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PART III

Data Analysis, Visualisation, Filtering and Validation - Formulas, Functions and other Excel tools
- Excel Tables, Charts, PivotTables and PivotCharts

FROM RANGES OF CELLS TO TABLES

Turning a range of cells into an Excel Table makes managing and analyzing data easier. Excel Tables are considered a tool for data structuring that outweighs ranges of cells in terms of not only formatting features but also functionality. Some of the advantages in using Excel Tables include the following:

- When a Table is created, Excel automatically applies specific formatting on it, which is easily modified as a whole, using a gallery of styles designed to enhance readability and presentation of content. For instance, with a single mouse-button click, the user can
    - add/remove banded rows and/or columns
    - add/remove a row summarizing key statistical calculations
    - add/remove a header row and/or column
    - apply a different table style.
- Filtering buttons can be added to a Table automatically upon its creation.
- Tables, unlike ranges of cells, can automatically expand in size when typing content into a blank row/column adjacent to the last row/column of the table.
- When tables expand in size, they also 'expand' in format, with the table style applied to every new part of the Table.
- An excel table automatically names its rows and columns. This allows the use of named ranges (rows and/or columns) in formulas or other Excel functions, instead of ranges referenced by the columns' and rows' identification letters and numbers.
- Tables also do have names, so that the range of cells they include can be referenced by the Table name.
- When a formula is inserted in a Table cell, it can be automatically copied to the rest of the subsequent cells in the column.

FROM TABLES TO PIVOTTABLES

An Excel PivotTable is a powerful tool to calculate, summarize, and analyze data. Its core functionality consists in the ability to rearrange (or 'pivot') selected fields of an Excel table or range, and calculate summary statistics for those fields (e.g. COUNT, AVERAGE, MIN, MAX, PRODUCT, COUNT NUMBERS, STDEV, etc.).

This tool helps Excel users quickly present data in a way that highlights and supports specific points they wish to communicate from a dataset.

For example, let us imagine a Table that would include information on the company's fixtures arranged during the last three years. Column A would include the date each fixture was arranged, column B the vessel name, C the vessel age, D the vessel capacity, E the charterer, F the duration of the charter, and G the charter rate. Let us now imagine how much time would be required to rearrange the table in order to group all the information per charterer and calculate the respective average values for the following figures: charter rate agreed, age of the chartered vessels and vessel capacity. Alternatively, let us also imagine how time-consuming it would be to create sub-tables that would group vessel names under different durations of the charter-contracts (i.e. which vessels would be chartered for 10 months, which ones for 20 months, etc.). Organizing data in a PivotTable would allow producing the aforementioned information and much more at some clicks only.

Tables (rather than ranges of cells) are a great PivotTable data source, because rows added to a table are automatically included in the PivotTable when data gets refreshed, and any new columns are also included in the PivotTable Fields List.

THE IMPORTANCE OF VISUALIZING DATA – CHARTS AND PIVOTCHARTS

Data visualization is the representation of data or information in a graph, chart, or other visual formats. It is an important tool in data analysis but also an effective way to communicate information in the workplace.

Visualizing data is a cornerstone in data analysis: it allows detecting patterns, trends, and outliers more easily than looking through thousands of rows and columns on a spreadsheet. For example, using a chart to observe the development of containership charter rates for the last 20 years helps detect time periods of high or low rates more easily than observing the same data in a table or range of cells. Moreover, if any abnormally high values of charter rates are observed in a Chart during a period of low markets, this easily provides an indication that either false data entries have occurred, or further investigation is required. Thus, visualizing data both helps verify the expected and brings in new information. Besides, it is not by coincidence that research ideas very often emerge from interesting patterns observed in data.

Graphs and charts are also powerful tools for communicating information. They facilitate attracting attention to specific points, help the audience/readers/viewers relate better to the content and make comparisons, incite emotional response more easily, possibly generate more impact on the viewer, and also help memorize information better since they require less intellectual effort.

Microsoft Excel provides tools for Chart and PivotChart creation. PivotCharts complement PivotTables by adding visualizations to the summary data and PivotTable Fields.

Choosing the right type of a chart is just as important as deciding to use a chart. Different charts will display the same data in very different ways, so the most appropriate chart type should be selected according to the type of data to be visualized. For example, a line chart shows the relationship of the changes in the data over a period of time, a pie chart shows the relationship of the parts to the whole, a bar chart emphasizes the comparison between items at a fixed period of time, etc.

In this section, participants will further develop their skills in using different types of functions (date and time, logical, statistical and others) and combine them with the intention of filtering datasets, calculating figures, analyzing and validating information. Also, they will learn how to a) use formula auditing tools to check for errors in formulas and trace their referenced values, b) structure data in Tables and work with structured references, c) create PivotTables and modify them, d) visualize data creating and modifying Charts and PivotCharts, e) create different views of worksheets/workbooks and manage content to facilitate reading and editing, and f) prepare the worksheet for printing.

The workbook 'Port Congestion' provides congestion records for different types of containerships and anchorage areas all over the world during the period from May to August 2020.

1. Freeze the first row of the worksheet (View Ribbon, Window tab, Freeze top row).
2. Freeze the first column of the worksheet (View Ribbon, Window tab, Freeze first column).
3. Freeze the first row and column simultaneously (View Ribbon, Window tab, Freeze Panes).
4. Find the entries 'East Mediterranean' and replace them with 'East Med' (Ctrl+F, Replace OR Home Ribbon, Editing tab, Replace button).
5. Format columns E to F as numbers, with two decimal places and a thousand separator (Revision question).
6. Change the dates' format in cell A1 to also include the day of the week. Use Autofill to apply the same format to the rest of the cells in column A (Revision question).
7. Insert a blank column before column B. Copy column A to column B using only the keyboard (To insert the column: right click on the header of column B, Insert. Keyboard shortcut for copying content: Ctrl+C, Keyboard shortcut for pasting content: Ctrl+V).
8. Undo the action using the keyboard (Ctrl+Z).
9. Repeat the copy-paste procedure using two alternative ways. Explore the paste special options (Home Ribbon, Clipboard group, Paste, Paste special OR Ctrl+click and drag the content to be pasted).
10. Can you separate the weekday from the date and insert them in two separate columns? (Data Ribbon, Data tools, Flash Fill).
11. Use the date function 'Weekday' and the logical function 'IFs' to calculate the weekday and display it in text format.
12. Insert a table for the whole range of data (Insert Ribbon, Table).
13. Add a total row in the table and calculate for the whole time-period (11th May – 13th August 2020):

    a. the greatest number of vessels congested

    b. the average value of congestion in terms of vessel capacity (TEUs)

    c. the total number of vessels larger than 8000 TEUs congested

    d. the total number of vessels larger than 3000 TEUs congested

    e. the total number of vessels larger than 1000 TEUs congested

    (Table Design Ribbon, Table Style Options, Total row).

14. Calculate the respective figures for congestion reported in June (Filter button).
15. Using the SUMIF function and structured references, calculate the number of vessels congested per weekday.
16. Insert a chart to visualize the results of the aforementioned calculations (Insert Ribbon, Charts group).
17. Edit the Chart Title, add axis titles, data labels, a data legend and gridlines (Chart Design and Format Ribbons).
18. Check the different layouts, how to switch rows/columns, select data and change chart type. Resize the chart. Move the chart to a Chart Sheet (Chart Design and Format Ribbons).
19. Using the SUMIFS function, calculate the number of vessels congested per week day in Black Sea. Create a chart with total number of vessels congested and vessels congested in Black Sea per day of the week.
20. Using the AVERAGEIFS function, calculate the average value of TEUs congested per week day in the Eastern Mediterranean ('East Med') zone.
21. Create a PivotTable in a new worksheet summarizing all the above-calculated via functions figures. Check how you can work with fields, slicers and filters, and how you can modify the table formatting.
22. What happens if there are changes in values in the Data Source of the PivotTable? How does the PivotTable get updated?
23. Visualize the PivotTable data in a PivotChart. Add an outline and fill of your preference.
24. Change the PivotChart to display figures per month instead of weekday. What do you notice regarding the PivotTable?
25. Using the PivotTable, generate a new table with all details for congestion in ports of the Black Sea and Eastern Mediterranean ('East Med') zones during May.

The workbook 'Fixtures' contains fixtures for containerships of narrow beam (3,091 – 5,031 TEU) for the time-period from January 2017 to August 2020.

1. Insert a blank column and calculate the age of each vessel.
2. Count the number of fixtures for which the charter rate is provided (COUNTA function).
3. Count the number of fixtures for which the charter rate is <u>not</u> provided (COUNTBLANKS function).
4. Count the number of fixtures for which the charter rate is greater than 10,000 $/day (COUNTIF function)
5. Count the number of vessels that are at least 20 years old and chartered at 9,000 $/day or higher (COUNTIFS function).
6. Use the logical function AND to find vessels owned by "Danaos Shipping" and chartered by "MSC".

7. Create a nested function to find the charter rate for the aforementioned fixtures (nested AND into IF).
8. Choose a fixture of Danaos and MSC and calculate the rank of its rate in the range of fixtures arranged by Danaos in the respective year (RANK function).
9. Calculate the percent rank of the aforementioned rate (PERCENTRANK function) and double check the result via the PERCENTILE and QUARTILE functions.
10. Experiment with the formula auditing tools for the above formulas you inserted: Show Formulas, Error Checking, Evaluate Formula, Trace Precedents/Dependents, Watch Window (Formulas tab, Formula Auditing Group).
11. Use Data Bars to visualize rates (Home tab, Styles group, Conditional Formatting, Data bars).
12. Open four excel workbooks and arrange them a) tiled, b) horizontally, c) vertically (or side by side), d) cascaded (View tab, Window group, Arrange all).
13. Create a second window to the same worksheet to work simultaneously on different parts of it. See how you can arrange viewing both windows of the same active worksheet. (View tab, Window group, New Window).
14. Hide a workbook. Unhide it. (View tab, Window group, Hide/Unhide)
15. Split the table with the fixtures to work simultaneously on different parts of it (View tab, Window group, Split).
16. Remove the table split.
17. Print columns A-F (Page Layout tab, Page Setup group, Print Area, Set Print Area).
18. Repeat on each printed page the first row and column of the table (Page Layout tab, Page Setup group, Print Titles).
19. Adjust the margins, size of the page and change its orientation (Page Layout tab, Page Setup group, Margins/Size/Orientation).
20. Insert a customized header and footer with the content of your preference (Insert Tab, Text group, Header & Footer).
21. Insert a page break at line 19 (Page Layout tab, Page Setup group, Breaks).
22. Print the gridlines (Page Layout tab, Sheet Options group, Gridlines).
23. Do not print the header and footer on the first page (Insert Tab, Text group, Header & Footer, Options, Different First Page).
24. Print comments and select draft quality (File, Print, Page Setup, Sheet, Print Section).

Appendix V:

Microsoft official support pages for the commands used in Part V

✓ Freeze panes to lock rows and columns
✓ Find or replace text and numbers on a worksheet
✓ Insert or delete rows, and columns
✓ Undo, redo, or repeat an action
✓ Paste Special
✓ IFS function
✓ WEEKDAY function
✓ Create and format tables

- ✓ MAX function
- ✓ SUMIF function
- ✓ AVERAGEIF function
- ✓ Using structured references with Excel tables
- ✓ Filter data in a range or table
- ✓ Create a chart from start to finish
- ✓ Add or remove titles in a chart
- ✓ Show or hide a chart legend or data table
- ✓ Update the data in an existing chart
- ✓ Display or hide chart gridlines
- ✓ Change the chart type of an existing chart
- ✓ Change the layout or style of a chart
- ✓ Move or resize a chart
- ✓ SUMIFS function
- ✓ AVERAGEIFS function
- ✓ Create a PivotTable to analyze worksheet data
- ✓ Use slicers to filter PivotTable data
- ✓ Use the Field List to arrange fields in a PivotTable
- ✓ Filter data in a PivotTable
- ✓ Create a PivotTable timeline to filter dates
- ✓ Create a PivotChart
- ✓ Refresh PivotTable data
- ✓ COUNTA function
- ✓ COUNTBLANK function
- ✓ COUNTIF function
- ✓ COUNTIFS function
- ✓ AND function
- ✓ RANK function
- ✓ PERCENTILE function
- ✓ QUARTILE function
- ✓ Detect errors in formulas
- ✓ Use data bars, color scales, and icon sets to highlight data
- ✓ View multiple panes, sheets, or workbooks
- ✓ Hide or show worksheets or workbooks
- ✓ Split tables
- ✓ Set or clear a print area on a worksheet
- ✓ Print rows with column headers on top of every page
- ✓ Page Setup
- ✓ Headers and footers in a worksheet
- ✓ Insert, move, or delete page breaks in a worksheet
- ✓ Print gridlines in a worksheet
- ✓ Print comments and notes in Excel