

## Excel #4: Using Functions

Create a new workbook.

A company is considering the purchase of a machine that will cost \$50,000 at the start of the year. The company will have to pay 2,000 in maintenance costs at the start of the next three years, followed by \$5,000 at the start of the last year. With the purchase of the machine, the company will expand production and earn an additional profit of \$10,000 the first year, followed by \$12,000, 13,000, 14,000 and 15,000. Assume this profit is earned at the start of each year.

Enter the data into a worksheet

Year	Cost	Profit
2007	-50000	10000
2008	-2000	12000
2009	-2000	13000
2010	-2000	14000
2011	-5000	15000

Since the money is spent and earned at different years, you need to compute the net present value of the cash flows to determine the true value of the machine. That is, the individual entries have to be discounted to the present time by dividing the values for each year by  $(1 + \text{rate})^{\text{Nyear}}$

Add a cell near the top of the worksheet to hold the discount rate.

Enter 0.04 as the rate value and add a label to identify the cell.

Add an NPV row below the bottom of the table.

Excel has several internal financial functions to determine values over time.

Select the cell in the Cost column and NPV row.

Click the fx icon to open the formula wizard.

Choose Financial as the category.

Click on an entry in the function list and press the N key to jump to functions that start with the letter N.

Select the NPV function and click the OK button.

Click the selection icon next to the Rate box and click the cell holding the 0.04 rate.

Press the F4 key to fix the cell reference.

Press the Enter key.

Click on the selection icon next to the Value1 box.

Select the five entries in the Cost column. Note that you cannot select heading or footing rows or it will throw off the count of the number of years.

Press the Enter key to accept the choice.

Click the OK button to compute the present value of the costs.

Copy the new NPV formula to the profit column.

Select the cell to the right of the Profit NPV.

Press the = sign to enter a formula.

Select the NPV/Cost cell, and press the + key.  
 Select the NPV/Profit cell and press the Enter key.

	rate	0.04	
Year	Cost	Profit	
2007	-50000	10000	
2008	-2000	12000	
2009	-2000	13000	
2010	-2000	14000	
2011	-5000	15000	
NPV	(\$57,523.27)	\$56,563.18	(\$960.10)

The final NPV (costs + profits) is negative, so it does not make sense to purchase the machine at the \$50,000 price.

If you could buy the machine for a lower price, would the deal make sense?  
 There are financial formulas to help compute this value, but there is an easier way. This tool is particularly useful if the other values are interrelated. For example, the annual maintenance costs might be expressed as a percentage of the original purchase price. For now, use the simple case as it is written.

Choose Data/Data Tools/What-If Analysis, then Goal Seek from the main ribbon.  
 For the Set cell value, select the final NPV sum (the -960) cell).  
 Enter 0 as the “To value,” because that is the break-even point.  
 For the “By changing cell,” select the 50,000 cost cell.  
 Click the OK button to run the analysis.

The screenshot shows an Excel spreadsheet with the following data:

	rate	0.04	
Year	Cost	Profit	
2007	-50000	10000	
2008	-2000	12000	
2009	-2000	13000	
2010	-2000	14000	
2011	-5000	15000	
NPV	(\$56,563.18)	\$56,563.18	\$0.00

The Goal Seek dialog box is open, showing:

- Set cell: \$D\$12
- To value: 0
- By changing cell: \$B\$7

The cost value will be slightly over \$49,000, which is the most you should pay to buy the machine. If you click the OK button, this value will be inserted into the cell.

Alternatively, you might not be able to negotiate the price of the machine, but you might be able to get a different rate.

Click the cancel button (or use Ctrl+Z to undo the change if you already clicked OK).

Run the Goal Seeker again.

Choose the same first two entries to set the total NPV cell to 0.

For the cell to change, select the 0.04 interest rate.

If you can get a rate of about 2.95 percent, the deal will break even.

You can use a similar process to test other values. However, the Goal Seeker only supports changing one cell at a time. Essentially, it iterates (loops) through possible values until the desired condition is reached, or some number of iterations is reached and the system gives up—signifying that the value you wish to change cannot be used to reach the desired value.

Click the Cancel button to close the Goal Seeker.

If your spreadsheet is going to be used by others in the future, you should leave notes to help explain where some data items came from or why a formula is built a certain way.

Select the cell holding the “Profit” heading.

Right-click and choose Insert Comment from the menu.

Enter: Profit estimates are from George in engineering.

Click on a blank cell in the spreadsheet to close the Comment window.

Notice the small marker in the Profit cell.

Roll the mouse over that marker and the comment will pop up.

	A	B	C	D	E
1					
2					
3					
4		rate	0.04		
5					
6	Year	Cost	Profit		
7	2007	-50000	10000		
8	2008	-2000	12000		
9	2009	-2000	13000		
10	2010	-2000	14000		
11	2011	-5000	15000		
12	NPV	(\$57,523.27)	\$56,563.18	(\$960.10)	
13					

The advantage of these comments is that they remain with the spreadsheet but do not intrude on the user. In particular, they are not printed with the spreadsheet.

When you use data-entry cells in a formula, a useful trick can make them easier to read. You can name the cell, and use the cell’s name in the formula.

Select the cell holding the 0.04 interest rate value.

Choose Insert/Name/Define from the main menu.

If necessary, type rate as the name to use.

Check to be sure the “Refers to:” box points to the correct cell.

Click the OK button to assign the name to the cell.

Select the first NPV calculation and click the F2 button to edit it.

The first parameter in the formula references the rate cell.

Delete the cell reference and replace it with the name: rate.

Do the same thing for the second NPV calculation.

All of the computations will remain the same, but when you display the formula, it is easier to read.

	rate	0.04	
Year	Cost	Profit	
2007	-50000	10000	
2008	-2000	12000	
2009	-2000	13000	
2010	-2000	14000	
2011	-5000	15000	
NPV	(\$57,523.27)	\$56,563.18	(\$960.10)