# **Microsoft Excel 2019**

# **Module 8: Performing What-If Analyses**

# **A Guide to this Instructor’s Manual:**

We have designed this Instructor’s Manual to supplement and enhance your teaching experience through classroom activities and a cohesive module summary.

This document is organized chronologically, using the same headings in blue that you see in the textbook. Under each heading you will find (in order): Lecture Notes that summarize the section, Teacher Tips, Classroom Activities, and Lab Activities. Pay special attention to teaching tips and activities geared toward quizzing your students, enhancing their critical thinking skills, and encouraging experimentation within the software.

In addition to this Instructor’s Manual, our Instructor’s Resources also contains PowerPoint Presentations, Test Banks, and other supplements to aid in your teaching experience.

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**Module Objectives**

Students will have mastered the material in this module when they can:

Section 8.1

* Explore the principles of cost-volume-profit relationships
* Create a one-variable data table
* Create a two-variable data table

Section 8.2

* Create and apply different Excel scenarios with the Scenario Manager
* Generate a scenario summary report
* Generate a scenario PivotTable report

Section 8.3

* Explore the principles of a product mix
* Run Solver to calculate optimal solutions
* Create and apply constraints to a Solver model
* Save and load a Solver model

**[Understanding Cost-Volume Relationships](#FM2)**

LECTURE NOTES

* Explore the principles of cost-volume-profit relationships.
* Compare expenses and revenue.
* Explain break-even analysis.
* Demonstrate how to find the break-even point with what-if analysis.

TEACHER TIP

Point out that a CVP analysis shows the relationship between a business's expenses, volume of business, and profit. It shows how much volume the business needs to break even, given the expenses that the business incurs. It also shows what happens to the profit if the volume of business increases above the break-even point, or decreases below the break-even point.

CLASSROOM ACTIVITIES

1. Class Discussion: Engage your students in the following concept: How can you calculate the profits from a business? (Answer: If you know the fixed expenses, and you know the total variable expenses for a given volume of business, and you know the total revenue for that same volume of business, all you have to do is total the expenses and subtract them from the revenue.)
2. Quick Quiz:

* \_\_\_\_\_\_\_ change in proportion to the amount of business a company does. (Answer: Variable expenses)
* What does CVP stand for? (Answer: Cost Volume Profit)
* The point where revenue equals expenses is called the \_\_\_\_\_\_\_. (Answer: break-even point)
* A \_\_\_\_\_\_\_\_ expense is an expense that is part variable and part fixed. (Answer: mixed)

LAB ACTIVITY

Before students begin using the various solution tools in this module, have them try to solve the problem themselves. Divide the class into groups of three or four. Have each group print out the Creative worksheet. Ask each group to try to come up with some solutions for reaching the optimal product mix. Encourage them to try to come up with more than one solution. The idea of this exercise is for students to get a feel for how difficult it is to solve these kinds of problems on their own. Allow the groups as much time as you can spare to allow them to falter a bit. After some time, have the groups come back together and share with the class one of their solutions.

**Working with Data Tables**

LECTURE NOTES

* Demonstrate how to create and chart a one-variable data table.
* Show how to modify a data table.

TEACHER TIP

Point out that doing multiple what-if analyses is time-consuming and tedious if you do it by hand. Even if you have an Excel spreadsheet set up to do the calculations, you can only calculate the results for one input variable at a time. However, your students should know that, in Excel, you can set up a data table to display the results of several input values. That is, you can ask Excel to do multiple what-if analyses, and display the results in a table.

CLASSROOM ACTIVITIES

1. Quick Quiz:

* True/False: A one-variable table contains one input cell and any number of result cells. (Answer: True)
* A \_\_\_\_\_\_\_ table is an Excel table that displays the results from several what-if analyses. (Answer: data)
* The \_\_\_\_\_\_\_ is the cell on which values placed in the first column of the data table are based. (Answer: column input cell)

1. Class Discussion: How do you fill a table with the result values? (Answer: You select the range that contains the data table (excluding the column headings), and then you open the Data Table dialog box, specifying the input cell based on whether the input values are arranged in rows or columns.)
2. Class Discussion: Ask students if they can see the benefits of doing a cost-volume-profit analysis. Can they provide examples from their own work situation or from current business news? Is there a difference between one-variable data tables and two-variable data tables? Which data tables are more useful for which types of applications?
3. Class Discussion: One-variable data tables provide the results of several what-if analyses, but the results are often clearer if you include a CVP chart. Why? (Answer: The chart gives a better picture of the relationship between sales volume, revenue, and expenses.)

**Creating a Two-Variable Data Table**

LECTURE NOTES

* Explain what a two-variable data table is and how to use it.
* Show how to format the result cell.

TEACHER TIP

Explain that sometimes you want to see what would happen if you vary two inputs, instead of just one. Excel provides the capability to create two-variable data tables, which allow two input variables and one result variable. The data table will have the values for one input variable across the top row of the table, and the values for the other input variable down the first column.

CLASSROOM ACTIVITIES

1. Quick Quiz:

* A(n) \_\_\_\_\_\_\_ data table uses two input cells. (Answer: two**-**variable)
* True/False: A two-variable data table involves two input cells and two result cells. (Answer: False, one result cell)
* True/False: The two-variable data table is generated using the same Data Table command used with the one-variable data table. (Answer: True)
* True/False: When formatting a result cell, you don’t want to hide the cell value because that may be confusing. (Answer: False)
* True/False: You can chart the values from a two-variable data table using lines to represent the different columns of the table. (Answer: True)

**Exploring Financial Scenarios with the Scenario Manager**

LECTURE NOTES

* Show how to create and apply different Excel scenarios.
* Explain how to define a scenario.
* Demonstrate how to view a scenario.
* Discuss how to edit a scenario.

TEACHER TIP

Explain that to perform what-if analyses with more than two input variables, you have to use scenarios. A scenario is a set of input values used to perform a what-if analysis. In Excel, you use the Scenario Manager to set up and view different scenarios.

CLASSROOM ACTIVITIES

1. Class Discussion: How can scenarios be useful? Ask the students to consider the time it would take them to learn to use the Scenario Manager and become proficient with it, and compare that to the time it would take them to create possible scenarios manually. Ask them if they can provide a current example of a chart based on a scenario, perhaps from a newspaper or a magazine.
2. Quick Quiz:

* A(n) \_\_\_\_\_\_\_ is a set of values that Excel can put into a worksheet. (Answer: scenario)
* A(n) \_\_\_\_\_\_\_ enables you to create as many scenarios as you want. (Answer: Scenario Manager)
* True/False: The Scenario Manager defines input values for various scenarios and allows you to switch a workbook from one scenario to another. (Answer: True)
* True/False: The Scenario Manager cannot create reports to summarize the impact of scenarios. (Answer: False)
* True/False: The number of scenarios you can create is limited only by your computer’s memory. (Answer: True)

**[Creating Scenario Summary Reports](#FM2)**

LECTURE NOTES

* Show how to generate a scenario summary report.

TEACHER TIP

Explain that using the Scenario Manager, you can display a summary of the results from all of the scenarios you have created. This data can be displayed in a summary table or a PivotTable.

CLASSROOM ACTIVITIES

1. Quick Quiz:

* A(n) \_\_\_\_\_\_\_ lists the values for the changing cells and result cells under each scenario. (Answer: scenario summary report)
* True/False: Scenarios are listed by number. (Answer: False, by name)
* Once scenarios are merged, they can be analyzed using a Scenario \_\_\_\_\_\_\_\_\_\_ report. (Answer: PivotTable)

**Optimizing a Product Mix**

LECTURE NOTES

* Discuss how to maximize profit margins using optimal product mix.

CLASSROOM ACTIVITIES

1. Quick Quiz:

* What is an optimal product mix? (Answer: The product mix that will result in the most profit for the company while still meeting the demands of the market.)
* What approach gives a quick financial picture under different scenarios? (Answer: Trial-and-error)
* True or False: Using a formula that takes into account sales price, costs, and variable expenses, it is easy to find the optimal product mix for a company. (Answer: False. The best way to find the optimal product mix usually isn’t obvious. There are just too many possible combinations.)

**[Finding the Optimal Solution with Solver](#FM2)**

LECTURE NOTES

* Explain how to activate Solver.
* Discuss how to set the objective cell and variable cell.
* Show how to create and apply constraints to a Solver model.

TEACHER TIP

It is likely that some of your students are wondering how Solver works. Share with them that it is designed to use an iterative process. That is, it starts with an initial solution, and then does the problem over and over, using different values in the changing variables. When a change to a variable results in a better solution, Solver makes another change to the same variable in the same direction. When a change results in a worse solution, Solver does not make any more changes to that variable in that direction. Solver continues to make changes and re-run the problem, until it arrives at a solution that is not significantly better than the previous one. At that point, Solver reports success.

CLASSROOM ACTIVITIES

1. Quick Quiz:

* Solver is an \_\_\_\_\_\_\_\_, which is a program that adds commands and features to Microsoft Office applications such as Excel. (Answer: add-in)
* True/False: Solver is supplied with every desktop version of Microsoft Excel, but might not be “turned on.” (Answer: True)
* True/False: Constraints can be applied only to adjacent ranges. (Answer: True)
* Which of the following constraint types constrains the cell(s) to be integers? (Answer: A)

1. Int
2. Bin
3. Dif
4. <=

**Exploring the Iterative Process**

LECTURE NOTES

* Describe what the iterative process is.
* Discuss the usefulness of a Solver answer report and demonstrate how to create one.

CLASSROOM ACTIVITIES

1. Quick Quiz:

* What is the iterative process? (Answer: When Solver starts with an initial solution and uses that as a basis to calculate a new solution.)
* What are the two types of “optimum” used in the Iterative process? (Answer: Global and Local)
* What type of different reports can Solver create? (Answer: answer report, sensitivity report, limits report)
* A(n) \_\_\_\_\_\_\_ constraint is a constraint that must be included in the Solver model, and is a limiting factor in arriving at the solution. (Answer: binding)
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is used for simple linear expressions involving only the operations of addition, subtraction, multiplication, and division. (Answer: Simplex LP method)
* Which method is used for complicated expressions involving nonlinear functions such as some exponential and trigonometric functions? (Answer: B)

1. Simplex LP method
2. GRG Nonlinear method
3. Evolutionary method
4. Optimum method

* A(n) \_\_\_\_\_\_\_ constraint is a constraint that did not need to be included as part of the Solver model. (Answer: nonbinding)

**[Saving and Loading Solver Models](#FM2)**

LECTURE NOTES

* Show how to save and load a Solver model.

CLASSROOM ACTIVITIES

1. Quick Quiz:

* True or False: You can only create one solver model at a time. (Answer: False. You can create as many as you need to effectively analyze the data.)
* True or False: When new data is entered, you will need to create a new Solver model to analyze it. (False; you can load and apply existing models as new data is entered.)

**End of Module Material**

* **Review Assignments:** Review Assignments provide students with additional practice of the skills they learned in the module using the same module case, with which they are already familiar. These assignments are designed as straight practice and do not include anything of an exploratory nature.
* **Case Problems:** A typical NP module has four Case Problems following the Review Assignments. Short modules can have fewer Case Problems (or none at all); other modules may have five Case Problems. The Case Problems provide further hands-on assessment of the skills and topics presented in the module, but with new case scenarios. There are five types of Case Problems:
* **Apply**. In this type of Case Problem, students apply the skills that they have learned in the module to solve a new problem.
* **Create**. In a Create Case Problem, students are either shown the end result (such as a finished Word document) and asked to create the document based on the figure provided, or, students are asked to create something from scratch in a more free-form manner.
* **Challenge**. A Challenge Case Problem involves one or more Explore steps. These steps challenge students by having them go beyond what was covered in the module, either with guidance in the step or by using online Help as directed.
* **Research**. A Research Case Problem requires students to find information on the Internet to help solve a problem or to include in the file they are creating.
* **Troubleshoot**. In this type of Case Problem, certain steps of the exercise require students to identify and correct errors that are intentionally placed in the files. Completing these steps helps to promote problem solving and critical thinking.

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