Note from Scott Ehrlich: This article was written by Nicole Karp, who is Mind the GAAP's resident Excel guru. Nicole has helped our clients develop Excel workbooks to create debt amortization schedules, attribution tables for share-based payment awards, and intangible asset valuations. Please contact Nicole or me if you would like to learn more about our modeling services.

If you are reading this article, chances are that you either create or review Excel models on a frequent basis. You probably have your own preferences when setting up new Excel files – and perhaps some "pet peeves" around the organization, format, or style of models that you review. I'm certainly that way.

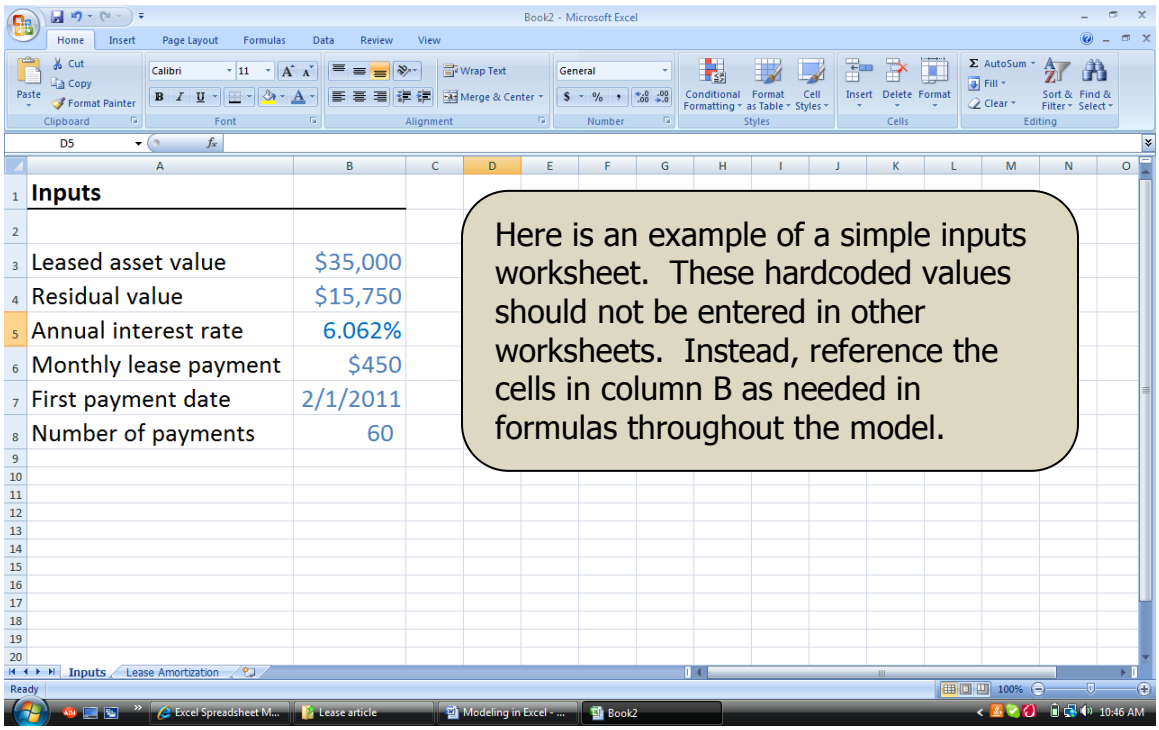
As Mind the GAAP's "Excel Modeler in Chief" (Scott's term – not mine), I'd like to share some of my thoughts around best practices in creating Excel models. I hope you find some of these tips helpful!

Inputs/Assumptions versus Formulas

Models comprise inputs and formulas applied to those inputs.

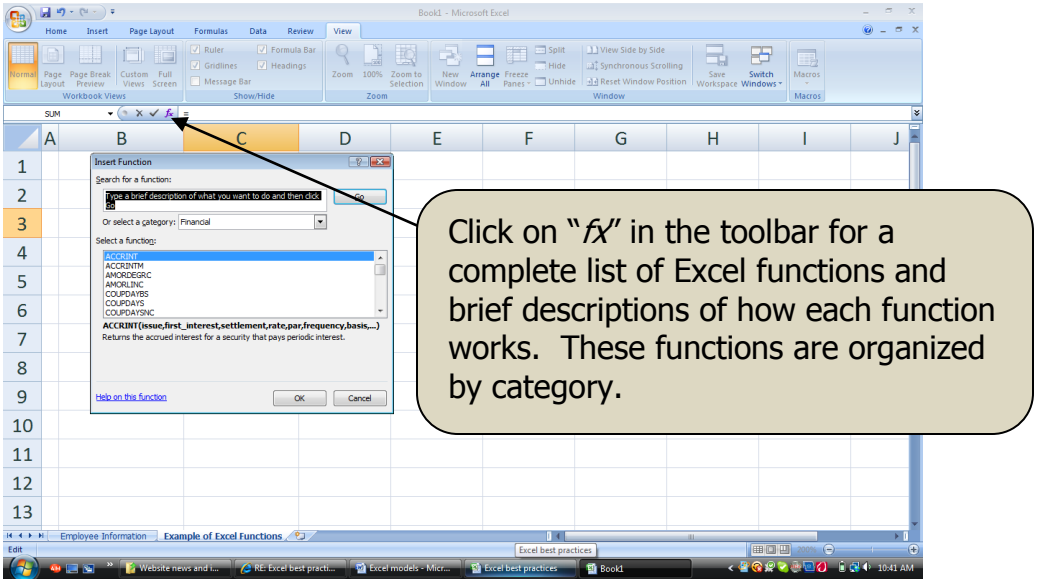
Ideally, each input should be entered only once, in a tab or section dedicated to inputs. That way, if an input needs to be modified, you will only have to do so in one place. Often, the models I review have inputs hardcoded into the formulas, meaning that a simple assumption change will require amendments to multiple cells – this is certainly risky and quite inefficient.

I personally recommend having a separate "inputs" worksheet so that all hardcoded inputs have a home and can be easily found. If applicable, I also recommend distinguishing inputs from calculated cells with a different font color – for instance, blue for inputs, and black for other types of cells. If you stay disciplined with these conventions, other individuals who are reasonably knowledgeable in basic spreadsheet development can pick up the model and make their own modifications without sacrificing the reliability of the spreadsheet.



Let's Borrow from Steve Jobs (sorry, Microsoft) …"There's a Formula for That"

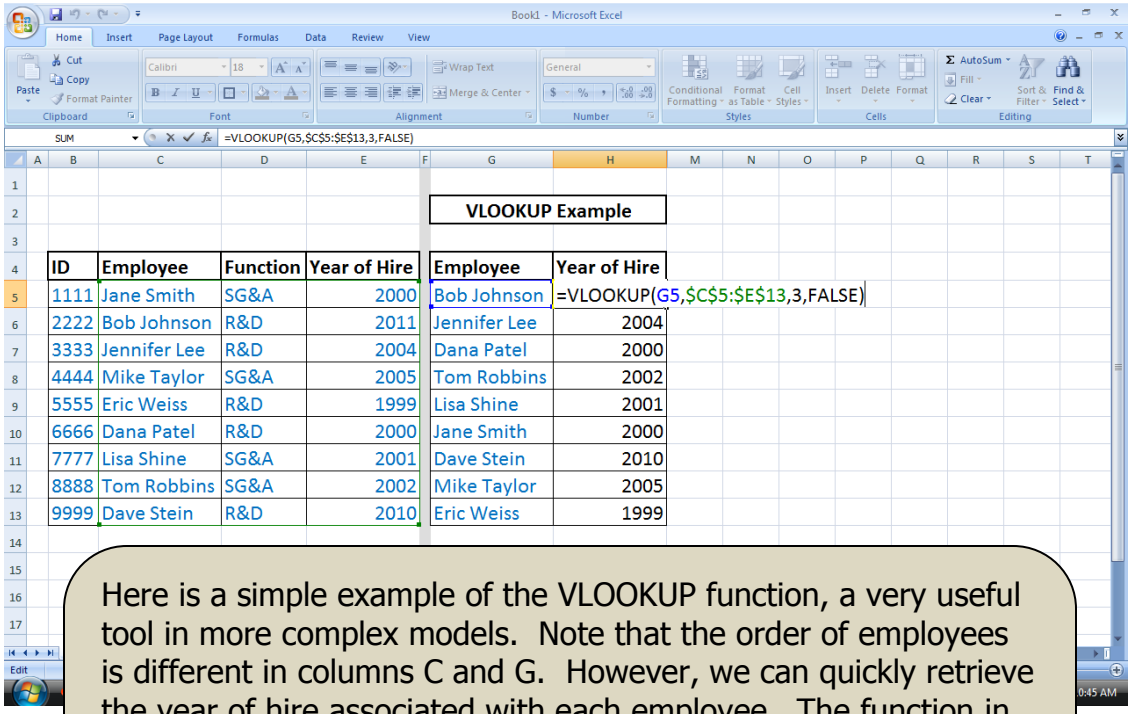
For whatever you are trying to accomplish with an Excel model, chances are "there's a formula for that". I strongly recommend examining the list of Excel functions, organized by Excel into various categories.



Making the complex understandable

The "Financial" category has functions that compute NPV and IRR when given the necessary inputs. The "Date & Time" category contains a number of useful functions. For instance, did you know that there is a "DAYS360" function that returns the number of days between two dates (based on a 360 day year)? And, the "NETWORKDAYS" function returns the number of whole *work days* between two dates (that is, Excel will disregard weekend days).

The "Lookup & Reference" category contains some of Excel's most powerful modeling tools. The "HLOOKUP", "VLOOKUP" and "OFFSET" functions can be critical when building more complex models, as shown in the following example:

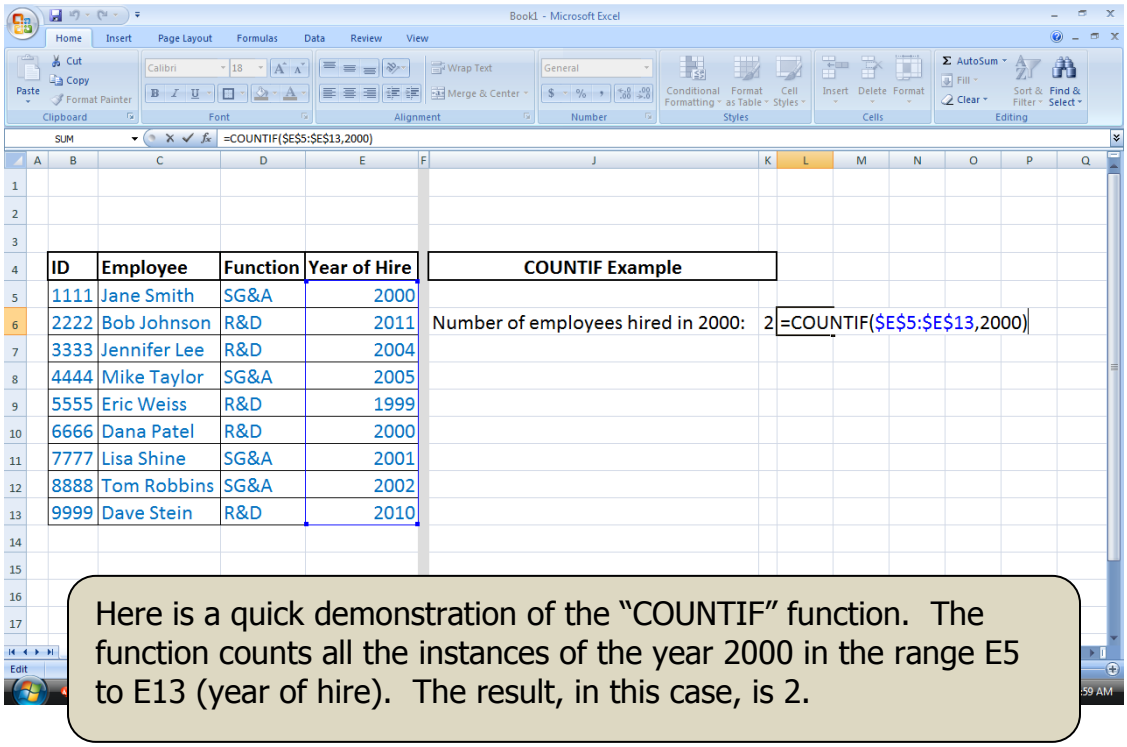


ID	Employee	Function	Year of Hire
1111	Jane Smith	SG&A	2000
2222	Bob Johnson	R&D	2011
3333	Jennifer Lee	R&D	2004
4444	Mike Taylor	SG&A	2005
5555	Eric Weiss	R&D	1999
6666	Dana Patel	R&D	2000
7777	Lisa Shine	SG&A	2001
8888	Tom Robbins	SG&A	2002
9999	Dave Stein	R&D	2010

Employee	Year of Hire
Bob Johnson	=VLOOKUP(G5,$C$5:$E$13,3,FALSE)
Jennifer Lee	2004
Dana Patel	2000
Tom Robbins	2002
Lisa Shine	2001
Jane Smith	2000
Dave Stein	2010
Mike Taylor	2005
Eric Weiss	1999

Here is a simple example of the VLOOKUP function, a very useful tool in more complex models. Note that the order of employees is different in columns C and G. However, we can quickly retrieve the year of hire associated with each employee. The function in cell H5 searches for the name "Bob Johnson" (cell G5) in the range C5 through E13. Excel then looks to the third column over from the reference column C (column C is included in the 3 column count) to retrieve the year of hire…in this case, 2011.

"SUMIF" and "COUNTIF" are also two of Excel's more useful functions, as shown in the following example:

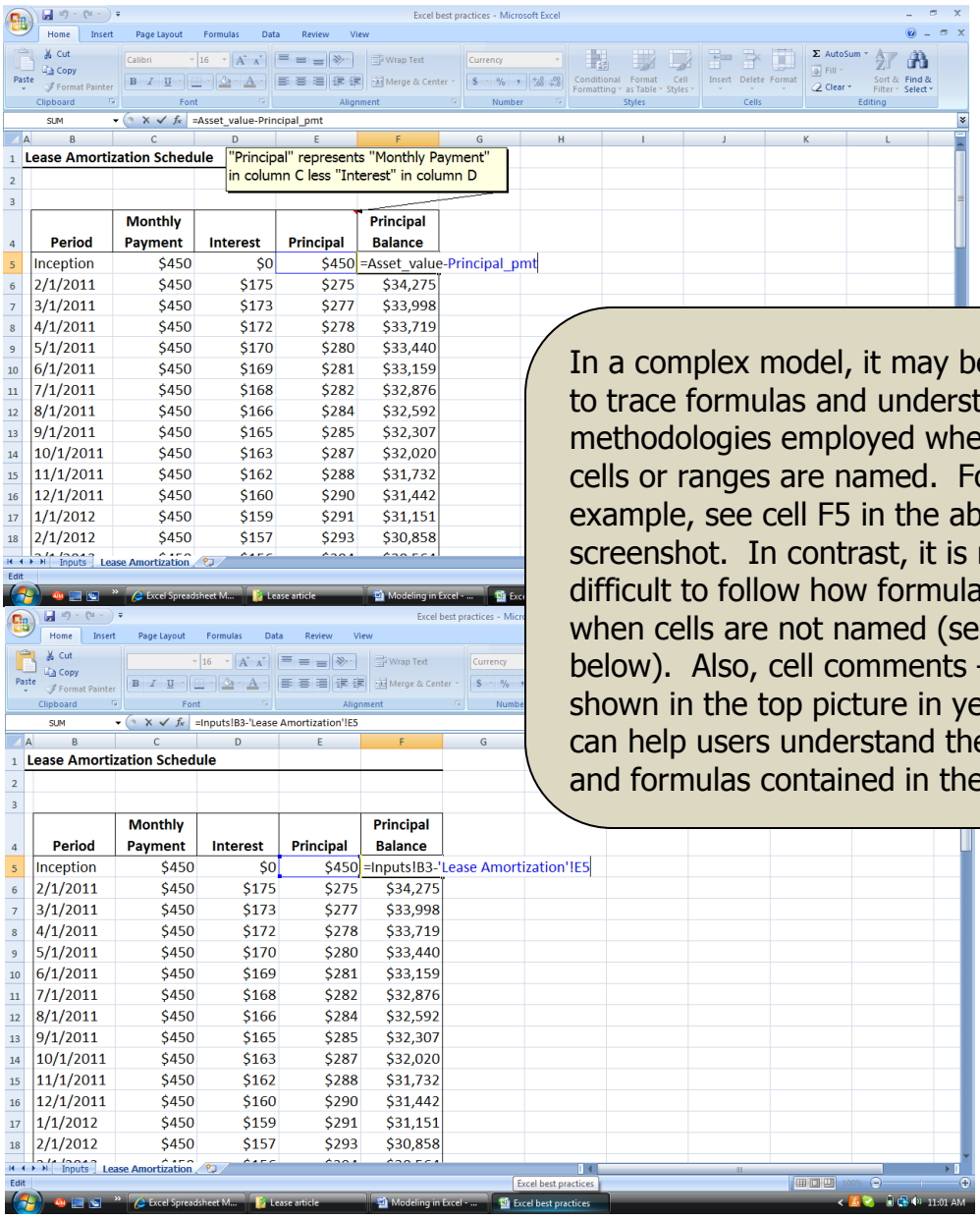


I recognize that I am just scratching the surface on Excel's functionality. Not only are there hundreds of useful functions but when used in combination with one another, most any modeling objective can be accomplished using an Excel spreadsheet. I strongly recommend taking the time to experiment with these functionalities!

Avoiding the "How did I do that again?" Syndrome

If an Excel model is well designed, you or someone else reasonably knowledgeable in basic spreadsheet development should be able to look at the model at a future date without wondering "How does this work?"

To achieve this goal, I recommend using cell comments to briefly describe methodologies used. In addition, it is sometimes helpful to name cells or ranges using the "control-F3" key combination.



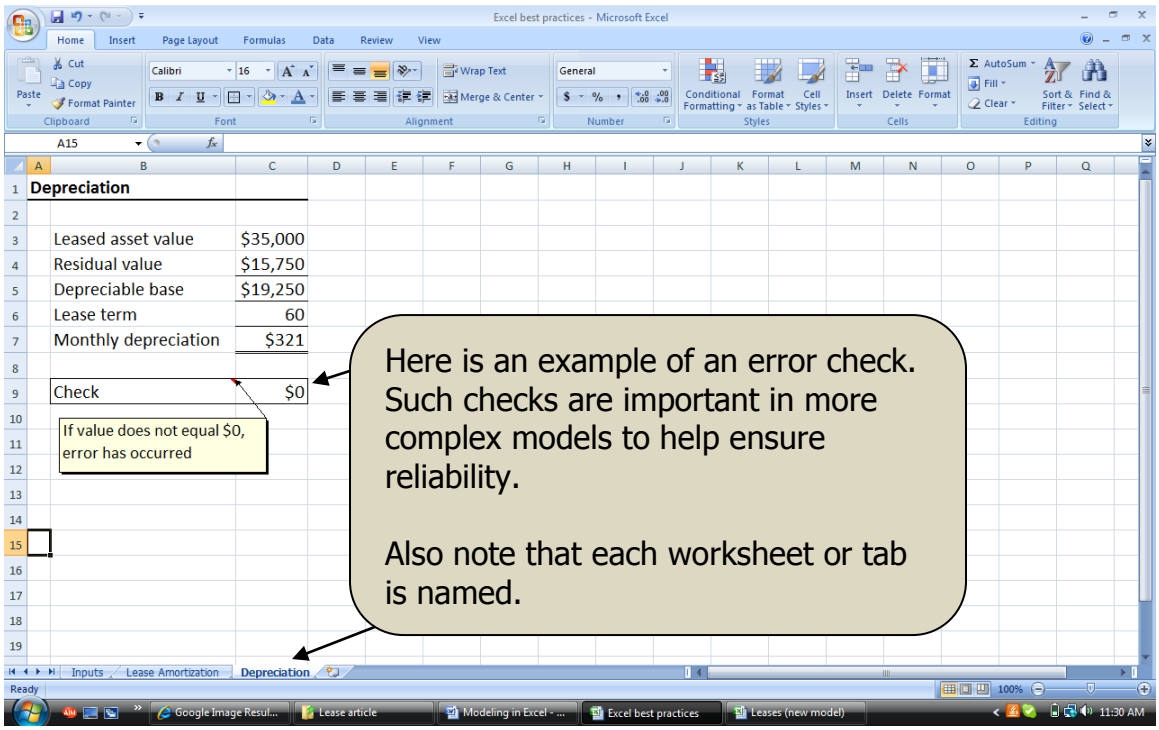
In a complex model, it may be easier to trace formulas and understand methodologies employed when data in cells or ranges are named. For example, see cell F5 in the above screenshot. In contrast, it is more difficult to follow how formulas work when cells are not named (see cell F5 below). Also, cell comments – as shown in the top picture in yellow – can help users understand the data and formulas contained in the model.

Finally, I recommend including a worksheet upfront – perhaps the first or second tab – that describes how the model works, including any model limitations or special instructions.

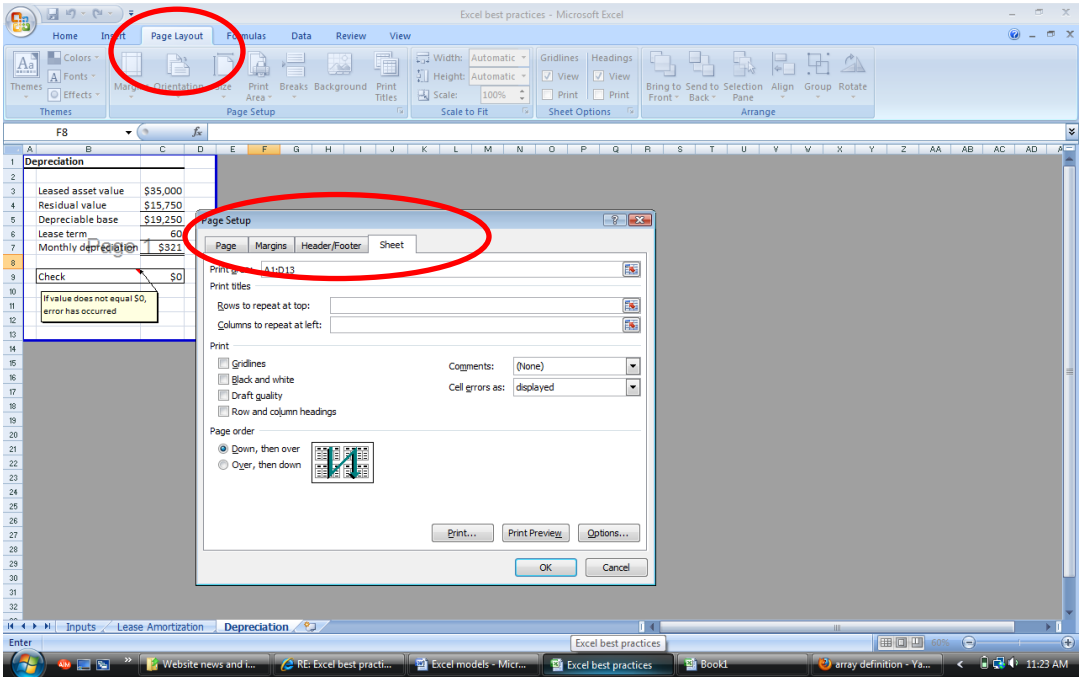
Other Tips

- Consistency matters! For instance, if dollars are in millions in one worksheet, dollars should be in millions in all worksheets. Also, formatting conventions should be applied the same way throughout the various tabs of the workbook (e.g., all inputs in blue font).

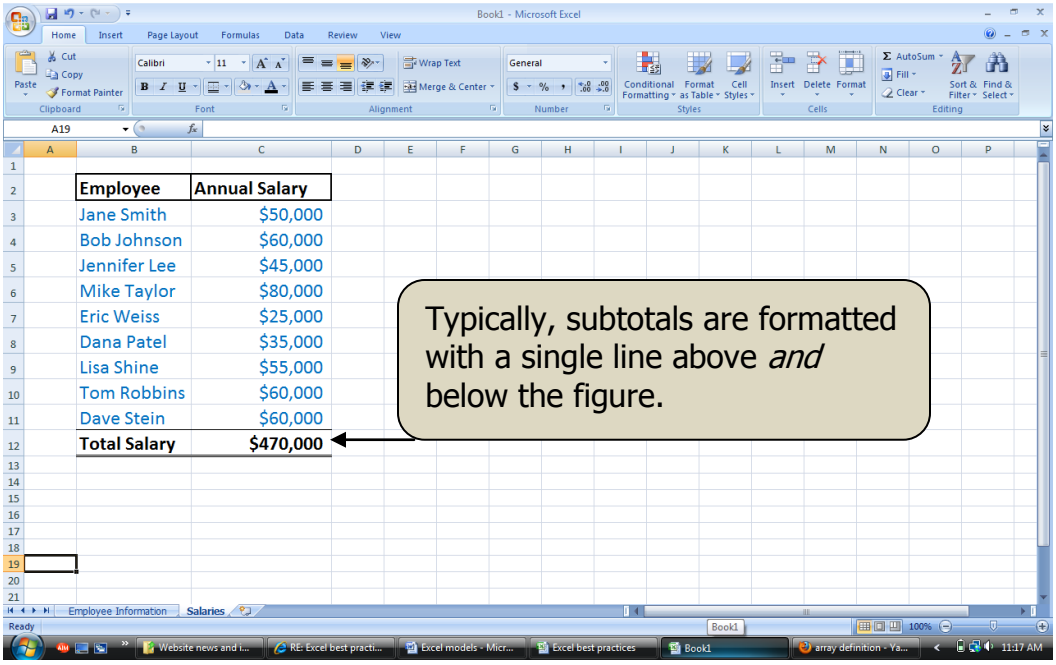
- Include error-checks in your models. For instance, calculate a figure in a different way to ensure that the model is working correctly.



- It's worth repeating…design the model so that it is user friendly. In addition to the recommendations discussed earlier, name worksheets or "tabs" to identify their purpose. Additionally, format worksheets so that they are print ready (unless you are certain that they would never be printed). When preparing a worksheet for printing, use the tools found within "Page Layout" (as shown on the screen shot on the next page). Here you will be able to adjust the print range, include headers or footers, or display column headers or gridlines.



- Be sure that the model outputs are easy to find. It can be helpful to include a tab upfront that summarizes the model's end result. Furthermore, ensure that totals and subtotals are formatted so that they're easily identified.



Making the complex understandable

- Keep your models as simple as possible. Avoid making links to outside files/workbooks. Also, avoid including any "excess" data or worksheets that do not contribute to the functionality of the model.

While the examples used in this brief article are simple, the more complex the model, the more important that it is well-designed and incorporates the best practices described herein. Excel is a powerful tool…just make sure you use that power wisely!