



# Excel Business Modelling

Sample manual - first two chapters



**Wise Owl**  
Training

## TABLE OF CONTENTS (1 of 5)

1	SEVEN MODELLING GUIDELINES	Page
1.1	Guideline 1 – Use a Cover Sheet	7
1.2	Guideline 2 – Separate Inputs and Calculations	8
	<i>Checking for Rogue Formulae</i>	8
1.3	Guideline 3 – Use Styles	9
1.4	Guideline 4 – Use Range Names	10
1.5	Guideline 5 – Keep Formulae Simple	10
1.6	Guideline 6 – Copy Formulae Across	11
1.7	Guideline 7 – Use Consistent Period Headings	11

2	RANGE NAMES	Page
2.1	What are Range Names?	12
	<i>Going to a Range Name</i>	12
2.2	Creating Range Names	13
	<i>Method 1 – Using the Name Box</i>	13
	<i>Method 2 – Defining Names</i>	13
	<i>Method 3 - Creating Range Names from Selected Cells</i>	14
2.3	Range Names in Formulae	15
	<i>Referencing Range Names in Formulae</i>	15
	<i>Dealing with Spill Errors</i>	16
	<i>The Possible Spill Errors</i>	16
	<i>Implicit Intersection using @</i>	17
	<i>Two-Dimensional Range Formulae</i>	17
	<i>Getting Aggregation Functions to Work using +</i>	18
2.4	Working with Range Names	19
	<i>Editing and Deleting Range Names</i>	19
	<i>Viewing Range Names</i>	19
2.5	The Scope of Range Names	20
	<i>Choosing the Scope of a Range Name</i>	20
	<i>Copying Worksheets Copies their Range Names with Local Scope</i>	20
2.6	3-Dimensional Ranges	21

3	STYLES	Page
3.1	Overview of Styles	22
	<i>Benefits of Styles (1) – Consistent Formatting</i>	22
	<i>Benefits of Styles (2) – Protection</i>	22
3.2	Applying Styles	23
	<i>Adding Styles to the Quick Access Toolbar</i>	23
3.3	Creating Styles	24
	<i>Creating Partial Styles</i>	24
3.4	Changing Styles	25
3.5	Merging Styles	26

4	NUMBER AND DATE FORMATS	Page
4.1	What are Number Formats?	27
	<i>Examples of Number Formats</i>	27
	<i>Examples of Date Formats</i>	27
4.2	Formatting Dates	28
	<i>How Dates and Times are Stored</i>	28
	<i>Quick Ways to Enter Dates and Times</i>	28
	<i>Quick Formatting Dates and Times</i>	29
	<i>Selecting Different Date/Time Formats</i>	29
	<i>Custom Date Formats</i>	30
	<i>Custom Date Formatting Codes</i>	30
	<i>Custom Time Formatting Codes</i>	31
	<i>Displaying Elapsed Times without Overflow</i>	31
4.3	Standard Number Formats	32
	<i>Standard Number Formats using the Ribbon</i>	32
	<i>Standard Number Formats using Format Cells</i>	33
4.4	Custom Number Formats	34
	<i>Creating Custom Number Formats</i>	34
	<i>General Rules for Custom Number Formats</i>	34
	<i>Example of a Typical Custom Number Format</i>	35
	<i>Re-using Custom Number Formats</i>	35
4.5	Tricks with Number Formats	36
	<i>Tricks with Text</i>	36
	<i>Hiding Parts of a Number Format</i>	36
	<i>Colouring Parts of a Number Format</i>	36
	<i>Getting Positive and Negative Numbers to Line Up</i>	37
	<i>Getting Decimal Points to Line Up</i>	37
	<i>Fractions</i>	37
	<i>Scaling Large Numbers</i>	38
	<i>Filling Spaces</i>	38

## TABLE OF CONTENTS (2 of 5)

5	CONDITIONAL FORMATTING	Page
5.1	Overview	39
5.2	Creating Conditional Formats	40
	<i>Applying a Pre-set Conditional Format</i>	40
	<i>Creating your own Conditional Format – a Case Study</i>	41
5.3	Editing and Deleting Conditional Formats	42
	<i>Changing the Order in which Rules Apply</i>	42
5.4	More Sophisticated Rules	43
	<i>Picking out Statistical Trends</i>	43
	<i>Using Formulae in Rules</i>	44
	<i>Using Formulae in Rules to Highlight a Whole Row</i>	45
5.5	Viewing Conditionally Formatted Cells/Rules	46
	<i>Viewing All Conditionally Formatted Cells</i>	46
	<i>Viewing all Conditional Formatting Rules</i>	46

6	NOTES	Page
6.1	Overview of Notes	47
6.2	Working with Notes	48
	<i>Creating Notes</i>	48
	<i>Changing the Default User Name</i>	48
	<i>Editing and Deleting Notes</i>	49
	<i>Formatting Notes</i>	49
	<i>Printing Notes</i>	50
6.3	Ways to Show Notes	51
	<i>Hiding Red Triangles</i>	51
	<i>Showing/Hiding All Notes</i>	51
	<i>Selecting Cells Containing Notes</i>	51

7	DATA VALIDATION	Page
7.1	What is Data Validation?	52
7.2	Creating Validation Rules	53
	<i>Step 1 – Saying what is Allowed</i>	53
	<i>Step 2 – Defining your Punishment for Mistakes</i>	54
7.3	Referencing Formulae in Validation	55
7.4	Dropdown Lists	56
	<i>Step 1 - Creating a Range Name</i>	56
	<i>Step 2 – Setting the List</i>	56
7.5	Input Messages	57
7.6	Copying and Clearing Validation Settings	58
	<i>Copying Validation</i>	58
	<i>Clearing Validation Settings</i>	58
7.7	Highlighting Validated Cells	59
	<i>Highlighting Cells which have Validation Applied</i>	59
	<i>Circling Invalid Data</i>	59

8	PROTECTION	Page
8.1	Types of Protection	60
8.2	Protecting Worksheets	61
	<i>Unlocking Cells</i>	61
	<i>A Note on Unprotecting Cells using Styles</i>	62
	<i>Protecting and Unprotecting Worksheets</i>	62
8.3	Protecting a Workbook's Structure	63
8.4	Password-Protecting Workbooks	64
8.5	Preventing Accidental Changes to a Workbook	65
8.6	Hiding Worksheets	66
	<i>Very Hidden Worksheets</i>	66
8.7	Hiding Cells and Formulae	67
	<i>Hiding Cells</i>	67
	<i>Hiding Formulae</i>	67

## TABLE OF CONTENTS (3 of 5)

9	GROUPING (OUTLINING)	Page
9.1	Using Grouping	68
9.2	Creating Grouping/Outlining	69
	<i>Creating Automatic Outlines</i>	69
	<i>Manually Grouping Rows/Columns</i>	69
9.3	Problems with Grouping/Outlining	70
	<i>Changing Outlining Position</i>	70
	<i>Using Grouping/Outlining with Protection</i>	70
9.4	Removing Outlining/Grouping	71
	<i>Removing Outlining/Grouping from Selected Rows/Columns</i>	71
	<i>Removing All Outlining</i>	71

10	IF FUNCTIONS	Page
10.1	Overview of IF Functions	72
	<i>Relational Operators</i>	72
10.2	Creating IF Functions	73
	<i>Typing IF Functions</i>	73
	<i>Using the Function Wizard</i>	74
10.3	Nesting IF Conditions	75
	<i>Step 1 – Define the Conditions</i>	75
	<i>Step 2 – Create the Nested IF Function</i>	75
	<i>An Alternative: the IFS function</i>	76
10.4	The SWITCH Function	77

11	INFORMATION FUNCTIONS	Page
11.1	The CELL and INFO Functions	78
	<i>The INFO Function</i>	78
	<i>The CELL Function</i>	78
11.2	Sheet Number / Numbers	79
	<i>The SHEET Function</i>	79
	<i>The SHEETS Function</i>	79

12	TEXT FUNCTIONS	Page
12.1	List of Text Functions	80
	<i>Searching and Replacing Text</i>	80
	<i>Extracting one String from Another</i>	80
	<i>Converting Strings</i>	81
	<i>Other Text Functions</i>	81
	<i>Joining Multiple Items</i>	81
	<i>Converting Numbers and Dates to Text</i>	82
12.2	Text Functions – a Case Study	83

13	DATE AND TIME FUNCTIONS	Page
13.1	Returning Date Information	84
	<i>Returning Parts of a Date</i>	84
	<i>Returning today's Date/Time</i>	84
	<i>Returning Parts of a Time</i>	85
	<i>Converting Numbers/Text into Dates/Times</i>	85
13.2	Manipulating Dates	86
	<i>Returning Different Dates</i>	86
	<i>Returning the Difference between Dates</i>	86

14	THE VLOOKUP FUNCTION	Page
14.1	Types of Lookup Table	87
	<i>Exact Matches or Not?</i>	87
	<i>Horizontal or Vertical?</i>	87
14.2	Inexact Matches (Continuous Value Lookups)	88
	<i>Creating the Lookup Table</i>	88
	<i>Giving the Lookup Table a Range Name</i>	88
	<i>Creating the VLOOKUP Formula</i>	89
14.3	Exact Match Lookup Tables	90
	<i>Syntax of the Exact VLOOKUP Function</i>	90
	<i>Creating a Range Name for your Lookup Table</i>	91
	<i>Creating the Lookup Formula</i>	91
14.4	Trapping Errors	92
	<i>Method 1 - Preventing Errors Happening with Data Validation</i>	92
	<i>Method 2 - Adding Outliers to your Input Table</i>	93
	<i>Method 3 – Converting Invalid Values using IF</i>	93
	<i>Method 4 – Trap Errors when they Occur</i>	93

15	INSPECTION AND ERROR FUNCTIONS	Page
15.1	Inspection Functions	94
	<i>Non-Error Inspection Functions</i>	94
	<i>Error Inspection Functions</i>	94
15.2	Handling Errors	95
	<i>General Error Trapping using IFERROR</i>	95
	<i>Avoiding the Error in the First Place</i>	95

## TABLE OF CONTENTS (4 of 5)

16	THE XLOOKUP FUNCTION	Page
16.1	Introduction to XLOOKUP	96
	<i>Our Example for this Chapter</i>	96
	<i>The XLOOKUP Function Arguments</i>	96
16.2	Using XLOOKUP	96
	<i>Basic Lookups</i>	97
	<i>Reversing the Sort Order</i>	97
	<i>Using Wildcards</i>	98
	<i>Setting a Not Found Value</i>	99
	<i>Returning Arrays</i>	99

17	CONDITIONAL STATISTICS	Page
17.1	Overview of Conditional Statistical Functions	100
	<i>Using IF instead of Conditional Statistical Functions</i>	100
	<i>The Special Functions Available</i>	100
17.2	SUMIFS, COUNTIFS, etc	101
	<i>Syntax of the Functions</i>	101
	<i>Worked Example</i>	101
	<i>Example with Multiple Criteria and Wildcards</i>	102
	<i>AVERAGEIF, COUNTIF and SUMIF</i>	103
	<i>Using with a Summation Range</i>	103
	<i>Combining the Criteria and Summation Range</i>	103

18	LOGICAL FUNCTIONS / MASKING	Page
18.1	Masking	104
18.2	Logical Functions	105

19	OTHER LOOKUP FUNCTIONS	Page
19.1	Combining MATCH and INDEX	106
	<i>Reasons to Prefer MATCH/INDEX to VLOOKUP</i>	106
	<i>The Range Names for our Example</i>	107
	<i>The Syntax of MATCH</i>	107
	<i>Using MATCH to Find Row/Column Numbers for our Example</i>	108
	<i>Syntax of the INDEX Function</i>	108
	<i>Creating the INDEX Function for our Example</i>	109
	<i>Combining MATCH and INDEX in a Single Function</i>	109
19.2	The XMATCH Function	110
	<i>The XMATCH Function Arguments</i>	110
19.3	The CHOOSE Function	111
19.4	The OFFSET Function	112
	<i>Basic Offsetting</i>	112
	<i>Setting the Number of Rows/Columns Returned</i>	113
19.5	The INDIRECT Function	114
	<i>Example: Picking Out Figures from a Chosen Worksheet</i>	114

20	THE SUMPRODUCT FUNCTION	Page
20.1	Our Example	115
20.2	Solutions without SUMPRODUCT	116
	<i>Summing the Results of IF Functions</i>	116
	<i>Using SUMIFS</i>	116
20.3	The SUMPRODUCT Function	117
	<i>What Summing Products Means</i>	117
	<i>Vectors of TRUE / FALSE values</i>	117
	<i>Forcing SUMPRODUCT to Calculate True/False Correctly</i>	118
	<i>Weighted Averages using SUMPRODUCT</i>	118

21	DYNAMIC RANGE NAMES	Page
21.1	Examples of Dynamic Range Names	119
21.2	Making a Range Name Dynamic	120
	<i>The Principle: the OFFSET Function</i>	120
	<i>Creating the Range Name</i>	120
	<i>Using Dynamic Range Names</i>	121
21.3	Dynamic Range Names and Charts	122
	<i>Creating the Range Names</i>	122
	<i>Making the Chart Refer to these Ranges</i>	122

## TABLE OF CONTENTS (5 of 5)

22	CASHFLOW	Page
22.1	Template for a Cashflow Calculation	123
22.2	Calculating Interest	124
	<i>Step 1 – Splitting the Cash Stream into Positive and Negative Amounts</i>	124
	<i>Step 2 – Calculating the Deposit/Loan Rate</i>	125
	<i>Step 3 – Calculating the Deposit/Loan Amount</i>	125

23	INVESTMENT APPRAISAL	Page
23.1	Discount Rates	126
23.2	Discounted Cashflow	127
23.3	NPV and IRR Functions	128
	<i>NPV Function</i>	128
	<i>IRR Function</i>	129
	<i>Using IRR or NPV to Assess an Investment</i>	129
	<i>Non-Periodic Cashflows using XNPV and XIRR</i>	130
	<i>Modified Internal Rate of Return Function</i>	130

24	MULTIPLE WORKSHEETS	Page
24.1	Moving between Worksheets	131
24.2	Common Tasks	132
	<i>Selecting and De-selecting Worksheets</i>	132
	<i>Renaming Worksheets</i>	132
	<i>Changing Worksheet Tab Colours</i>	133
	<i>Hiding and Unhiding Worksheets</i>	133
24.3	Inserting and Deleting Worksheets	134
	<i>Inserting Single Worksheets</i>	134
	<i>Inserting Multiple Worksheets</i>	134
	<i>Deleting Worksheets</i>	134
24.4	Moving and Copying Worksheets	135
	<i>Moving Worksheets within a Workbook</i>	135
	<i>Copying Worksheets within a Workbook</i>	135
	<i>Moving and Copying to a Different or New Workbook</i>	136
24.5	Group Mode	137
24.6	Summing across Sheets	138

25	SCENARIOS	Page
25.1	Overview of Scenarios	139
25.2	Creating a Scenario	140
	<i>Base case scenarios</i>	140
	<i>Starting the Scenario Manager</i>	140
	<i>Creating a Scenario</i>	141
25.3	Showing Different Scenarios	142
	<i>Showing Different Scenarios using the Ribbon</i>	142
	<i>Switching Scenarios using the Quick Access Toolbar</i>	142
25.4	Editing, Deleting and Merging Scenarios	143
	<i>Editing or Deleting Scenarios</i>	143
	<i>Merging Scenarios</i>	143
25.5	Summarising Scenarios	144

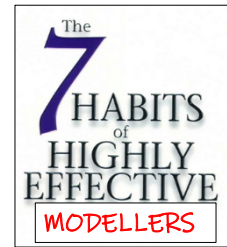
26	GOAL-SEEKING	Page
26.1	Goal-Seeking Example	145
26.2	Using Goal-Seeking	146

27	DATA TABLES	Page
27.1	Overview of Data Tables	147
	<i>One-Way and Two-Way Data Tables</i>	147
	<i>Example of a Data Table</i>	147
27.2	One-Way Data Tables	148
	<i>Step 1 – Create your Formulae</i>	148
	<i>Step 2 – Create your Inputs</i>	148
	<i>Step 3 – Create the Data Table Itself</i>	149
27.3	Two-Way Data Tables	150
	<i>Step 1 – Create your Formula</i>	150
	<i>Step 2 – Create your Inputs</i>	150
	<i>Step 3 – Create the Data Table</i>	151

28	MODELLING SHORT-CUTS	Page
28.1	Creating a Row of Data	152
28.2	Other Keyboard Shortcuts	154
	<i>Shortcuts for Moving and Selecting</i>	154
	<i>Shortcuts for Formatting</i>	154
	<i>Shortcuts for Range Names</i>	155
	<i>Shortcuts for Formulae and Data</i>	155

## CHAPTER 1 - SEVEN MODELLING GUIDELINES

This chapter lists the seven habits of highly effective modellers (with apologies to Stephen R. Covey).



### 1.1 Guideline 1 – Use a Cover Sheet

Our first guideline is to include a cover sheet as the first worksheet in any model:

	A	B	C	D
1				
2		Title of model ==>	The Chocolate Emporium	
3				
4		Start date for model ==>	01 Sep 2020	
5				
6		Version number ==>	1.0	
7				
8		Status ==>	(Very) untested	
9				

You can hide all of the columns and rows not being used to create a tidier effect.

Things this might contain include:

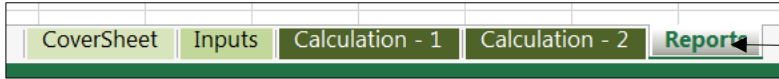
Cover sheet field	Notes
<i>Who wrote the model</i>	Your name and contact details
<i>Revision dates and version number</i>	When the model was created, when it was last revised and any version number
<i>Confidentiality</i>	Whether the model contains confidential data



If your company or organisation has a standard model template which you can use, so much the better!

## 1.2 Guideline 2 – Separate Inputs and Calculations

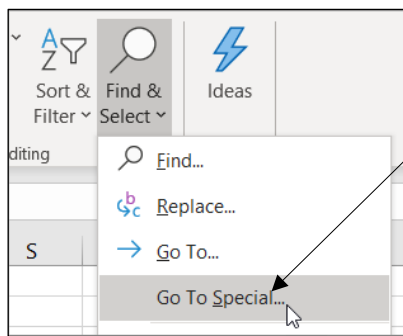
As a fundamental principle, you should put all of your input assumptions on one (or more) separate worksheet(s):



You could use colouring to show the different types of worksheet tab.

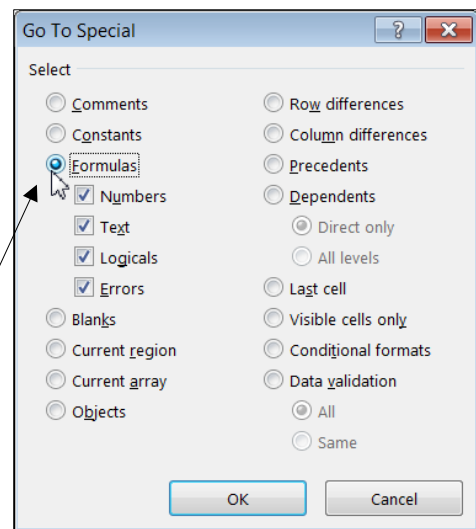
### Checking for Rogue Formulae

You can highlight any rogue formulae in an input worksheet as follows:



a) Choose this tool from the **HOME** tab of the ribbon (or press **F5** and choose the **Special...** button at the bottom left of the dialog box which appears).

b) Choose to highlight formulae.



	A	B	C	D	E	F	G	H
1	The Chocolate Emporium		Period ==>			1	2	3
2			Start date ==>			01/03/2015	01/04/2015	01/05/2015
3	Section	Input row title	Units	End date ==>		31/03/2015	30/04/2015	31/05/2015
4								
5	<b>Costs</b>							
6		Raw materials	£'			-500	-500	-600
7		Labour	£'			-400	-390	-380
8		Overheads	£'			-300	-350	-400
9								
10	<b>Revenue</b>							
11		Base sales	£'		1000	Revenue		
12		Sales multiplier	%			0	0.1	0.2

c) Apart possibly from column headers, as here, no cells should be selected on input sheets.



Another good way to check this is to press **Ctrl** + **`** (this strange symbol, called a backtick, is usually at the top left of your keyboard, above the **Tab** key) to display formulae. For an inputs worksheet, this shouldn't change any of the displayed values.

### 1.3 Guideline 3 – Use Styles

Imagine how much easier modelling in your company or organisation would be if everyone used consistent formatting!

1	The Chocolate Emporium		Period ==>	1	2
2			Start date ==>	01/09/2020	01/10/2020
3	Section	Input row title	Units	End date ==>	30/09/2020 31/10/2020
4					
5	<b>Costs</b>				
6		Raw materials	£	-500	-300
7		Labour	£	-400	-390
8		Overheads	£	-300	-350
9					
10	<b>Revenue</b>				
11		Base sales	£	1000	RevBase
12		Sales multiplier	%	0	0.1
13					

This input cell is formatted with the **InputCell** style, which makes it appear with a yellow background and borders ...

... which is also why all of these other input cells have the same formatting.

Here is a suggestion for a set of styles that you could create:

Worksheet type	Suggested name	Used for
Inputs	<i>InputPercent</i>	Input cells which contain percentages
	<i>InputCurrency</i>	Input cells which contain currency amounts
	<i>InputDate</i>	Input cells which contain dates
	<i>InputOther</i>	Input cells containing text and numbers
Calculations	<i>CalcPercent</i>	Calculation cells which contain percentages
	<i>CalcCurrency</i>	Calculation cells which contain currency amounts
	<i>CalcDate</i>	Calculation cells which contain dates
	<i>CalcOther</i>	Calculation cells containing text and numbers
Reports	<i>RepPercent</i>	Report cells which contain percentages
	<i>RepCurrency</i>	Report cells which contain currency amounts
	<i>RepDate</i>	Report cells which contain dates
	<i>RepOther</i>	Report cells containing text and numbers
General	<i>GenRangeName</i>	How range names appear to the right of each row
	<i>GenUnits</i>	How units appear
	<i>GenTitle</i>	Titles for blocks of data
	<i>GenItem</i>	Individual item lines in a report



*It doesn't matter whether your input cells are blue, pink or red with yellow spots, just as long as they are consistent.*

## 1.4 Guideline 4 – Use Range Names

A *range name* is a name given to a cell (or to a block of cells), which you can then use in your formulae. Range names make formulae easier to read, write, maintain and test!

fx	=CostLabour+CostMaterials+CostOverheads				
	C	D	E	F	G
£				1000	1100
£				-1200	-1240
£				-200	-140

Range names like this are so much easier to read ... ..

... than cell references like this.

fx	=Inputs!F7+Inputs!F6+Inputs!F8				
	C	D	E	F	G
£				1000	1100
£				-1200	-1240
£				-200	-140



You should aim to avoid using any references at all in your models (although there will be a few times when you have to relax this slightly).

## 1.5 Guideline 5 – Keep Formulae Simple

Here is a sequence of formulae which display a message saying how many spaces there are in a worksheet name (this is a daft thing to do, but that's not the point!).

A series of formula to display a message like this in the final cell:

List of calcs has 2 space(s)	Message
------------------------------	---------

=CELL("filename")	FileName
=FIND("]",FileName)+1	SheetStarts
=RIGHT(FileName,LEN(FileName)-SheetStarts+1)	SheetName
=SUBSTITUTE(SheetName," ","")	WithoutSpaces
=LEN(SheetName)-LEN(WithoutSpaces)	NumberSpaces
=SheetName & " has " & NumberSpaces & " space(s)"	Message

Here's the same thing done in a single formula – probably!

```
=RIGHT(CELL("filename"),LEN(CELL("filename"))-FIND("]",FileName)+1) & " has " & (LEN(RIGHT(CELL("filename"),LEN(CELL("filename"))-FIND("]",FileName)+1))-LEN(SUBSTITUTE(RIGHT(CELL("filename"),LEN(CELL("filename"))-FIND("]",CELL("filename"))+1)," ",""))) & " space(s)"
```

Our guideline will be to keep formulae short and simple (if necessary breaking them up into several steps).



If you prefer the single long formula above, you're not going to like your Wise Owl Excel course!



## CHAPTER 2 - RANGE NAMES

### 2.1 What are Range Names?

You can assign *names* to individual cells, or to blocks of cells:

4									
5	<b>Costs</b>								
6		Raw materials	£		-500	-500	-500	-500	-500
7		Labour	£		-400	-390	-380	-300	-290
8		Overheads	£		-300	-350	-400	-800	-850
9									
10	<b>Revenue</b>								
11		Base sales	£	1000	RevBase				
12		Sales multiplier	%		0	0.1	0.2	1	1.1

For example, you could call this single cell a name like **RevBase** ...

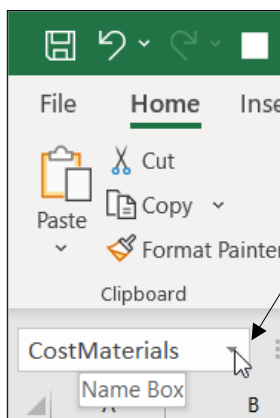
... and this block of cells a name like **CostMaterials**.



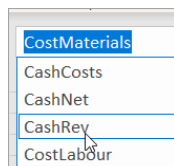
The key to using Excel effectively is to gain a thorough understanding of what range names are and how you can use them in your formulae.

### Going to a Range Name

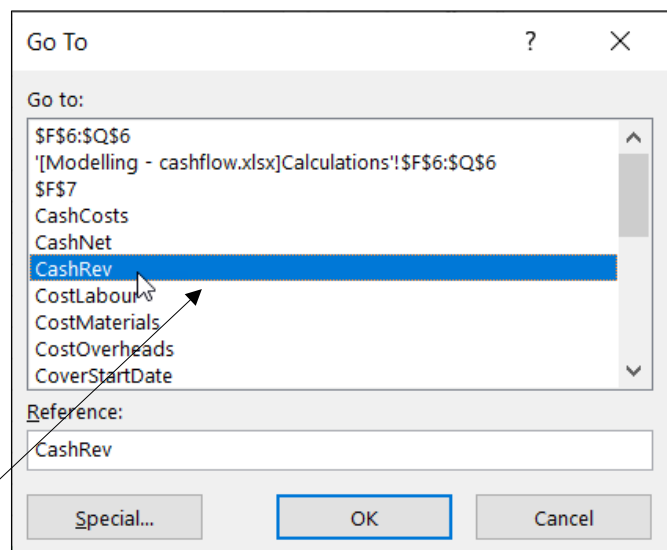
One of the many benefits of range names is that they allow you to find a cell (or block of cells) quickly:



You can click on this arrow to the right of the **Name Box**, and choose which range you want to go to (it doesn't have to be on the same worksheet):



Alternatively, press the **F5** function key to go to a range, then double-click on it in the list (or select it and choose **OK**).

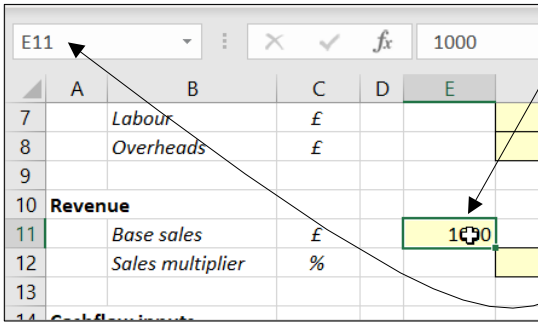


## 2.2 Creating Range Names

There are (at least) three ways to create a range name in Excel – the best one is probably the last!

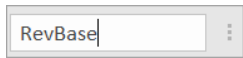
### Method 1 – Using the Name Box

To create a range name for a cell or block of cells using the **Name Box**:



a) Select the cell or cells to which you want to attach a name.

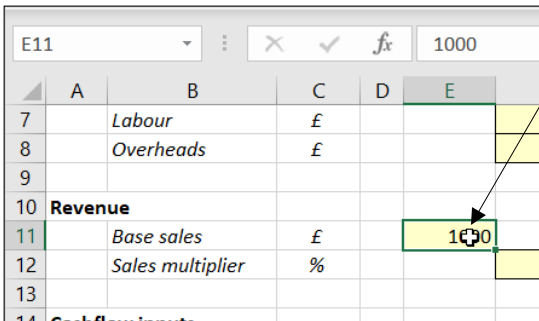
b) Click in the name box, and type in the name you want to use (you can use underscores, but can't use spaces):



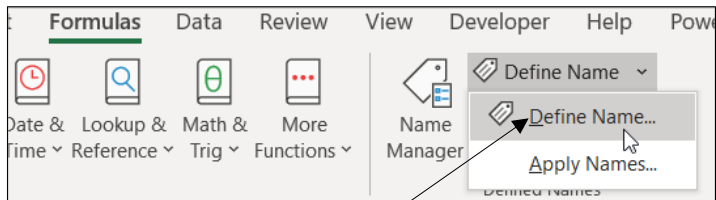
You must then press **Enter** to confirm the range name.

### Method 2 – Defining Names

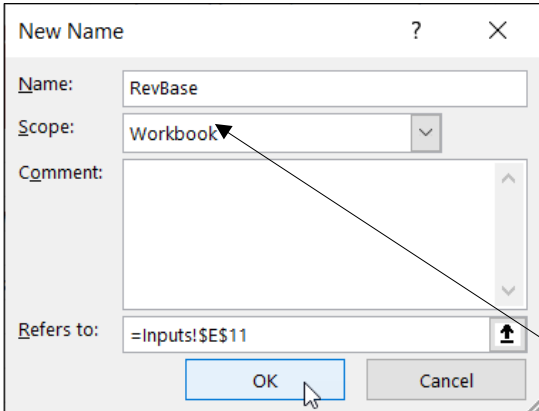
Another (harder) way to create a range name is using the ribbon:



a) As for the first method, first select the cell or cells you want to name.




b) Choose to define a range name on the **Formulas** tab of the ribbon.



c) Type in a name for your range (again, no spaces please) and select **OK** (the best thing to do is to leave the scope as **Workbook** – scope is explained later in this chapter).

### Method 3 - Creating Range Names from Selected Cells

This is the best way to create range names, partly because it lets you assign names to lots of blocks of cells at the same time.



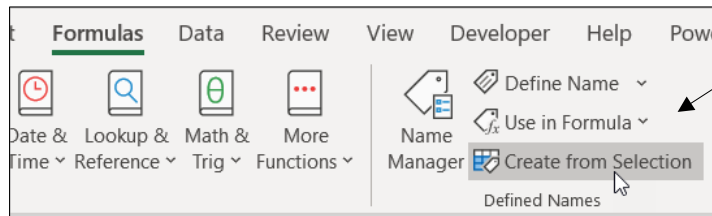
**Wise Owl's Hint**

Another advantage of this method is that you can see which names refer to which blocks of cells, but be aware that this is not dynamic (if you change the range name typed in next to a block of cells, this won't have any affect on the existing range name applied to them).

Here's how to use this method:

- a) Select a block of cells which includes the names that you want to use and the cells that you want to name.

	A	B	C	D	E	F	G	P	Q	R
1	The Chocolate Emporium		Period ==>		1	2		11	12	PeriodIn
2			Start date ==>		01/09/2020	01/10/2020		01/07/2021	01/08/2021	StartDateIn
3	Section	Input row title	Units	End date ==>	30/09/2020	31/10/2020		31/07/2021	31/08/2021	EndDateIn
4										
5	<b>Costs</b>									
6		Raw materials	£			-500	-500	-500	-500	CostMaterials
7		Labour	£			-400	-390	-300	-290	CostLabour
8		Overheads	£			-300	-350	-800	-850	CostOverheads
9										
10	<b>Revenue</b>									
11		Base sales	£		1000					
12		Sales multiplier	%			0	0.1	1	1.1	RevMultiplier
13										



- b) Choose this option on the **Formulas** tab of the ribbon (or you can do the same thing by pressing **Ctrl** + **Shift** + **F3**).

- c) Excel often (but not always) guesses correctly what you want to do. On this occasion we do want to create range names using labels in the right-hand column, so select **OK**.

Create Names from Sele... ? X

Create names from values in the:

Top row

Left column

Bottom row

Right column

Microsoft Excel X

**i** Replace existing definition of 'CostMaterials'?

- d) If you already have one or more ranges with these names, you will be prompted whether you want to override them.

	CostMaterials	CostMaterials
	CostLabour	CostLabour
	CostOverheads	CostOverheads
00	RevMultiplier	RevMultiplier

- e) Excel creates these four range names for this example (the blank cells/rows are ignored).

## 2.3 Range Names in Formulae

### Referencing Range Names in Formulae

For the following example, suppose we want the total cost to be the sum of the three ranges called **CostMaterials**, **CostLabour** and **CostOverheads**. Here's how to create this formula:

a) Start typing in a formula, and begin typing the first range name that you want to reference. Press the **Tab** key to get this:

=CostMaterials
----------------

5	<b>Costs</b>						
6	Raw materials	£		-500	-500	-500	CostMaterials
7	Labour	£		-400	-390	-380	CostLabour
8	Overheads	£		-300	-350	-400	CostOverheads
9							
10	<b>Revenue</b>						
11	Base sales	£	1000	RevBase			
12	Sales multiplier	%		0%	10%	20%	RevMultiplier
13							
14	<b>Monies in/out</b>						
15	Total cost	£		=Cost			
16	Total revenue	£					
17							
18							
19							

b) Type in a **+** sign, then type in the start of the next range name and again press **Tab**.

c) For the third range name, as an alternative you could press **F3** to bring up a dialog box listing the range names in your workbook in alphabetical order:

=CostMaterials+CostLabour+
----------------------------


Paste Name dialog box showing a list of range names with **CostOverheads** selected.

CashCosts
CashNet
CashRev
CostLabour
CostMaterials
<b>CostOverheads</b>
CoverStartDate
CoverStatus

d) Double-click on the final range name to complete your formula.

14	<b>Monies in/out</b>					
15	Total cost	£		-1200	-1240	-1280
16	Total revenue	£				
17						

e) The formula fills cells corresponding to the widths of the referenced ranges.



Once you've clicked in the list of range names, you can type the first letter of a range name repeatedly to cycle to it (so for the above example you could press **C** six times to go to the 6<sup>th</sup> range name beginning with a **C**).

## Dealing with Spill Errors

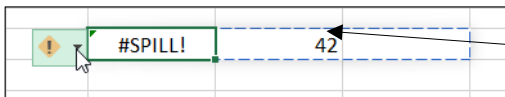
The formula we've created only exists in the left-hand cell, but it uses a new Excel feature called *dynamic arrays* to fill multiple cells:

	A	B	C	D	E	F	G	H	I
7		Labour	£			-400	-390	-380	CostLabour
8		Overheads	£			-300	-350	-400	CostOverheads
9									
10		Revenue							
11		Base sales	£		1000	RevBase			
12		Sales multiplier	%			0%	10%	20%	RevMultiplier
13									
14		Monies in/out							
15		Total cost	£			-1200	-1240	-1280	

The formula shows up in light grey in the formula bar if you click on ...

... any cell apart from the left-hand one in your row.

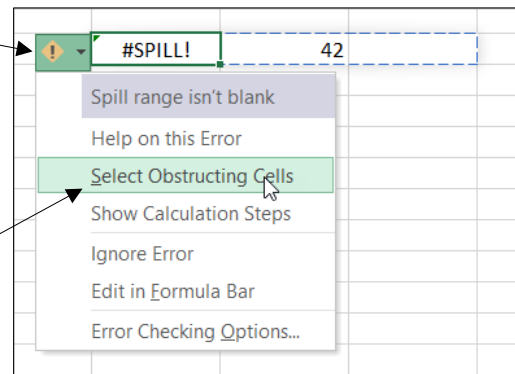
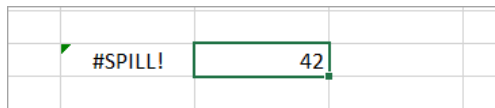
If there's something in the way Excel can't create the formula and shows a spill error:



a) Here someone has typed 42 into the second cell, preventing the formula from spanning its full width.

b) You can click on the floatie to see what the error is.

b) It's as we thought: the spill range isn't blank. The best thing to do would be to select (and then delete the contents of) the obstructing cells:



## The Possible Spill Errors

You can get a **#SPILL!** error in Excel when one of the following happens:

Error	How to solve
<i>The spill range isn't blank</i>	Remove the obstructing cell contents (as above)
<i>Indeterminate size</i>	Don't use functions like <b>=RAND</b> or <b>=RANDBETWEEN</b> with dynamic arrays
<i>Extends beyond worksheet edge</i>	Use a smaller range/array
<i>Table formula</i>	Spilled array formulae are not supported in tables
<i>Out of memory</i>	Try referencing a smaller array or range
<i>Spill into merged cells</i>	Un-merge the cells
<i>Unrecognized / Fallback</i>	Check your formula for errors!

### Implicit Intersection using @

You can prefix range names with the @ character to tell Excel not to use dynamic arrays:

-500	-500	-500	CostMaterials
-400	-390	-380	CostLabour
-300	-350	-400	CostOverheads

=CostMaterials+CostLabour+CostOverheads

This example uses dynamic arrays: the formula entered fills all 3 cells.

-500	-500	-500	CostMaterials
-400	-390	-380	CostLabour
-300	-350	-400	CostOverheads

=@CostMaterials+@CostLabour+@CostOverheads

This example doesn't use dynamic arrays: the formula entered only fills the left-hand cell, and you would have to copy it across to the other two cells:

-500	-500	-500	CostMaterials
-400	-390	-380	CostLabour
-300	-350	-400	CostOverheads

-1200



When you open a workbook created in an older version of Excel, Microsoft will add @ prefixes before range names in formulae to show that you are not using dynamic ranges (you couldn't have been; they didn't exist in earlier versions).

### Two-Dimensional Range Formulae

You can create a matrix of results by creating formulae combining ranges of different shapes:

	A	B	C	D	E	F	G
2							
3							
4			1	2	3	4	SampleRow
5		=SampleRow*SampleColumn			15	20	
6		6	6	12	18	24	
7		7	7	14	21	28	
8		SampleColumn					

Here the formula multiplies the value in the green range (SampleRow) for the column in question by the value in the blue range (SampleColumn) for the row in question.

## Getting Aggregation Functions to Work using +

Some common statistical functions (think **SUM**, **MAX**, **MIN**, **AVERAGE**, **COUNT**) work on a whole range, whereas we want them to work sometimes on a cell-by-cell basis:

	A	B	C	D	E	F	G
1							
2			<b>Quarterly Forecast Sales</b>				
3							
4			<i>Quarters</i>				
5			1	2	3	4	
6							
7		Cash balance (£m)	(100.0)	50.0	(25.0)	125.0	CashBalance
8							
9		Postive balance	=max(CashBalance,0)				PostiveBalance
10		Negative balance					NegativeBalance

Without any modification this formula will give us 125 in each cell, since this is the highest value out of -100, 50, -25, 125 and 0!

Cash balance (£m)	(100.0)	50.0	(25.0)	125.0
Postive balance	125.0	125.0	125.0	125.0

To get this formula to give the positive balance for each quarter, precede the range name by a **+**:

		<i>Quarters</i>			
		1	2	3	4
	Cash balance (£m)	(100.0)	50.0	(25.0)	125.0
	Postive balance	=MAX(+CashBalance,0)			
	Negative balance				

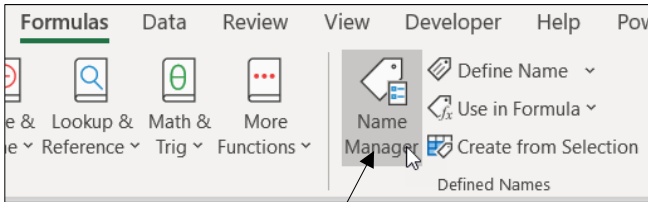
It's amazing how much difference a single plus sign can make in a formula. This would give:

Cash balance (£m)	(100.0)	50.0	(25.0)	125.0
Postive balance	0.0	50.0	0.0	125.0

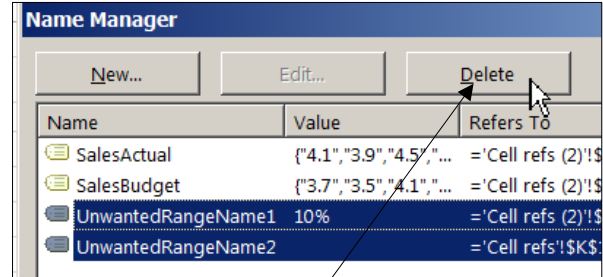
## 2.4 Working with Range Names

### Editing and Deleting Range Names

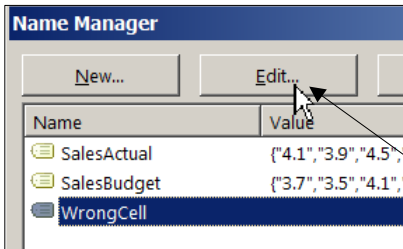
Range names are harder to edit/delete than they are to create!



Press **Ctrl + F3** or click on this tool on the **Formulas** tab of the ribbon to bring up the **Name Manager** in Excel.



To delete ranges, select them (using the **Ctrl** key if more than one) and click on **Delete**.



To edit a range name (whether to change its name, or to change the cells that it points to) select the range name in the list and click on the **Edit...** button.

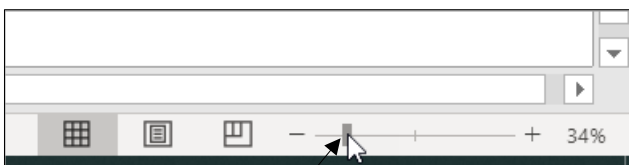


**Wise Owl's Hint**

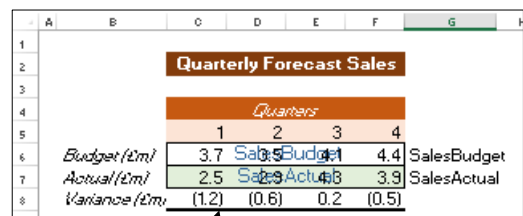
Because editing range names to point to different cells is a pain (and in particular, because it can't be done using the **Name Box**), by far the easiest way to change the cells that range names point to is by using the **Create from Selection** facility shown earlier in this chapter..

### Viewing Range Names

A bizarre feature of Excel is that if you zoom in to a tiny view (generally anything less than 40% will do) you can see range names superimposed:



If you use this slider at the bottom right corner of Excel to zoom in to a number less than 40% ...



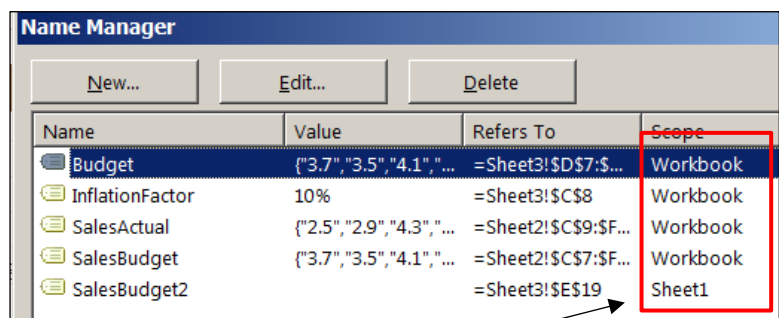
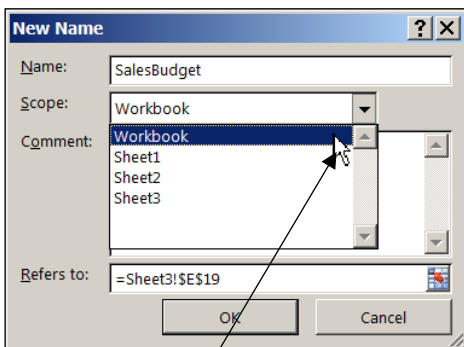
... you can see range names superimposed on the cells to which they apply (but it's useless, because the font is too small to read!).

## 2.5 The Scope of Range Names

The *scope* of a range name controls where you can use it. Range names can be scoped to an entire workbook, or to a specific worksheet within it.

### Choosing the Scope of a Range Name

You can only choose the scope of a range name when you create it, and then only if you use the **Define Name** method (range names created by other methods always have workbook scope).

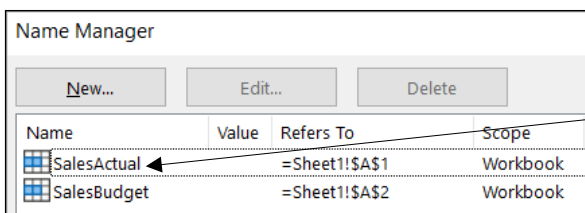


You can choose the scope of a range name when creating it by clicking on this drop list.

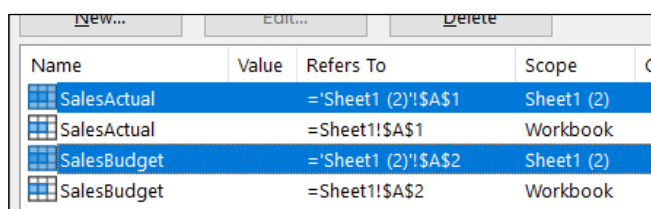
You can use **Name Manager** to view range name scopes, as here. You can refer to names scoped to a workbook from any worksheet, but names scoped to a specific worksheet can only be used in that worksheet.

### Copying Worksheets Copies their Range Names with Local Scope

When you copy a worksheet, you create copies of all of its range names:



Suppose you have a worksheet called **Sheet1** which contains two range names as shown, and you then take a copy of this worksheet:



Excel will create one local copy of each range name – for example:

Range name	Scope
SalesActual	Workbook
SalesActual	Local to the new copied sheet



*This can be very confusing! The best strategy may be to carefully rename unwanted local copies of range names immediately after you copy any worksheets.*

## 2.6 3-Dimensional Ranges

To impress friends you can create 3-dimensional range names:

	A	B	C	D	E	F
1						
2			Quarterly Forecast Sales			
3						
4			Quarters			
5			1	2	3	4
6		Budget (£m)	3.7	3.5	4.1	4.4
7		Actual (£m)	2.5	2.9	4.3	3.9
8		Variance (£m)	(1.2)	(0.6)	0.2	(0.5)

	Year 1	Year 2	Year 3	Total
30				

	A	B	C	D	E	F
1						
2			Quarterly Forecast Sales			
3						
4			Quarters			
5			1	2	3	4
6		Budget (£m)	2.9	3.9	4.1	4.4
7		Actual (£m)	4.1	3.3	3.9	3.8
8		Variance (£m)	1.2	(0.6)	(0.2)	(0.6)

	Year 1	Year 2	Year 3	Total

	A	B	C	D	E	F
1						
2			Quarterly Forecast Sales			
3						
4			Quarters			
5			1	2	3	4
6		Budget (£m)	2.8	4.0	4.4	4.9
7		Actual (£m)	2.2	3.7	4.4	4.4
8		Variance (£m)	(0.6)	(0.3)	0.0	(0.5)

	Year 1	Year 2	Year 3	Total

Suppose that you want to create a single range name called **AllBudget** which includes cells C6:F6 on worksheets **Year 1**, **Year 2** and **Year 3**, such that the following formula would work:

	B	C	D
Total budget ==>		47.1	

To do this, follow these steps:

**New Name** [?] [X]

Name: AllBudget

Scope: Workbook

Comment:

Refers to: ='Year 3'!\$C\$6:\$F\$6

OK Cancel

a) On the **FORMULA** tab of the ribbon, choose **Define Name** to create a new range name and type in a name.

b) Click here to select a range of cells, and select the block of cells on the first worksheet (here **Year 1**):

	A	B	C	D	E	F
1						
2			Quarterly Forecast Sales			
3						
4			Quarters			
5			1	2	3	4
6		Budget (£m)	3.7	3.5	4.1	4.4
7		Actual (£m)	2.5	2.9	4.3	3.9
8		Variance (£m)	(1.2)	(0.6)	0.2	(0.5)

	Year 1	Year 2	Year 3	Total

c) Hold down the **Shift** key and click on the last worksheet for the range name, then press **OK** twice.

d) The result is a range name for a 3D block of cells!

Name	Value	Refers To	Scope
AllBudget	(...)	=Year 1:Year 3!\$C\$6:\$F\$6	Workbook
CashBalance	#REF!	=#REF!\$C\$7:\$F\$7	Workbook





















































# What we do!

		Basic training	Advanced training	Systems / consultancy
<b>Office</b>	Microsoft Excel			
	VBA macros			
	Office Scripts			
	Microsoft Access			
<b>Power BI, etc</b>	Power BI and DAX			
	Power Apps			
	Power Automate (both)			
<b>SQL Server</b>	SQL			
	Reporting Services			
	Report Builder			
	Integration Services			
	Analysis Services			
<b>Coding</b>	Visual C#			
	VB programming			
	MySQL			
	Python	