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.

Creating a Pivot Table

A simple example of a pivot table was given in the document *Microsoft Excel 2013: An Intermediate Guide*. A different set of data is used here (note that this does not refer to real people):

1. Load up Excel as usual and press <Ctrl o> to [Open] the file *advanced.xlsx* in the D:\Training directory
2. Click on the Accounts tab – you should find that the set of data is already selected (if not then click in cell A1 to be in the data)
3. On the INSERT tab click on the [PivotTable] button
4. Accept the default area (or type in A1:D61)

5. Place the Pivot Table on the **Existing Worksheet** in cell G4 - press <Enter> or click on [OK]

A skeleton Pivot Table is now drawn and two special PivotTable tabs (**ANALYZE** and **DESIGN**) appear on the **Ribbon**. In addition, a special task pane appears on the right showing the **PivotTable Fields**.

You now have to select which data series you are summarizing by dragging the field buttons from the **PivotTable Fields** pane on the right and dropping them into the areas **below** the field list. 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 down into the area marked **Rows**
2. Drag and drop the **[Amount]** field list button into the area under **∑ Values**

The Pivot Table is now automatically filled in with the data. The end result should look like this:
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.

Note that in Excel 2013, there is a [Recommended PivotTables] button on the INSERT tab, and this could have been used to produce the same pivot table as above (Sum of Amount by Employee) in a new worksheet.

To get the Pivot Table to show Employee rather than Row Labels, carry out the following sequence of instructions:

3. Click on the [Options] button (on the far left of the PIVOTTABLE TOOLS ANALYZE tab) or right click in the table and choose PivotTable Options…:

4. In the PivotTable Options window that appears, click on the Display tab

5. Click in the box next to Classic PivotTable layout to turn this option on and click [OK]

Employee has now appeared at the top, but the layout of the Pivot Table looks different. To return it to the original layout, but with Employee still at the top (instead of Row Labels):

6. Repeat steps 3-5, with the last step turning off the Classic PivotTable layout option

Now your Pivot Table should show as follows:
To sort the names into a different alphabetical order and show the figures as money:

7. Click on G5 then on the HOME tab followed by the [Sort & Filter] button in the Editing group and finally the 2nd option of Sort Z to A - the names are sorted in reverse alphabetical order
8. Next, select the current totals in the pivot table by dragging through them (cells H5 to H12)
9. Click on the HOME tab and the [Accounting] button in the Number group (the one with the gold coins) – there should be £ symbols to the left of each number

A Two-Dimensional Table

By using a second dimension (i.e. 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 PIVOTTABLE TOOLS ANALYZE tab and then [Clear] button in the Actions group followed by Clear All to start all over again
2. Drag and drop the [Employee] field button down into the area marked Rows
3. Drag and drop the [Category] field button down into the area marked Columns
4. Drag and drop the [Amount] field button into the area under ∑ Values

The Pivot Table now shows the breakdown of each employee's expenditure for the three categories, i.e. Food, Stationery and Travel, as follows:

<table>
<thead>
<tr>
<th>Sum of Amount</th>
<th>Category</th>
<th>Food</th>
<th>Stationery</th>
<th>Travel</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chris</td>
<td></td>
<td>40.44</td>
<td>100</td>
<td>140.44</td>
<td></td>
</tr>
<tr>
<td>Emma</td>
<td></td>
<td>4.01</td>
<td>14.62</td>
<td>18.63</td>
<td></td>
</tr>
<tr>
<td>Liz</td>
<td></td>
<td>2.38</td>
<td>22</td>
<td>24.38</td>
<td></td>
</tr>
<tr>
<td>Mike</td>
<td></td>
<td>42.34</td>
<td>133.93</td>
<td>176.27</td>
<td></td>
</tr>
<tr>
<td>Paul</td>
<td></td>
<td>12.51</td>
<td>4.78</td>
<td>30.39</td>
<td>47.68</td>
</tr>
<tr>
<td>Sarah</td>
<td></td>
<td>42.55</td>
<td>3.32</td>
<td>257.48</td>
<td>303.35</td>
</tr>
<tr>
<td>Steve</td>
<td></td>
<td>45.29</td>
<td>2.17</td>
<td>93.6</td>
<td>141.06</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td>149.08</td>
<td>87.33</td>
<td>615.4</td>
<td>851.81</td>
</tr>
</tbody>
</table>

To return to a one-dimensional table:

5. In the PivotTable Fields pane on the right (if this has closed, either click on the Pivot Table data in the sheet or click on the [Field List] button in the Show group on the PIVOTTABLE TOOLS ANALYZE tab), click on the Category box in the Columns area and select Remove Field from the menu

To obtain a two-dimensional table once more:

6. Drag and drop the [Category] field list button down into the area marked Columns
7. Select the data (H6 to K13), click on the HOME tab and the [Accounting] button in the Number group (the one with the gold coins)
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 <Ctrl> as you press <Enter> keeps the active cell where it is

This should isolate the month from the date, in this case, Jan. If you want to learn more about the Text function, work through the notes entitled Microsoft Excel 2013: Dates and Times.

3. Double click on the small green square in the bottom right-hand corner of the E2 cell to fill down the column with the months
4. Click on a cell in the pivot table to reactivate the PivotTable Fields pane and the PIVOTTABLE TOOLS ANLYZE and DESIGN tabs
5. On the PIVOTTABLE TOOLS ANALYZE tab, click on the icon above the [Change Data Source] button in the Data group
6. Redefine the data source table/range to include column E (i.e. change $D$61 to $E$61) – click on [OK]
7. Drag and drop the new [Month] field button into the area under Filters in the PivotTable Fields pane

To look at the accounts for any one month:
8. Click on the list arrow in cell H2, select the month required (e.g. Jan) then click on [OK]

Your Pivot Table should look as follows (if you chose Jan as your month):

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>£</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sum of Amount</strong></td>
<td><strong>Category</strong></td>
<td>Stationery</td>
</tr>
<tr>
<td><strong>Employee</strong></td>
<td><strong>Food</strong></td>
<td>£</td>
</tr>
<tr>
<td>Chris</td>
<td>£</td>
<td>100.00</td>
</tr>
<tr>
<td>Emma</td>
<td>£</td>
<td>5.96</td>
</tr>
<tr>
<td>Liz</td>
<td>£</td>
<td>5.99</td>
</tr>
<tr>
<td>Mike</td>
<td>£</td>
<td>6.40</td>
</tr>
<tr>
<td>Paul</td>
<td>£</td>
<td>5.12</td>
</tr>
<tr>
<td>Sarah</td>
<td>£</td>
<td>3.79</td>
</tr>
<tr>
<td>Steve</td>
<td>£</td>
<td>22.00</td>
</tr>
</tbody>
</table>

9. Repeat step 8, choosing (All) to reshow all the data

Hiding and Showing Summary Values

If you don't want certain values displayed (e.g. 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 in cell H4
2. Click on the Stationery check box to remove the tick then click on [OK]

Only Food and Travel are now shown and a filter indicator shows in H4. To show Stationery again:

3. Click on the filter indicator attached to the Category column heading in cell H4
4. Click on the Stationery check box to restore the tick then click on [OK]
5. Use the same process, this time using the list arrow attached to the Employee row heading in cell 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 $\sum$ Values area of the PivotTable Fields pane. 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 under $\sum$ Values (you can also click on the Employee field button and choose the appropriate Move option).

You now have both the Sum of amount and the Count of Employee for the claims submitted by each employee. Note that the count is also 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 $\sum$ Values field button from the Columns area to below the Employee field button in the Rows area.

Your Pivot Table should now look like this:

3. Drag the $\sum$ Values field button above the Employee field button in the Rows area under PivotTable Fields.

The data is now summarized first by the Values fields and then by Employee.
Changing the Summary Statistics and Data Format

To change the summary statistics:

1. Click on the Sum of Amount field button in the \( \sum \) Values area under PivotTable Fields and choose Value Field Settings... from the menu - a dialog box appears:

   ![Dialog Box]

2. Under Summarize value field by choose Average (note what else is available)
3. 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.

Another method of changing the field settings is to right click on the data in the Pivot Table:

4. Right click on Average of Amount in the Pivot Table and choose Value Field Settings...
5. Change Summarize value field by back to Sum then press <Enter> or click on [OK]

You can also change the data format in the Value Field Settings dialog box:

6. Click on the Count of Employee field button in the \( \sum \) Values area under PivotTable Fields and choose Value Field Settings...
7. Click on the [Number Format] button in the bottom left – the Format Cells window appears
8. Change the Category: to Number and set Decimal places: to 0
9. Press <Enter> or click on [OK] to confirm this, then again to close the Value Field Settings dialog box

Your Count of Employee data should now just be numbers without £ symbols in front as shown below:

![Pivot Table]

An easier way to change the format is to right click on Count of Employee in the Pivot Table and choose Number Format....
Removing a Summary Statistic

To remove a summary statistic from the Pivot Table, in this case, the Count of Employee:
1. Note the area labelled Σ Values in the bottom right corner of the PivotTable Fields pane
2. Click on Count of Employee and choose Remove Field

Only the Sum of Amount is now shown.

Multiple Row/Column/Filter Fields

You can have more than one Row, Column or Filter 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 box from the Filters area into either the Rows or Columns area of the PivotTable Fields pane:
1. Drag the Month field button from the Filters area to the Columns area, and put it under the Category field button so that you are viewing by Category and then Month

Your Pivot Table data and fields will look something like:

A better arrangement is obtained by moving the Month box into the Rows area of the PivotTable Fields pane:
2. Drag the Month field button from the Columns area to the Rows area, and put it under the Employee field button
To hide each employee’s total:

3. Click on the Employee field button and choose Field Settings...

The following Field Settings dialog box should appear:

4. Change the setting under Subtotals to None and click [OK]

To view by Month then Employee:

5. In the Rows area, drag the Month field button above the Employee field button

To display the monthly totals:

6. Click on the Month field button and choose Field Settings...

7. Change the setting under Subtotals to Automatic and click [OK]

To hide the details for a particular month:

8. Click on the [-] button to the left of the month name in the data area of the Pivot Table

9. To redisplay the details, click on the same button (which now appears as [+] )

Note: These expand/contact buttons can be turned off by clicking on the [+/- Buttons] icon in the Show group on the right of the PIVOTTABLE TOOLS ANALYZE tab.

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

Your Pivot Table data and fields will now look something like:
Grouping and Details

Earlier in these notes (in the three-dimensional table section), 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 (e.g. 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. Click on the Month field button in the Rows area and choose Remove Field
2. Drag the Date field button from the top of the PivotTable Fields pane to below the Employee field button in the Rows area at the bottom - expenditure is shown for each date
3. Next, right click on any date value in column H and choose Group (or click on any date and then click on the [Group Selection] button in the Group area of the PIVOTTABLE TOOLS ANALYZE tab) - a dialog box appears (the one on the right shows the Grouping window for numeric data):

   ![Grouping window](image)

   4. Change the Starting date: to 01/01/2001
   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 field button in the Columns or Rows area, you can use the grouped data in the Filters area:

6. Drag the Date field button from the Rows area to the Filters area in the PivotTable Fields pane
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 moving the Date field button out of the Filters area and back to the Rows area under the Employee field button

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 and choose Expand/Collapse followed by Expand - the Show Detail dialog box appears

![Show Detail dialog box]

12. From the available fields choose Amount then press <Enter> for on [OK]

Your Pivot Table data and fields should now look something like:

![Pivot Table example]

13. To hide the detail you can repeat step 11, but choose Expand/Collapse followed by Collapse, or click on the [-] button to the left of Apr

14. End by removing the Detail column for the Amount by clicking on the Amount field button in the PivotTable Fields pane and selecting Remove Field

**Tip:** Pivot Tables have another very useful feature. If you double click on any of the calculated cells in a table (often a total), a copy of that data is pasted onto a new 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 L29.
Row/Column Field Options and Built-in Styles

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 button under the Rows area in the PivotTable Fields pane and choose Field Settings...
2. Under Subtotals, you can decide whether you want the same statistic as in the data area (i.e. Sum) or whether you want to set a different one – click on Custom then choose Average
3. Click on [Layout & Print] and investigate the options - turn on Show item labels in outline form (make sure Display subtotals at the top of each group is turned off)
4. Press <Enter> or click on [OK] and the table is updated to reflect the changes made - note the monthly averages now show (instead of totals)

Your Pivot Table data and fields should now look something like:

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

5. Click on the PIVOT TABLE TOOLS DESIGN tab on the Ribbon
6. Move the mouse over the various PivotTable Styles provided – the pivot table shows a preview of the new style
7. To see more styles, click on the [More] button below the scroll bar attached to the styles

It’s unlikely you will be making use of these styles but it’s worth knowing of their existence. You can even design your own style via the New PivotTable Style... option below the pre-defined styles. The buttons in the PivotTable Style Options group on the Ribbon can also be used to customise the settings. Here:

8. If you have applied a style, [Undo] it (or press <Ctrl z>) to remove any formatting
9. End this section by moving the Date field button from the Rows area back into the Filters area in the PivotTable Fields pane
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 J6 isn’t updated
2. Click on cell J6 then on the PIVOTTABLE TOOLS ANALYZE tab followed by the [Field Settings] button in the Active Field group. In the Value Field Settings window, change Summarize Values By to **Max** (press <Enter> or click on [OK]) - again, J6 doesn’t change
3. Drag the **Amount** field button from the top of the PivotTable Fields pane into the Σ Values area and under the Max of **Amount** field button at the bottom - Chris’ travel appears twice as £100!
4. Click on the [Refresh] button on the PIVOTTABLE TOOLS ANALYZE tab (or right click on the data and choose Refresh) – the new figure now shows
5. End by removing Max of **Amount** - click on Max of **Amount** in Σ Values in the bottom right of the PivotTable Fields pane and choose Remove Field

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:

6. Click on the [Options] button (on the far left of the PIVOTTABLE TOOLS ANALYZE tab) or right click in the table and choose PivotTable Options…:
   The PivotTable Options window will appear, as shown on the right.
7. On Layout & Format, note the option For empty cells show – type in a value of 0 (empty cells are currently shown as blank)
8. On the Totals & Filters tab, turn off Show Grand totals for rows
9. On the Display tab, change Field List to Sort A to Z
10. On the final Data tab, turn on the option to Refresh data when opening the file
11. Press <Enter> for [OK] to confirm the changes to the options

You should find that the Grand Total column on the right of the table is no longer showing, that £ - appears where there was no expenditure and that the fields at the top of the PivotTable Fields pane on the right are now listed alphabetically as shown below:
Pivot Charts

When you first inserted the PivotTable at the very start of this training, you could have chosen to have a pivot 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 [PivotChart] button in the Tools group on the PIVOTABLE TOOLS ANALYZE tab – press <Enter> for [OK] to accept the default (Column) chart

A column chart appears on the same sheet and three new PIVOT CHART TOOLS tabs (ANALYZE, DESIGN and FORMAT) are added to the Ribbon. To move the chart onto a separate sheet:

2. Click on the PIVOT CHART TOOLS DESIGN tab followed by the last [Move Chart] button, and then select the New Sheet radio button and click on [OK]

Your Pivot Chart and fields should look something like:

3. In the top left-hand corner of the Pivot Chart, click on the list/filter arrow to the right of Date and choose a particular month, e.g. Jan, and click [OK]

**Tip:** If you return to look at the data in the Pivot Table on the Accounts sheet, you will see that it is showing the same information as on the Pivot Chart, but in numbers. Remember to click back on the Chart1 sheet to return to the Pivot Chart.

4. Repeat step 3, but turn on Select Multiple Items and choose a second month, e.g. Mar

5. Repeat step 3, but choose (All) to reshow all the data

6. Click on the list/filter arrows attached to Employee (bottom left by the axes) and Category (middle right of chart above the legend) to set the Employee(s) and Category(ies) respectively

7. Repeat step 6, but choose (Select All) to reshow all the data

8. Using the PivotChart Fields pane on the right of the chart, drag the Month field button below the Employee field button in the AXIS (CATEGORIES) area – you now have a chart showing each employee’s monthly spending

9. Drag the Month field button above the Employee field button in the AXIS (CATEGORIES) area to show a summary by month then employee
10. Drag the **Month** field button into the Σ Values area to get the **Count of Month** (i.e. how many claims per month) figures (note that these may still be in a currency rather than number format)

11. Click on **Count of Month** and choose **Remove Field** to get rid of the extra columns

The last two PivotChart Tools tabs are in fact the regular tabs you get with any chart. You can use these to customise your chart (change chart type or colour etc.). The **ANALYZE** tab is unique to Pivot Charts and Tables. To see it in action:

12. Click on the **PivotChart Tools Analyze** tab

13. Select one of the series (e.g. **Travel**) by clicking on any of its columns – little circles, known as **handles** appear on the columns

14. Click on the **[Expand Field]** button in the Active Field group, choose one of the options, e.g. **Category**, and click on **[OK]**

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