

Excel Concerns (and Five Typical Risks)

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1 Introduction

Excel is a very flexible tool for keeping lists of data and doing calculations based on those lists. Excel's flexibility is a key strength but also a key weakness in that, unlike a modern programming language, there is no enforced discipline on sheet layout or calculation flow. One can build any old layout or convoluted calculation flow, but only using a tidy layout and neat calculation flow will work reliably.

This document is written from the point of view of an experienced Excel practitioner who has seen **and caused** all the problems listed. The overall message is that if Excel is to be used for business critical calculations then care and attention to detail is needed to alleviate the risks which Excel itself will not detect.

2 Concerns and Risks

Most of the concerns and risks in this section are associated with modifications to existing spreadsheets. It is very difficult to know what unseen effects a modification, such as adding sheet rows, will have across a workbook containing a number of sheets. Below are five things to watch for as common sources of spreadsheet risk:-

1. SUM(s) not including all the rows
2. Formulas that reference a previous row (or column).
3. Use of Drag & Drop (or Cut & Paste) in Data Areas.
4. Failure to check pasted formulas after using Copy & Paste.
5. The use of long and/or complex formulas.

The risk of a spreadsheet/workbook having errors or being damaged by modifications increases with size and complexity. Complexity is a function of the number of individual formulas, where a filled area (e.g. a SUM() filled across columns) is considered as one individual formula. Manual re-checking is usually adequate if there is only one sheet and less than 30 individual formulas. Manual re-checking becomes very difficult once a workbook contains more than 100 individual formulas and/or extends over several sheets.

2.1 *SUM() Not Including all the Rows*

If areas of data or formulas are summed (down the rows or across the columns), it is essential to have a blank row at the bottom and/or a blank column to the right, which is included in the SUM(). Other functions using range references (e.g. "G5:G9") require the same treatment. Most workbooks I have seen do not have these blank rows/columns and, where they are absent, there are often rows/columns that have been inserted which are not included in the SUM(s).

2.2 *Formulas that Reference a Previous Row/Column*

In a typical bank statement type sheet there is usually a column that forms a running balance by referencing the balance in the previous row and adding/subtracting credits/debits. Inserting rows through this type of formula, and just filling into the blank cells in the balance column, leaves the formula below the inserted rows referencing the wrong cell. For safety the whole column should be re-filled.

2.3 Moving Data Around

If data in an input area has been entered in the wrong cell, it is very tempting to Drag & Drop (or Cut & Paste) the data to move it to the correct cells. If there are any formulas (other than SUM()s or other range references) referencing the cells that are Dragged & Dropped, they will be corrupted. Corrupted cells may show “#REF!” and re-filling these will correct some of the errors. However, there will be other formulas that now reference the wrong cells but show no sign of an error. Re-filling the whole area containing the formulas will normally fix the problem but not if the top left formula has been corrupted by the Drag & Drop.

2.4 Copy and Paste (Relative/Absolute References)

The use of Copy & Paste to duplicate areas of formulas is very risky. Failure to check the pasted formulas often leads to blank cells being accessed instead of the intended source cells. The pasted formulas need to be examined to check that they reference the intended cells.

All the reference books mention that Copy & Paste adjusts the formulas, **this adjustment is only an illusion** due to the way formulas are displayed. The reality is that relative and absolute references are pasted unchanged. A relative reference refers to a cell at the same distance from the pasted location as the original cell was from the copied location (the **illusion** of adjustment). An absolute reference in the copied and pasted locations refers to the same cell.

All this looks complex, and it is. I still make errors using Copy & Paste and what happens all depends on placing those irksome dollar (\$) characters in the references. The \$ characters make a reference absolute, rather than relative which is the default.

2.5 The use of Long Formulas

Excel is very good at allowing calculations to be split up into stages showing the intermediate steps in different areas of cells. However, this comes at the cost of making modifications more difficult as, if additional rows are required, then there are more areas of formulas to extend. The difficulty of updating many formula areas sometimes leads to a temptation to create very long formulas with many nested bracket levels and/or functions within functions. Such formulas are very difficult to check. Although they may work for most inputs, they can give erroneous results some specific combinations of inputs.

It is best to split up complex calculations so that the intermediate results become visible. Errors in some combinations of inputs can then be more easily spotted as the intermediate results may show that there is an unexpected value being generated.

3 Conclusion

If you are using Excel for business critical calculations then be aware of the risks and be careful and tidy in the way you design spreadsheets. Alternatively, for complex business calculations, such as accounts and cash flow, stop using Excel and go for an accounting package which is securely designed to do the job without risk.

For further help and advice on reducing the risks of using Excel to a low level, contact Fairway Associates Ltd. (www.fairwayassociates.co.uk). By the way, **don't link to cells in other workbooks** unless you wish to increase the risks about five fold.