

# Determining Effective Data Display with Charts

1

## Chart Types Covered

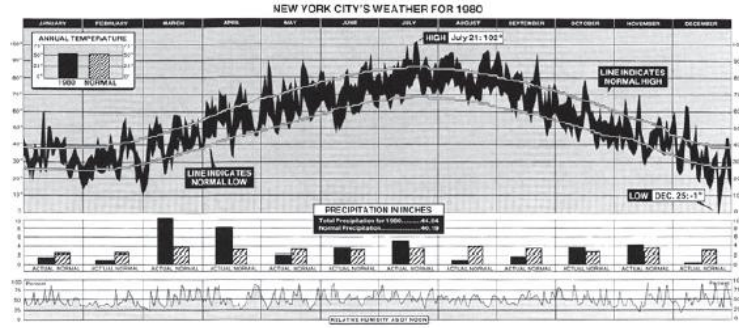
2

- Column
- Line
- Pie
- Stock
- XY (Scatter)
- Area
- Bubble

# Visualizing Data

3

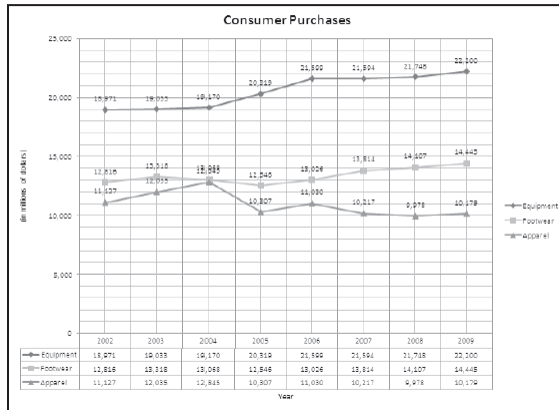
Figure 3.1: Historical chart of New York City weather in 1980



# Data Graphics Principles

4

Figure 3.2: An example of "chart junk"



## Data Graphics Principles

5

- **“Above all else show the data”**
  - Reminder not to clutter a chart by adding unneeded illustration or decoration.
- **“Maximize the data-ink ratio”**
  - Refers to the portion of ink that is devoted to displaying the data vs. the portion of graphic that can be removed without losing the data.

## Data Graphics Principles

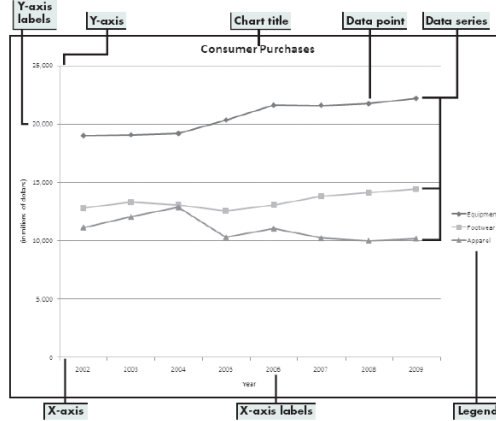
6

- **“Erase non-data-ink”**
  - Non-data-ink is a part of the chart that decorates more than informs.
- **“Erase redundant data ink”**
  - Redundant data ink is ink that repeats information.
- **“Revise and edit”**
  - Revise and edit charts like you would a piece of writing.

## Data Graphics Principles

7

Figure 3.3: "Chart junk" removed



## Effective Charting in Excel












8

- **Creating Chart in Excel**
  - Select data to display
  - Click Insert tab on Ribbon
  - Click a button in Charts group or dialog box launcher

## Chart Types

9

**Table 3.1: Excel chart types**

Chart Type	Icon	Description
Column		Compares values across categories in a vertical orientation. Values are indicated by the height of the columns.
Bar		Compares values across categories in a horizontal orientation. Values are indicated by the length of the bars.
Line		Displays trends over time or by category. Values are indicated by the height of the lines.
Area		Displays trends over time or by category. Values are indicated by the filled areas below the lines.
Pie		Compares the contribution each value in a single numeric data series makes to the whole, or 100%. Values are indicated by the size of the pie slices.
Doughnut		Compares the contribution each value in multiple numeric data series makes to the whole, or 100%. Values are indicated by the size of the doughnut segments.
XY (Scatter)		Compares pairs of numeric values on the x- and y-axes, with the data points plotted proportionally to the values on the x-axis; can also be used to display a functional relationship, such as $y=mx+b$ . Values are indicated by the position of the data points.
Stock		Displays stock price and volume trends over time. Plotted values can include volume, opening price, highest price, lowest price, and closing price.
Radar		Compares values across categories in a circular orientation. Values are indicated by the distance from a center point.
Bubble		Compares sets of three values. Values are indicated by the size of the bubbles (filled circles).
Surface		Displays value trends in three dimensions. Values are indicated by areas with colors or patterns on the surface of the chart.

## Understanding Line and Column Charts

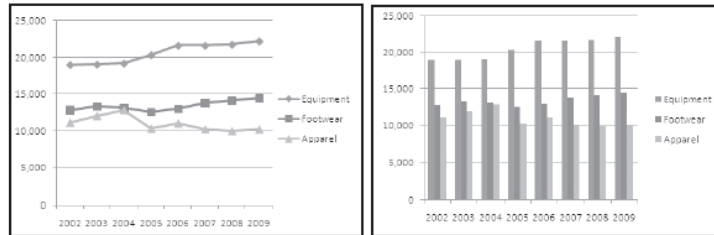
10

- **Line chart-** displays trends over time or by category.
- **Column chart-** compares values across categories in a vertical orientation.

## Understanding Line and Column Charts

11

Figure 3.5: Line chart versus column chart



Line chart emphasizes the trend in each category over time

Column chart emphasizes the contribution that each category made each year

## Comparing Line and XY (Scatter) Charts

12

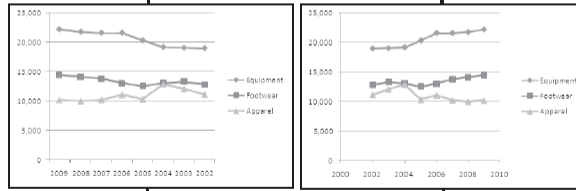
- **XY (Scatter) charts** plot numeric values on *both* the X- and Y- axes based on the value of the data.
  - Whereas a line chart plots numeric values on one axis and category labels equidistantly on the other axis.

# Comparing Line and XY (Scatter) Charts

13

Figure 3.6: Line chart versus XY (Scatter) chart

	A	B	C	D	E	F	G	H	I	J
1	Consumer Purchases by Category									
2	Sales in millions of dollars									
3										
4		2009	2008	2007	2006	2005	2004	2003	2002	
5	Equipment	22,206	21,748	21,594	21,569	20,219	19,170	18,033	16,971	
6	Footwear	18,418	14,107	13,814	13,026	12,249	13,098	13,318	12,816	
7	Apparel	10,179	9,978	10,217	11,030	10,207	12,845	12,035	11,127	
8	<b>Total</b>	<b>46,824</b>	<b>45,835</b>	<b>45,625</b>	<b>45,635</b>	<b>43,196</b>	<b>45,083</b>	<b>44,387</b>	<b>42,914</b>	
9										



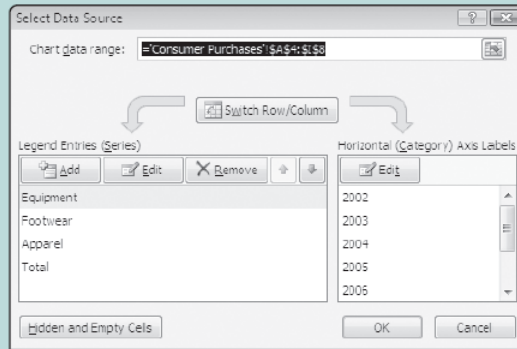
The line chart plots the x-axis based on the position of the categories in the data range

The XY (Scatter) chart plots the x-axis in numeric order based on the values in the data range

# Changing the Chart Source Data

14

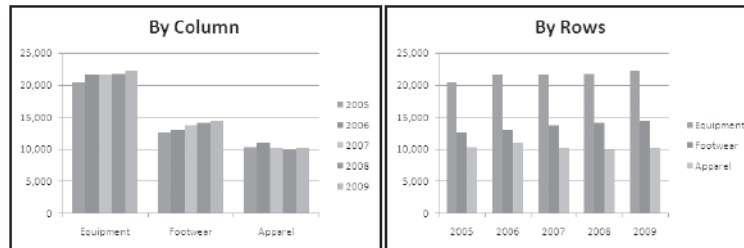
Figure 3.7: Select Data Source dialog box



## Results of Changing Source Data

15

**Figure 3.8: Displaying the data series by columns or by rows**



**Compares the amount of each year's sales for each category**

**Emphasizes the contribution that each category made to each year's performance**

## Specifying Chart Layout Options

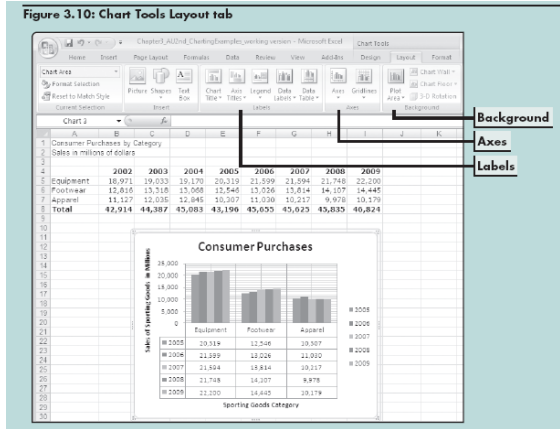
16

- Click chart to display Chart Tools contextual tabs
- Chart Tools Layout Tab
  - Options grouped by Labels, Axes, and Background



# Specifying Chart Options

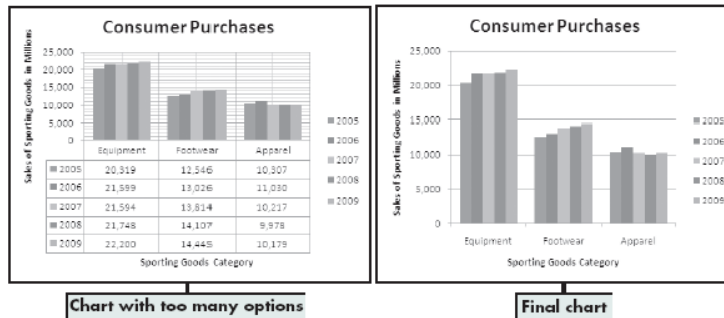
17



# Specifying Chart Options

18

**Figure 3.9: Selecting the right number of chart options**



## Chart Options

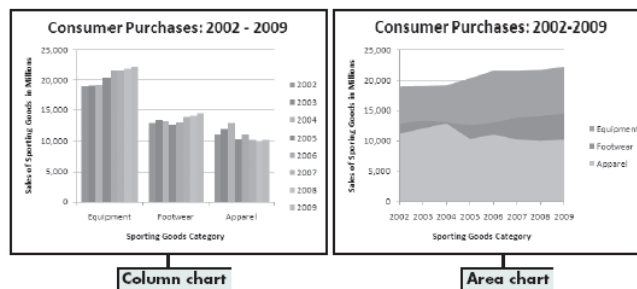
19

- **Area chart**- combines the features of a line chart with a bar or column chart by filling in the area below the line, and displaying the trend values over time or categories.
- **Pie chart**- displays the percentage contribution that each category makes to a whole or 100%.

## Column Charts and Area Charts

20

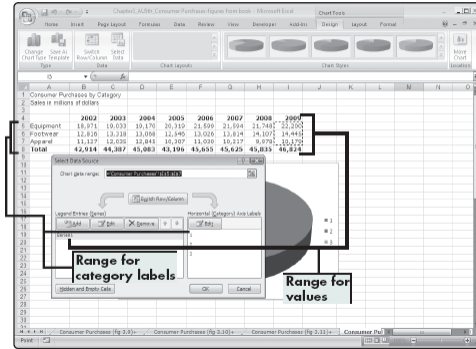
Figure 3.11: Column chart versus area chart



# Selecting Pie Chart Source Data

21

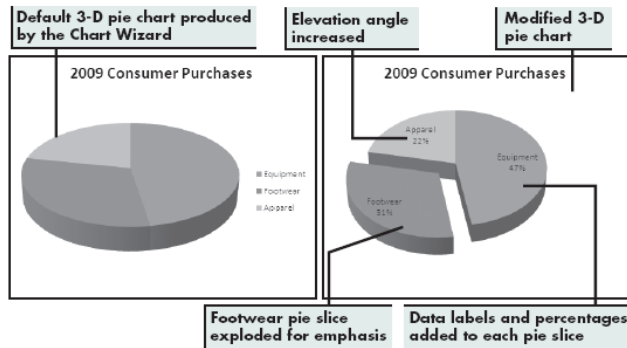
Figure 3.12: Selecting the pie chart source data



# Pie Charts

22

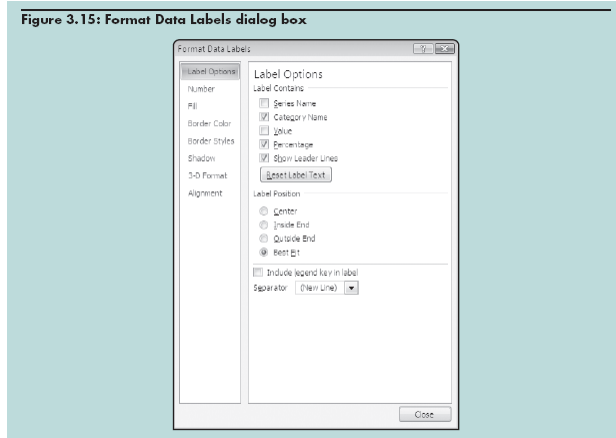
Figure 3.13: Default pie chart and modified pie chart



# Formatting Data Labels

23

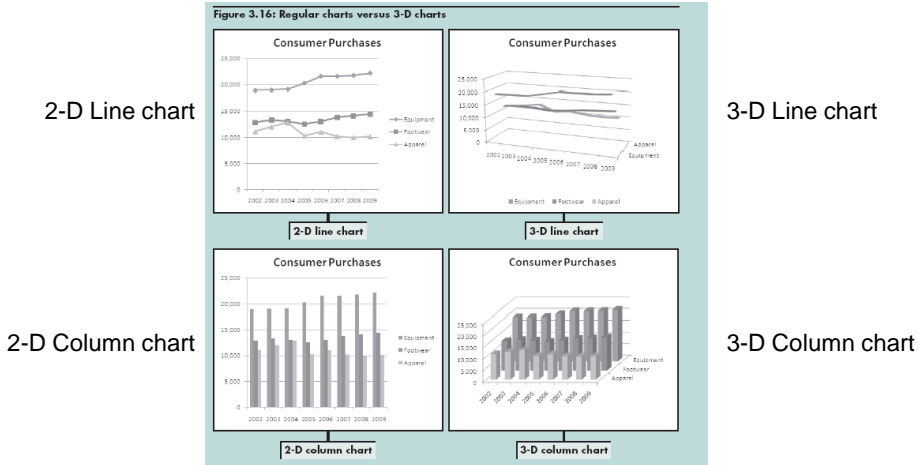
Figure 3.15: Format Data Labels dialog box



# Working with 3-D Charts

24

Figure 3.16: Regular charts versus 3-D charts



## Summary 1

25

- Using charts to illustrate quantitative information adds visual analysis to problem solving
- How choice of chart type can influence viewer's perception of information presented
- Differences between main chart types
- Different interpretation of data can result from use of different chart type

## Objectives: Evaluating Chart Sub-Types

26

- Examine the effectiveness of different chart sub-types
- Evaluate the stacked and 100% stacked sub-types
- Explore the Pie of Pie and Bar of Pie sub-types
- Create various stock charts to display financial data
- Clarify data with trendlines and moving averages

# Examining Sub-types for Various Chart Types

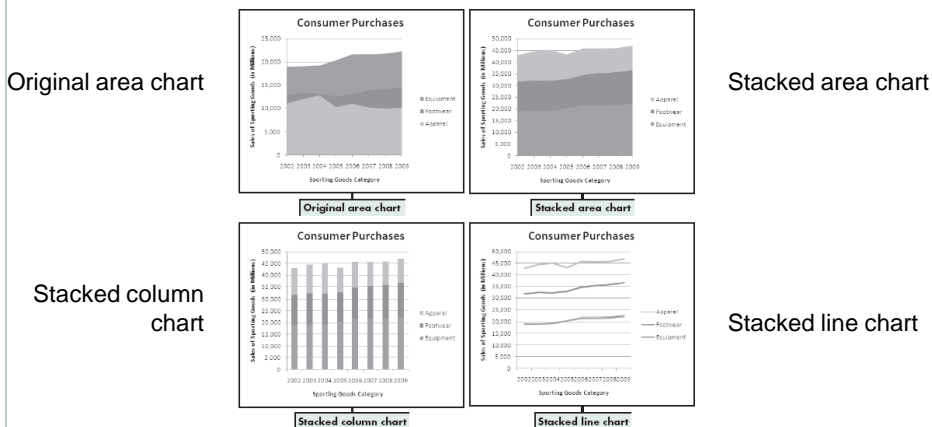
27

<p><b>Stacked charts</b></p>	<ul style="list-style-type: none"> <li>• Illustrate cumulative effects of data in categories</li> <li>• Available for line, bar, column, area charts</li> </ul>
<p><b>Summing to 100% (100% stacked sub-type)</b></p>	<ul style="list-style-type: none"> <li>• Illustrate cumulative (rather than individual) contribution for each category as a percentage</li> <li>• Available for line, bar, column, area charts</li> <li>• Combines features of a pie chart with features of line, column, or area charts</li> <li>• Similar to pie except pieces are in a column instead of a circle</li> </ul>

# Adding Things Up: Stacked Chart Options

28

Figure 3.17: Area chart compared with stacked charts

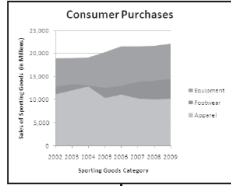


## Summing to 100%: Alternatives to Pie Charts

29

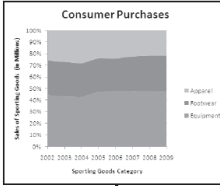
Figure 3.18: Comparison of 100% stacked charts

Original area chart



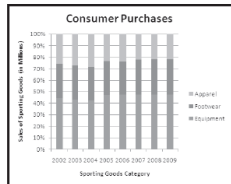
Original area chart

100% stacked area chart



100% stacked area chart

100% stacked column chart



100% stacked column chart

100% stacked line chart



100% stacked line chart

## Summing to 100%: Alternatives to Pie Charts

30

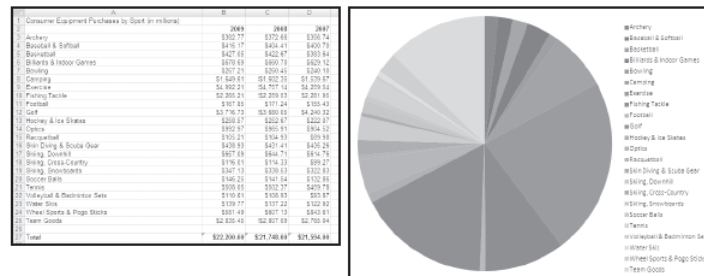
- Showing the cumulative contribution for each category as a percentage can reduce confusion over whether the line on the chart represents the **individual** or **cumulative** contribution to the whole.

## Slicing the Pie Too Thin: Summarizing Too Much Detail in Pie Charts

31

An excessive number of pie slices makes the chart cluttered and confusing.

Figure 3.19: Consumer equipment purchases



## Pie of Pie and Bar of Pie Chart Sub-Types

32

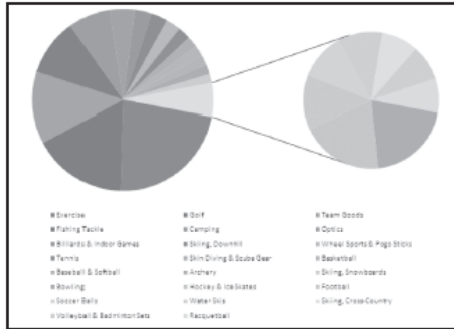
- Decrease number of pie segments to improve visual display of data
- Use Format Data Series dialog box to select options for splitting data series
  - Position
  - Value
  - Percent Value
  - Custom



# Pie of Pie Sub-Type

33

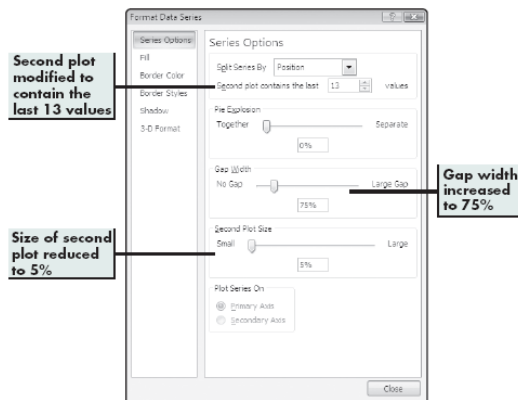
Figure 3.21: Pie of Pie sub-type applied to the chart



# Using Format Data Series to Change the Format

34

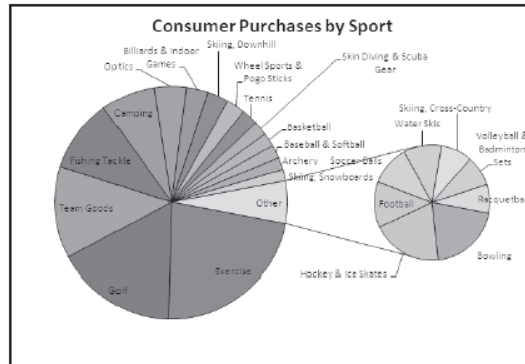
Figure 3.22: Changing the format of the Pie of Pie chart



## Applied Formatting Changes

35

Figure 3.23: Pie of Pie chart with formatting changes



## Doughnut Charts

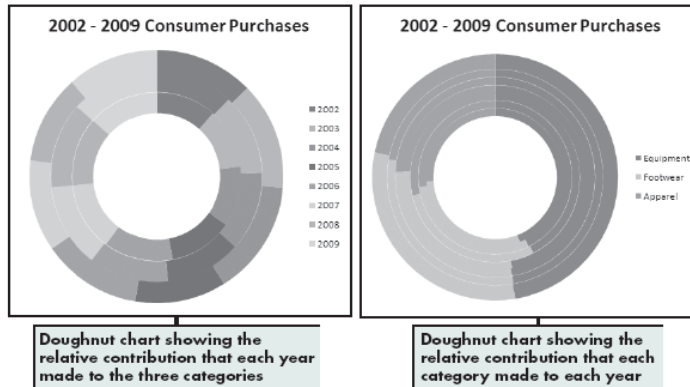
36

- Show individual percentages contained in a pie chart for more than one series

## Doughnut Charts

37

Figure 3.24: Two sample doughnut charts



## Monitoring a Business with Stock Charts

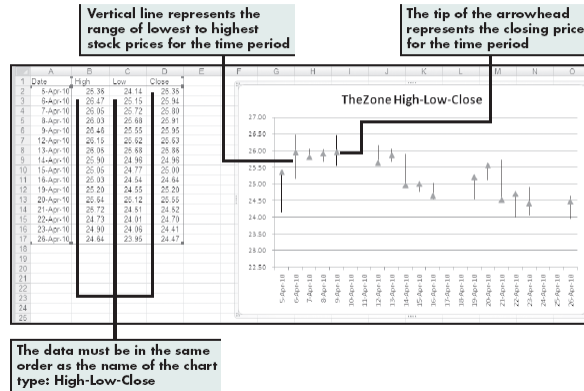
38

- Excel stock reporting charts are somewhat based on the candlestick plot format
- Stock chart sub-types
  - High-Low-Close
  - Open-High-Low-Close
  - Volume-High-Low-Close
  - Volume-Open-High-Low-Close

# Sample High-Low-Close Chart

39

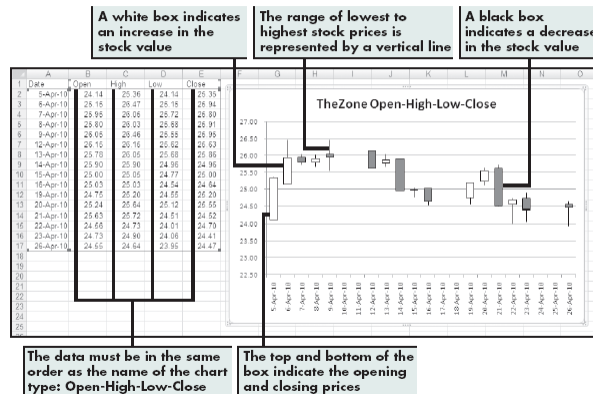
Figure 3.25: Worksheet and sample High-Low-Close chart



# Sample Open-High-Low-Close Chart

40

Figure 3.26: Sample Open-High-Low-Close chart

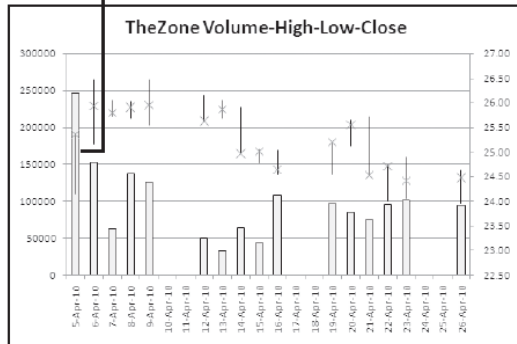


# Sample Volume-High-Low-Close Chart

41

Figure 3.28: Modified Volume-High-Low-Close chart

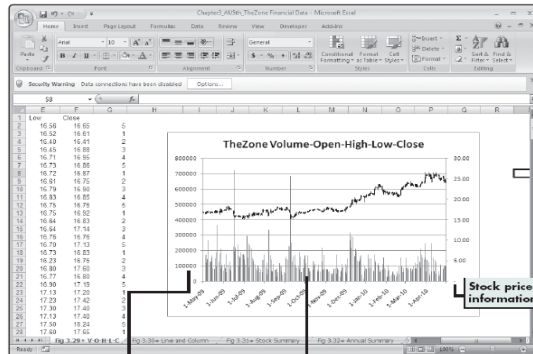
Color change makes stock price more visible



# Sample Volume-Open-High-Low-Close Chart

42

Figure 3.29: Volume-Open-High-Low-Close chart showing data for one year



Stock volume information

Because this chart shows a year's worth of stock price data, the difference between the opening, high, low, and closing prices can't be determined

Stock price information

## Adding Trendlines and Moving Averages

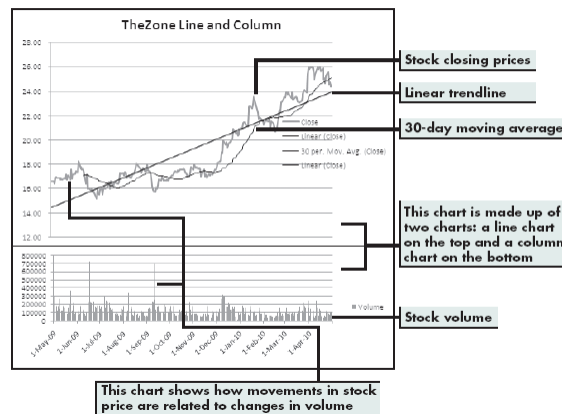
43

- **Trendlines**
  - Graphically illustrate trends in data using a statistical technique known as regression
- **Moving average line**
  - Used to smooth out the data, making it easier to spot trends

## Adding Trendlines and Moving Averages

44

Figure 3.30: Alternative line and column chart combination



## Summary 2

45

- Chart sub-types for line, column, and area charts (stacked and 100% stacked)
- Pie of Pie and Bar of Pie chart sub-types
- Sub-types of stock charts
- Clarifying data in stock charts using trendlines and moving averages

## Chart Summary

46

**Table 3.2: Summary of Excel chart types and sub-types**

Chart Type	Description
<b>Column</b>	
Clustered Column	Compares values across categories
Stacked Column	Compares the contribution of each value to a total across categories
100% Stacked Column	Compares the percentage each value contributes to a total across categories
3-D Column	Compares values across categories and across series
<b>Bar</b>	
Clustered Bar	Compares values across categories
Stacked Bar	Compares the contribution of each value to a total across categories
100% Stacked Bar	Compares the percentage each value contributes to a total across categories

**Table 3.2: Summary of Excel chart types and sub-types (cont.)**

Chart Type	Description
<b>Line</b>	
Line	Displays a trend over time or categories
Stacked Line	Displays the trend of the contribution of each value over time or categories
100% Stacked Line	Displays the trend of the percentage each value contributes over time or categories
3-D Line	Displays a line with a 3-D visual effect
<b>Pie</b>	
Pie	Displays the contribution of each value to a total
3-D Pie	Displays the contribution of each value to a total with a 3-D visual effect
Pie of Pie	Displays a main pie chart with user-defined values extracted and combined into a second pie plot
Exploded Pie	Displays the contribution of each value to a total value while emphasizing individual values
Bar of Pie	Displays a main pie chart with user-defined values extracted and combined into a stacked bar as the second plot
<b>X Y (Scatter)</b>	
	Compares pairs of values; display options include Scatter with data points connected by lines; Scatter with data points connected by smoothed lines without markers; and Scatter with data points connected by lines without markers
<b>Area</b>	
Area	Displays the trend of values over time or categories
Stacked Area	Displays the trend of the contribution of each value over time or categories
100% Stacked Area	Displays the trend of the percentage each value contributes over time or categories
<b>Doughnut</b>	
Doughnut	Displays the contribution of each value to a total (similar to a pie chart), but can contain multiple series
Exploded Doughnut	Displays the contribution of each value to a total value while emphasizing individual values (similar to an exploded pie chart), but can contain multiple series
<b>Radar</b>	Displays changes in values relative to a center point
<b>Bubble</b>	Compares sets of three values; similar to a scatter chart with the third value displayed as the size of a bubble marker
<b>Stock</b>	
High-Low-Close	Requires three series of values in this order
Open-High-Low-Close	Requires four series of values in this order
Volume-High-Low-Close	Requires four series of values in this order
Volume-Open-High-Low-Close	Requires five series of values in this order