Instructor’s Manual Materials to Accompany

EXPLORING MICROSOFT® OFFICE 2013, VOLUME 1

## EXCEL CHAPTER 6: What-If Analysis

### Available Instructor Resources

|  |  |  |
| --- | --- | --- |
| **Resource** | **File Name** | **Found** |
| **Student Data Files** | various | Online Instructor Resource Center |
| **Solution Files** | various | Online Instructor Resource Center  |
| **Answer Keys**  |   | Online Instructor Resource Center  |
|  Matching | e06\_answerkey\_match |
|  Multiple Choice | e06\_answerkey\_mc |   |
|  Concepts Checks | e06\_answerkey\_concepts |   |
| **Scorecards** | e06b1Tips\_scorecard | Online Instructor Resource Center  |
| **Scoring Rubrics** | e06b1Tips\_rubric | Online Instructor Resource Center  |
| **Annotated Solution File** | e06b1Tips\_annsolution | Online Instructor Resource Center  |
| Scripted Lecture (Script) | e06\_script | Online Instructor Resource Center  |
|  Scripted Lecture Solution | e06\_script\_solution |
|  Scripted Lecture Data | e06\_script\_data |   |
| **PowerPoint Presentation** | e06\_powerpoints | Online Instructor Resource Center  |
| **Testbank** | e06\_testbank | Online Instructor Resource Center  |
| **Instructor's Manual (lesson plans incl.)** | e06\_instructormanual | Online Instructor Resource Center  |
| **Assignment Sheet** | e06\_assignsheet | Online Instructor Resource Center  |
| **Prepared Exam (Chapter & App)** |   | Online Instructor Resource Center  |
|  Prepared Exam-Chap instruction | e06\_exam\_chap\_instruction |
|  Prepared Exam-Chap solution | e06\_exam\_chap\_solution |
|  Prepared Exam-Chap Data | e06\_exam\_chap\_data |
|  Prepared Exam-Chap Annotated Sol. | e06\_exam\_chap\_annsolution |
|  Prepared Exam-Chap Scorecard | e06\_exam\_chap\_scorecard |
|  Prepared Exam-App instruction | e06\_cumexam\_instruction |   |
|  Prepared Exam-App solution | e06\_cumexam\_solution |   |
|  Prepared Exam-App Data | e06\_cumexam\_data |   |
|  Prepared Exam-App Annotated Sol. | e06\_cumexam\_annsolution |   |
|  Prepared Exam-App scorecard | e06\_cumexam\_scorecard |   |
| **File Guide** | e06\_file\_guide | Online Instructor Resource Center  |
| **Instructor Resource Card** | e06\_ircard | Online Instructor Resource Center  |
| **Objective Map** | e06\_objectivesmap | Online Instructor Resource Center  |
| **Online Chapter Review** | e06\_chapt\_checklist | Companion Website for Students |
| **Grader Project** |   |   |
|  Grader-instruction | e06\_grader\_instruction | Online Instructor Resource Center  |
|  Grader-solution | e06\_grader\_solution |
|  Grader-data | e06\_grader\_data |
|  Grader-annoted. Solution | e06\_grader\_annsolution |   |
|  Grader-scorecard | e06\_grader\_scorecard |   |
| **Additional Projects (Practice & Mid Level)** |   | Online Instructor Resource Center  |
|  Additional Proj-Practice instruction | e06\_p\_addproject\_instruction |
|  Additional Proj- Practice solutions | e06\_p\_addproject\_solution |
|  Additional Proj-Practice Data | e06\_p\_addproject\_data |
|  Additional Proj-Practice Ann Sol. | e06\_p\_addproject\_annsolution |
|  Additional Proj-Practice Scorecard | e06\_p\_addproject\_scorecard |
|  Additional Proj-Mid Level instruction | e06\_ml\_addproject\_instruction |   |
|  Additional Proj-Mid Level solutions | e06\_ml\_addproject\_solution |
|  Additional Proj-Mid Level Data | e06\_ml\_addproject\_data |
|  Additional Proj-Mid Level Ann Sol. | e06\_ml\_addproject\_annsolution |   |
|  Additional Proj-Mid Level Scorecard | e06\_ml\_addproject\_scorecard |   |

### CHAPTER OBJECTIVES

#### When students have finished reading this chapter, they will be able to:

* Create a one-variable data table
* Create a two-variable data table
* Identify an input value with Goal Seek
* Use Scenario Manager
* Generate scenario summary reports
* Load the Solver add-in
* Optimize results with Solver

### CHAPTER OVERVIEW

#### The major sections in this chapter are:

1. **One- and Two-Variable Data Tables:** Creating a one-variable data table; creating a two-variable data table
2. **Goal Seek and Scenario Manager:** Identifying an input value with Goal Seek; using Scenario Manager; generating scenario summary reports
3. **Solver:** Loading the Solver add-in; optimizing results with Solver

### CLASS RUNDOWN

1. Have students turn in homework assignments.
2. Talk about chapter using discussion questions listed below.
3. Use PowerPoint presentation to help students understand chapter content.
4. Demonstrate Excel 2013.
5. Run through Scripted Lectures for chapter.
6. Have students complete Capstone Exercise for Excel Chapter 6.
7. Use MyITLab for in-class work or to go over homework.
8. Give students Homework Handout for next class period.

### LEARNING OBJECTIVES

#### At the end of this lesson students should be able to:

* Enter substitution values for a one-variable data table
* Enter formulas and complete the data table
* Format the one-variable data table
* Set up the structure for a two-variable data table
* Complete the two-variable data table
* Use Goal Seek
* Create a scenario
* Create additional scenarios
* Generate and format a summary report
* Load the Solver add-in
* Set the objective and variable cells
* Define the constraints
* Generate a report

### KEY TERMS

### Add-in – A program that can be added to Excel to provide enhanced functionality.

### Binding constraint – A constraint that Solver enforces to reach the target value.

### Changing variable cell – A cell containing a variable whose value changes until Solver optimizes the value in the objective cell.

### Constraint – A limitation that imposes restrictions on a spreadsheet model as Solver determines the optimum value for the objective cell.

### Goal Seek – A tool that identifies the necessary input value to obtain a desired goal.

### Nonbinding constraint – A constraint that does not restrict the target value that Solver finds.

### Objective cell – The cell that contains the formula-based value that you want to maximize, minimize, or set to a value in Solver.

### One-variable data table – A data analysis tool that provides various results based on changing one variable.

### Optimization model – A model that finds the highest, lowest, or exact value for one particular result by adjusting values for selected variables.

### Scenario – A set of values that represent a possible situation.

### Scenario Manager – A tool that enables you to define and manage scenarios to compare how they affect results.

### Scenario summary report – A worksheet that contains scenarios, their input values, and their respective results from using Scenario Manager.

### Solver – An add-in application that manipulates variables based on constraints to find the optimal solution to a problem.

### Substitution value – A value that replaces the original value of a variable in a data table.

### Two-variable data table – A data analysis tool that provides results based on changing two variables.

### Variable – A value that you can change to see how that change affects other values.

### What-if analysis – The process of changing variables to observe how changes affect calculated results.

### DISCUSSION QUESTIONS

### Why is it important to know whether to use a one- or a two-variable data table?

### What is what-if analysis?

* What are the differences between a data table, a list, and a data range? Why is it important to know?

### WHEN USING SCRIPTED LECTURE IN CLASS, DEMONSTRATE HOW TO:

* Enter substitution values for a one-variable data table
* Enter formulas and complete the data table
* Format the one-variable data table
* Set up the structure for a two-variable data table
* Complete the two-variable data table
* Use Goal Seek
* Create a scenario
* Create additional scenarios
* Generate and format a summary report
* Load the Solver add-in
* Set the objective and variable cells
* Define the constraints
* Generate a report

### CONNECTIONS PRACTICAL PROJECTS AND APPLICATIONS

* Have students use Goal Seek to determine how much they would need to deposit monthly, quarterly, and/or annually to have saved $1,000,000 by their retirement age. Provide an interest rate for them.
* Reports have to generate meaningful data to be useful. Ask students to discuss how “garbage in, garbage out” applies to data and reports, and have them speculate on which type of reports might provide useless or even wrong information to users.

### TEACHING NOTES

#### One- and Two-Variable Data Tables

*What-if analysis enables experimentation with different variables or assumptions which can be observed and compared as to how the changes affect a related outcome.*

1. Creating a One-Variable Data Table
	* Plan the format of your data table. Users need to be able to immediately tell what they are looking at, where to start on the page, and have context for the information.
	* **Teaching** **Tip**: Instead of using the Series dialog box, you can use Auto Fill to complete a series of substitution values. To do this, enter the first two substitution values (such as 5% and 5.5%). Select the cells containing these two values and drag the fill handle down until the ScreenTip displays the last substitution value you want. Excel sets the increment pattern based on the difference between the first two values.
	* Users sometimes “hide” data on a spreadsheet by using a white font on a white background. This might be fine for the original user, but if someone else has to maintain or edit the sheet, it can be problematic. The Find tool will let you find any cells that have been formatted this way.
2. Creating a Two-Variable Data Table
	* **Teaching Tip:** After formatting the numbers, you may see ### displayed in the cells. The pound signs indicate the number is larger than the width of the column. To automatically expand the column to the proper width, click the HOME tab, click Format from the Cells group, and then select Auto Fit Column Width.
	* Be wary of formatting cells as Text. The Text cell format treats every value as text—which might cause problems later, and troubleshooting could be time consuming. When in doubt, use General formatting.
	* Avoid using tables just to format data—tables do not have access to more advanced features, such as Subtotals. If you just want your data to look like a table, you can manually format it, without losing access to functionality.
	* Avoid hiding rows and columns unless it’s really necessary—even if the row or column is hidden, Excel will still evaluate the data, and this can cause errors. In addition, it’s very easy for another user to overlook the fact that you have hidden rows and columns—causing more problems.
	* Avoid using numbers in column headers—it can cause mathematical errors when those cells are inadvertently included. Use descriptive text instead.

#### Goal Seek and Scenario Manager

 *What-if analysis tools such as Goal Seek and Scenario Manager are better suited for some situations, such as making forecasts or predictions involving quantifiable data.*

1. Identifying an Input Value with Goal Seek
	* The Goal Seek Status dialog box tells you that Goal Seek found a solution—if this is not the case, the Step and Pause buttons become active.
	* Students sometimes will not notice the Goal Seek tool has performed its job by changing the value in the destination cell—and they think it did not work. Make sure you show this step enough times so they understand it.
	* To toggle between the “after” and “before” values after you have closed the Goal Seek Status dialog box, click the Undo button or use Ctrl+Z (for “before”) or Redo/Ctrl+Y (for “after”).
2. Using Scenario Manager
	* **Teaching** **Tip**: When you create scenarios, Excel maintains those scenarios on the worksheet that was active when you created them. You can create scenarios for each worksheet in a workbook. The Scenario Manager dialog box displays only those scenarios you have created on the active worksheet.
	* **Teaching Tip**: To help you know what data to enter for the changing cells, you might want to assign a range name to the variable cells before using Scenario Manager. If you do this, the range names, rather than the cell references, appear in the Scenario Values dialog box.
	* **Teaching Tip**: If you believe you made any data entry errors, or if you want to double-check your values, select a scenario and click Edit. You can then change values in the Edit Scenario dialog box and click OK.
3. Generating Scenario Summary Reports
	* **Teaching** **Tip**: Unlike one- and two-variable data tables that update results if you change other values in the input area, scenario reports do not update. If you change other values or assumptions, or if you add, edit, or delete scenarios, you will have to generate a new scenario report. To avoid this problem, do your best to double-check the scenarios to ensure they are perfect before you generate a scenario summary report.
	* **Teaching Tip**: Each time you generate a summary, Excel inserts another Scenario Summary worksheet. You can delete a summary worksheet if you no longer need the data.

#### Solver

*Add-ins such as Solver provide enhanced functionality; Solver searches for the best or optimum solution to a problem by manipulating values.*

1. Loading the Solver Add-In
* **Teaching Tip:** If you are working in a campus computer lab, your institution may prevent you from loading applications, such as Solver. Check with your instructor if your system in the lab prevents you from loading Solver.
* Users might need administrator privileges to load the Solver add-in.
1. Optimizing Results with Solver
	* **Teaching** **Tip**: One of the constraint operators is integer. This constraint requires the changing variable cell to be an integer, or whole number. For example, a manufacturing plant does not produce partial units such as 135.62 units, and a department store does not sell 18.32 shirts. To ensure that Solver produces realistic results, you should create integer constraints for these types of quantities.
	* **Teaching Tip**: Another often-overlooked constraint is the requirement that the value of a variable cell be greater than or equal to zero. Physically, it makes no sense to produce a negative number of products in any category. Mathematically, however, a negative value in a changing variable cell may produce a higher value for the objective cell. By default, the Make Unconstrained Variables Non-Negative check box is selected to ensure variable values are greater than or equal to zero. If you want to allow the lower end of a variable’s value to be a negative value, you can create a constraint such as B2>=−100. That constraint takes priority over the Make Unconstrained Variables Non-Negative check box.
	* **Teaching Tip**: If you want to save the solution parameters to use in Scenario Manager, click Save Scenario in the Solver Results dialog box and type a name for the scenario in the *Scenario name* box.
* **Teaching Tip**: Be careful to select the correct range when using Solver. If you accidentally select the wrong cell, Solver might produce inaccurate results.
* **Teaching Tip**: Click Add to complete the current constraint and open an Add Constraint dialog box to enter another constraint. Click OK in the Add Constraint dialog box only when you have completed the last constraint and want to return to the Solver Parameters dialog box to solve the problem.
* **Teaching Tip**: If you see the error message, Solver: An unexpected internal error occurred, or available memory was exhausted, close Solver, click Undo, remove Solver as an add-in, save and close the workbook, open the workbook again, and then enable the Solver add-in again. Then click Solver in the Analysis group, click Solve, select Answer Report, and then click OK.
* Solver can be used in conjunction with the Scenario Manager to help set up a problem or to save a solution to view at a later date.
* You can save Solver’s solution to a problem as a scenario—use the Save Scenario button in the Solver dialog box. This lets you view it later with the Scenario Manager.
* Remind students that the Solver add-in has to be loaded before it can be used—if they have loaded it at school, they will need to perform that step again on their own computer. This may seem obvious but it’s a common mistake. If the Solver button is visible in the Analysis group on the Data tab, the add-in has been loaded.

### ONLINE CHAPTER REVIEW

To find an online chapter review to help your students practice for tests, visit the Companion Website at <http://www.pearsonhighered.com/exploring/>.

### ADDITIONAL WEB RESOURCES

1. What's new in Excel 2013 — <http://office.microsoft.com/en-us/excel-help/what-s-new-in-excel-2013-HA102809308.aspx>
2. Online Excel Help – [www.mrexcel.com](http://www.mrexcel.com)
3. Microsoft Tech Support – <http://support.microsoft.com>

### PROJECTS AND EXERCISES

|  |  |  |
| --- | --- | --- |
|  | **Data file** | **Save As** |
| Hands-on Exercise 1 | e06h1Mortgage.xlsx | e06h1Mortgage\_LastFirst.xlsx |
| Hands-on Exercise 2 | e06h1Mortgage\_LastFirst.xlsx | e06h2Mortgage\_LastFirst.xlsx |
| Hands-on Exercise 3 | e06h2Mortgage\_LastFirst.xlsx | e06h3Mortgage\_LastFirst.xlsx |
| Practice Exercise 1 | e06p1Bonus.xlsx | e06p1Bonus\_LastFirst.xlsx |
| Practice Exercise 2 | e06p2Bakery.xlsx | e06p2Bakery\_LastFirst.xlsx |
| Mid-Level Exercise 1 | e06m1House.xlsx | e06m1House\_LastFirst.xlsx |
| Mid-Level Exercise 2 | e06m2RaysAC.xlsx | e06m2RaysAC\_LastFirst.xlsx |
| Mid-Level Exercise 3 | none | e06m3CollegeBudget\_LastFirst.xlsx |
| BYC 2 Research | e06b2Snow.xlsx | e06b2Snow\_LastFirst.xlsx |
| BYC 3 Disaster Recovery | e06b3Mining.xlsx | e06b3Mining\_LastFirst.xlsx |
| BYC 4 Collaboration | e06b4Repayment.xlsx | e06b4Repayment\_LastFirst.xlsx |
| Capstone | e06c1Dance.xlsx | e06c1Dance\_LastFirst.xlsx |

### CHAPTER REVIEW/ANSWERS TO END OF CHAPTER MATERIAL

**Key Terms Matching Answer Key**

1. A **Binding constraint (B)** is a constraint that Solver enforces to reach the target value.
2. A **Changing variable cell (C)** is a cell containing a variable whose value changes until Solver optimizes the value in the objective cell.
3. **Solver (M)** is an add-in application that manipulates variables based on constraints to find the optimal solution to a problem.
4. A **One-variable data table (H)** is a data analysis tool that provides various results based on changing one variable.
5. A **Scenario (J)** is a set of values that represent a possible situation.
6. An **Objective cell (G)** is the cell that contains the formula-based value that you want to maximize, minimize, or set to a value in Solver.
7. An **Optimization model (I)** finds the highest, lowest, or exact value for one particular result by adjusting values for selected variables.
8. A **Nonbinding constraint (F)** is a constraint that does not restrict the target value that Solver finds.
9. A **What-if analysis (Q)** is the process of changing variables to observe how changes affect calculated results.
10. A **Variable (P)** is a value that you can change to see how that change affects other values.
11. A **Substitution value (N)** replaces the original value of a variable in a data table.
12. A **Constraint (D)** is a limitation that imposes restrictions on Solver.
13. An **Add-in (A)** is any program that can be added to Excel to provide enhanced functionality.
14. A **Scenario summary report (L)** is a worksheet that contains scenario results.
15. A **Two-variable data table (O)** is a data analysis tool that provides results based on changing two variables.
16. **Goal Seek (E)** is a tool that identifies the necessary input value to obtain a desired goal.
17. **Scenario Manager (K)** enables you to define and manage scenarios to compare how they affect results.

**Multiple Choice Answer Key**

1. Which what-if analysis tool is the best for complex calculations requiring constrained optimization?

**(d) Solver**

1. Which tools are best suited to calculate the impact of multiple interest rates on an auto loan? (Check all that apply)

**(b, c) Scenario Manager; One-variable data table**

1. Which tool is most effective when comparing the impacts of both various interest rates and down payments on a home mortgage?

**(c) Two-variable data table**

1. This tool calculates the value required in a single cell to produce a desired result within a related cell.

**(a) Goal Seek**

1. This analysis tool has the ability to handle multiple adjustable cells while minimizing, maximizing, or meeting goals.

**(b) Solver**

1. Which of the following is an Excel Add-in?

**(b) Solver**

1. Doug would like to purchase a new automobile. He has budgeted for $600 per month. If the interest and number of payments are constant variables that cannot change, which analysis tool should Doug use to calculate the amount to spend on a car?

**(a) Goal Seek**

1. Which dialog box enables you to specify the result cells for a scenario summary report?

**(a) Scenario Summary**

1. Which of the following tools can incorporate constraints?

**(b) Solver**

1. How can you determine if the Solver add-in is active? (Check all that apply)

**(a, c) Solver is available via right-click; Solver appears in the Data tab of the Ribbon.**