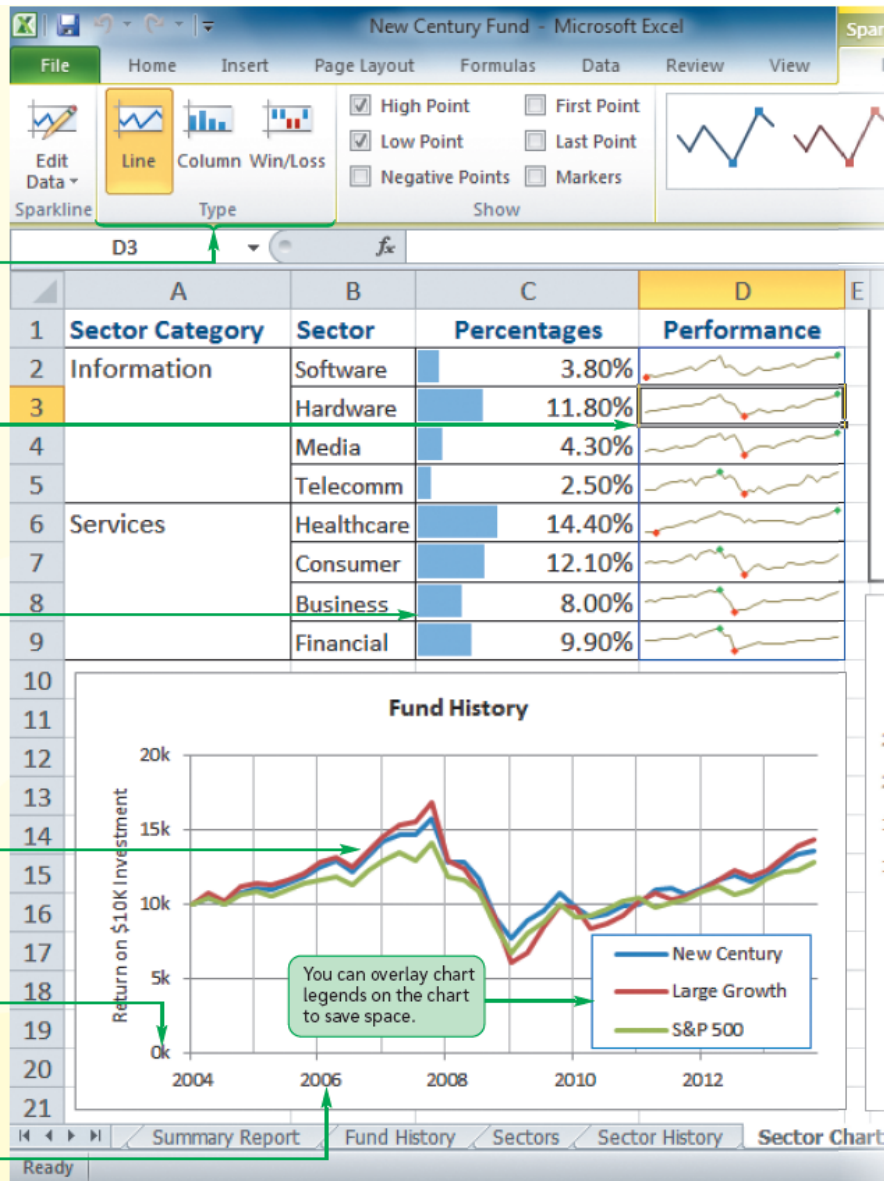
Line sparklines can contain data markers to identify the high and low points (as shown here), negative points, first and last point, and all points.

A **data bar** is a conditional format that adds a horizontal bar to the background of a cell proportional in length to the cell's value.

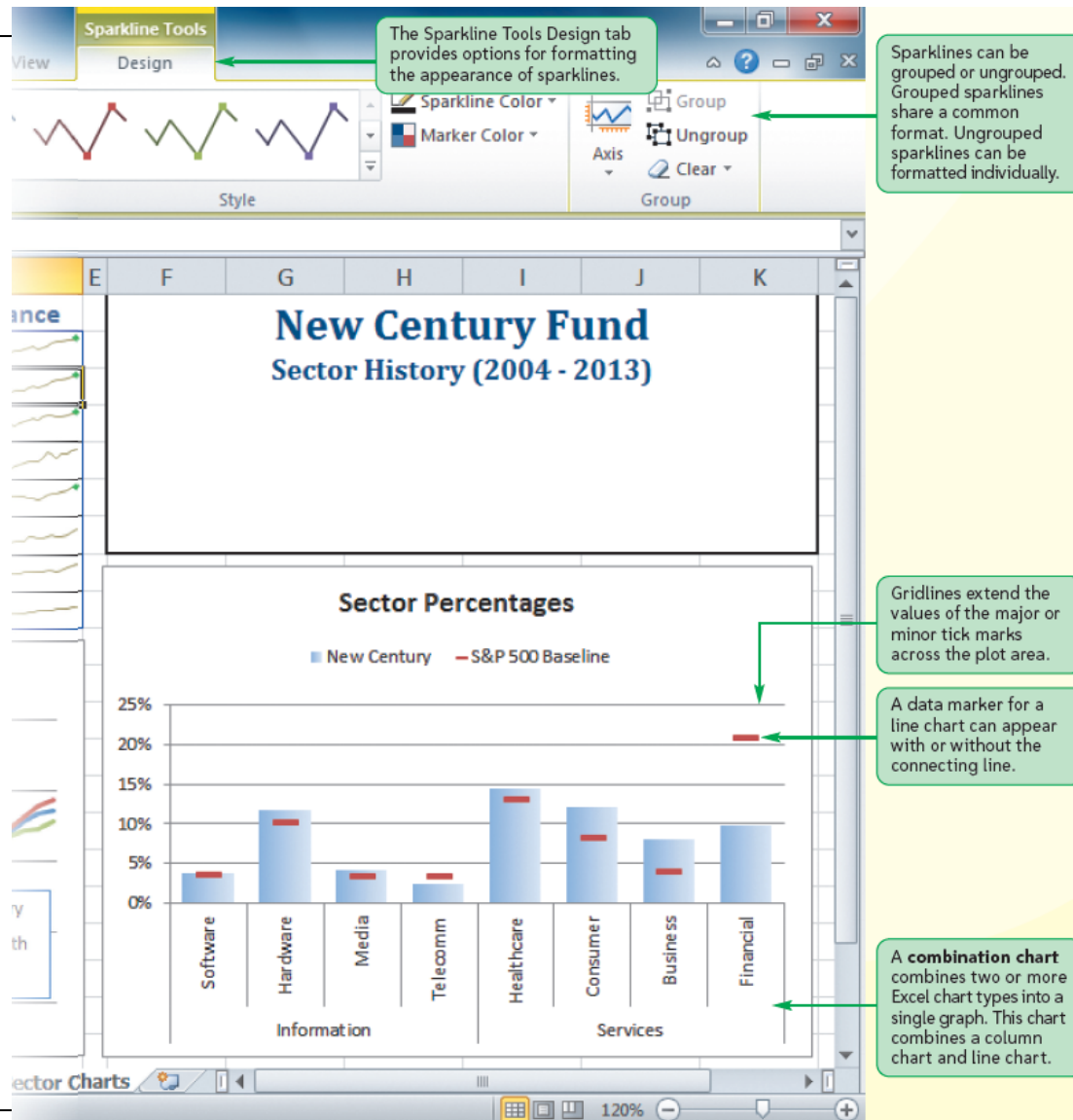
A **line chart** displays data values using a connected line rather than columns or bars.

You can create custom label units; the value axis entries are displayed with the thousands unit.

When the axis labels are date values, you can create a custom date format, such as yyyy, to display the four-digit year value shown here.



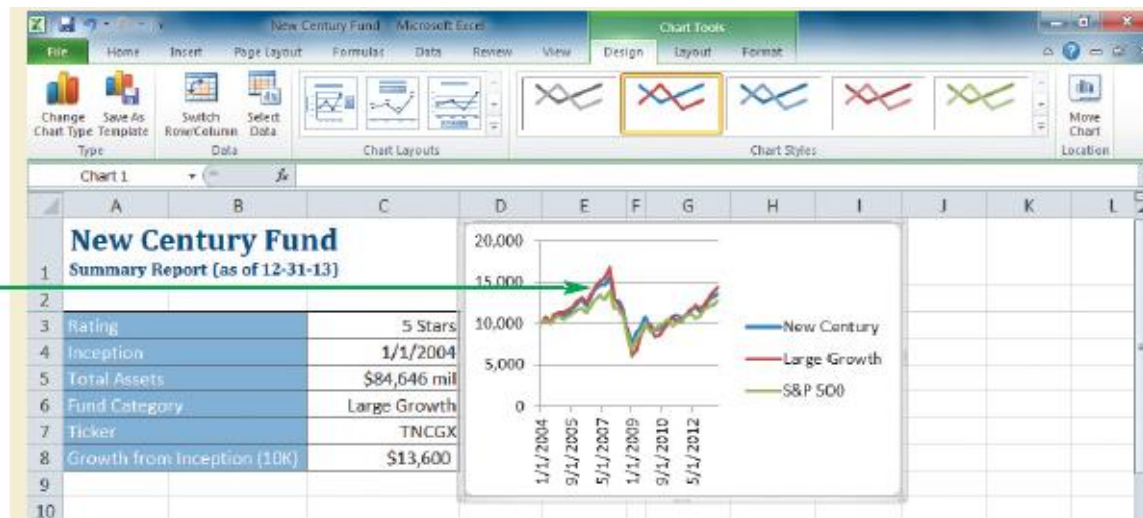
Charts, Sparklines, and Data Bars



Creating a Line Chart

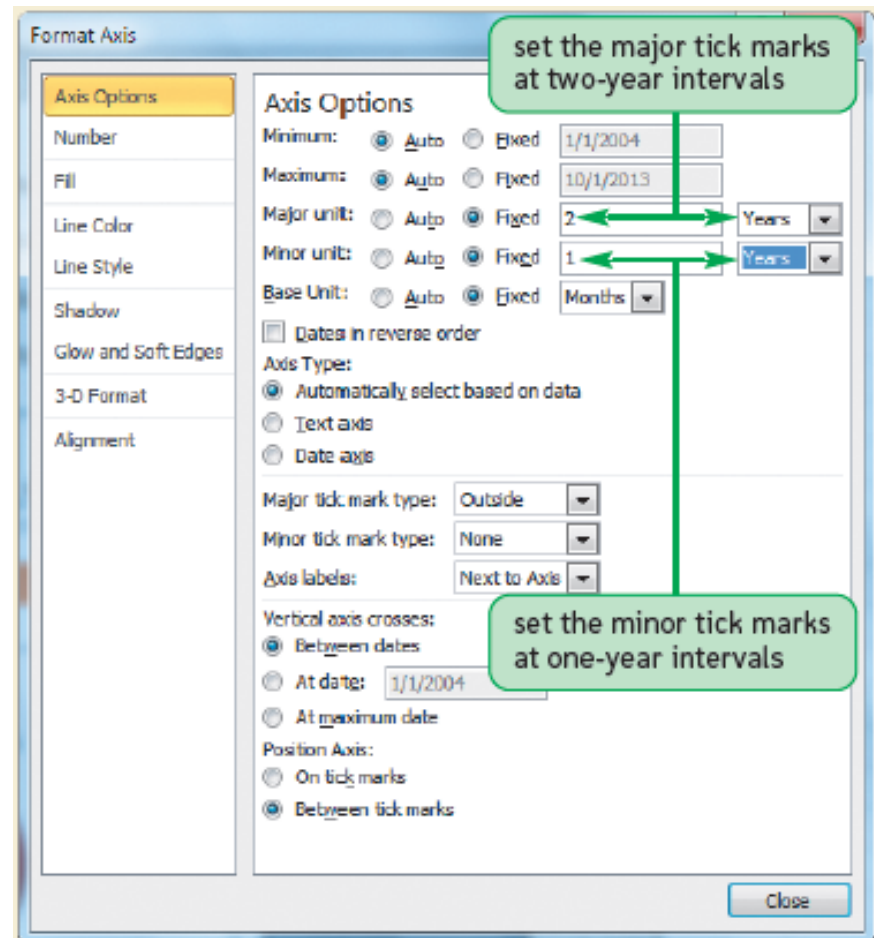
- Use when data consists of values drawn from categories that follow a sequential order at evenly spaced intervals
- Displays data values using a connected line rather than columns or bars

line chart with
three data series



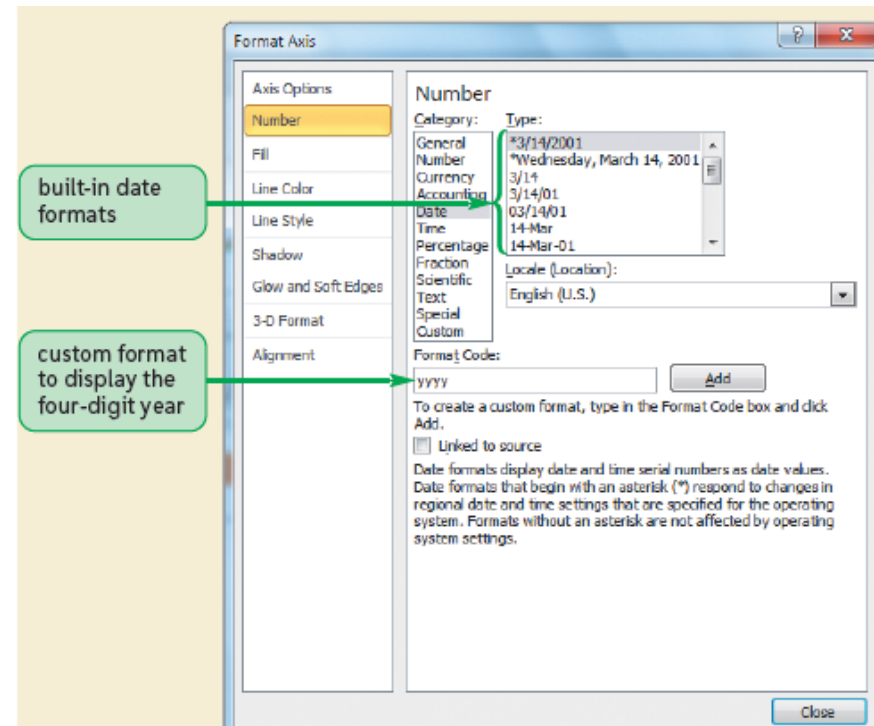
Formatting Date Labels

- Set minimum and maximum dates to use in the scale's range
- Set major and minor units as days, months, or years to use for the scale's interval



Formatting Date Labels

- Custom date formats use combinations of “m”, “d”, and “y” for months, days, and years
- Number of letters controls how Excel displays the date



Setting Label Units

- Simplify a chart's appearance by displaying units of measure appropriate to data values
 - Useful when space is at a premium
 - Example: Display the value 20 to represent 20,000 or 20,000,000
- Apply custom formats to numbers, including adding text

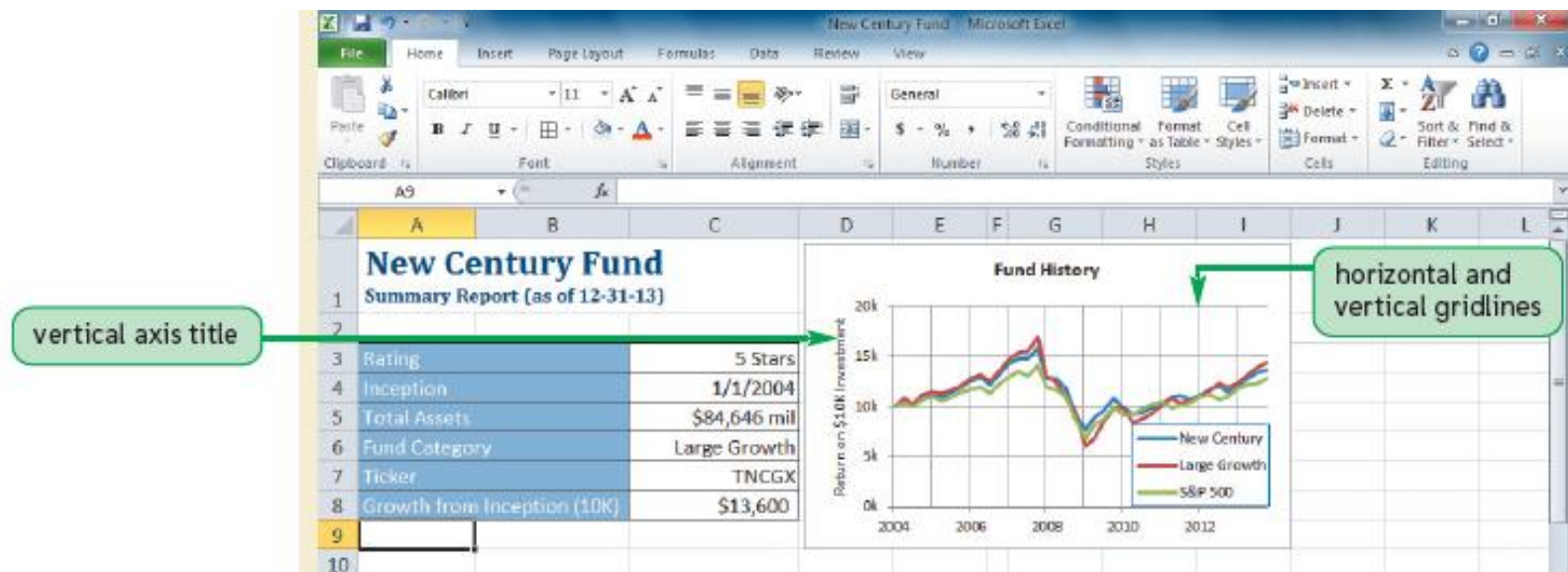
Overlaying a Chart Legend

- Makes more space for the plot area
- An overlaid chart element floats in the chart area and is not fixed to a particular position; can be dragged to a new location



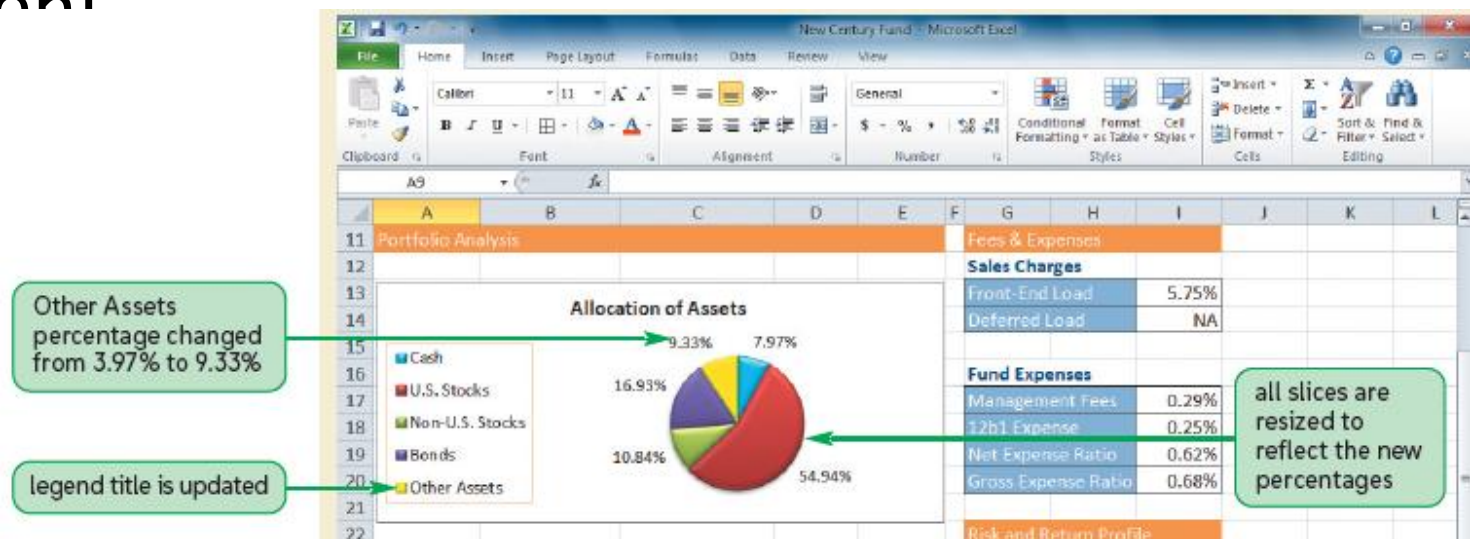
Creating a Line Chart

- Adding gridlines
- Adding an axis title



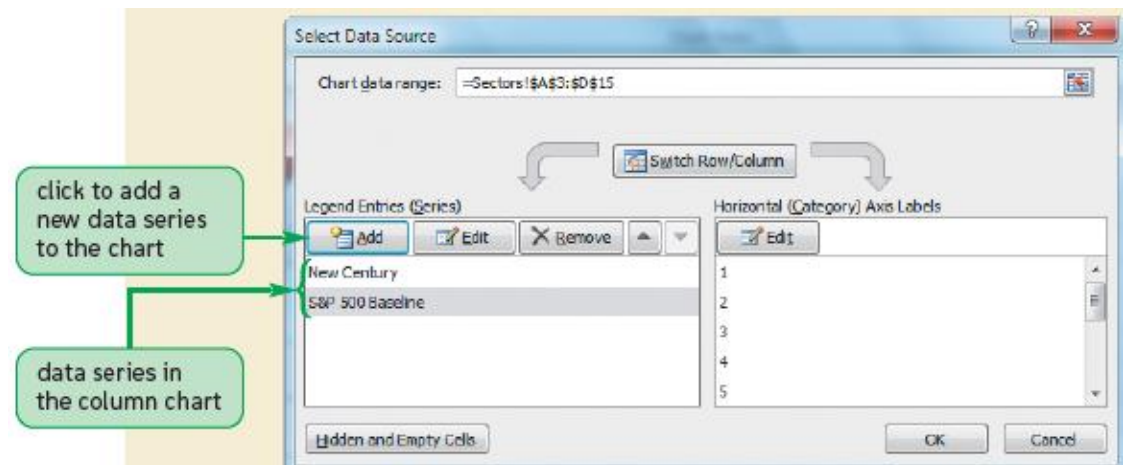
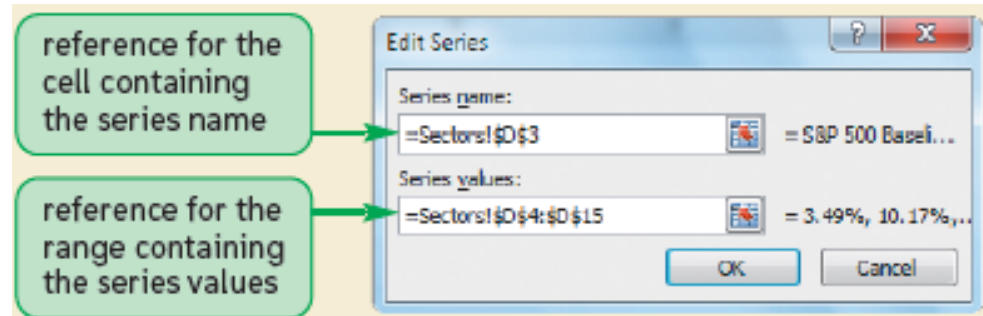
Editing and Revising Chart Data

- Modify the data range that the chart is based on (do not directly modify data in the chart)
- If values/labels in data source are changed, chart automatically updates to show new content



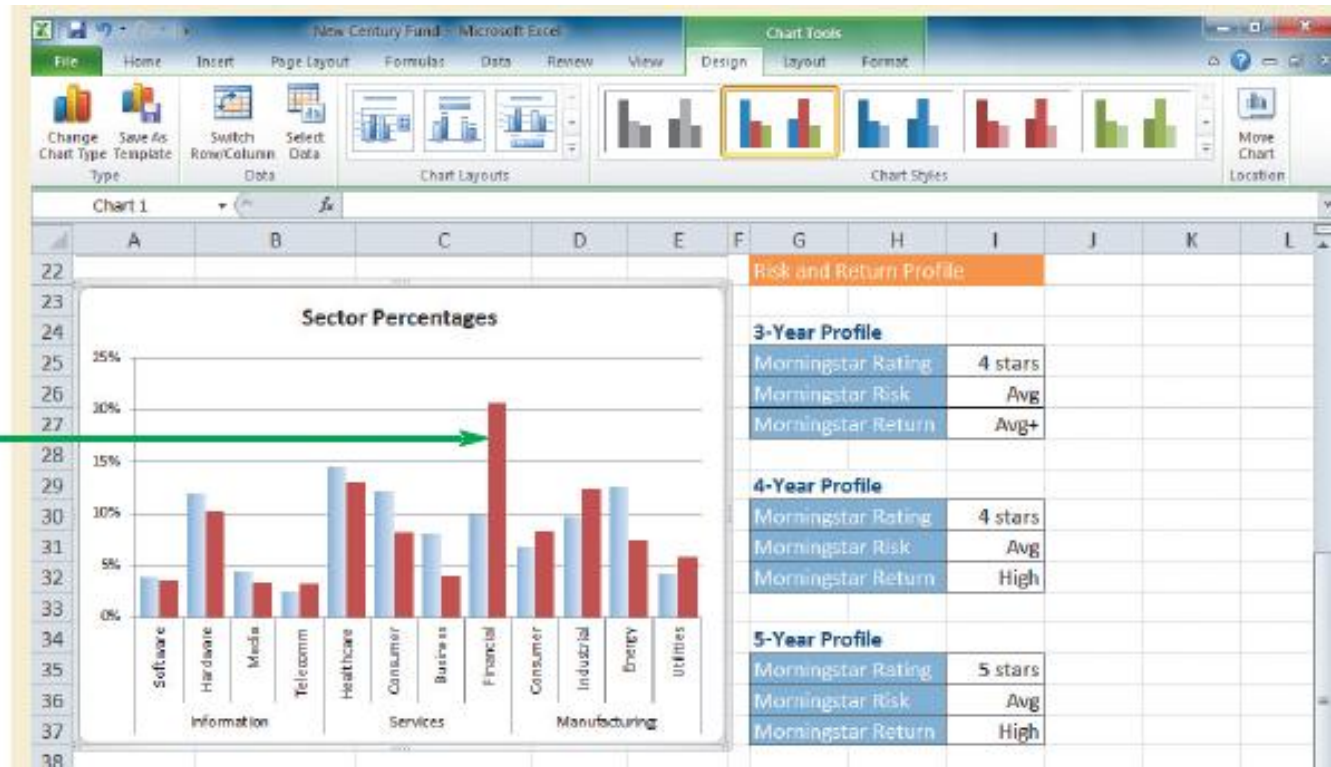
Adding a Data Series to an Existing Chart

- New data series appears in the chart with a different set of data markers



Adding a Data Series to an Existing Chart

S&P 500 values are shown in red columns



Adding a Data Series to an Existing Chart

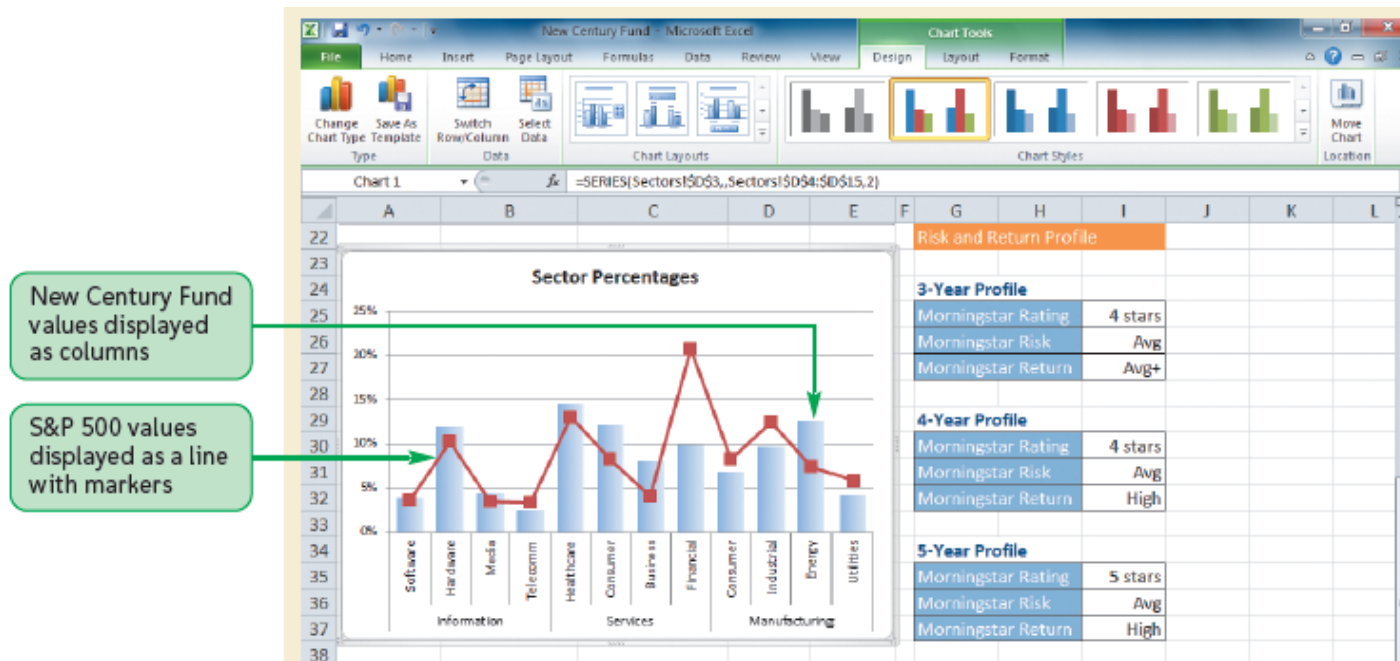
- Understanding the SERIES function

```
=SERIES(name, categories, values, order)
```

- Can be edited within the formula bar to make quick changes to the chart, but the function is tied to an existing chart; it cannot be used within a worksheet cell or referenced from another Excel formula

Creating a Combination Chart

- Select a data series in an existing chart
- Apply a new chart type to that series, leaving the other data series in its original format

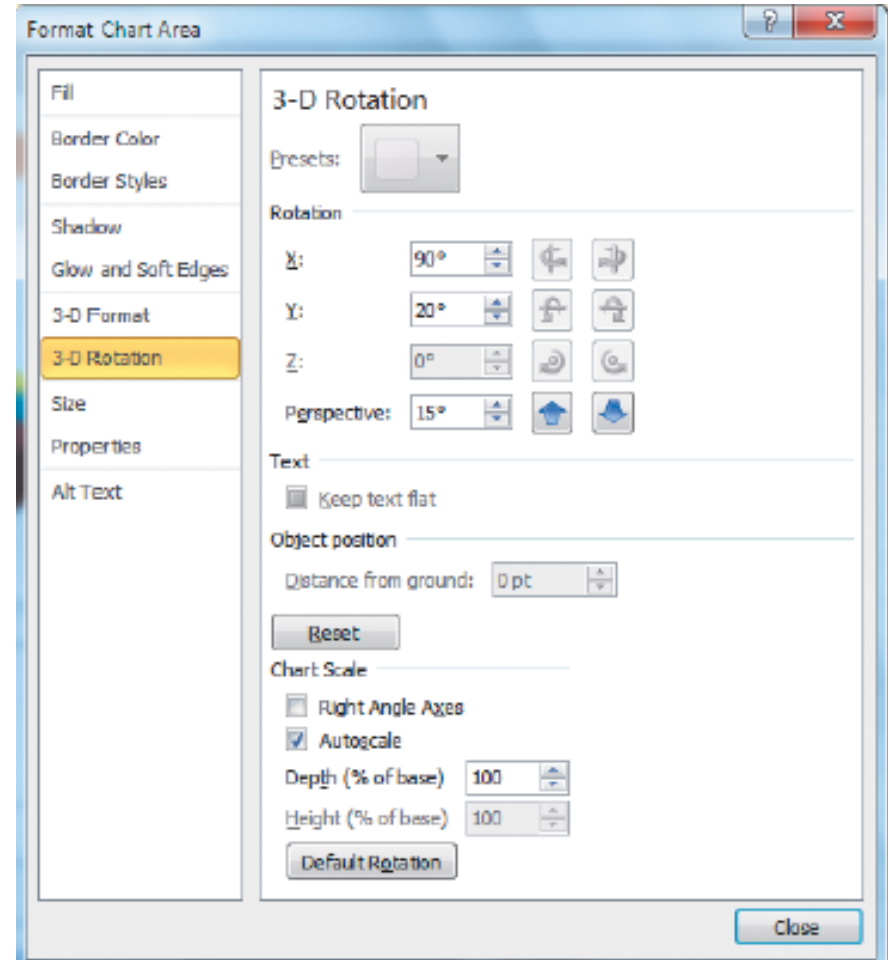


Choosing the Right Chart

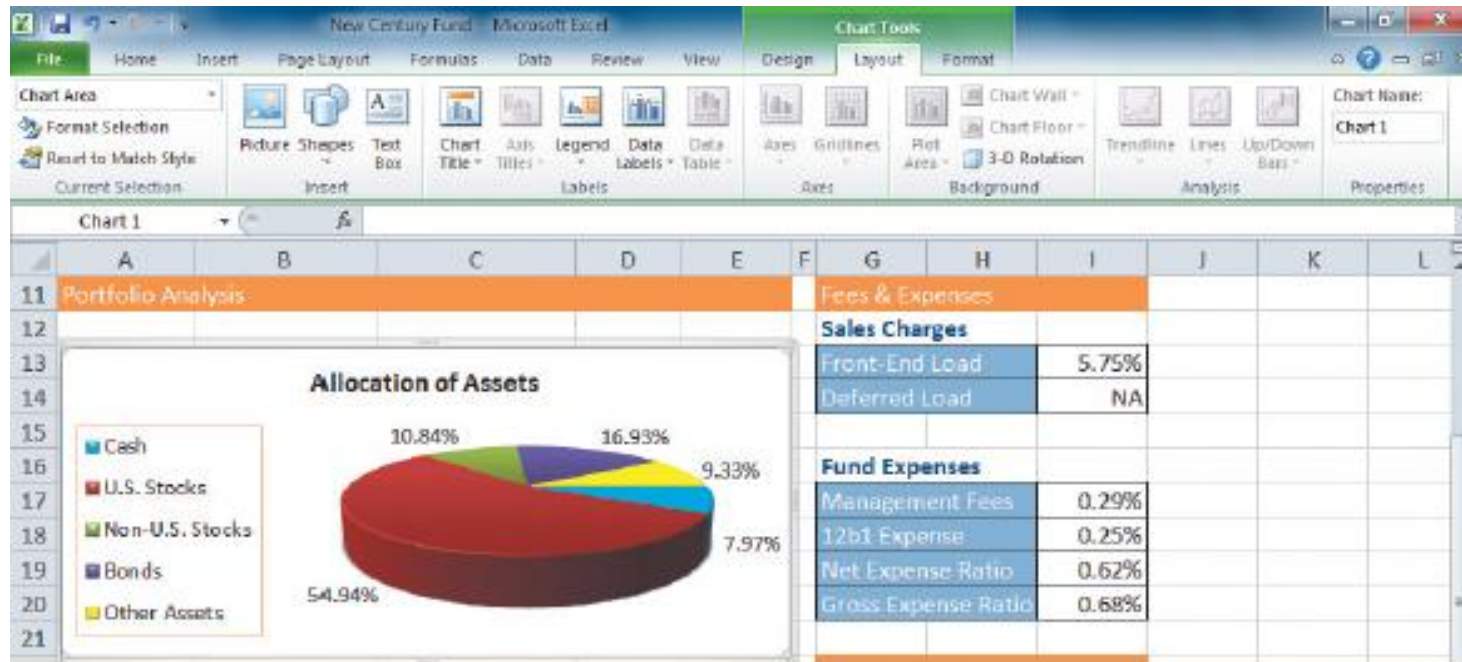
Chart	When to Use
Pie charts	Small number of categories; easy to distinguish relative sizes of slices
Column or bar chart	Several categories
Line charts	Categories follow a sequential order
XY scatter charts	To plot two numeric values against one another
Custom chart	Available charts don't meet your needs

Creating a 3-D Chart

- Provide illusion of depth and distance
- Adds three spatial dimensions:
 - The **x-axis** (length)
 - The **y-axis** (height)
 - The **z-axis** (depth)
- Chart's **perspective** controls how fast the chart appears to recede



Creating a 3-D Chart



Adding Sparklines and Data Bars

- Both convey graphical information about worksheet data without occupying a lot of space

Creating Sparklines

- A mini chart displayed within a worksheet cell
- Compact in size; doesn't include chart elements
- Goal is to convey maximum amount of graphical information in a very small space
- Can be grouped or ungrouped
 - Grouped sparklines share a common format
 - Ungrouped sparklines can be formatted individually

Types of Sparklines

- Line sparkline
 - Highlights trends
- Column sparkline
 - For column charts
- Win/Loss sparkline
 - Highlights positive and negative values

line sparklines

	A	B	C
1	Sales by Department (sales in millions)		
2	Department	Current	1-Year
3	Laptops	\$ 29.4	
4	Printers	\$ 13.2	
5	Monitors	\$ 13.0	
6	Peripherals	\$ 11.5	
7	All Departments	\$ 67.1	

column sparklines

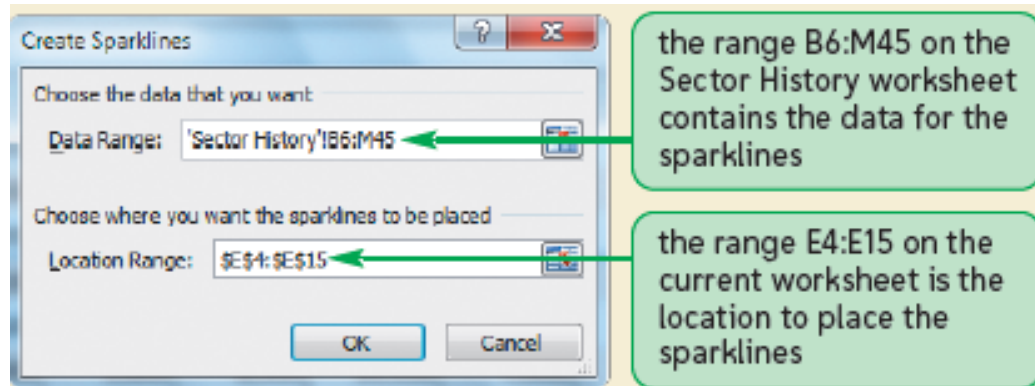
	A	B	C
1		Temperature Record	
2	City	Yearly	Monthly
3	Seattle	37.7°C	
4	Buenos Aires	54.0°C	
5	Moscow	14.3°C	
6	Melbourne	47.4°C	

win/loss sparklines

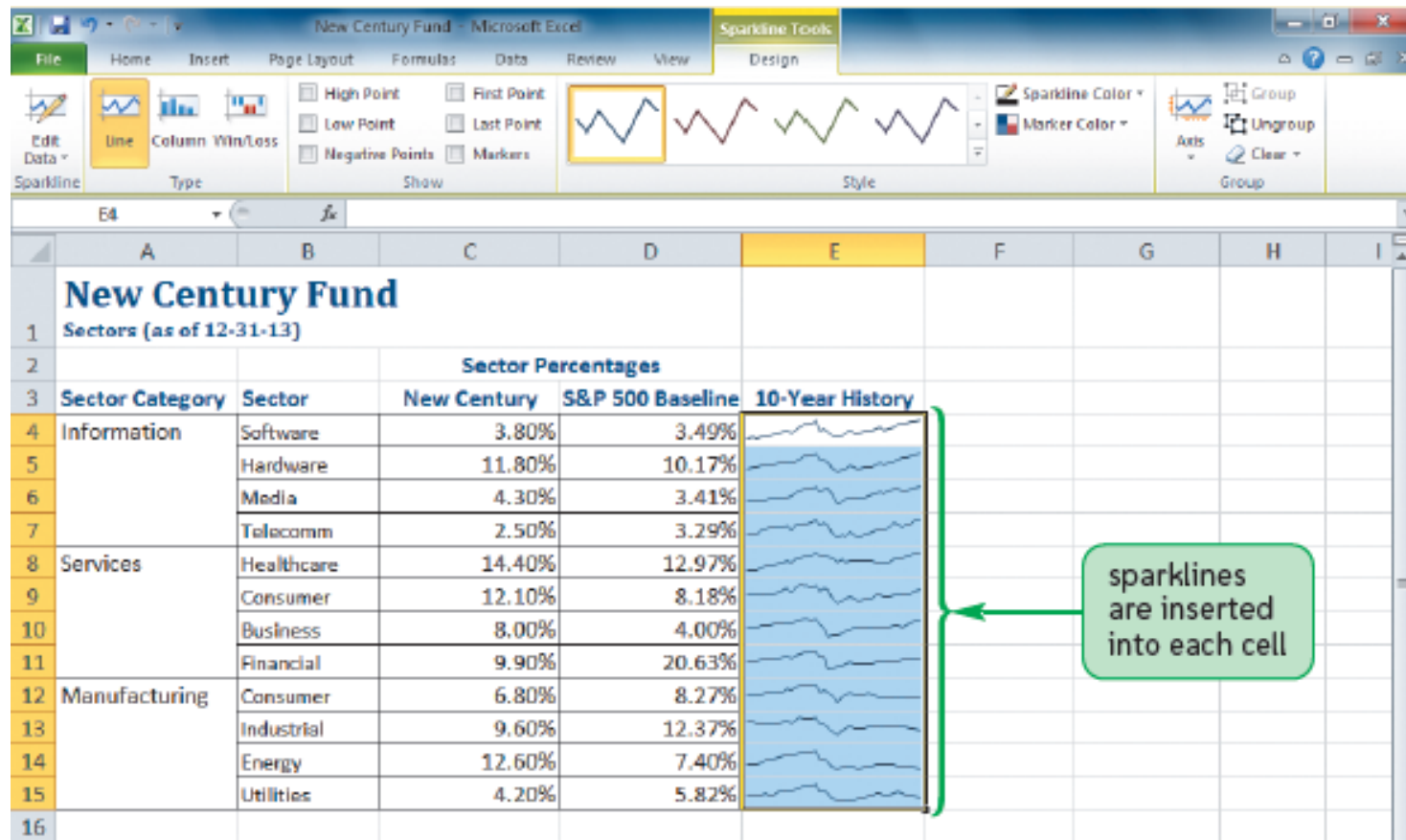
	A	B	C
1	Team	Record	Season
2	Cutler Tigers	10 - 2	
3	Apsburg Hawks	8 - 4	
4	Central City Spartans	6 - 6	
5	Liddleton Lions	3 - 9	

Creating Sparklines

- Select a data range containing data to graph
- Select a location range where you want sparklines to appear



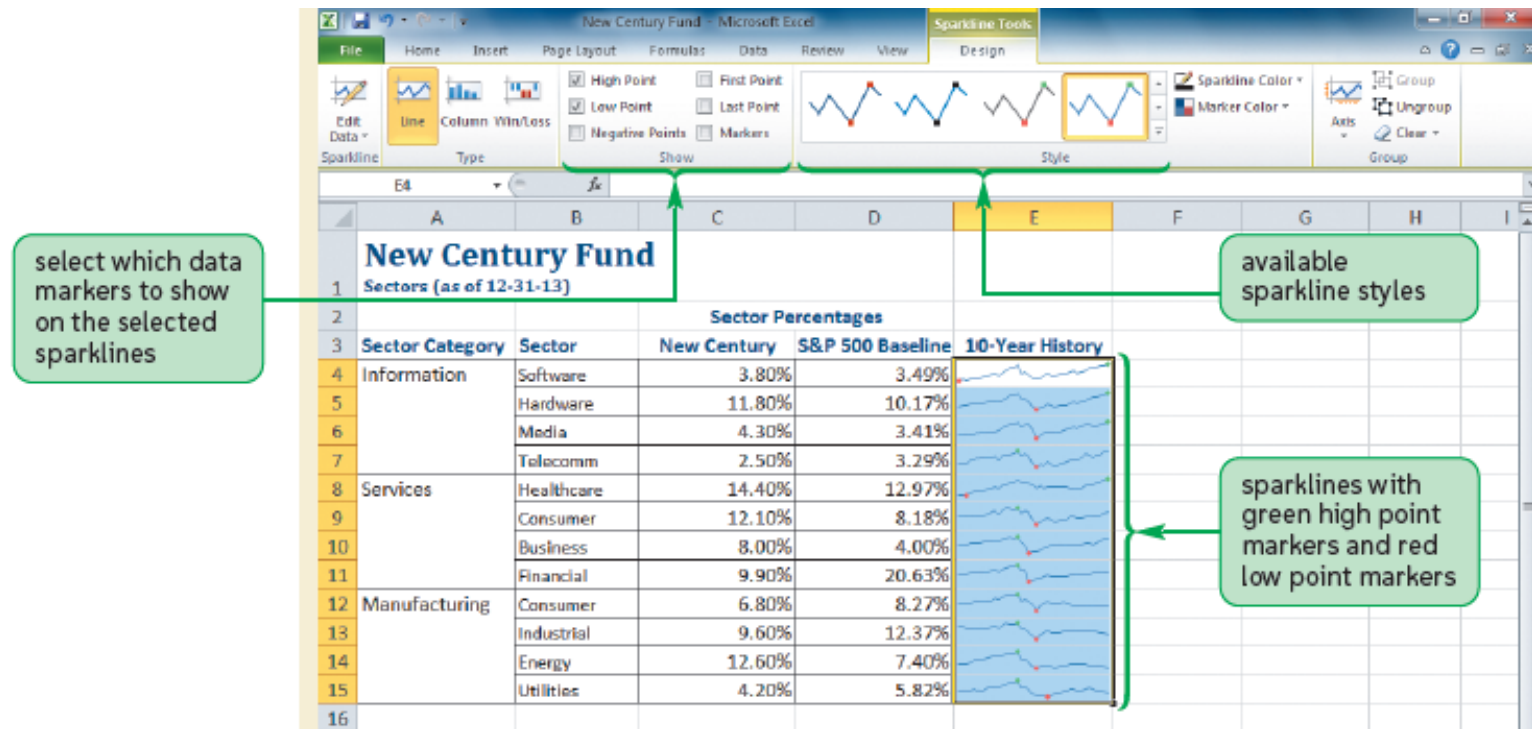
Creating Sparklines



Adding and Formatting Sparkline Markers

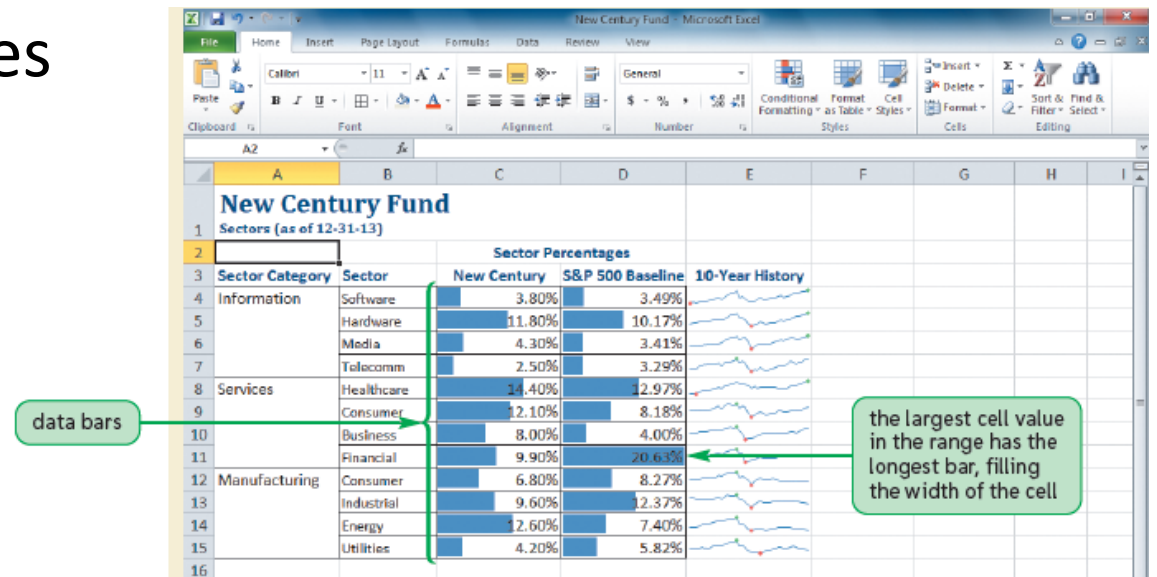
- Can specify only line color and marker color
- Can create line markers for highest value, lowest value, all negative values, first value, and last value
- Can create markers for all data points regardless of value or position in data source
- Can add an axis to a sparkline – horizontal line that separates positive and negative values

Adding and Formatting Sparkline Markers



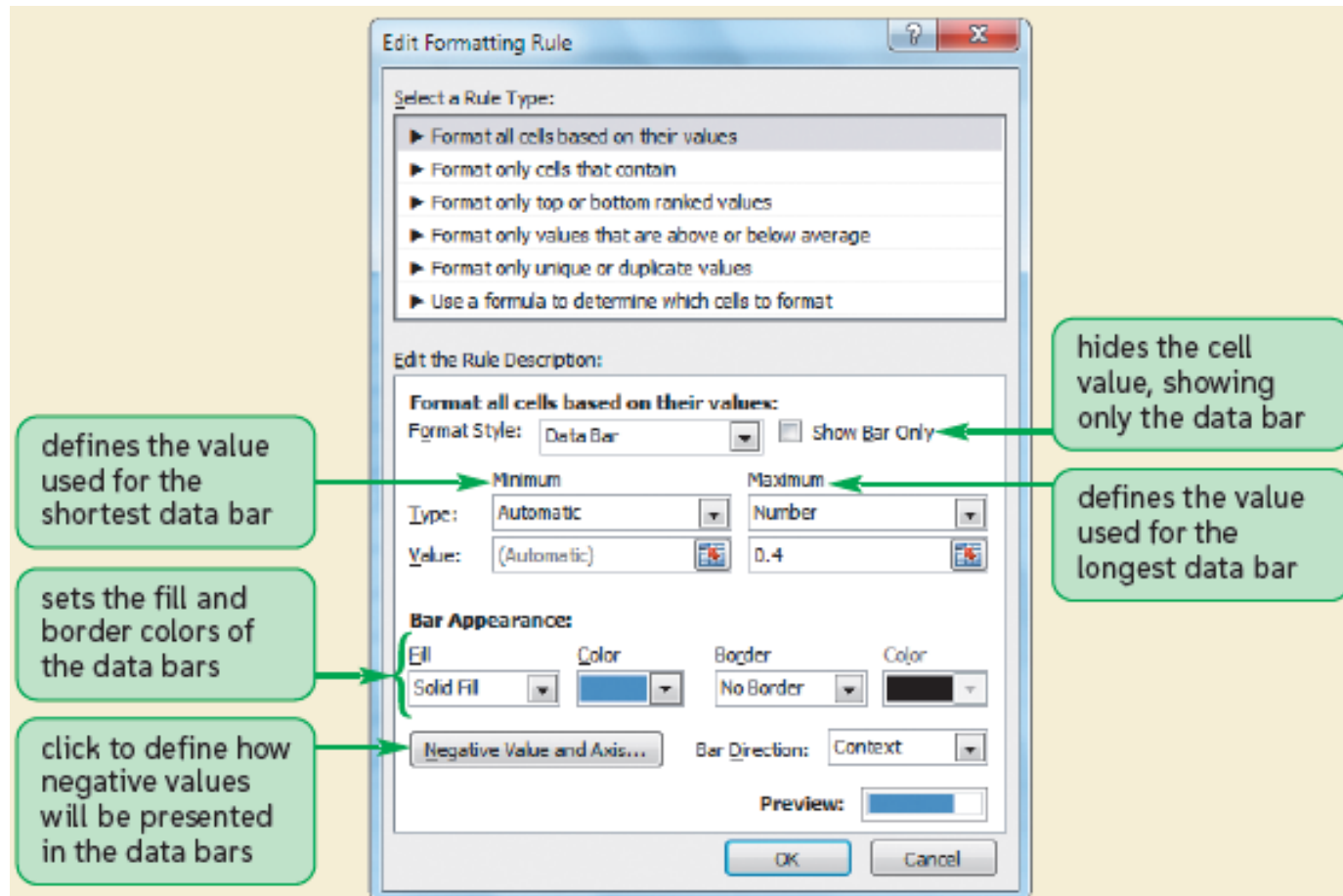
Creating Data Bars

- Conditional format that adds a horizontal bar to background of a cell containing a numeric value
 - Length based on value of each cell in selected range
- Dynamic
 - Lengths of data bars automatically update if cell's value changes

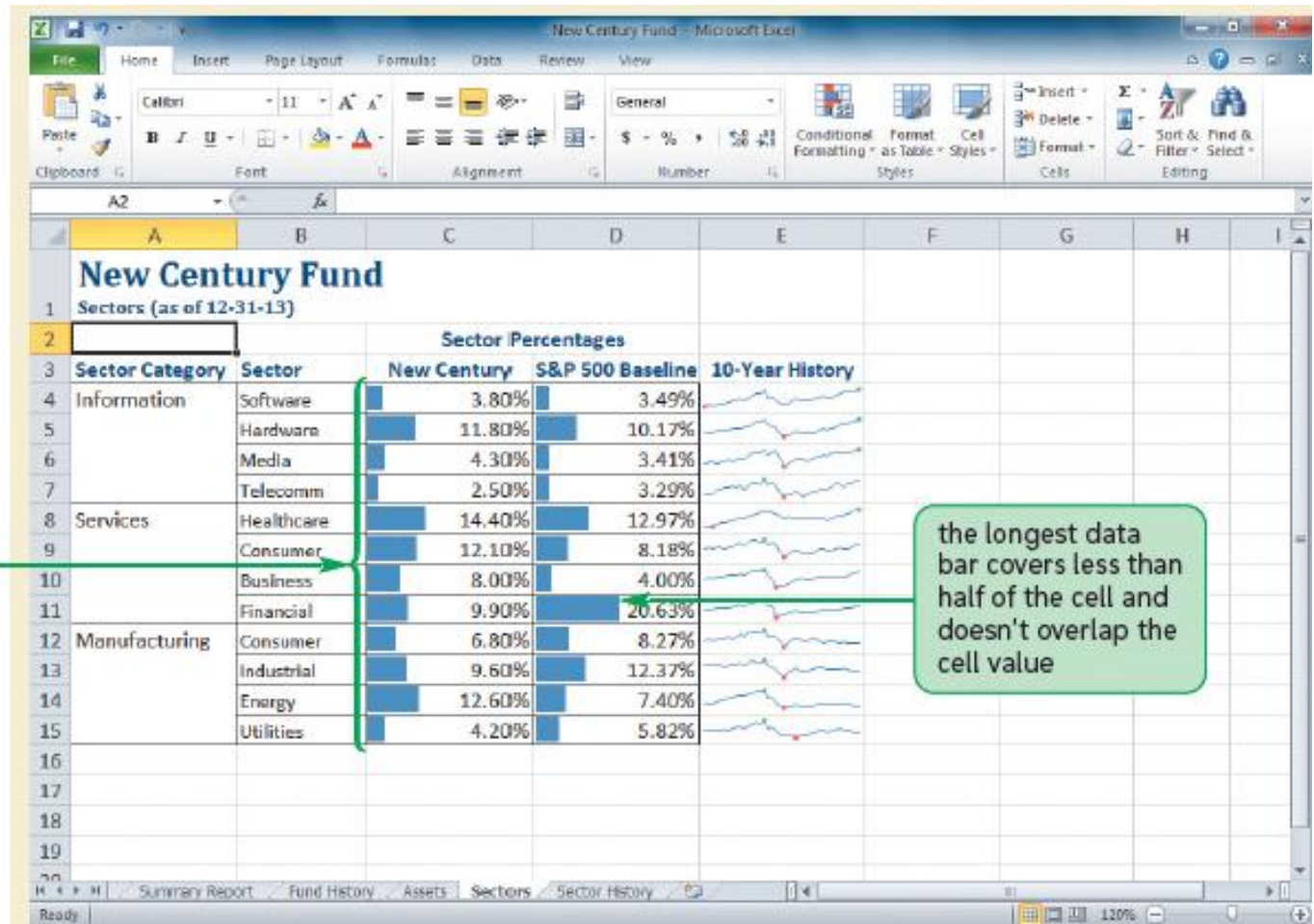


Modifying a Data Bar Rule

- Alter rules of the conditional format



Modifying a Data Bar Rule



data bar lengths are expressed relative to a maximum value of 40%

the longest data bar covers less than half of the cell and doesn't overlap the cell value

Creating a Chart Sheet

- For detailed charts that need more space to be seen clearly or to show a chart without any worksheet text or data
- Do not contain worksheet cells for calculating numeric values

Creating a Chart Sheet

