Fun & Games with Range Names

by

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EXCEL CONSULTING, TRAINING AND WEBINARS

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1. Introduction

STRUCTURE = FLEXIBILITY

This little equation seems counter-intuitive, but it is a philosophy that has allowed me to build many successful Excel models. As Accountants we know that a well-structured Chart of Accounts is a joy to work with. We also know the frustrations that come with a badly structured Chart of Accounts.

Well, that is an example where the right structure provides flexibility and lack of structure makes things inflexible.

A correctly structured spreadsheet can also be a joy to work with. I am sure you have all faced badly structured spreadsheets and know the headaches that they provide.

The hardest part of my job is working with unstructured spreadsheets. There have been many occasions where it has been necessary for me to spend most of my time structuring the files to make the solution better and more flexible to use.

In this session I will offer you a number of ways to incorporate structure into your spreadsheet models. The techniques I will share have been used successfully for years.

Now, the important distinction here is that the structure you use must lend itself to flexibility. That usually requires decisions and assumptions at design time. You must specify the types of flexibility you require. Eg do you want it to be easy to add a new department to your model?

Your structure will determine what will be flexible and what will require a major amendment to change.

Excel Models

These techniques take time to establish and they are most applicable to larger spreadsheet models where extra time spent including range names will reap larger benefits. Common examples of Excel models are files that produce monthly reports; budgets and forecasts. Large models are often the hardest to amend and the techniques I will share will make amendments easier to implement, and provide the flexibility I have mentioned.

What Are Range Names?

To be honest range names are actually named formulas, but the common terminology is a range name. Excel calls then defined names.

You don’t think twice about naming a sheet or a file. Well you can also give a name to a cell; a range; a value or a formula. Once you have created the names you can use them in a formula, a macro or use it to navigate around your file.

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Range names can

- make formulas easier to create, read, understand and maintain
- reduce the need for absolute and mixed references ($ signs in formulas)
- define input areas
- allow you to easily navigate in a large workbook
- make working with macros more reliable
- create dynamic ranges that expand and contract as data is added or removed
- create robust linking between files

Range Name Rules

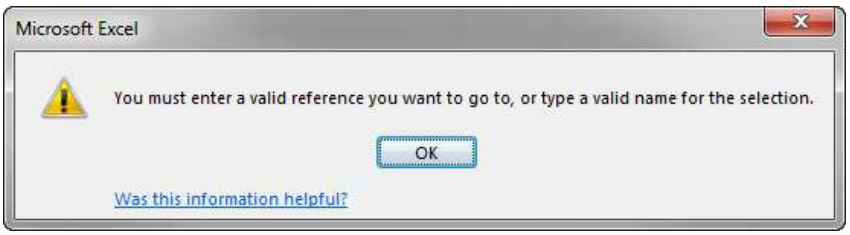
- Names cannot contain spaces or symbols. You can use the full stop and the underscore characters e.g. Tax_Rate or Tax.Rate.

- You cannot use names that are also cell references eg you can't use Q1 for Quarter 1 because it is a cell reference. Q_1 is acceptable. In Excel 2007 and later versions QTR1 is also a cell reference. Virtually all three letter words or combinations are column references. QTR_1 is acceptable.

- You can't start a name with a number eg 2ndQtr is not permitted. _2ndQtr is acceptable.

- Names must be less than 255 characters. Names should be as short as possible whilst still being meaningful. Be careful using abbreviations as their meaning may not be apparent to other users.

Excel will not let you create an invalid range name. This message will display if you try to create an invalid range name.



Naming Suggestions

These are my suggestions that make using range names easier and also contribute to adding structure to their use.

- Use at least one upper case letter when creating a name. Like function names, when Excel recognises a range name it will change the case to match the name. Hence, you can type the name in lowercase and if you make a mistake the name will remain in lowercase (like an incorrectly spelled function name) and an error is displayed in the cell. Identifying errors is easy because lowercase names have been misspelled and need to be corrected.

- Capitalise the first letter of each word in the range name e.g. TaxRate. This makes it easier to read. (BTW: This is called camel case.)

- Use prefixes and suffixes in your range names to add structure and simplify creating formulas. Prefixes allow you to list all similar names together in the Name. Suffixes can simplify changing a formula from a month calculation to a year to date calculation.

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Keyboard Shortcut

The F3 function key is dedicated to range names. There are a number of shortcuts for range names and they all involve the F3 key.

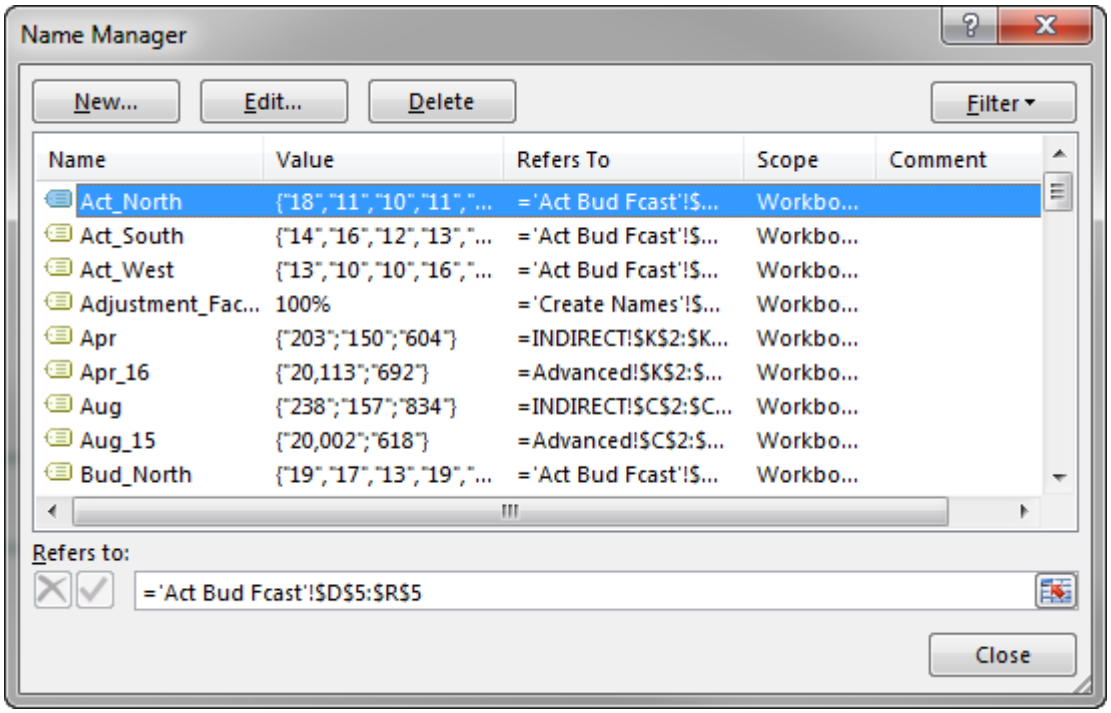
Creating Range Names

There are three ways to create range names.

- **Name Box** – the easiest way to create a single name.
- **Create from selection** – the easiest way to create multiple names in one step.
- **Define Name dialog box** – the only way to create formula or constant value range names.

The Formulas ribbon tab contains the Defined Names section which has the Name Manager icon.

Name Manager



In the rest of the Manual when I use "name" or "names" I am referring to a range name.

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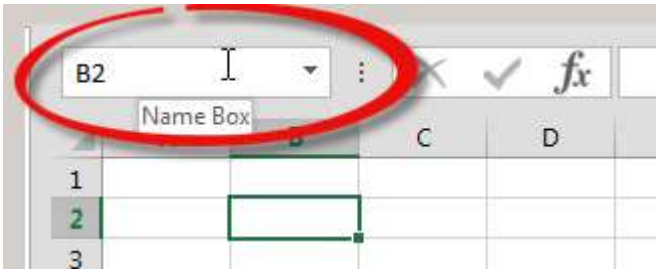
2. Name Box

The Name Box is above the column letters and to the left of the Formula Bar. It normally displays the reference of the currently selected cell. If you point to it with the mouse it will display its name.

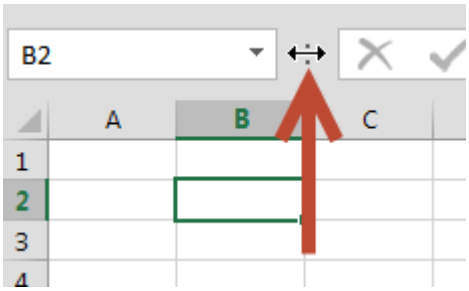


It has a drop down arrow to allow you to view most of the names in the file.

NOTE: not all names will display in the Name Box. Formula-based names or constants do not display.

Resizing the Name Box

The three dots to the right of the Name Box allow you to resize it. This allows you to see longer names. (It is a small circle icon in Excel 2010)



Checkout the last section of the manual for a few Name Box tricks.

Creating a Name

Named Cell

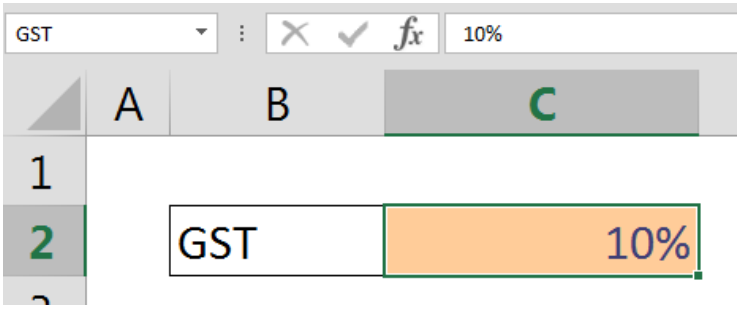
If you want to create a single name that refers to a cell or range then the easiest way is to select the cell or range and click in the Name Box; type the name and then press Enter. Name created. Remember the naming rules and suggestions mentioned in the Introduction.

Once created you can use the name in formulas throughout the file.

Single cell names and named ranges behave slightly differently when used in formulas. We will examine both types to see how they work.

PRACTICE:

1. In the GST sheet click cell C2 and then click in the Name Box and type GST and press Enter. Note: you must press Enter otherwise the name will be ignored. You can tell that the name has been accepted because it will remain in the Name Box.



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2. We can now use the GST name in a formula. In cell E5 type the following formula.

   =IF(D5="Y",C5*GST,0)

3. The formula can be copied down to the other grey cells below. Notice that we did not have to include any $ signs in the formula as the GST name was treated like a fixed or absolute reference.

4. You can also use a logic calculation in place of the IF function in this case. An alternative formula for cell E5 is

   =(D5="Y")*GST*C5

	A	B	C	D	E	F
1						
2		GST	10%			
3						
4			Amount	Incl GST	GST	Total Value
5		Invoice 1	$31,362.00	Y	$3,136.20	$34,498.20
6		Invoice 2	$37,717.00	N	$0.00	$37,717.00
7		Invoice 3	$54,946.00	Y	$5,494.60	$60,440.60
8		Invoice 4	$17,502.00	N	$0.00	$17,502.00
9		Invoice 5	$26,531.00	Y	$2,653.10	$29,184.10
10		Total	**$168,058.00**		**$11,283.90**	**$179,341.90**

5. The logical test within the brackets will return TRUE or FALSE. In Excel TRUE equals one and FALSE equals zero. Hence, if the logical test equates to FALSE it multiplies everything by zero which has the effect of zeroing the calculation.

The name GST can be used throughout this file. When used in a formula it acts like a fixed reference and can be copied anywhere and the reference will not change. You can use the Name Box drop down to navigate to the name from anywhere within this file.

Named Ranges

Named ranges work slightly differently to single cell names when used in formulas. We can see this from the example below.

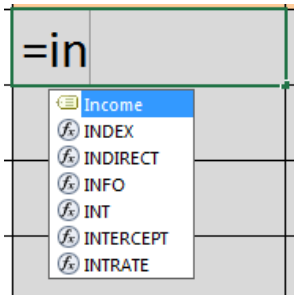
PRACTICE:

1. In the Named Ranges sheet we have a list of income in column B and a list of superannuation rates in row 2. We want to calculate the various superannuation $ amounts for the various incomes in the range C3 to H8.

2. We will create two range names to simplify this calculation. Select the range B3:B8 and click in the Name Box and type the word Income and press Enter. If you make a mistake you can use the Undo feature to reverse the name creation.

3. Select the range C2:H2 and click inside the Name Box and type the word Super and press Enter.

4. We can create the formula in cell C3. Press = and start typing the word income. As you type Excel will display suggestions as seen in the image on the right. To accept the blue highlighted entry press the Tab key. You can also use the arrows keys or mouse to select items in the list.



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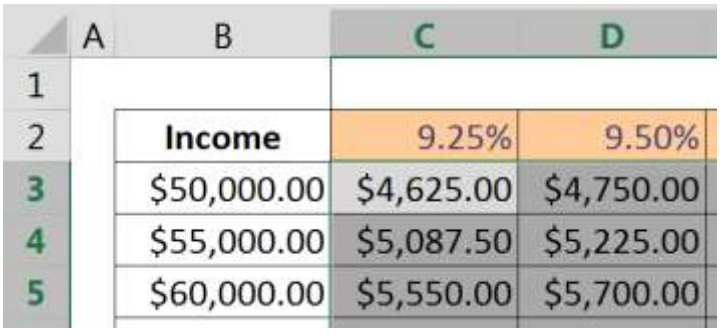
5. After selecting Income type * and then press the F3 function key which will list the available range names. Double-click on Super to enter it into the formula. You can use the F3 function key to list range names in most of Excel's dialog boxes. The final formula for cell C3 is

   =Income*Super

6. This can be copied down and across to the other grey cells.

   There are two important things to note.



	A	B	C	D
1				
2		Income	9.25%	9.50%
3		$50,000.00	$4,625.00	$4,750.00
4		$55,000.00	$5,087.50	$5,225.00
5		$60,000.00	$5,550.00	$5,700.00

   The first is that there are no $ signs used in the formula. The second is that all the formulas in the range are identical.

How Named Ranges Work

Single row and single column ranges work differently to single cell names.

A single row range, like Super, can be used throughout the file, but it can only be used in columns C across to H. When used it extracts the value from the same column as the cell using the name. Eg =Super in cell D11 will return 9.5% - the value from the same column in the name. If used outside of those columns the #VALUE! error will display. See **Function Note** below.

A single column range like Income can also be used throughout the file, but it can only be used in rows 3 to 8. When used it extracts the value from the same row as the cell using the name. Eg =Income in cell J4 will return 55000 - the value from the same row in the name. If used outside those rows the #VALUE! error will display. See **Function Note** below.

Function Note:

The above rules apply to using the names by themselves. You can use the names within functions that accept ranges anywhere within the file. Eg =COUNT(Income) will return 6 when used anywhere in the file, =SUM(Income) will return $375,000 when used anywhere in the file.

Name Box Navigation

Clicking the drop down next to the Name Box will display most of the names in the file and allow you to select the name. After using the Names Box to navigate to a name, press F5 and then press Enter to return to where you were before selecting the name.

Budget and Financial Models

It is common to use row based names (eg Super) in budget and financial models. The fact that an error will display is actually a good feature in these type of models because it alerts you to the fact that you are using the names outside of their defined ranges.

It is best practice in budget and financial models for columns to be consistent across all sheets. For example, column H might represent the month of July across all the sheets in the model. This rule makes the use of range names possible. When you use the name in column H you know it will refer to the corresponding column H wherever the name is defined.

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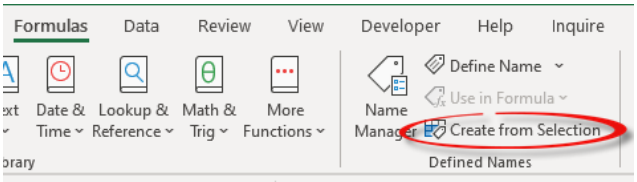
3. Create Names Automatically

The Name Box is useful when you only have to create a few names, but if you want to set up many names there is an alternative. Once you realise the power of names you will find yourself creating a large number of them.

To speed up the naming process there is a built-in feature that allows you to use existing structures and labels to automatically create the names. Once you see how quick this is you will amend the way you structure your files to incorporate the use of this feature.

In the Formulas ribbon tab, there is a Defined Names section. In that section there is an icon for Create from Selection.



This feature uses existing cell entries (labels) to create the names. If you structure your sheets correctly it becomes a quick and easy process to create multiple names in one step.

Create from Selection has a keyboard shortcut - Ctrl + Shift + F3.

This example will have a combination of single cell; row-based and column-based names in a simple budget example.

PRACTICE:

1 Open the Create Names sheet.

2 Select range B3:C4.

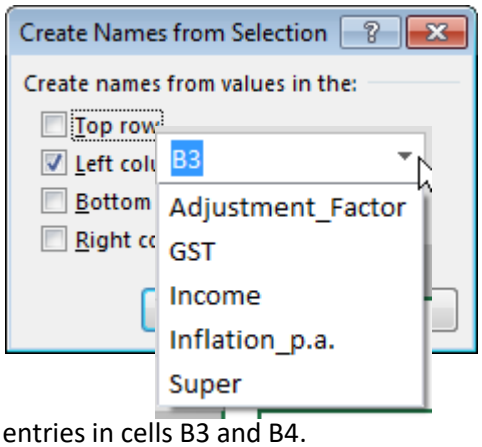
The entries (labels) in column B will be used to create the range names for column C.

For example cell C3 will be named Adjustment_Factor.

Since spaces are not allowed in range names, Excel inserts the underscore character whenever it encounters a space in a cell value that is to be used as a name.

3 Press Ctrl + Shift + F3

4 Ensure only the Left column box is ticked and click OK.



Excel has created 2 single cell names based on the cell entries in cells B3 and B4.

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5 In cell D8 enter the following formula

=1+(Inflation_p.a./12*D6)

6 There are values in cells C8 and C9 that we will use to create two more names.

Select the range C8:O9 and press Ctrl + Shift + F3.

Ensure only the Left column box is ticked, click OK. This created the names Inflation and Days.

7 Two more names are required.

Select the range C11:C16 and press Ctrl + Shift + F3 and ensure the Top Row option is ticked and click OK. This created the name Costs.

8 The last name we will enter manually.

Use the Name Box to name cell P9 as TotDays.

We are now ready to create a single formula in cell D12 that can be copied down and across with no reference issues.

The formula in D12 will be (use the autocomplete feature to save typing)

=Costs*NumDays/TotDays*Inflation*Adjustment_Factor

This formula will be identical in all the cells in the range. By reading it you can gain an understanding of what it is calculating. It is self-documenting.

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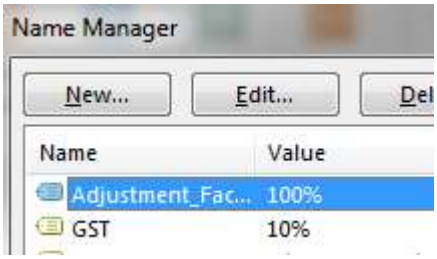
4. Define Name

The last way to create a name is by using the Define Name dialog. It has an icon on the Formulas ribbon tab.

You can also access this via the Name Manager screen using the New button in the top left – see image on right.



This method also provides the ability to use a formula to define the name which allows for some creative solutions to Excel problems.

Names and Table Names

Excel has a feature that automatically extends ranges without the need to worry about formulas. The feature is called Format As Tables and is on the HOME ribbon. I have included information on the feature in the Appendix.

I will not go into detail about the feature because what we need to use to achieve a dynamic name is quite simple. When you use Format As Table Excel automatically creates names, called structured references, and they can be considered table names. These table names basically work like range names. Table names automatically expand and so are ideal for drop down lists.

Unfortunately Excel will not allow you to refer to table names in the Data Validation Source box.

To get around this limitation and to create more robust dynamic names we can combine names and table names to create a dynamic name that doesn't have the two limitations for formula-based names.

PRACTICE:

1. In the Lists sheet column C contains a list of cities. Notice that the column has blank columns on either side. This makes it easier for Excel to auto-select the correct range – saving you the step of manually selecting the range.

2. Click a cell in the Cities list. Press Ctrl + T (Format as Table shortcut) and click OK. We won't name the table and will just use the default name.

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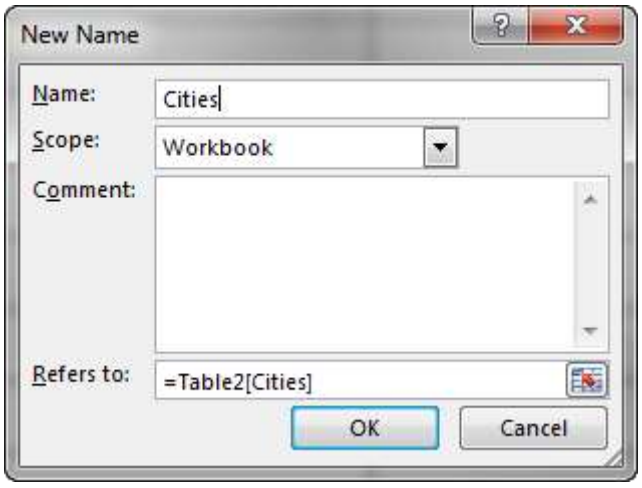
3. Select the range C2:C5 and click the Formulas tab and click the Define Name icon.



4. Excel will try to guess the name and it will put Perth in the Name box. Change it to Cities as per the dialog.

5. Note the Refers to box already includes the table name and field. Click OK to create the Cities name.

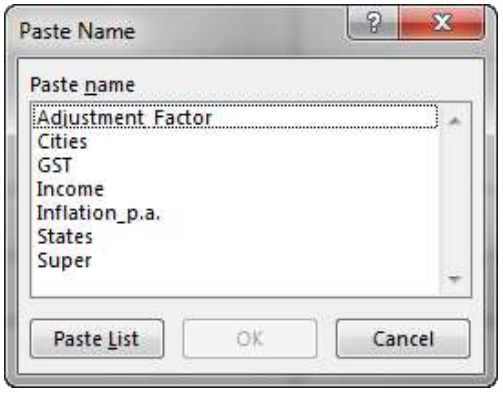
6. In cell C6 of the Drop Down sheet create a List drop down for cities and use the new names.

7. Add some extra city names and test the drop down.

Using table names avoids the blanks in the list issue and you can still have entries below the table and these won't affect the name.

Paste Names

Once you start using names more, it is common to add a list of names to the file as part of the documentation process. The easy way to do this is to press F3 and use the Paste List button.



Try this in cell E2 of the Lists sheet. **Note:** this list is not updated after you paste. You need to re-paste the list when you add or amend names.

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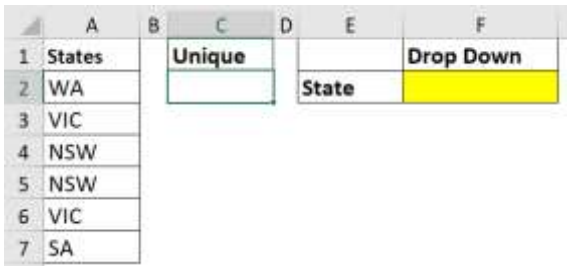
5. Dynamic Arrays and Names

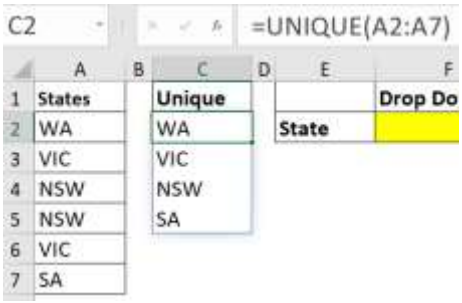
Let's review the image on the right.



We want to create a drop down in cell F2. We want to choose from the states in column A, **BUT** we don't want duplicates listed.

The new dynamic array function UNIQUE removes duplicates. Enter the following formula in cell C2.

=UNIQUE(A2:A7)

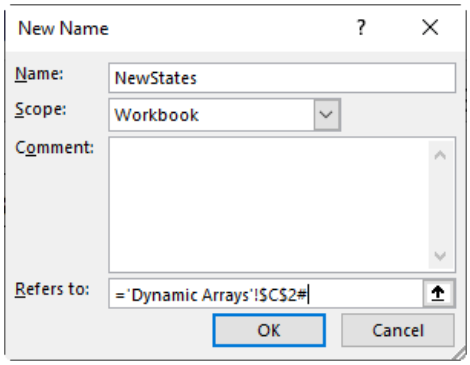


This lists the unique states as shown on the right.

We can create a name that refers to this unique list by using the # symbol. The # symbol refers to spill ranges. You refer to the top left cell of the spill range and include the # on the end.

Select cell C2 then press Alt M M D in sequence, not held down. This aopen the New Name dialog.

In that dialog create a new name NewStates and add the # to the end of the reference, as shown below.



This create a list that automtically expands – or spills.

Now use Alt A V V to create a drop down in cell F2 using the name NewStates.

Change cell A5 to QLD and press Enter.

This will automatically update the list in column C.

Try the drop down in cell F2 and see if QLD is there and there are 5 entries.

If you want to sort the list change the formula in cell C2 to

=SORT(UNIQUE(A2:A7))

Now check the drop down.

SORT is a new dynamic array function too.

Dynamic array functions rule!

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6. Name Box Tricks

The Name Box has a few tricks up its sleeve. You have already seen how you can go directly to a cell by typing a cell reference and pressing Enter. Here are a few more tricks.

Go to a cell in another sheet

Simply type the sheet name followed by the! And then the cell reference and press Enter. If the name has spaces, you must include the apostrophes around the sheet name.

Selecting a range

You can type a range reference in the Name Box and press enter to select it. E.g. A1:A1000.

Testing a function

This works for at least three functions. INDEX, OFFSET and XLOOKUP. These are functions that can return a reference to a cell or range.

If you copy the function from a cell into the Name Box and press Enter it will select the cell/range that the function would have selected.

Selecting a macro

If you use macros, you can type a macro name in the Name Box press Enter and it will take you to the macro screen where the macro is. Who knew!!

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