Microsoft Excel 2013: Data Analysis

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Description
We will show you how to use Excel to extract meaning from data. We will bring in data from webpages, convert and format data in automated ways, look at ways to make data cleaner and more reliable, introduce various data analysis tools in Excel, including Conditional formatting, Tables, What-if Analysis and solvers.

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Learning Objectives

- Know how to use sort and filter
- Use conditional formatting to have a quick analysis on large data set
- Understand the differences between tables and ranges
- Learn how to insert, sort and filter a table, and how to display a total row
- Learn how to use goal seek and other What-if Analysis tools

Web Resources

- Microsoft Office Online Training
  (http://office.microsoft.com/en-us/training/).
- Safari Tech Books Online – electronic books. Type “Safari” in Penn Libraries FindIt box to get the link.
- Lynda.com video tutorials – Weigle information Commons and the Vitale Digital Media Lab have a site license to Lynda.com (http://wic.library.upenn.edu/wicideas/lynda.html).
- Google!
Data Analysis Tools in Excel

- **Sort**: You can sort your Excel data on one column or multiple columns. You can sort in ascending or descending order.
- **Filter**: Filter your Excel data if you only want to display records that meet certain criteria.
- **Conditional Formatting**: Conditional formatting in Excel enables you to highlight cells with a certain color, depending on the cell's value.
- **Charts**: A simple Excel chart can say more than a sheet full of numbers. As you'll see, creating charts is very easy.
- **Pivot Tables**: Pivot tables are one of Excel's most powerful features. A pivot table allows you to extract the significance from a large, detailed data set.
- **Tables**: Tables allow you to analyze your data in Excel quickly and easily.
- **What-If Analysis**: What-If Analysis in Excel allows you to try out different values (scenarios) for formulas.
- **Solver**: Excel includes a tool called solver that uses techniques from the operations research to find optimal solutions for all kind of decision problems.
- **Analysis ToolPak**: The Analysis ToolPak is an Excel add-in program that provides data analysis tools for financial, statistical and engineering data analysis.

Note: For Sort, Filter you can see handout of Excel Basics workshop (http://guides.library.upenn.edu/content.php?pid=319072&sid=2611376)

Also for Chart (http://guides.library.upenn.edu/content.php?pid=319072&sid=2611377)

Pivot Tables (http://guides.library.upenn.edu/content.php?pid=319072&sid=2611378)

Solver and Analysis ToolPak are both in Excel Add-Ins

Solver (http://www.solver.com)


**Conditional Formatting**

1. Select the data range that you want to conditionally format
2. Under **Home** Ribbon, **Styles** group, click on **Conditional formatting**

Note: You can use **Highlight Cells Rules, Top/Bottom Rules** to make emphasis on your data. **Data Bars, Color Scales and Icon Sets** can be used to show the trend of data. You can also create new rule on your own by clicking on **New Rules**.
Tables
In new versions of Excel, “format as data table” makes data analysis easy. It automates naming, sorting, filtering and also adding data easily.

Insert a table
1. Choose a chunk of data and click on Insert ribbon, choose table
2. Check for names at top left under Design, Properties
   Use Convert to Range to get back to normal range.

Formatting and Style
Under Design ribbon, in the Table Style Options group, you can choose to add or delete table elements by clicking checking boxes.
In the Table Styles group, Excel has already provided several default styles and also you can create new table styles.

Sort, Filter, and total row
Each data table comes with filters and sorting options so that you can filter and sort the data in that table independently.

By clicking Total Row under Table Style Options, you can easily make summary with your data.
What’s more, you can also easily change the summary type from defaulted “Sum” to other types, such as “Average”, “Count” and so on.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Unit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pencil</td>
<td>$1.00</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Ruler</td>
<td>$2.00</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Eraser</td>
<td>$3.00</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Note: in table, you can write meaningful looking formulas instead of using cell references.

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Unit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pencil</td>
<td>$1.00</td>
<td>3</td>
<td>=[@Price]*[@Unit]</td>
</tr>
</tbody>
</table>
What-If Analysis

What-if analysis is the process of changing the values in cells to see how those changes will affect the outcome of formulas on the worksheet.

You can find What-if Analysis under DATA ribbon, Data Tools group. There are three components of What-if Analysis: Goal Seek, Data Table and Scenario Manager.

Goal Seek

Goal Seek is like finding the solution of an equation - you have already known the value of dependent variable then you want to see what input value the formula requires to get the result.

For example, suppose there is a store, which sells 1000 products one day with price of 15 dollars and cost of 6 dollars per product, thus the profit should be 1000*(15-6)=9000 dollars.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Store</td>
</tr>
<tr>
<td>2</td>
<td>Items Sold</td>
</tr>
<tr>
<td>3</td>
<td>Unit Price</td>
</tr>
<tr>
<td>4</td>
<td>Cost per Item</td>
</tr>
<tr>
<td>5</td>
<td>Profit</td>
</tr>
</tbody>
</table>

Now the owner wants to reach 10000 dollars profit for one day, then you can use Goal Seek to determine how many products you have to sell for one day without changing price and cost.

Open Goal Seek dialog box.

Set cell – the cell contains the value you want to get: B6;
To value – set value to 10000;
By changing cell – the independent variable you want to change: B2.

Then you should see the value in B2 changes to 1111.111.

Note: Goal Seek works with only one variable input value. If you want to determine more than one input value, you should instead use the Solver add-in.
Data Table

If you have a formula that uses one or two variables, or multiple formulas that all use one common variable, you can use a data table to see all the outcomes in one place.

Take the same example as in Goal Seek.

One Variable Data Table

Suppose you want to know how the change on the unit price will change the daily profit.

- First, build a table like this:
  In H2:H7 are those changed Unit Price and in cell I1, type “=B6” (refer to the Profit Cell).
- Select the range H1:I7 and open Data Table under What-if Analysis.
- Click in the Column input cell and select B3 (Since this a one variable data table we will leave Row input cell empty for now).
- Click OK and then you will find the corresponding profit value in cells I2:I7.

Two Variables Data Table

- This time, build a table like this:
  In H2:H7 are those changed Unit Price, in I1:K1 are changed value of Items Sold, and in cell H1, type “=B6” (refer to the Profit Cell). So in this case, we have two variables – Unit Price and Items Sold.
- Select the range H1:K7 and open Data Table under What-if Analysis.
- Click in the Column input cell and select B3, click in the Row input cell and select B2.
- Click OK and then you will find the corresponding profit value in cells I2:K7.

Scenario Manager

Here is the definition of Scenario Manager from Microsoft:
A scenario is a set of values that Excel saves and can substitute automatically in cells on a worksheet. You can create and save different groups of values on a worksheet and then switch to any of these new scenarios to view different results.

- Open Scenario Manager dialog box under What-if Analysis.
- Add a scenario by click on Add.
- In Scenario name type a name, in this example, 30 Unit Price.
- Click on Changing cells and select cell B3, click OK.

- In Scenario Values box, type 30 and click on OK again.

- Add more scenarios as you want.

- If you want to see the result of one scenario, select the scenario and click Show button, you will see the changed value of Profit.
If you want to see all the results, click on Summary, and select B6 for Result cells and click OK. Then you will have this Scenario Summary table appear as a new spreadsheet.

<table>
<thead>
<tr>
<th>Changing Cells:</th>
<th>$B$3</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Result Cells:</td>
<td>$B$6</td>
<td>9000</td>
<td>14000</td>
<td>19000</td>
<td>24000</td>
</tr>
</tbody>
</table>

Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.