

Excel 2013 Spreadsheet Inquire

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Abstract

Excel 2013 (version 15) includes an add-in 'Inquire'¹ for auditing spreadsheets. We describe the evolution of such tools in the third-party marketplace and assess the usefulness of Microsoft's own add-in in this context. We compare in detail the features of Inquire with similar products and make suggestions for how it could be enhanced. We offer a free helper add-in that in our opinion corrects one major shortcoming of Inquire.

Introduction

From the earliest days of spreadsheets, auditors and reviewers have been seeking ways of gaining an understanding of their underlying structure of formulas. Once Excel arrived and large worksheets became common, it rapidly became obvious that simple formula listings were too tedious to work with, and spreadsheet auditing tools were developed that provided two indispensable services: a visual overview of the structure of a spreadsheet, and a detailed listing of features ('bad smells') which from the experience of the auditors may indicate an actual error or a weakness that could easily materialise as a defect in use.

One of the first of these, and still in use, is the Spreadsheet Detective² which created maps using single-letter codes such as F for Formula, and symbols such as > to indicate a formula was copied to its right. With a small column width and a black-and-white printer, one could quickly see how a spreadsheet had been structured. Later, colouring was added and auditing software like SpACE³ added many colourful schemes and detailed lists of suspect features. The authors of SpACE also published one of the first frameworks for spreadsheet audit, as presented by Ray Butler in a pioneering EuSpRIG 2000 paper "Risk Assessment For Spreadsheet Developments: Choosing Which Models to Audit"⁴. For a later view of how financial service companies do it, see "A Typical Model Audit Approach: Spreadsheet Audit Methodologies in the City of London" by Grenville Croll⁵.

Many more such products have been created in what was largely a cottage industry. The author has his own product, XLTest⁶. Some added features to assist with building and debugging the formulas in certain types of spreadsheets, eg financial modelling, such as Operis OAK⁷. Some, with the impetus of the FDA's 21 CFR Part 11, focused on locking down spreadsheets under control, such as ABB's DACs⁸. More recently, enterprise spreadsheet management systems such as Liquidity⁹, ClusterSeven¹⁰ and Cimcon¹¹ have provided a visualisation of the use and development over time of systems of spreadsheets, and have added monitoring and control features. For example, see the white papers by Clusterseven or the EuSpRIG 2007 paper "Managing Critical Spreadsheets in a Compliant Environment by Soheil Saadat¹². A list of these tools is maintained at <http://www.sysmod.com/sslinks.htm>

These tools are like standard static software analysis. While they considerably increase the efficiency of the auditor in getting through large amounts of routine analysis, they are less useful as a predictor of the cost of an audit. This is discussed by David Colver in his EuSpRIG 2011 paper "Drivers of the Cost of Spreadsheet Audit"¹³. Neither will they detect errors in logic. In their EuSpRIG 2010 paper "The Detection of Human Spreadsheet Errors by Humans versus Inspection (Auditing) Software", Salvatore Aurigemma and Raymond R. Panko reported "[tools] were almost useless for correctly flagging natural (human) errors in this study."

These tools are excellent in raising questions; the remedial actions are however a matter of skill and judgment, as discussed by Louise Pryor in her Eusprig 2008 paper "Correctness is not enough"¹⁴.

The Inquire Add-in

Excel version 15 has an Add-in that came from Microsoft's purchase of the Prodiance SpreadsheetIQ product, which adds an "INQUIRE" tab to the Ribbon. To activate the Add-in, click File > Options > Add-Ins, in the Manage list, select COM Add-ins, click the Go button, and check the Inquire Add-in. The menu is shown in Fig.1

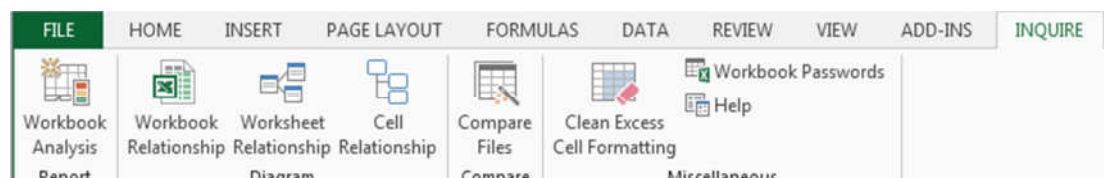


Figure 1

Overview of the commands

The Workbook Analysis Report creates an interactive report showing detailed information about the workbook and its structure, formulas, cells, ranges, and warnings.

The Workbook Relationship Diagram creates an interactive, graphical map of workbook dependencies created by connections (links) between files. The types of links in the diagram can include other workbooks, Access databases, text files, HTML pages, SQL Server databases, and other data sources.

The Worksheet Relationship Diagram creates an interactive, graphical map of connections (links) between worksheets both in the same workbook and in other workbooks.

The Cell Relationship Diagram creates a detailed, interactive diagram of all links from a selected cell to cells in other worksheets or even other workbooks. These relationships with other cells can exist in formulas, or references to named ranges. The diagram can cross worksheets and workbooks.

The Compare Files command lets you see the differences, cell by cell, between two open workbooks. Results are colour coded by the kind of content, such as entered values, formulas, named ranges, and formats. A window shows VBA code changes line by line.

The Excel 2013 preview had an Interactive Diagnostics command that was withdrawn from the released version.

The Clean Excess Cell Formatting command removes excess formatting and can greatly reduce file size. This helps you avoid "spreadsheet bloat," which improves Excel's speed.

The Workbook Passwords command maintains a password list, which will be saved on your computer encrypted and only accessible by you. The password list is needed so that Inquire can open its saved copy of your workbook.

The Help command gives details and examples of these commands.

In the following section we describe these commands in detail, give some of their uses and show their limitations.

Workbook Analysis Report

If the workbook has unsaved changes, you will be asked "Only changes that have been saved will be included in this analysis. Would you like to save your changes now?" Click Yes to save the workbook.

The Summary sheet shows the basic properties: Workbook name, Creation Date, Modified Date, File Size (bytes), Title, and Author; and then the count of each of these detailed findings which are listed in separate subsequent sheets. It would be useful for the Summary sheet to be hyperlinked to the sheets listed.

Linked Workbooks	DDE Links
Data Connections	Visible Sheets
Hidden Sheets	Very Hidden Sheets
Formulas	Array Formulas
Formulas With Errors	Formulas With Logical Values
Formulas With Numeric Values	Formulas With Date/Time Values
Formulas With Textual Values	Formulas With Numeric Constants
Formulas With Textual Constants	Formulas With Nested IF Statements
Formulas Without Cell References	Formulas Referencing Blank Cells
Formulas Referencing Hidden Cells	Formulas Referencing Text Cells
Formulas Referencing External Workbooks	Formulas Formatted As Text
Positive Formulas	Negative Formulas
Unique Formulas	Duplicate Formulas
Inconsistent Formulas	Cells With Dependents
Cells With Textual Constants	Cells With Numeric Constants
Cells With Comments	Cells With Validation Criteria
Cells With Conditional Formatting	Cells With Numerics Stored As Text
Invisible Cells	Used Input Cells
Unused Input Cells	Occupied Cells
Merged Cells	Blank Cells
Blank Referenced Cells	Unlocked Cells
Hidden Rows and Columns	Named Items
Named Items With Errors	Warnings

How to use the Summary report

You would scan this sheet and note items of interest, such as items that you would not expect to find, or to find in different numbers to what is reported. What you notice is going to be influenced by your previous experience and expectations of this spreadsheet, or similar spreadsheets from this user or business unit, and your knowledge of Excel in general. If the meaning of any item is not clear, you may need to refer to some training materials, or ask questions on online Excel forums, to obtain further information. It is beyond the scope of this paper to provide such explanation.

What is missing from the Summary report

The Summary sheet lists for the properties only the Title and Author.. Other tools show the name of the previous author, the last print date, and custom document properties which may indicate company-specific information such as contact people or tracking numbers.

It does not report whether the workbook was saved with Automatic or Manual calculation, nor the existence of Circular references or Iteration.

It does not report Styles – not even a count, which would indicate workbooks with excessive styles; nor unusual number formats that may hide data.

It does not report VBA – not even the presence of macros is shown.

Neither does it show the use of Data Lists, Pivot Tables, Consolidation Sources, Views or What-if features such as Scenarios or Goal Seek.

The detailed list sheets all begin with three rows of two merged cells at the top which means that if you copy and paste either the heading in A1 or the filename in A2 into a Word document, or into a worksheet as values, you get two copies.

The remaining sheets in the Workbook Analysis Report

The lists of links (Linked Workbooks, DDE Links, Data Connections) give only the bare name or link reference, not where they were found, and do not indicate whether the link source file actually exists, nor whether the linked content is up-to-date, nor for queries where they are used nor the CommandText.

There are separate sheets to list the names of Visible Sheets, Hidden Sheets, and Very Hidden Sheets, but it does not indicate the presence of Chart sheets, nor of Macro or Dialog sheets which may exist in very old Excel files. It does not give the following information which other tools report such as excessive used range; the Print Area; Page Header and Footers; Objects such as embedded charts or graphics or Form or ActiveX buttons; whether a worksheet has the old Lotus evaluation rules set; whether the sheet windows are not displaying the Formula Bar, Scroll Bars, Row & Column headings; Zero values; and user-definable search strings such as "password".

The 'All Formulas' sheet as one per line in A1 style, with no concept of how the same formula in relative terms has been copied over areas. This is the single biggest failing because the ability to summarise a spreadsheet succinctly is a feature of nearly every other spreadsheet formula audit tool.. The vast majority of spreadsheets contain rows, columns, or blocks of repeated formulas, also known as clones or copies of a unique formula. One of the most important tests of the structural soundness of a spreadsheet is to verify the integrity of such areas, that they are neither too small nor too large relative to similar areas, and that no inconsistent entries exist inside them. For a detailed discussion of the mechanics see the EuSpRIG 2008 paper by Markus Clermont "A Spreadsheet Auditing Tool Evaluated in an Industrial Context"¹⁵.

It is surprising that such a list, with an implication that each formula is different and has to be individually checked off in a list, would have been accepted as useful in a commercial product. Their list of "unique formulas" is therefore exactly the same as the complete

formula list, except for any formulas which are duplicated in A1 style. Therefore we make available an IQHelper add-in to group similar formulas together to make checking easier. It is available from

<http://sysmod.wordpress.com/2013/03/06/excel-2013-inquire-addin-improved-iq/>

The 'Array Formulas' sheet is interesting as a separate list, but they could be simply distinguished in the 'All Formulas' sheet by a separate indicator that the formula is an array. Currently they are recognisable by being enclosed in braces { }.

The 'Error Formulas' sheet lists those cells with #Error values. An overflow error, such as a negative or excessive date value, is not reported in this sheet but in 'All Formulas' as a real date (eg 14/04/1791 01:17:02) rather than the ##### error value.

I'm not clear what value there is in listing Logical Formulas, Numeric Formulas, Date/Time Formulas, and Textual Formulas; but somebody probably wants it. The author's preference is for sheets to be given a map with a specific colour for each data type.

'Numeric Constant Formulas', or 'Textual Constant Formulas' that is, cells with constants embedded ('hardcoded') in the formulas, are a useful list to check for (eg) adjustment values that should be moved to their own cells.

'Nested Ifs' shows formulas with more than one level of IF nesting. This is a useful indicator of a common cause of difficulty in understanding formulas with multiple logic paths. It would be even nicer if the depth of nesting was shown. It would be even better if the complexity measure was applied to All Formulas, rather than just nested Ifs.

'No Cell Refs' is a list of calculations like =1+2+3 but they can also be system functions such as =NOW().

'Blank Cell Refs' is one of these unavoidable reports where most of the information is not useful but buried in there are some possible problem formulas. Excel's error checking has that option turned off by default. It would be helpful to see these highlighted in context by a mapping tool. Like all auditing tools, all that can be done is to raise the question and leave the judgment to the reviewer.

'Hidden Cells Refs' is potentially of interest, and again a judgement call as to whether the reason for hiding the source cells is for readability (hiding detail not normally needed), analysis (eg grouping or filtering) or obscurity (potential deception).

'Text Cells Refs' can be simply formulas that copy or transform text values, but this report may also pick up the problem where a sum range includes text cells by mistake, or cells accidentally formatted as text.

'External Workbook Refs' is a useful place to collect all the external references. It is clever enough to include external links embedded in defined names. For some reason it also reports some internal cross-sheet references; for example:

=Nov'06!G5 is reported, but

=Oct 06!F4 is not reported

'Formatted As Text' can be useful to pick up formulas that are not calculating because they were entered into cells formatted as text. Sometimes people temporarily remove formulas by prefixing them with an apostrophe and then forget to reinstate them.

'Positive Formulas' eg =+B1 may be a sign of old Lotus 1-2-3 habits, where users begin a formula entry with a plus sign rather than an equals sign but are not normally seen as a problem.

'Negative Formulas' eg -=B1 could be an entry made with an initial minus sign or potentially be a keyboard 'fat finger' error because the minus key is beside the equals key on the keyboard. It's not one I've ever seen but there's always a first time.

'Unique Formulas' is probably the most useless listing there is, because all the formulas are regarded as unique in A1 style. One might speculate that they simply didn't understand how the term 'unique formula' is normally used in auditing. It is used to describe formulas which are unique in R1C1 style. Other terms for these are 'root formulas' which are copied in blocks, or 'schemas'.

'Duplicate Formulas' shows formulas which are identical on the same sheet in A1 style. This is actually a correct definition of 'duplicate' in this context. It may be useful in order to show several references to the same cell, typically a parameter or title.

'Inconsistent Formulas' are those reported by Excel in its Error Checking rules. It includes those that the user has chosen to ignore and so suppress the green triangle indicator. The following table has the complete list of Excel's rules:

Excel Error Checking rule	Where reported in Analysis
Cells containing formulas that result in an error	'Formulas With Errors'
Inconsistent calculated column formula in tables	n/a
Cells containing years represented as 2 digits	Not reported
Numbers formatted as text or preceded by an apostrophe	'Numerics As Text'
Formulas inconsistent with other formulas in the region	'Inconsistent Formulas'
Formulas which omit cells in a region	n/a
Unlocked cells containing formulas	n/a
Formulas referring to empty cells	'Blank Cell Refs'
Data entered in a table is invalid	n/a

Other cell checks that other tools do are:

- Overflow error
- Formula too long
- Formula with double minus
- Numeric text right aligned
- Range_Lookup missing the fourth parameter
- Formula Hidden
- Formula Unlocked

'Cells With Dependents' lists every cell that is further referenced by other cells. It is not obvious what the value in this is. Other tools provide a colour map that gives a specific colour to each number of dependents, so that if you see a cell that has five dependents in a block where the surrounding cells have four or six, you have something to check.

'Textual Constants' and 'Numeric Constants' list every input value in the workbook. This may have a value for decision models with a few inputs and many calculations, to guide in knowing what cells could be grouped together in an input area.

The 'Comments' sheet lists the sheet name, cell address, formula, value, comment author and text. It may be useful to indicate what people thought useful as meta-data, as information about the spreadsheet formulas and observations on the results. It may reveal previous users and obsolete comments too.

'Validation Criteria' and 'Conditional Formatting' are useful lists as they make obvious structure which is normally under the surface. However, it does not list the actual conditional formatting rules, merely the number of formats applied to each cell.

'Numerics As Text' is also one of Excel's error-checking rules. It is particularly useful when reviewing imported data

'Invisible Cells' are those in hidden rows or columns. It does not report cell contents hidden by formatting codes such as ";;;" or white text, which other auditing tools pick up as bad smells.

'Used Input Cells' are all those which are referred to by formulas. 'Unused Input Cells' are those not referenced by formulas. It does not recognise cells referred to indirectly by OFFSET or INDIRECT.

Rather than a simple list, a colouring map in place would indicate more usefully areas or cells in or beside other used areas, that ought (or ought not) to be referenced.

In the map in Fig. 2 from XLTest, most cells in the table have 2 dependents (coloured yellow) but two rows have a different colour which means they have only one dependent. This is because the formula to their right omits those cells.

Number of plays per week:				
1	2	3	4	Total
311	117	207	301	936
132	252	272	272	928
262	262	234	125	883
172	198	189	234	793
198	132	189	172	691
189	156	96	198	639
181	172	164	76	593
148	189	76	110	523
125	117	117	110	469
103	117	164	76	460
117	96	64	132	409
125	70	82	103	300
82	70	76	64	292
103	64	46	76	289
41	36	82	58	217
64	31	70	46	211
36	27	70	41	174
46	27	58	22	126
31	36	31	27	125
22	18	27	22	89
14	27	22	18	81
11	8	8	11	38
5	5	8	11	29
2	2	2	2	8
1	1	1	1	4
2521	2230	2355	2308	9307
alty				€465.39

Figure 2

'Merged Cells' may be useful because references to merged areas, or a copy/paste of them, are known to be problematical.

'Occupied Cells' is a list of every value and formula in the workbook. Can anyone think of a use for this? Comparing two versions maybe? Its complement is 'Blank Cells', all the unused cells. What on earth is that for?

'Blank Referenced Cells' may be useful to indicate missing values but again I'd much prefer to see that in context rather than a list.

'Unlocked Cells' indicates that the user has thought of input cells and protection. But the Inquire add-in does not show when sheets are protected. And it does not list separately unprotected cells with formulas, which is one of Excel's error-checking rules. Neither does it list formula cells with the 'Hidden' protection checked.

'Hidden Rows and Columns' is a useful list, although curiously it is sorted by range address regardless of sheet name. It reports rows or columns fully hidden but not very narrow ones which are visually hidden.

'Named Items' only lists the visible names, not the hidden ones. And it does not highlight which names are duplicated with local and global scope, although if they are visible it reports in the Warnings sheet that they exist ('Workbook contains duplicate named ranges.')

'Named Items With Errors' is fair enough, although I'd simply show that as a filter on the full Named Items list.

The final 'Warnings' sheet gives miscellaneous other findings, although there is no documented list of what it is capable of reporting. When that was asked that on the Microsoft forums, the response was "Can you write a justification for this idea? Why document the message list is necessary." They found it hard to believe that someone actually wanted to know what this add-in could do! From internal evidence, the possible warnings are:

1. Workbook is setup to change results to same precision as display.
2. Workbook contains formulas with errors.
3. Workbook contains hidden rows or columns.
4. Workbook contains hidden sheets.
5. Workbook contains invisible cells.
6. Workbook contains unlocked cells.
7. Workbook contains duplicate named ranges.
8. Workbook Title has not been set.
9. Workbook Author has not been set.
10. Workbook is setup for R1C1 reference style.
11. Workbook contains sheet names with leading and/or trailing blanks. The sheet names are: . . .

Comparison of representations of repeated formulas

Inquire:

Sheet Name	Cell Address	Formula	Value	Reviewer Comments
Oct 06	G11	=SUM(C11:F11)	936	
Oct 06	G12	=SUM(C12:F12)	928	
Oct 06	G13	=SUM(C13:F13)	883	
Oct 06	G14	=SUM(C14:F14)	793	
Oct 06	G15	=SUM(C15:F15)	691	
Oct 06	G16	=SUM(C16:F16)	639	
Oct 06	G17	=SUM(C17:F17)	593	
Oct 06	G18	=SUM(C18:F18)	523	
Oct 06	G19	=SUM(C19:F19)	469	
Oct 06	G20	=SUM(C20:F20)	460	
Oct 06	G21	=SUM(C21:F21)	409	
Oct 06	G22	=SUM(C22:F22)-80	300	
Oct 06	G23	=SUM(C23:F23)	292	
Oct 06	G24	=SUM(C24:F24)	289	
Oct 06	G25	=SUM(C25:F25)	217	
Oct 06	G26	=SUM(C26:F26)	211	
Oct 06	G27	=SUM(C27:F27)	174	
Oct 06	G28	=126	126	
Oct 06	G29	=SUM(C29:F29)	125	
Oct 06	G30	=SUM(C30:F30)	89	
Oct 06	G31	=SUM(C31:F31)	81	

Figure 3

This is easy enough for twenty formulas, less so for hundreds or thousands.

Compare that with the Operis Analysis Kit (OAK) Review listing in fig. 3 and map in fig. 4:

Worksheet	Address	Complexity	Frequency	External Refs	Formula
06-Oct	SGS11	1	11		=SUM(C11:F11)
06-Oct	SGS22	2	1		=SUM(C22:F22)-80
06-Oct	SGS23	1	5		=SUM(C23:F23)
06-Oct	SGS28	1	1		=126
06-Oct	SGS29	1	7		=SUM(C29:F29)
06-Oct	SC37	1	5		=SUM(C11:C36)

Figure 4

The map shows in red the beginning of each new block of a distinct formula.

	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
1	Yell	##	##	##	##	##	##	^
2	Ver	##	##	##	##	##	##	^
3	Unt	##	##	##	##	##	##	^
4	Zigt	##	##	##	##	##	##	^
5	Wh	##	##	##	##	##	##	^
6	Say	##	##	##	##	##	##	^
7	Ricj	##	##	##	##	##	##	^
8	Qui	##	##	##	##	##	##	^
9	The	##	##	##	##	##	##	^
10	Pay	##	##	##	##	##	##	^
11	Old	##	##	##	##	##	##	^
12	Mo	##	##	##	##	##	##	^
13	Ne	62	70	76	64			^
14	Lar	##	##	##	##	##	##	^
15	Kas	41	36	82	58			^
16	Jun	64	31	70	46			^
17	InT	36	27	70	41			^
18	Har	46	27	58	22			^
19	Go	31	36	31	27			^
20	Fan	22	18	27	22			^
21	Eve	14	27	22	18			^
22	Do	11	8	8	11			^
23	Car	5	5	8	11			^
24	Ber	2	2	2	2			^
25	All	1	1	1	1			^
Tot	<	<	<	<	<			

Figure 5

Another kind of map is illustrated by the XLTest Distinct Formula listing in fig. 6

	A	B	C	D	E	F	G	H
1	Distinct Formula R1C1 in 'Oct 06'		Formula A1	Count	Areas	Ranges		
2	1	=SUM(RC[-4]:RC[-1])	=SUM(C11:F11)	23	3	Oct 06!G11:G21	!G23:G27	!G29:G35
3	2	=SUM(RC[-4]:RC[-1])-80	=SUM(C22:F22)-80	1	1	ot.xls!Oct 06!G22		

Figure 6

Which gives the colour key for the XLTest Distinct Formula map in fig. 7:

Song Title	Number of plays per week:				Total
	1	2	3	4	
1 Yellow Nautic	311	117	207	301	936
2 Very Fancy	132	252	272	272	928
3 Unbelievable Wanderer	262	262	234	125	883
4 Zigbee Follies	172	198	189	234	793
5 What Was That About	198	132	189	172	691
6 Say You Can't Say What	189	156	96	198	639
7 Rich Rio River Rap	181	172	164	76	593
8 Questioning, Asking, Wondering	148	189	76	110	523
9 The Long and Twisting Way	125	117	117	110	469
10 Pay a Packet	103	117	164	76	460
11 Old Times Best Forgotten	117	96	64	132	409
12 More for the Road	125	70	82	103	300
13 Never say maybe	82	70	76	64	292
14 Larry the Louche Lizard	103	64	46	76	289
15 Kasbah Kismet	41	36	82	58	217
16 Jump the Rabbit	64	31	70	46	211
17 In Times Gone By	36	27	70	41	174
18 Happy Horroreen	46	27	58	22	126
19 Go for Gold	31	36	31	27	125
20 Fantastic journeyer	22	18	27	22	89
21 Ever in the Future	14	27	22	18	81
22 Do what you do be do	11	8	8	11	38
23 Can't walk without you	5	5	8	11	29
24 Bertie's Blues	2	2	2	2	8
25 All about the house	1	1	1	1	4
Totals	2521	2230	2355	2308	9307
Royalty					€465.35

Figure 7

Compare the listing of defined names

Inquire, fig. 8, misses the hidden names (in this case 'Oct 06'!Royalty, see later):

	A	B	
1	Named Items (4 total)		
2	F:\DOCS\SCC3\TestWB\PlayTime5 unprot.xls		
3			
4	Name	Value	Reviewer
5	Playlist3	=Dec-06!\$B\$11:\$B\$35	
6	Royalty	=0.071*F:\DOCS\MyDocs\[Currencies.xls]XE!\$D\$7	
7	'Errors'!x	=Errors!#REF!	
8	'ECB EuroFXref'!index.en	=ECB EuroFXref!\$A\$1:\$I\$220	
9			

Figure 8

OAK, fig. 9, shows the hidden names and gives useful information on the dimensions of the ranges referred to, to help in consistency checking. Another sheet reports names with overlapping ranges.

Full Name	Short Name	Defined on Sheet	Formula	Refers to Sheet	Address	Area	Top	Bottom	Height	Left	Right	Width
'ECB EuroFXref'!index.en	index.en	ECB EuroFXref	=ECB EuroFXref!\$A\$1:\$I\$220	ECB EuroFXref	\$A\$1:\$I\$220	1 1	220	220	1	9	9	9
Playlist3	Playlist3		=Dec-06!\$B\$11:\$B\$35	06-Dec	\$B\$11:\$B\$35	1 11	35	25	2	2	2	1
Royalty	Royalty		=0.071*F:\DOCS\MyDocs\[Currencies.xls]XE!\$D\$7	*** Formula Reference ***	\$B\$39	1 39	39	1	2	2	2	1
'Oct 06'!Royalty	Royalty	06-Oct	=Oct 06!\$B\$39	06-Oct	\$B\$39	1 39	39	1	2	2	2	1
'Errors'!x	x	Errors	=Errors!#REF!	*** Error Reference ***								
'Nov'06'!Z_062E4F23_7EA_Z_062E4F23_7EA0_Nov'06			=Nov'06!\$A:\$A	Nov'06	\$A:\$A	1 1	65536	65536	1	1	1	1
'Dec-06'!Z_062E4F23_7EA_Z_062E4F23_7EA0_06-Dec			=Dec-06!\$36:\$36	06-Dec	\$36:\$36	1 36	36	1	1	1	256	256
'Nov'06'!Z_062E4F23_7EA_Z_062E4F23_7EA0_Nov'06			=Nov'06!\$1:\$1	Nov'06	\$1:\$1	1 1	1	1	1	1	256	256
'Nov'06'!Z_DBFAFBC0_74_Z_DBFAFBC0_7477_Nov'06			=Nov'06!\$A:\$A	Nov'06	\$A:\$A	1 1	65536	65536	1	1	1	1
'Dec-06'!Z_DBFAFBC0_74_Z_DBFAFBC0_7477_06-Dec			=Dec-06!\$36:\$36	06-Dec	\$36:\$36	1 36	36	1	1	1	256	256
'Nov'06'!Z_DBFAFBC0_74_Z_DBFAFBC0_7477_Nov'06			=Nov'06!\$1:\$1	Nov'06	\$1:\$1	1 1	1	1	1	1	256	256

Figure 9

XLTest, fig. 10, shows the visibility and current value:

	Name	Defined Name	Refers to	Local to sheet	Visible	Type	Value/SUM
55	1	index.en	=ECB EuroFXref!\$A\$1:\$I\$220	'ECB EuroFXref'	True	Range	0
56	2	Playlist3	=Dec-06!\$B\$11:\$B\$35		True	Range	0
57	3	Royalty	=Oct 06!\$B\$39	'Oct 06'	False	Range	0.05
58	4	Royalty	=0.071*F:\DOCS\MyDocs\[Currencies.xls]XE!\$D\$7		True	Error	#REF!
59	5	x	=Errors!#REF!	Errors	True	Error	#REF!
60	6	Z_062E4F23_7E	=Nov'06!\$A:\$A	'Nov'06'	False	Range	0
61	7	Z_062E4F23_7E	=Dec-06!\$36:\$36	'Dec-06'	False	Range	0
62	8	Z_062E4F23_7E	=Nov'06!\$1:\$1	'Nov'06'	False	Range	0
63	9	Z_DBFAFBC0_7	=Nov'06!\$A:\$A	'Nov'06'	False	Range	0
64	10	Z_DBFAFBC0_7	=Dec-06!\$36:\$36	'Dec-06'	False	Range	0
65	11	Z_DBFAFBC0_7	=Nov'06!\$1:\$1	'Nov'06'	False	Range	0

Figure 10

Workbook Relationship

This is a useful picture, fig. 11, of the dependencies in systems of linked workbooks.

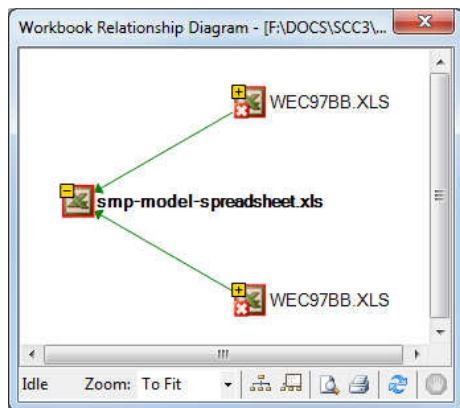


Figure 11

This illustration shows the dead links in the Names. It would be useful if clicking on those linked files gave more information, such as where the links were found.

Worksheet Relationship Diagram

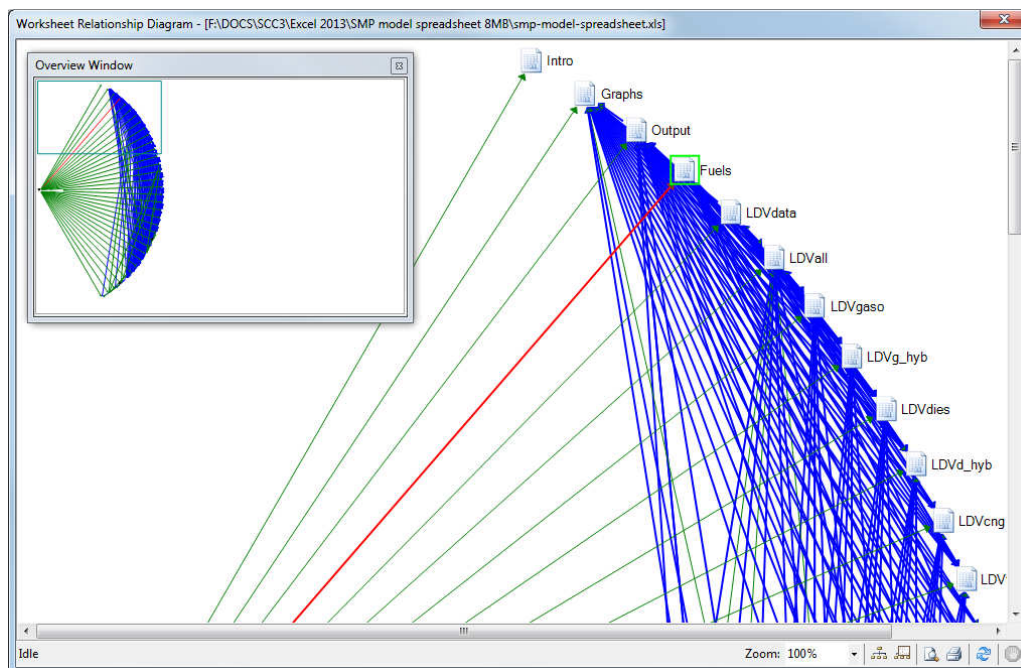


Figure 12

For any moderately complex workbook, this does not provide much enlightenment. There is little value in showing the workbook on the left hand side and all the links going to that, as we already know that they are all in that workbook. It would be clearer to show for example “Intro” on its own unlinked to anything. And the arrows could be annotated with information such as how many links there are for one arrow.

Cell Relationship

This shows the links between individual cells. Because it does not have any concept of ranges of similar formulas, the diagrams rapidly sprawl as the number of copied formulas increases. Fig. 13 is an image from a simple tax calculation spreadsheet:

It is therefore probably best suited to simple spreadsheets.

It will try to expand the tree for all the precedent cells in a LOOKUP formula, which could be thousands. Take the simple example shown in fig. 14:

This can cause Excel to hang (the window goes frosty and the title bar says "(Not Responding)" for several minutes. Task Manager can show you how it using memory and CPU time, see fig. 15.

Image Name	User Name	CPU	Memory (...)	Description
EXCEL.EXE	Patrick	25	390,780 K	Microsoft Excel

Figure 15

Eventually it will give you a graph with thousands of nodes, as shown in fig. 16.

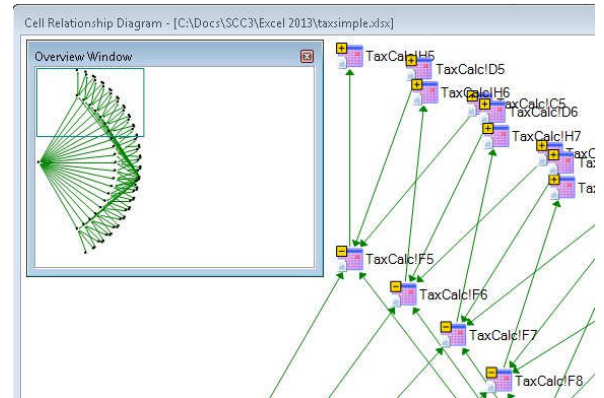


Figure 13

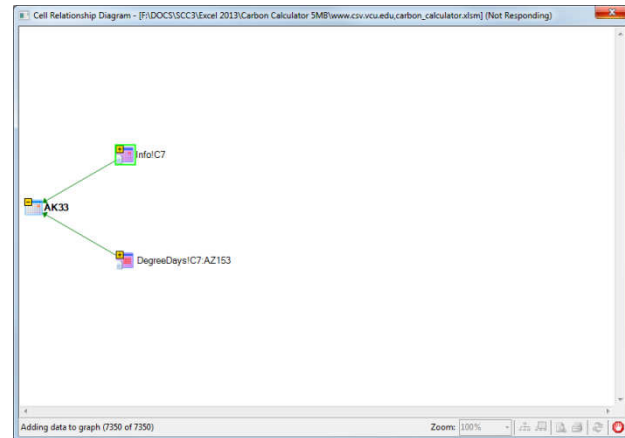


Figure 14

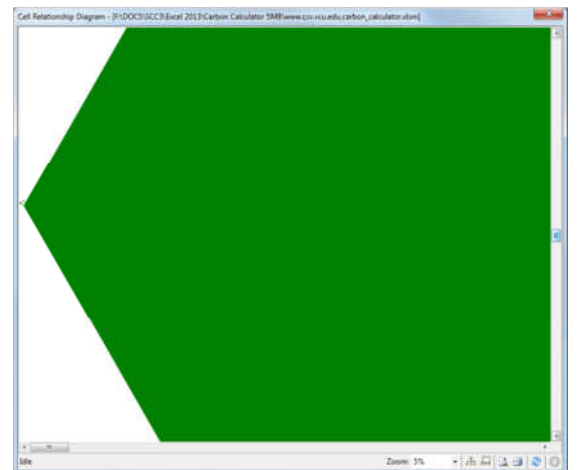


Figure 16

Compare Files

The Compare Files command lets you see the differences, cell by cell, between two workbooks. Results are colour-coded by the kind of content, such as entered values, formulas, named ranges, and formats. A window shows VBA code changes line by line. Differences between cells are shown in a grid layout, fig. 17:

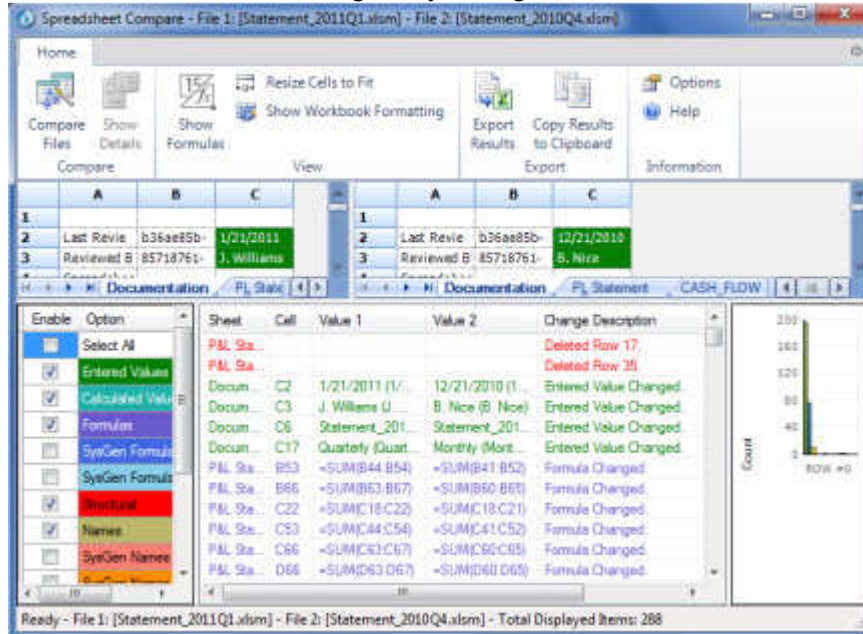


Figure 17

The "Show Details" button applies to VBA differences and shows a WinDiff output of the code. Clicking "Help" just gets you "We're sorry, but there is no help available for Spreadsheet Compare in this market."

There is a bug in the Compare Options list. If you click the Option heading in the Option checkboxes at the bottom left, the table is sorted alphabetically by Option. But the first checkbox is still "Select All"; that is, the action of the checkboxes does not change from the unsorted list.

The 'Entered Values' comparison is case sensitive, and there does not appear to be an option to make it treat upper and lower case as being the same.

If you get a message "Excel 2013 is required to open the specified file", it may be because you have multiple versions of Excel installed and the default application on your PC to open Excel files is a previous version of Excel. To avoid this:

1. Launch the Windows Control Panel
2. Click Programs, Programs and Features
3. Select Microsoft Office 2013, click Change
4. Click Yes to any User Access Control alert
5. Choose the Repair option, and click Continue.

There is a rather obscure term 'SysGen ...' in the options that is not explained anywhere in the Help. It only makes a difference to the report after you tick the option 'Include system generated changes in result' in the Options dialog (fig. 18) which appears when you start a Compare; so you have to do at least one comparison, even if you do not use the output, to get at the following dialog: (As you can unselect the four SysGen checkboxes in the Options, it may be better to always process them by default as you can always tick or untick the display later.)

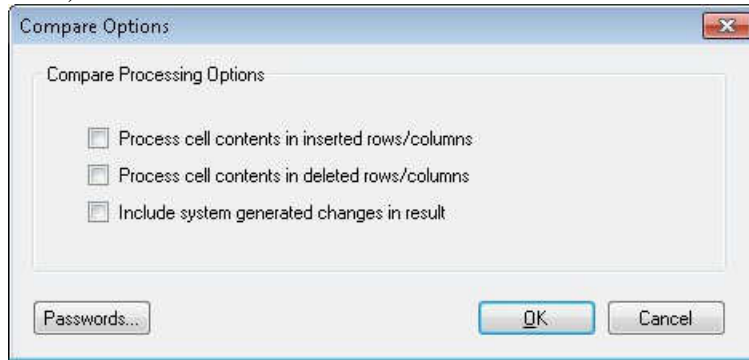


Figure 18

By 'system generated changes' they mean formulas that have been automatically changed by Excel as a result of an insertion or deletion. For example, say you have a formula =SUM(E6:E9) and you delete row 9 so the formula now shows =SUM(E6:E8).

With 'SysGen Formulas' unticked, no difference is reported in fig.19

	A	B	C	D	E	F	G	H	I	J	K	L
1	Staffing Plan				Staffing	Staffing	Staffing	Staffing	Staffing	Staffing	Staffing	"Annual"
2					Q1	Q2	Q3	Q4	Q1	Q2	Q3	"Salary"
3					Year 1	Year 1	Year 1	Year 1	Year 2	Year 2	Year 2	
4												
5	Engineering											
6		CTD	Input		1	1	1	1	1	1	1	\$ 150,000
7		Programmer	Input		5	8	10	12	14	16	20	\$ 75,000
8		Tech Writer	Input		-00	1	1	2	2	4	4	\$ 60,000
9		Other	Input		-00	-00	-00	-00	-00	-00	-00	\$ 80,000
10		Total Eng			6	10	12	15	17	21	25	

Figure 19

When ticked, the difference is highlighted in fig.20:

	A	B	C	D	E	F	G	H	I	J	K	L
1	Staffing Plan				Staffing	Staffing	Staffing	Staffing	Staffing	Staffing	Staffing	"Annual"
2					Q1	Q2	Q3	Q4	Q1	Q2	Q3	"Salary"
3					Year 1	Year 1	Year 1	Year 1	Year 2	Year 2	Year 2	
4												
5	Engineering											
6		CTD	Input		1	1	1	1	1	1	1	\$ 150,000
7		Programmer	Input		5	8	10	12	14	16	20	\$ 75,000
8		Tech Writer	Input		-00	1	1	2	2	4	4	\$ 60,000
9		Other	Input		-00	-00	-00	-00	-00	-00	-00	\$ 80,000
10		Total Eng			6	10	12	15	17	21	25	

Figure 20

'SysGen Names' refers to Excel's internal names such as Print_Area.

For display purposes OAK can insert rows or columns to line up the sheets to match. The table below has some rows deleted to save space. The coloured mapping in Fig. 22 is shown on its side to fit to the page.

Range	Cell contents on 1st Sheet	Cell contents on 2nd Sheet
From		1 rows inserted
Row = 9		
From		1 rows inserted
Row = 11		
From	1 columns inserted	
Column =		
K		
K1		Staffing
K2		Q3
K3		Year 2
K6		1
K7		20
K8		4
B9	Other	
C9	Input	
E9	0	
J9	0	
L9	80000	
E10	=SUM(E6:E9)	=SUM(E6:E8)
F10	=SUM(F6:F9)	=SUM(F6:F8)
G10	=SUM(G6:G9)	=SUM(G6:G8)
H10	=SUM(H6:H9)	=SUM(H6:H8)
I10	=SUM(I6:I9)	=SUM(I6:I8)
J10	=SUM(J6:J9)	=SUM(J6:J8)
K10		=SUM(K6:K8)
K13		1
K14		3
K15		2
K16		2
K17		=SUM(K13:K16)
K19		=K10+K17
C21	350000	400000
I21	=ROUND(\$C\$21/I19,-3)/4/1000	=ROUND(\$C\$21/I19/1000,0)/4
J21	=ROUND(\$C\$21/J19,-3)/4/1000	=ROUND(\$C\$21/J19/100,0)/4
K21		=ROUND(\$C\$21/K19/100,0)/4

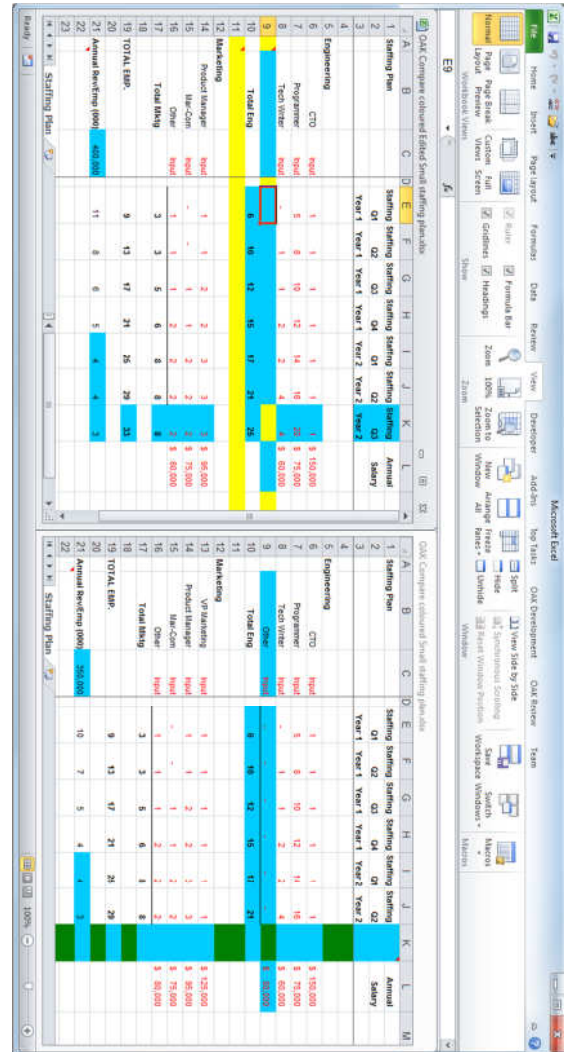


Figure 22

Clean Excess Cell Formatting

This says it clears excessive formatting but does not tell you beforehand what will be cleared, nor afterwards what was cleared.

Interactive analysis

This was removed from the final release of the Inquire add-in for Excel 2013, because of stability problems.

By comparison, OAK has a menu to report various items of interest, see fig 23, and a facility to understand the reconstruct the components of a formula and to progressively simplify it, for example by pruning inactive paths.

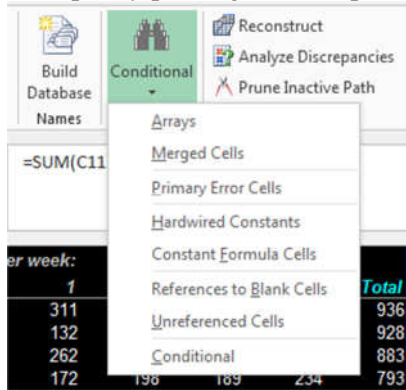


Figure 23

Sheet	Type	Sheet Tab Name	Visibility	Contents	Sum Total	Rows	Columns
1	Worksheet	\$TOC(1)	Visible				
2	Worksheet	\$Nuf Front (1)	Visible	Number Format	46	6	9
3	Worksheet	\$Sty Front (1)	Visible	Styles	15	2	7
4	Worksheet	\$Nuf Dec-06(1)	Visible	Number Format	19	4	7
6	Worksheet	\$DpC Consolidated(1)	Visible	Dependents Count in 'Consolidated'	0	1	1
14	Worksheet	\$PrL Front (1)	Visible	Precedents Location in 'Front '	0	1	1
23	Worksheet	\$Use Front (1)	Visible	Data Type and Usage in 'Front '	0	1	1
32	Worksheet	\$Typ Front (1)	Visible	Data Types in 'Front '	0	1	1
41	Worksheet	\$Val Front(1)	Visible	Data Validation	3	2	6
42	Worksheet	\$For Front (1)	Visible	Distinct Formulas	152	16	6
51	Worksheet	\$Cof Nov'06(1)	Visible	Conditional Formats	9	2	6
52	Worksheet	\$Nuf Nov'06(1)	Visible	Number Format	9	3	7
55	Worksheet	\$Sty Front(1)	Visible	Styles	9	3	7
58	Worksheet	\$Inf Front (1)	Visible	Inf_ Inspection of 'Front '	15386	63	6
69	Worksheet	\$VBA(1)	Visible	Reference	2610	27	7
70	Worksheet	\$WSXref(1)	Visible	First reference by each sheet named across the page	11	22	14
71	Worksheet	\$DOOC(1)	Visible	26/02/2013	#REF!	168	31
72	Worksheet	\$APP(1)	Visible	Excel Application Settings	42201.49313	62	7
73	Worksheet	\$XLTEST LOG	Visible	Date, time	11458786455	103	14

Figure 24

XLTEST (see fig. 24) provides a detailed worksheet analysis listing all the occurrences of the seven Excel #Error values, the nine Excel error-checking warnings, plus: Overflow error, Number in formula, Hiding by Format, Formula too long, Formula with double minus, Numeric text right aligned, Range_Lookup missing parameter.

For sheets, it provides statistics on Distinct Formulas, Formula Hidden, Formula Unlocked, Longest Formula, Array Formulas, Merged Areas, Number Formats used:, Custom Styles used, Circular References, Excel Functions used, Objects and Onactions (OLE, buttons, pictures, chart series...),

For the workbook, it lists many non-obvious attributes: properties, sheet statistics, link sources, queries, data connections, defined names, Styles, NumberFormats, Views, OnAction button macros, VBA macros, and a cross-reference table showing how sheets are linked.

Conclusion

The Inquire add-in has the great advantage of being included with Excel, rather than a separate purchase. It provides some minimum standard of documentation, although the simplistic formula listing is not useful for large workbooks. Commercial auditing software offers much more and for a modest cost, typically less than 400 US dollars. Some, like OAK, go beyond review facilities and offer development assistance as well.

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