

CHAPTER 10

Smart *Excel* Appendix

Appendix Contents

Excel prerequisites

- Move or copy a worksheet
- Delete a worksheet
- Rename a worksheet

Learn to use three tools to analyze risk

- Break even analysis
- Sensitivity analysis
- Scenario analysis

Use the Smart *Excel* spreadsheets and animated tutorials at the Smart Finance section of <http://www.cengage.co.uk/megginson>.

EXCEL PREREQUISITES

You need to be familiar with the following *Excel* features to use this appendix:

- Move or Copy a worksheet
- Delete a worksheet
- Rename a worksheet

If this is new to you be sure to complete the *Excel Prereqs* tab in the Chapter 10 *Excel* file located **at the Smart Finance Web site** before proceeding.

RISK AND CAPITAL BUDGETING

Chapter 10 considers the risk dimension of project analysis. This appendix explains how to apply *Excel* to use three tools commonly used to analyze the sources of uncertainty of a project's cash flows: breakeven analysis, sensitivity analysis and scenario analysis.

One reason we have emphasized building models in the *Excel* appendices is that often input assumptions are not known with certainty. A well-built model enables the user to easily change the input assumptions and analyze the effect on output. This provides valuable information and can enhance decision making.

Now consider a common tool for analysis of risk: breakeven.

BREAKEVEN ANALYSIS

Problem: Consider the data provided on Carbonlite and Fiberspeed in Table 10.1. Create a model to find *EBIT* for each firm. Carbonlite management also wants to know how many units each firm must sell to reach *EBIT* equal to zero or breakeven.

Approach: Create a simple model to calculate *EBIT* and breakeven.

Try it yourself in a blank *Excel* file. Think about what to include in the input section and how to set up your calculations and output.

Find *EBIT* and breakeven quantity for Carbonlite and Fiberspeed.

$$\text{Breakeven} = \text{Fixed costs} / (\text{Sales price per unit} - \text{Variable cost per unit})$$

Be sure to use the parentheses in your equation to ensure the correct order of mathematical operations.

Alternatively, you can use the setup file provided on the *Breakeven* tab of the Chapter 10 *Excel* file located at the Smart Finance Web site.

You should get the following results:

Calculations and Output

	Carbonlite	Fiberspeed
Revenues	10,000,000	10,000,000
Fixed costs	5,000,000	2,000,000
Variable costs	4,000,000	7,000,000
<i>EBIT</i>	1,000,000	1,000,000
Breakeven quantity	8,333	6,667

Apply it

- **What is the significance of breakeven to Carbonlite and Fiberspeed?**

Breakeven is calculated here by setting *EBIT* to zero. The breakeven shows the number of units each firm must sell to cover fixed and variable costs. Breakeven is significantly higher for Carbonlite than for Fiberspeed due to the higher operating leverage of Carbonlite.

Breakeven provides useful information to firms contemplating new projects. Often, in project analysis, many input assumptions are unknown. As you saw in Chapter 9, changing key input assumptions can have a significant effect on net present value and internal rate of return. Breakeven provides additional information for use in project analysis, because the firm can estimate the number of units that must be sold to cover fixed and variable costs. Management can then assess the probability of reaching breakeven sales.

SENSITIVITY ANALYSIS

Another tool for analyzing risk is sensitivity analysis. In sensitivity analysis, one variable is changed, while all others are held constant. This can be repeated for all uncertain variables. The exercise illustrates which variables the output is sensitive to. We have conducted sensitivity analysis throughout these appendices, but look at this technique in more detail here.

You can conduct sensitivity analysis in our models in several ways.

1. Simply change one input assumption and note the effect on output.
2. Create a formula to analyze the effect of different input values on output.
3. Create a data table to analyze the effect of different input values on output.

Apply Approach 1

- **Suppose Carbonlite management is uncertain about future unit sales. Use the first approach to analyze the sensitivity of *EBIT* to unit sales. Simply change the input assumption on sales volume.**

What if sales are only 9,000 units?

What if sales are 11,500 units?

	Carbonlite <i>EBIT</i>	Fiberspeed <i>EBIT</i>
9,000 units	€400,000	€700,000
11,500 units	€1,900,000	€1,450,000

Carbonlite's *EBIT* is more sensitive than Fiberspeed's *EBIT* to changes in sales due to the firm's higher operating leverage.

Apply Approach 2

- **Now use the second approach to analyze the sensitivity of Carbonlite *EBIT* to sales volume. Allow volume to vary between 5,000 and 15,000 units.**

To use this approach:

First, use the fill-series feature to set up a range of sales volume from 5,000 to 15,000 on the *Sensitiv* tab of the Chapter 10 file.

Next, create a formula for *EBIT* that can be copied down the column of sales volume inputs.

The result is:

Unit Sales	EBIT
5,000	(2,000,000)
6,000	(1,400,000)
7,000	(800,000)
8,000	(200,000)
9,000	400,000
10,000	1,000,000
11,000	1,600,000
12,000	2,200,000
13,000	2,800,000
14,000	3,400,000
15,000	4,000,000

Apply Approach 3

- *Use Approach three: create a data table to analyze the sensitivity of Carbonlite EBIT to sales volume. Allow volume to vary between 5,000 and 15,000 units.*

This is an example of a one-variable data table: the variable is sales volume. Data tables were introduced in Chapter 3. See the Chapter 3 *Excel Prereqs* tab if you need to review.

1. The data table is controlled by cell D56. Enter a cell reference to *EBIT* in this cell.
2. Either copy the various sales assumptions from approach 2 or use the fill-series feature in cells C57 through C67.
3. Select the cells in the data table, cells C56:D67.
4. Create the data table by accessing the data menu and selecting table.
5. Do not use the row input cell because this is a one-variable data table with the data in the column. The column input cell is the sales assumption in cell C22. Press OK.

The result is a data table showing *EBIT* at various sales levels. The solution yields the same results as approach 2.

Which approach is best? *It depends. Approach 1 is easy and allows you to simply and quickly perform sensitivity analysis. You also see all calculations and output. Approaches 2 and 3 allow you to see at once the output for more possible input values. With complex calculations, data tables may be simpler to use than Approach 2 and may allow for two-variable analysis.*

Sensitivity analysis may be applied to other input assumptions as well.

SCENARIO ANALYSIS

A third tool for analyzing risk is scenario analysis. In scenario analysis, multiple input assumptions are changed to create likely scenarios. Often scenario analysis includes a base case, best case and worst case, though any number of scenarios can be created.

Scenarios can be created in our models in three ways.

1. Simply change the relevant input assumptions in the model and note the effect on output.
2. Copy the model elsewhere on the sheet and change the input assumptions to create alternative scenarios that are all visible.
3. Copy the sheet to create a separate sheet for each scenario.

Which approach is best? *It depends. Approach 1 is easy and allows you to simply and quickly perform scenario analysis, but you can only view the results of one scenario at a time. Approach 2 is not as fast but allows you to view all results at once and on the same sheet. This works well if the model is not too large. Approach 3 is fairly quick to create and also allows you to have multiple scenarios at once, but only one sheet is visible at a time. Use Approach 3 if your model is too large to view multiple scenarios on the same sheet.*

Apply it

- *Assume Carbonlite management is fairly confident about its estimate of fixed costs but is concerned about the uncertainty in its estimates of variable cost per unit, sales price, and sales volume. You have been asked to analyze the following three possible scenarios for operations next year. The base case corresponds to the original analysis.*

	<i>Best-Case Scenario</i>	<i>Base-Case Scenario</i>	<i>Worst-Case Scenario</i>
<i>Variable cost per unit</i>	350	400	450
<i>Sales price</i>	1,250	1,000	850
<i>Sales volume</i>	13,500	10,000	8,000

Apply Approach 1: Carbonlite

- *Simply change the input assumptions.*

Note that *EBIT* is negative in the worst-case scenario, and the breakeven is much higher.

Your results should match:

Inputs

	Carbonlite	Solution – Best Carbonlite	Solution – Worst Carbonlite
Fixed costs per year	5,000,000	5,000,000	5,000,000
Variable cost per bike frame	400	350	450
Sales price per bike frame	1,000	1,250	850
Sales volume	10,000	13,500	8,000

Calculations and Output

Revenues	10,000,000	16,875,000	6,800,000
Fixed costs	5,000,000	5,000,000	5,000,000
Variable costs	4,000,000	4,725,000	3,600,000
<i>EBIT</i>	1,000,000	7,150,000	(1,800,000)
Breakeven quantity	8,333	5,556	12,500

Apply Approach 2: Carbonlite

- *Copy the model elsewhere on the sheet, label the scenarios and change the input assumptions to reflect the scenario.*
The results are the same as in Approach 1.

See the solution provided on the Scenario tab.

Apply Approach 3: Gamebuzz.tv

- *Copy the sheet to create a separate sheet for each scenario.*

The Carbonlite model is so simple that approach 3 is not worthwhile. Instead, apply Approach 3 to scenario analysis of the online casino project considered by Gamebuzz.tv in Chapter 9.

For this illustration, we have changed some of the input assumptions. As a result, the *NPV* and *IRR* differ from the chapter 9 results.

Examine the base case-solution on the *ClassicBase* tab. Note the new assumptions driving the model. In this example, units sold are derived from a formula that depends upon an assumed unit growth rate. Cost of goods sold is a percent of revenues.

Base-Case Assumptions

The price is €13.50 in year 0, and price grows at 2 percent per year.

Units sold start at 10,000 and grow 20 percent per year.

COGS is 74 percent of Revenues.

All other assumptions remain as in Chapter 9.

Best-Case Assumptions

The price is €15 in year 0 and price grows at 3.5 percent per year.

Units sold start at 12,000 and grow 25 percent per year.

COGS is 72 percent of Revenues.

All other assumptions remain as in Chapter 9.

Worst-Case Assumptions

The price is €12.75 in year 0 and price grows at 1 percent per year.

Units sold start at 9,000 and grow 15 percent per year.

COGS is 75 percent of Revenues.

All other assumptions remain as in Chapter 9.

To create the best-and worst-case scenarios, copy the *ClassicBase* tab sheet and rename. (See the *Excel Prereqs* tab for instructions on copying and renaming sheets.)

Then change the input assumptions to fit the scenario. The solution files appear on tabs *ClassicBest* and *ClassicWorst*. The base-case solution is on the *ClassicBase* tab.

Our results are:

	<i>Best-Case Scenario</i>	<i>Base-Case Scenario</i>	<i>Worst-Case Scenario</i>
<i>NPV – 2% growth</i>	<i>677,048</i>	<i>174,882</i>	<i>(31,844)</i>
<i>NPV – assets sold</i>	<i>116,408</i>	<i>5,952</i>	<i>(40,531)</i>

Approach 3 is an easy way to create scenarios for more complex models.