

Calculating Cash Flow Using Excel Data Lists

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Bank and credit card statements tell you where your money has gone, but they don't show you how much money you'll have on hand after your checks clear. You can use your checkbook's register to calculate those totals by hand, but it's much easier to let Excel do the math for you.

There is a trick to creating formulas that allow you to delete rows without causing errors in your worksheet. This technique, which uses the `OFFSET` function, avoids problems associated with formulas that reference cells directly.

In this article, I'll show you how to create a data list to manage your upcoming transactions, add and delete rows from the list, and accurately calculate a running balance using the `OFFSET` function.

Managing Excel Data Lists

I prefer to manage my cash flow worksheet using an Excel 2003 data list because of the list's built-in data entry, sorting, and filtering capabilities. You can also project your future cash flow in Excel 2002 and prior versions, or in Excel 2003 should you prefer not to organize your data as a list.

Creating a Data List in Excel 2003

Here's a look at the data list I use to project my cash flow (don't be jealous...I made up the numbers). Assume that the current date is 7/17/2006 and that I'm projecting the income and expenses to come in the next month.

	Date	Income	Expense	Description	Balance
3					
4	7/17/2006			Opening balance	\$ 14,801.97
5	7/25/2006		\$ 1,200.00	Retirement	\$ 13,601.97
6	7/28/2006		\$ 360.00	Web hosting	\$ 13,241.97
7	7/31/2006	\$ 5,000.00		Royalties	\$ 18,241.97
8	7/31/2006	\$ 5,000.00		Royalties	\$ 23,241.97
9	7/31/2006		\$ 2,341.62	Credit card	\$ 20,900.35
10	7/31/2006		\$ 1,800.00	Mortgage	\$ 19,100.35
11	7/31/2006		\$ 400.00	Rent	\$ 18,700.35
12	7/31/2006		\$ 177.00	Health care	\$ 18,523.35
13	8/9/2006		\$ 136.00	Insurance	\$ 18,387.35
14	8/15/2006	\$ 1,000.00		Dividend	\$ 19,387.35
15	*				

To create a data list in Excel 2003, follow these steps:

1. Type a series of column headers in cells at the top of your intended list.
2. Format the column header cells using Bold type and center alignment.
3. Type your first row of list data.
4. Select the header and data cells.
5. Choose Data | List | Create List.
6. In the Create List dialog box, check the My List Has Headers box, and then click OK.

When you select a cell in the data list, Excel displays a data entry row at the bottom of the list. All you need to do is type your data in the new row and press the Tab key to save the data and create a new row.

But what if you want to add an entry that's out of order? For example, suppose you have the following list and want to add an expense you expect to occur on August 2. Adding the expense at the bottom of the list means the expense falls out of the proper sequence.

	Date	Income	Expense	Description	Balance
3					
4	7/17/2006			Opening balance	\$ 14,801.97
5	7/25/2006		\$ 1,200.00	Retirement	\$ 13,601.97
6	7/28/2006		\$ 360.00	Web hosting	\$ 13,241.97
7	7/31/2006	\$ 5,000.00		Royalties	\$ 18,241.97
8	7/31/2006	\$ 5,000.00		Royalties	\$ 23,241.97
9	7/31/2006		\$ 2,341.62	Credit card	\$ 20,900.35
10	7/31/2006		\$ 1,800.00	Mortgage	\$ 19,100.35
11	7/31/2006		\$ 400.00	Rent	\$ 18,700.35
12	7/31/2006		\$ 177.00	Health care	\$ 18,523.35
13	8/9/2006		\$ 136.00	Insurance	\$ 18,387.35
14	8/15/2006	\$ 1,000.00		Dividend	\$ 19,387.35
15	8/2/2006		\$ 13,000.00	Roof repair	\$ 6,387.35
16	*				

The temporary disorder poses no real problem. Just type in the new data row, and then sort the data list so that it is once again in date order.

To sort a data list, follow these steps:

1. Click the filter arrow at the right edge of the column header by which you want to sort the list.
2. Click Sort Ascending.

The following image shows the result.

3	Date	Income	Expense	Description	Balance
4	7/17/2006			Opening balance	\$ 14,801.97
5	7/25/2006		\$ 1,200.00	Retirement	\$ 13,601.97
6	7/28/2006		\$ 360.00	Web hosting	\$ 13,241.97
7	7/31/2006	\$ 5,000.00		Royalties	\$ 18,241.97
8	7/31/2006	\$ 5,000.00		Royalties	\$ 23,241.97
9	7/31/2006		\$ 2,341.62	Credit card	\$ 20,900.35
10	7/31/2006		\$ 1,800.00	Mortgage	\$ 19,100.35
11	7/31/2006		\$ 400.00	Rent	\$ 18,700.35
12	7/31/2006		\$ 177.00	Health care	\$ 18,523.35
13	8/2/2006		\$ 13,000.00	Roof repair	\$ 5,523.35
14	8/9/2006		\$ 136.00	Insurance	\$ 5,387.35
15	8/15/2006	\$ 1,000.00		Dividend	\$ 6,387.35
16	*				

When a transaction clears, you edit the opening balance (cell E4) and delete the cleared transactions from the list. To delete a row from a data list, follow these steps:

1. Click any cell in the data list to activate it.
2. Right-click any cell in the list row you want to delete, point to Delete, and then click Row.

Also notice that the right-most column contains a running total derived from the previous row's balance and the income or expense in the current row. Later in this article, I'll show you the exact formula I used.

Creating a Data Table without Using a Data List

If you use Excel 97-2002, or if you're using Excel 2003 and prefer not to create a data list, you can lay out your data using the same pattern.

3	Date	Income	Expense	Description	Balance
4	7/17/2006			Opening balance	\$ 14,801.97
5	7/25/2006		\$ 1,200.00	Retirement	\$ 13,601.97
6	7/28/2006		\$ 360.00	Web hosting	\$ 13,241.97
7	7/31/2006	\$ 5,000.00		Royalties	\$ 18,241.97
8	7/31/2006	\$ 5,000.00		Royalties	\$ 23,241.97
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11	7/31/2006		\$ 400.00	Rent	\$ 18,700.35
12	7/31/2006		\$ 177.00	Health care	\$ 18,523.35
13	8/2/2006		\$ 13,000.00	Roof repair	\$ 5,523.35
14	8/9/2006		\$ 136.00	Insurance	\$ 5,387.35
15	8/15/2006	\$ 1,000.00		Dividend	\$ 6,387.35

When you arrange your data as a table, with differently-formatted column headers and your data in rows, you can sort the table in the same manner as an Excel 2003 data list.

To sort an Excel 97-2002 data table, follow these steps:

1. Click any cell in the data table.
2. Click Data | Filter | AutoFilter.
3. Click the filter arrow at the right edge of the column header by which you want to sort the list.
4. Click Sort Ascending.

You can delete a row in your data table by right-clicking any cell in the row and then clicking Delete. In the Delete dialog box, check the Entire Row option button and then click OK.

Calculating a Running Balance

My data list contains columns for the following data:

- Transaction date
- Income amount (if any)
- Expense amount (if any)
- A description of the transaction
- The balance resulting from the transaction

The last column uses a formula to calculate the balance resulting from each transaction. As it turns out, there is a right way and a wrong way to create the formula to calculate those results.

How Not to Calculate a Running Balance

I always type my opening balance in the first list row; in this case, cell E4. For the next row, and all subsequent rows, I'll have to add income to and subtract expenses from the preceding row's balance to calculate my running balance. Given the data list in the previous graphic, that formula is =E4+B5-C5. Because the formula contains relative references, which change when you copy the formula to another cell, you can copy the formula down the list's Balance column.

To copy the formula to other cells in the Balance column, follow these steps:

1. Select the cell that contains the formula.
2. Drag the fill handle from the bottom right corner of the selected cell to cover the cells in the remainder of the column.

What's more, when you type a new row of data into the table, Excel creates the formula in the Balance column for you.

Unfortunately, this formula doesn't adapt properly when you delete a list row. Here's what happens when you delete the transaction from 8/2/2006.

	Date	Income	Expense	Description	Balance
3					
4	7/17/2006			Opening balance	\$ 14,801.97
5	7/25/2006		\$ 1,200.00	Retirement	\$ 13,601.97
6	7/28/2006		\$ 360.00	Web hosting	\$ 13,241.97
7	7/31/2006	\$ 5,000.00		Royalties	\$ 18,241.97
8	7/31/2006	\$ 5,000.00		Royalties	\$ 23,241.97
9	7/31/2006		\$ 2,341.62	Credit card	\$ 20,900.35
10	7/31/2006		\$ 1,800.00	Mortgage	\$ 19,100.35
11	7/31/2006		\$ 400.00	Rent	\$ 18,700.35
12	7/31/2006		\$ 177.00	Health care	\$ 18,523.35
13	8/9/2006		\$ 136.00	Insurance	#REF!
14	8/15/2006	\$ 1,000.00		Dividend	#REF!
15	*				

When you delete the row, the formula in the next row loses its reference, causing a reference (#REF!) error. Editing the first broken formula so that it refers to the proper cell in the Balance column also fixes the rest of the formulas in the column, but it's a pain to have to make that change every time you delete a list row. And what if someone else maintains your list while you're away? If they don't know what's wrong, they won't be able to fix it.

Calculating a Running Balance Correctly

Fortunately, you can create a different, albeit more complex, formula that doesn't break when you delete a row from a data list. That formula uses several instances of the OFFSET function, which has the following syntax:

OFFSET(reference, rows, columns, [height], [width])

Note: The last two arguments, [height] and [width], which enable you to return values from a range of cells, are optional. I won't use them in this explanation.

The OFFSET function returns the value of a cell a specified number of rows and columns away from the cell that contains the formula. Positive numbers cause Excel to look down or to the right, while negative numbers go up or to the left. For example, the formula OFFSET(E5, -1, 0) returns the value from E4, the cell one row above cell E5 (the zero in the column argument place means Excel doesn't move left or right to find the value). Similarly, the formula OFFSET(E6, 0, -3) finds the value in B6, the cell three columns to the left of cell E6.

3	Date	Income	Expense	Description	Balance
4	7/17/2006			Opening balance	\$ 14,801.97
5	7/25/2006		\$ 1,200.00	Retirement	\$ 13,601.97
6	7/28/2006		\$ 360.00	Web hosting	\$ 13,241.97
7	7/31/2006	\$ 5,000.00		Royalties	\$ 18,241.97
8	7/31/2006	\$ 5,000.00		Royalties	\$ 23,241.97
9	7/31/2006		\$ 2,341.62	Credit card	\$ 20,900.35
10	7/31/2006		\$ 1,800.00	Mortgage	\$ 19,100.35
11	7/31/2006		\$ 400.00	Rent	\$ 18,700.35
12	7/31/2006		\$ 177.00	Health care	\$ 18,523.35
13	8/2/2006		\$ 13,000.00	Roof repair	\$ 5,523.35
14	8/9/2006		\$ 136.00	Insurance	\$ 5,387.35
15	8/15/2006	\$ 1,000.00		Dividend	\$ 6,387.35

Using the worksheet above, which has the running balance in column E, income in column B, and expenses in column C, the following formula calculates the running balance for cell E5:

=OFFSET(E5,-1,0)+OFFSET(E5,0,-3)-OFFSET(E5,0,-2)

The three OFFSET functions point to these cells:

- OFFSET(E5,-1,0) points one row above and zero columns to the left or right of cell E5, which is cell E4
- OFFSET(E5,0,-3) points zero rows above or below and three columns to the left of cell E5, which is cell B5
- OFFSET(E5,0,-2) points zero rows above or below and two columns to the left of cell E5, which is cell C5

The formula =OFFSET(E5,-1,0)+OFFSET(E5,0,-3)-OFFSET(E5,0,-2) derives its result using the same values as the formula =E4+B5-C5, but it doesn't break when you delete a row that contains a cell used in the formula.

To copy the formula to other cells in the Balance column, follow these steps:

1. Select the cell that contains the OFFSET-based formula.
2. Drag the fill handle from the bottom right corner of the selected cell to cover the cells in the remainder of the column.

Because the OFFSET formula uses relative references, Excel modifies the formula to reflect the formula's new position.

Why Does the OFFSET Function Work?

Why is it that the formula that contains the cell references breaks, but the formula that contains the OFFSET functions doesn't? It's all in how Excel understands the references within the formula.

When you create a formula that contains a cell reference, such as E4, Excel takes your word that it is to use the value found in cell E4. When you delete the row that contains cell E4, Excel recognizes that the cell you wanted is gone and displays a #REF! error. Yes, the cell that was formerly E5 moves up a row into position E4, but the original E4 cell is no longer there. That's why Excel displays the error message.

The OFFSET function, by contrast, references a cell indirectly. Internally, Excel notes the base cell and how far to move (and in which direction) to find the target cell. My best guess is that Excel stores all of the arguments in an OFFSET function as indirect references and updates the references when the worksheet's structure changes.

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