Using Pivot Tables in Microsoft Excel 2003

Introduction

A Pivot Table is the name Excel gives to what is more commonly known as a cross-tabulation table. Such tables can be one, two or three-dimensional and offer a range of summary statistics. They can be modified interactively and can be based on data from more than one worksheet.

The Pivot Table Wizard

A simple example of using the wizard to create a table was given in the document *Microsoft Excel 2003 - An Intermediate Guide*. A different set of data is used here:

1. Load up Excel and **[Open]** the file called **advanced.xls** in the **D:\Training** directory
2. Click on the *Accounts* tab
3. Make sure the active cell is within the set of data (eg click on cell *A1*)
4. From the **Data** menu choose **PivotTable and PivotChart Report...** - the Wizard now runs
5. Check **Microsoft Office Excel list or database** and **PivotTable** are selected then press **<Enter>** or click on **[Next>]**
6. Accept the default area (or type in **A1:D61**) - press **<Enter>** or click on **[Next>]**
7. Place the Pivot Table on the **Existing worksheet** in cell **G4** - press **<Enter>** or click on **[Finish]**

A skeleton Pivot Table is now drawn and a special PivotTable Field List and PivotTable toolbar displayed. You have to specify which data series you are using in your cross-tabulation by dragging the field buttons from the *field list* into the skeleton. Text fields are usually used to specify the structure of a Pivot Table, with numeric fields supplying the data.

A One-Dimensional Table

One-dimensional pivot tables are very useful for obtaining subtotals. Here, for example, you might want to know the total expenditure by each employee:

1. Drag and drop the **[Employee]** field list button into the area marked *Drop Row Fields Here*
2. Drag and drop the **[Amount]** field list button into the area marked *Drop Data Items Here*

The Pivot Table is now automatically filled in with the data. As you used a numeric field for the summary data, the values are summed. Had you used a text field, the number of observations would have been counted. There are various other measures as you will see later.

To sort the names into a different alphabetical order and show the figures as money:

3. Click on *G6* then on the **[Sort Descending]** button - the names are sorted accordingly
4. Next, select the current totals in the pivot table by dragging through them (cells *H6* to *H13*)
5. Click on the **[Currency]** style button (near the centre of the *Formatting* toolbar)
6. If #### appears in certain cells, widen the column by *double clicking* on the column heading border (the line between heading **H** and **I**)

A Two-Dimensional Table

By using a second dimension (ie a column field as well as a row field) you can get a more detailed breakdown of the figures. Here, for example, you might want to know the expenditure by each employee for each category. This second field needs to be added to the pivot table layout. Until you are more familiar with how pivot tables work, it's best to re-display the skeleton first:

1. Click on the **[Pivot Table]** button (the first on the *PivotTable* toolbar) and choose **PivotTable Wizard**

This takes you back to Step 3 of the Wizard. You could change where the pivot table appears (if you wanted to) or you could use **[<Back]** to redefine the data source.

Note also the **[Layout...]** and **[Options...]** buttons. You will explore the options later, for now:

2. Click on the **[Layout...]** button
3. Drag and drop the **[Category]** field button into the area marked *COLUMN*
4. Press **<Enter>** or click on **[OK]** to close the *Layout* window then click on **[Finish]**

The Pivot Table now shows the breakdown of each employee's expenditure for the three categories.

You do not have to display the pivot table layout in order to add fields (row or column) or data values - you can just drag and drop them into or out of the table itself. To return to a one-dimensional table:

5. Drag the **Category** field column heading away from the pivot table - only release the button when the mouse cursor changes to an arrow plus cross. *Take great care not to release the mouse button while the heading is still within the table*

To obtain a two-dimensional table once more:

6. Drag the **[Category]** button from the PivotTable Field List back into the pivot table, dropping it over the **Total** column heading (or into the empty cell above)

A Three-Dimensional Table

You can add a third dimension to a pivot table by having a drop-down list from which you select the third variable. The remaining data series on this worksheet refers to dates, but as they stand they are of little use in summarizing the data (nearly every date is a different value). To get a breakdown for each month you first have to create a new field isolating this from the date:

1. In cell *E1* type the heading `Month` and press **<Enter>**
2. In cell *E2* type the formula `=text(a2,"mmm")` and press **<Ctrl Enter>** - if you didn't already know it, holding down **<Enter>** as you press **<Enter>** keeps the active cell where it is

This should isolate the month from the date. If you want to learn more about this function, work through the notes entitled *Dealing with Dates and Times in Excel* .

3. *Double click* on the small black *handle* attached the cell to fill down the column
4. Click on a cell in the pivot table to reactivate the *PivotTable* toolbar and *Field List*
5. Click on the **[Pivot Table]** button and choose **PivotTable Wizard**, then click on **[<Back]**
6. In step 2 of the wizard, redefine the data area to include column E (ie change *D61* to **`$e$61`**)
7. Click on **[Finish]** to close the wizard (there's no need to move on to Step 3)
8. Drag and drop the new **[Month]** field button into the area stretching from *G2* to *K2* labelled *Drop Page Fields Here*

To look at the accounts for any one month:

9. Click on the *list arrow* in cell *H2*, select the month required then click on **[OK]**
10. Repeat step **9**, choosing **(All)** to reshow all the data

Hiding and Showing Summary Values

If you don't want certain values displayed (eg you might only want figures for food and travel) then you can omit data from the Pivot Table using the list arrows attached to the summary fields.

1. Click on the *list arrow* attached to the **Category** column heading
2. Click on the **Stationery** check box to remove the tick then click on **[OK]**

Only Food and Travel are now shown. To show Stationery again:

3. Again click on the *list arrow* attached to the **Category** column heading
4. Click on the **Stationery** check box to restore the tick then click on **[OK]**

Use the same process, this time using the *list arrow* attached to the **Employee** row heading in *G5* to show or hide particular people. Make sure all the data is being shown when you have finished.

Adding New Data and Altering Table Layout

To summarize other data values, you simply drop them into the *Data* area of the pivot table. Here, for example, you might want to know how many expenses claims have been submitted by each employee:

1. Drag and drop the **Employee** field button into the area containing the summarized data - you can also drop the field into the top left corner of the table (where it says *Sum of Amount*)

You now have both a count of the claims submitted by each employee and the total amount. Sadly, the count is shown as a currency style - how to remove this is dealt with in the next section. The results would also look clearer if the two sets of figures were separated out:

2. Drag the **Data** column heading in *H5* and drop it over **Employee** in *G5*

The data is now summarized first by the *Data* fields and then by *Employee*.

Changing the Summary Statistics and Data Format

The data field settings can be changed in the pivot table layout:

1. Click on the **[Pivot Table]** button and choose **PivotTable Wizard**, then click on **[Layout...]**

To change the summary statistics:

2. *Double click* on **Sum of Amount** in the *DATA* area
3. Under *Summarize by:* choose **Average** (note what else is available)
4. Press **<Enter>** or click on **[OK]** to confirm this

Note that you can add the same data series into the Data area more than once if you need to - for example to show both the maximum and minimum values.

To change the data format:

5. *Double click* on **Count of Employee** in the *DATA* area
6. Click on the **[Number...]** button – a *Format Cells* window appears
7. Change the *Category:* to **Number** and set *Decimal places:* to **0**

8. Press **<Enter>** or click on **[OK]** to confirm this
9. Press **<Enter>** or click on **[OK]** *twice* more to return to the wizard
10. Click on **[Finish]** to close the wizard

A quicker method of changing data field settings is to use the **[Field Settings]** button, last but one button on the PivotTable toolbar:

11. Click on **Average of Amount** in the *Data* column in *G6* then on the **[Field Settings]** button
12. Change *Summarize by:* back to **Sum** then press **<Enter>** or click on **[OK]**

Note: You can also right click on a field heading and choose **Field Settings…** from the shortcut menu.

Removing a Data Series

To delete a set of data from the Pivot Table:

1. Click on the *list arrow* attached to the **Data** column heading
2. Click on the **Count of Employee** check box to remove the tick then click on **[OK]**

Only the *Sum of Amount* is now shown and the Pivot Table reverts to its original format. If you wanted to include the *Count of Employee* again, you would have to drag the field back into the Data area - unlike with the row/column headings, empty check boxes are not retained here.

Multiple Row/Column/Page Fields

You can have more than one Row, Column or Page field in a pivot table. A good example of the latter would be if you had years as well as months – you could then select a particular month in a particular year using the list arrows provided. If you want to display the breakdown by month for the current table, you have to move the Month field into a Row or Column heading:

1. Drag the **Month** field from the *Page* box to cell **I4** in the *Column* headings (ie to the right of **Category**) – for each month you now have the three categories

2. To view by Category then Month, drag **Category** from *I4* into *H4* (over **Month**)

A better arrangement is obtained by making Month a row heading:

3. Drag the **Month** field from the *Column* to the *Row* headings (into the right side of cell *G6*)
4. If you don't want each employee's total shown *right click* on *Steve Total* and select **Hide**
5. To view by Month then Employee, drag **Month** from *H5* into *G5* (over **Employee**)
6. Hide the monthly totals as in step **4**

Hopefully the above exercise has demonstrated the flexibility of pivot table layout and you now understand the various component parts of the table.

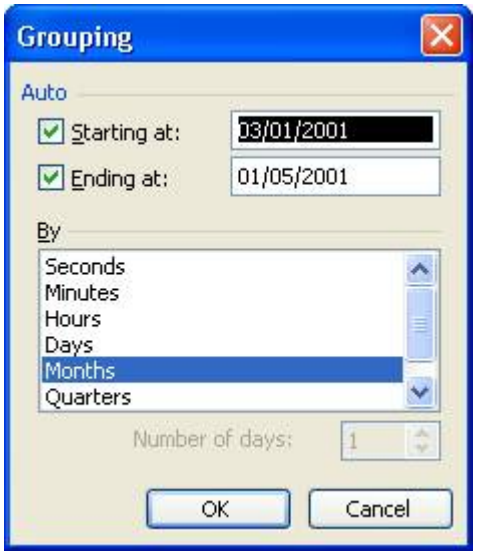
Grouping and Details

Earlier in these notes you calculated a *Month* field, to view the monthly expenditure statistics. In fact, there was no need to calculate a new field as you can group data in Pivot Tables.

The grouping available depends on the type of data held in the field. Numbers can be grouped in equally-sized ranges (eg values 0-10, 10-20, 20-30 etc) while dates/times can be summarized by years, quarters, months, days, hours etc. Grouping cannot be carried out on text values.

To view monthly expenditure without calculating a new field:

1. Drag the **Month** field out of the pivot table (from cell *G5*)
2. Now drag the **Date** field into the right side of *G5* - expenditure is shown for each date
3. Next, *right click* on any of the date values in column *H*
4. From the menu choose **Group and Show Detail** then **Group...** - the following dialog box appears (the one on the right shows the *Grouping* window for numeric data)



5. Under the heading *By:* select **Months** then press **<Enter>** for **[OK]**

Tip: For *Weekly* figures, choose **Days** then set the *Number of days:* to **7**.

You now get the same grouping you had earlier using the calculated *Month* field. Once grouping has been set on a *Column* or *Row Field*, you can use the grouped data as a *Page Field*:

6. Drag the **Date** field from *H5* to *G2*
7. Click on the *list arrow* in *H2* and note that you have all the months of the year listed
8. Select a month between *Jan* and *Apr* to see that month's figures - click on **[OK]**
9. Repeat step **8** but this time select **(All)**
10. End by resetting the **Date** field as a *Row Field* - drag it back from *G2* to the right side of *G5*

You could now Ungroup the data (as in steps **3** and **4**) but you might just want to see the breakdown of expenses for a single month:

11. *Right click* on **Apr** in *H9* then choose **Group and Show Detail** then **Show Detail**
12. From the available fields choose **Amount** then press **<Enter>** for on **[OK]**
13. To hide the detail you can repeat step **11** or, more simply, just *double click* on any cell showing *Apr* - this method can also be used to *Show Detail*

14. End by removing the *Detail* column - drag the **Amount** from *I5* away from the Pivot Table

Tip: if you *double click* on a cell within the *Data* area, the source rows used to calculate that cell are copied onto a separate sheet. For example, to see all of the Food expenses, *double click* on cell *I33*; to see Steve's claims for January, *double click* on cell *L6*.

Row/Column Field Options and Built-in Report Formats

Slightly different settings apply to fields being used as row/column headings from those being used in the data area. You have already had a brief look at the latter; now look at a row field setting:

1. Click on the **Employee** field heading in *G5* (or, indeed, on any of the data in that column)
2. Now click on the **[Field Settings]** button
3. Under *Subtotals* you can decide whether you want the same statistic as in the data area (ie *Sum*) or whether you want to set a different one - choose **Average**
4. Click on **[Advanced...]** to see what options are available - here you could set up a different sort order to list employees by increasing expenditure. Use **[Cancel]** as no change is needed
5. Click on **[Layout...]** and investigate the options provided - click on **Show items in outline form** then press **<Enter>** or click on **[OK]** to confirm this option
6. Click on **[OK]** again and the table is updated to reflect the changes made - note the monthly averages now show (instead of totals)

Pivot Tables are used a lot in the commercial world and built into Excel are various pre-defined layouts which make use the field setting and table layout options. To see these:

7. Click on the **[Format Report]** button - the second on the PivotTable toolbar
8. Select one of the formats provided (a *Table* is best) then press **<Enter>** or click on **[OK]**

It's highly unlikely you will be making use of these but it's worth knowing of their existence. Here:

9. Click on the **[Undo]** button to remove the new formatting
10. End this section by returning **Date** to the *Page* box - drag it from *H5* back into *G2*

Updating a Pivot Table

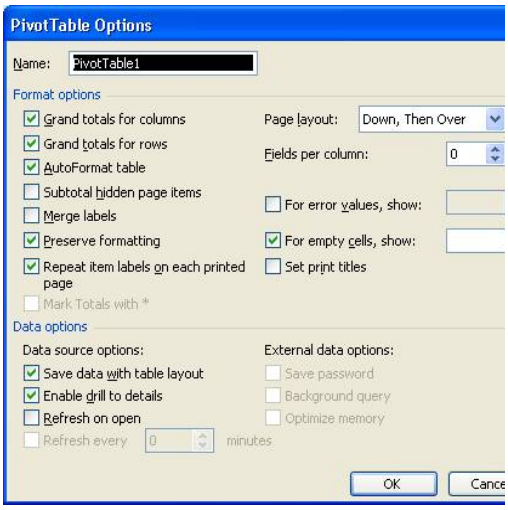
Although pivot tables appear to interact closely with the raw data, they are in fact based on a copy of the data values, held in temporary memory. If you change a data value, the pivot table will not reflect this – not even if you make fundamental changes to the layout or summary statistics. You have to explicitly refresh the data for the new values to be included in the summaries:

1. Change Chris' travel in cell *D4* from £100 to **`£3.75`** – note that cell *J12* isn't updated
2. Click on cell *J12* then on the **[Field Settings]** button and change *Summarize by:* to **Max** (press **<Enter>** or click on **[OK]**) - again, *J12* doesn't change
3. Drag **Amount** from the PivotTable Field List into the *Data* area - Chris' travel appears twice as £100!
4. Click on the **[Refresh Data]** button on the PivotTable toolbar – the new figure now shows
5. End by removing *Max of Amount* - click on the list arrow attached to *Data* in cell *G5* and empty the check box (click on **[OK]** to confirm)

Pivot Table Options

You can in fact ask Excel to update a pivot table every time you open the file or after a fixed period of time (if the data is from an external source). This is only one of several options which can be set:

1. Check the active cell is within the pivot table
2. Click on the **[Pivot Table]** button (the first button on the special toolbar) and select **Table Options...**



Note that you can also get to the options via the Pivot Table Wizard or by *right clicking* within the table.

The *PivotTable Options* window will appear, as shown on the right.

Format options

Under format options you can choose whether or not you want the Grand Totals showing for the rows and/or columns.

1. Click on *Grand totals for rows* to turn this off and hide the final column in the pivot table

The other main option of interest allows you to show empty cells in a particular way. Such cells are currently left blank, but they could be set to **xxxxx**, for example, using this option.

Data options

If *Refresh on open* is turned on then the pivot table will be automatically updated each time the file is opened. The *Refresh every ... minutes* option is greyed out here - this only works if the data is from an external source.

2. Press **<Enter>** for **[OK]** to close the *PivotTable Options* window and enforce any changes

Pivot Charts

When you first invoked the PivotTable Wizard at the very start of the exercise you were offered the option of having both a pivot table and chart. As an introduction to pivot tables that would have been very confusing. However, you can at any time plot a chart if you want one:

1. Click on the **[Chart Wizard]** button on the PivotTable toolbar - a column chart appears on a separate Chart sheet
2. List buttons are provided so that you can choose particular months, employees and categories. Click on the *list arrows* and experiment!
3. *Double click* on the **[Sum of Amount]** button to choose a different statistic
4. To hide the list buttons, *right click* on one and choose **Hide PivotChart Field Buttons**
5. To reshow them, click on the **[PivotChart]** button on the *PivotTable* toolbar and choose the same command - you can also use this method to hide them

The standard Excel Chart toolbar is also shown. Use this to change the chart type (click on the **[Chart Type]** button) and various other settings. *Double click* on an area to change its colour.

6. End by closing the file - there's no need to save the changes, unless you want to