

Lecture Note #15: PivotTables Part #1

BUSI 201: Business Data Analysis

Fall 2023

Topic 1. PivotTables

Charts are among the most powerful methods we have in summarizing any trends in the data. We can observe the correlations between variables using scatter charts, discover long run trends using line charts, and uncover the distribution of some variable using histograms. However, while visualization does provide an overview of the data, it lacks some clarity and exactness that tables can provide.

In most scenarios, it is necessary to generate a table that summarizes the data on hand, which we call “summary statistics.” Navigate to the worksheet PIVOT-01 in BUSI201-LEC15-Workbook.xlsx to find aggregated sales data for three employees over the period of roughly 3 years. In order to manually summarize this data, we must rely on functions.

	A	B	C	D	E	F	G	H	I	J	K
1											
2		Year	Month	Employee	Sales (\$)		Summary	Monthly Average Sales	Annual Total Sales		
3		2021	January	A	\$ 88,940.81		Total				
4		2021	February	A	\$ 66,793.73		2021				
5		2021	March	A	\$ 74,497.90		2022				
6		2021	April	A	\$ 44,960.47		2023				
7		2021	May	A	\$ 47,151.75		Total				
8		2021	June	A	\$ 52,510.32		2021				
9		2021	July	A	\$ 80,881.12		2022				
10		2021	August	A	\$ 69,283.09		2023				
11		2021	September	A	\$ 56,141.29		Total				
12		2021	October	A	\$ 68,160.26		2021				
13		2021	November	A	\$ 57,906.10		2022				
14		2021	December	A	\$ 84,227.43		2023				
15		2022	January	A	\$ 80,006.05						

Figure 1: PIVOT-01

Specifically to fill out the empty table in worksheet PIVOT-01, we will be using the functions we handled in previous classes, AVERAGEIFS and SUMIFS. Please try out manually filling the empty table using the functions. As a hint, the cells I4 and J4 can be filled out using:

- I4: =AVERAGEIFS(\$E\$3:\$E\$104,\$D\$3:\$D\$104,\$G\$3,\$B\$3:\$B\$104,\$H4)
- J4: =SUMIFS(\$E\$3:\$E\$104,\$D\$3:\$D\$104,\$G\$3,\$B\$3:\$B\$104,\$H4)

Inserting PivotTables

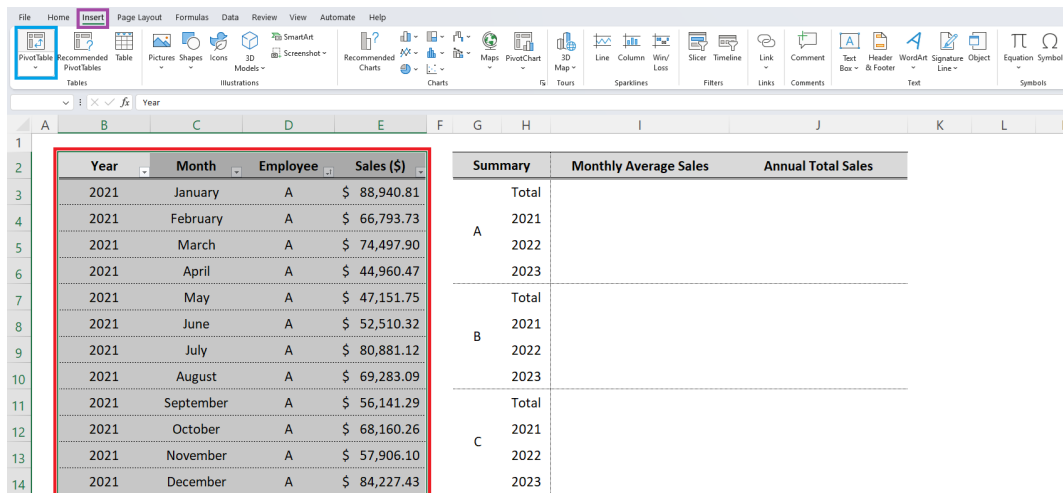


Figure 2: First Step of Inserting PivotTable

Instead of manually filling the table, we can rely on PivotTables to produce a summary table instead. We will replicate the table we just created using PivotTables. To create a table using PivotTables, follow the steps illustrated in Figure 2. First select the data including the variable names as shown in the red box. Then, head over to the **Insert** tab, and select PivotTable in the blue box.

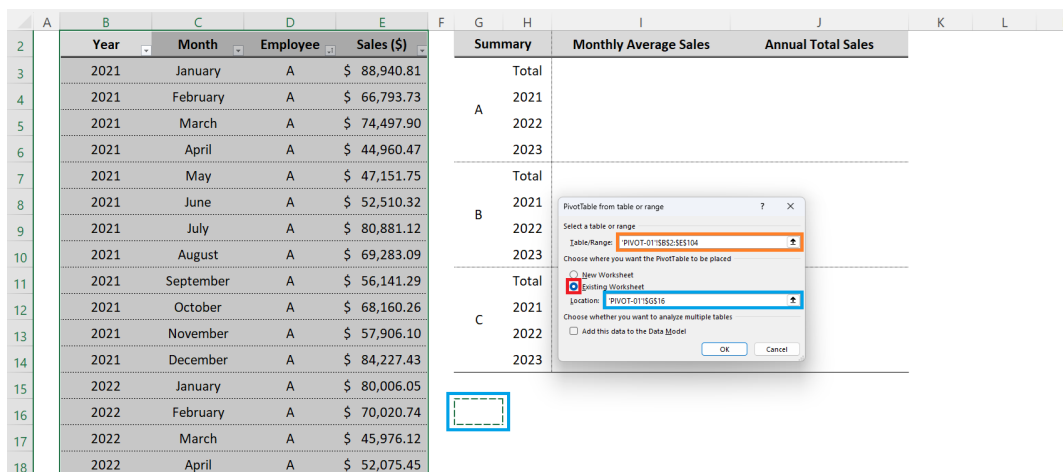


Figure 3: Second Step of Inserting PivotTable

A new window should pop up, and the Table range will be pre-populated with the range of the data we selected in the previous step.¹ For this exercise, we want the new table to be visible in the same worksheet, so we will be choosing **Existing Worksheet**, and then we will select a cell that we will “begin” building the new table. In this example, we will be using **G16** as the initial location, and click Ok.²

¹Note that it is not strictly necessary to select the table range before clicking the PivotTable button, as we can always add/change the range after we call up this new window by selecting a new data area in the orange box.

²Cell G16 will serve as the top left corner of the newly generated table.

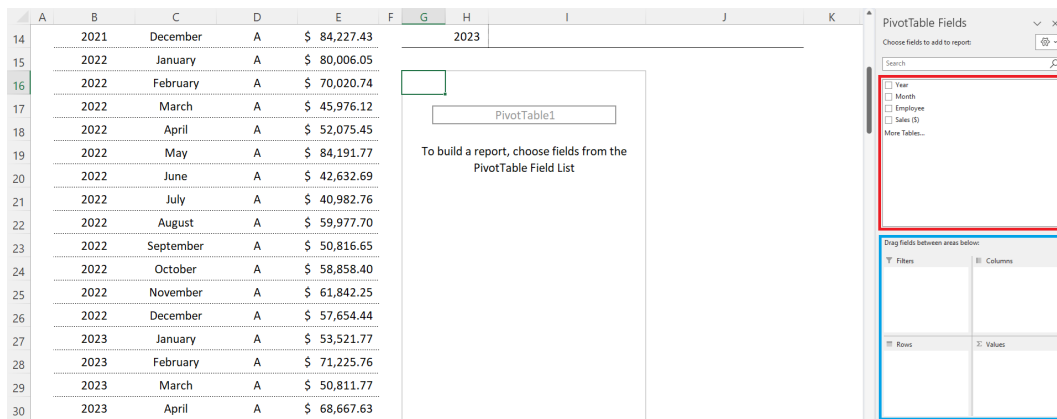


Figure 4: Third Step of Inserting PivotTable

Figure 4 shows us an empty PivotTable, which we will fill out by clicking and dragging items in the **red box** down to the appropriate bins in the **blue box**. It is at this point we will look back to the table we are attempting to replicate. The “row” elements are “two-layered,” in that the first (left) layer is divided up by employees, and the second (right) layer is divided by years. Then, there are two “values” that we will be calculating; the monthly average sales by years, and the annual total sales.

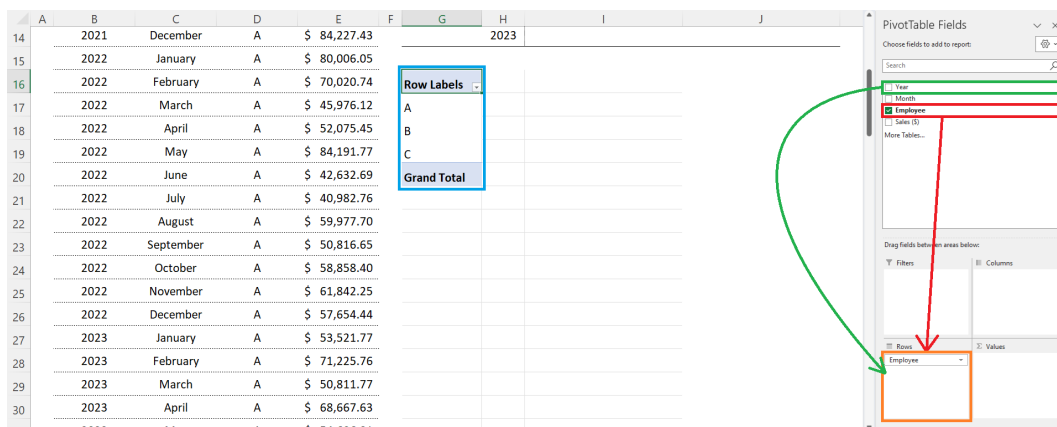


Figure 5: Fourth Step of Inserting PivotTable

See Figure 5 as we start with the row elements. Click and drag the field **Employee** to the **orange box**. This will start to populate the PivotTable which was previously empty. In the **blue box**, you can see some changes where the rows for each employees have been generated. Next, we will add the second layer of years, following a similar click-and-drag method shown in the **green box and arrow**. Make sure that the Year field is situated below Employee, as it is the inner most layer in our table.

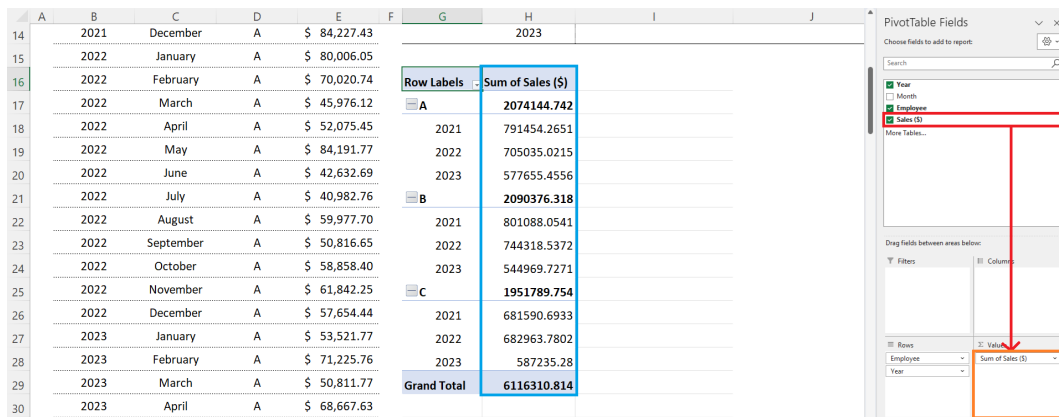


Figure 6: Fifth Step of Inserting PivotTable

Now we have the rows all ready, we can start adding the other elements. In this case, we will be adding the monthly average value of each employee's sales. Lets move on to the steps illustrated in Figure 6. Click, and drag the field **Sales (\$)** down to Values in the **orange box**. You will see that a new column has been added to the PivotTable in the **blue box**. However, it does not display the values that we want at this point, so we must edit its properties.

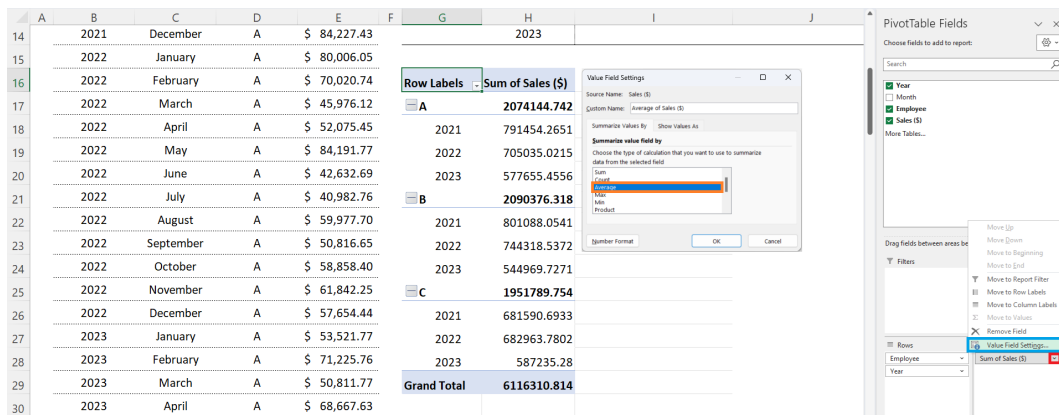


Figure 7: Sixth Step of Inserting PivotTable

Click the icon in the **red box** in Figure 7, and select **Value Field Settings**. Then, in the pop-up window **Value Field Settings**, select the option **Average**, and click Ok. It will automatically change the field's name to **Average of Sales (\$)**, and the PivotTable will also have been updated. Compare the two values highlighted in Figure 8.

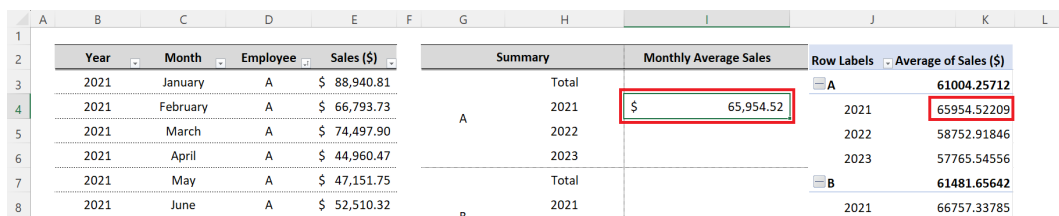


Figure 8: Comparing Functions and PivotTables

Row Labels	Average of Sales (\$)	Sum of Sales (\$)
A	61004.25712	2074144.742
2021	65954.52209	791454.2651
2022	58752.91846	705035.0215
2023	57765.54556	577655.4556
B	61481.65642	2090376.318
2021	66757.33785	801088.0541
2022	62026.54476	744318.5372
2023	54496.97271	544969.7271
C	57405.58099	1951789.754
2021	56799.22444	681590.6933
2022	56913.64835	682963.7802
2023	58723.528	587235.28
Grand Total	59963.83151	6116310.814

Figure 9: Final Step of Inserting PivotTable

We will now add the second element, annual total sales. To achieve this, simply click and drag the **Sales (\$)** down to Values in the **orange box** once more. In order to place this new entry to the right of the existing column, make sure to place it below the Average of Sales (\$).

Summary	Monthly Average Sales	Annual Total Sales
A	Total \$	61,004.26 \$ 2,074,144.74
	2021 \$	65,954.52 \$ 791,454.27
	2022 \$	58,752.92 \$ 705,035.02
	2023 \$	57,765.55 \$ 577,655.46
B	Total \$	61,481.66 \$ 2,090,376.32
	2021 \$	66,757.34 \$ 801,088.05
	2022 \$	62,026.54 \$ 744,318.54
	2023 \$	54,496.97 \$ 544,969.73
C	Total \$	57,405.58 \$ 1,951,789.75
	2021 \$	56,799.22 \$ 681,590.69
	2022 \$	56,913.65 \$ 682,963.78
	2023 \$	58,723.53 \$ 587,235.28

Row Labels	Average of Sales (\$)	Sum of Sales (\$)
A	61004.25712	2074144.742
2021	65954.52209	791454.2651
2022	58752.91846	705035.0215
2023	57765.54556	577655.4556
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Figure 10: Completed PivotTable

Comparing the table manually generated using functions to the PivotTable, we can see that they are identical. The only minor difference in the values would be their formatting.

Topic 2. PivotTable Columns

Navigate to the next worksheet PIVOT-02, which has revenue and profit data on a large corporation with offices in multiple cities. Suppose that we want to see how each offices' revenue evolved over time.

	2014	2015	2016	2017	2018	2019	2020	2021	2022
Atlanta									
Boston									
Chicago									
Denver									
Eugene									
Fort Worth									
Galesburg									
Houston									

Table 1: Empty Table to Replicate

That is, we want to use PivotTables to automatically fill out Table 1. In addition to the “rows” that we learned how to deal with in the previous section, we will now add “columns.” To start off this process, select the data and start off the PivotTable.

The screenshot shows an Excel worksheet with a PivotTable summarizing revenue by office and year. The PivotTable is located in the range B3:G22. The PivotTable Fields task pane on the right shows the following configuration:

- Filters:** None
- Columns:** Year
- Rows:** Office
- Values:** Sum of Revenue

The PivotTable data is as follows:

Office	2014	2015	2016	2017	2018
Atlanta	818403.33	462975.20	430191.58	219155.35	570443.14
Boston	587791.22	932301.96	137105.11	709333.24	304546.65
Chicago	430907.74	775170.75	552446.08	599624.31	645867.48
Denver	595079.59	952827.8	655636.46	105466.36	532064.37
Eugene	850002.7	261420.05	798342.97	433765.68	776052.14
Fort Worth	183354.42	972272.19	904482.44	778191.84	791010.74
Galesburg	980725.87	470698.13	165685.09	670793.84	803818.87
Houston	447294.17	106501.22	908074.37	474887.35	751431.21
Grand Total	4893559.04	4934167.3	4551964.1	3991217.97	5175234.6

Figure 11: Completed PivotTable

Replicate Figure 11 by moving Office to the red box, Year to the orange box, and Revenue to the blue box. Double check if the results are correct by comparing this new table to the table in the next worksheet, PIVOT-03.