



I ♥ pivot tables (and so should you)

To an Excel jockey, true happiness is normalized data. There is nothing more satisfying than looking at a normalized data set and quickly snapping together a pivot table and drilling down on every imaginable column heading. Oooooohhhh, just thinking about pivoty goodness makes me smile.

One of the favorite classes I took as an undergrad was K201 – *“The Computer in Business”* and focused on foundations of databases with MS Access and data analysis with MS Excel. K201 is a required class for all [Kelley School of Business](#) students and achieved a reputation of being difficult, yet critical for success in any field of business. I didn’t know it at the time but the skills I learned in K201 I would use every day in my professional life. Sorting through cost data, prioritizing projects based on multiple variables (e.g. organizational value, cost, risk, difficulty, complexity, etc.), and sequencing investments based on time are just a few dividends my K201 experience has paid. And it continues to pay off. Every time I open a spreadsheet I ask myself: is there a way I can normalize this data so we can construct a pivot table? The best part about pivot tables are: they allow you to see the data from different perspectives. Taking the extra time to think through the data set and construct normalized columns has saved countless hours and prevented wasteful re-work.

When I started working I assumed pivot tables were common knowledge and that everyone who went to college had a class like K201. Turns out: *not true*. In fact, many smart people spend long hours and late nights to build beautiful non-normalized spreadsheets only to waste time reworking the numbers every time a change is made. Now, I realize that it is impossible to use a pivot table for everything; in fact, there are many scenarios where database tools (e.g. MS Access, SQL, Oracle) or data visualization tools (e.g. Tableau, Spotfire, etc.) are more appropriate; however, you cannot dispute the value and efficiency of snapping a data set into an MS Excel pivot table.

OK already, I'll get off my soapbox but, before I do, let me show you what you can do with a pivot table.

Those who know me know that I am a harmonica junkie. I started playing about five years ago and I fell in love with the little pocket instrument right away. I was looking for something I could easily take with me on the road since my drums were not a practical "road instrument." I have played many brands of harmonica and have found Suzuki is one of the best large production manufacturers of harmonicas so, for this example, I thought I would categorize and build a pivot table with some of Suzuki's diatonic harmonicas.

Now, [Suzuki Harmonicas](#) has a chart on their website (see below) showing a subset of their diatonic harmonica line. This does not represent their full product line but I think it works for this example.

The harmonica chart

SUZUKI 10HOLE DIATONIC HARMONICAS

Category	Standard Models						Advanced Models	Specialized Models		
Model										
Key	Major 14keys	Major 14keys	Major 14keys	Major 14keys	Major 14keys	Major 14keys	Major 14keys	Major 14keys	C/Ab	G/Ab + C/Db/F
Material - Body	Wood/Resin Composite Combo	Wood/Resin Composite Combo	Aluminum	Aluminum	Aluminum	Resin	Brass	Rosewood	Resin	Special resin
Material - Cover	Stainless steel	Stainless steel	Brass	Brass	Brass	Stainless steel	Brass	Rosewood	Brass	Special resin
Finished Cover	-	Coating processing	Chrome plating	Gold plating	Black coating	-	Silver plating	-	Chrome plating	-
Dimension (mm)	100×27×18	100×27×20	100×27×20	100×27×20	100×27×20	103×30×22	100×27×20	100×27×21	104×30×22	103×28×20
Weight (g)	65	70	90	91	90	63	117	65	78	82
Weight (lb)	0.143	0.154	0.198	0.2	0.198	0.138	0.246	0.143	0.174	0.18
Accessories	Plastic case	Clutch case	Plastic case	Plastic case	Plastic case	Plastic case	Plastic case	Plastic case	Plastic case	Plastic case

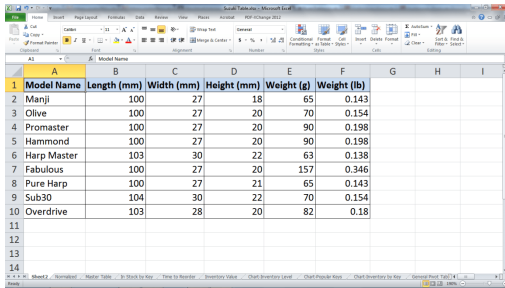
This chart is very helpful to anyone looking to purchase one of these harmonicas as it takes the features and specifications of each model and compares it against the other models in the chart. To a consumer, this type of chart is fantastic; to a data guru this chart is 100% pure evil and here's why:

First and foremost, the data is not normalized

A	B	C	D	E	F	G
1 Model Name	Comb Material	Cover Material				
2 Manji	Wood/Resin Composite Combo	Stainless Steel				
3 Olive	Wood/Resin Composite Combo	Stainless Steel				
4 Promaster	Aluminum	Brass				
5 Hammond	Aluminum	Brass				
6 Harp Master	Resin	Stainless Steel				
7 Fabulous	Brass	Brass				
8 Pure Harp	Rosewood	Rosewood				
9 Sub30	Resin	Brass				
10 Overdrive	Special Resin	Special Resin				

Normalization takes a data set and makes sure that every entry (or row) is unique based on the fields (or columns) by which the data is being described. In this case, in order to normalize the chart above, we would have to put the features and specifications attributes (such as “Material Body”, “Weight (g)”, etc.) as the column headings and fill in the data fields with the corresponding information related to the product.

Each data field contains too much data

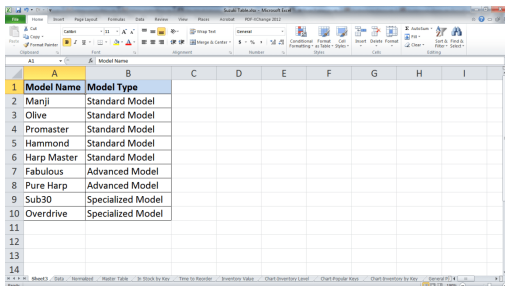


Model Name	Length (mm)	Width (mm)	Height (mm)	Weight (g)	Weight (lb)
Manji	100	27	18	65	0.143
Olive	100	27	20	70	0.154
Promaster	100	27	20	90	0.198
Hammond	100	27	20	90	0.198
Harp Master	103	30	22	63	0.138
Fabulous	100	27	20	157	0.346
Pure Harp	100	27	21	65	0.143
Sub30	104	30	22	70	0.154
Overdrive	103	28	20	82	0.18

For example, the “Key” field indicates “Major 14 Keys” for many of the models but it does not uniquely specify an individual key relative to an individual model. Unless we associate the Olive C-20 model to the key of A, there is no way we can establish a relationship between that harmonica model in that key to any meaningful data such as “in stock” or “price” for a particular key. The same goes for “Dimension (mm)”.

What if we wanted to find a 27mm wide harmonica? There is no easy way to search for it or pivot on that field because it is lumped together with other attributes.

Finally, the format of the table is fighting the function



Model Name	Model Type
Manji	Standard Model
Olive	Standard Model
Promaster	Standard Model
Hammond	Standard Model
Harp Master	Standard Model
Fabulous	Advanced Model
Pure Harp	Advanced Model
Sub30	Specialized Model
Overdrive	Specialized Model

Often times, we jump to the end result of the table and view we want to see without thinking about the data schema necessary to get us to the end-point. The headings like “Standard Models”, “Advanced Models” and “Specialized Models” relate to a specific set of harmonicas that fall underneath them but to a database or pivot table, the format of this table just does not work since it is not contained in a field.

OK, so what do we do? How can we solve these problems so we can get to our goal of pivoting on the

fields/columns?

Converting the data

The first step is converting this chart to a 136 row and 18 column normalized table. I also combined some additional data from the Suzuki website such as “Short Description” and “Model Type”.

Enriching the data

I also added three additional fields to show what you can do with this data:

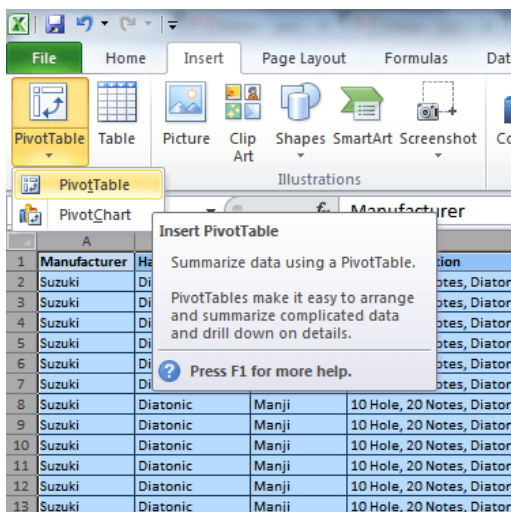
- **Number in Stock:** Represents the number of each harmonica in a particular key a hypothetical vendor has in stock at the moment.
- **Low Stock:** A Yes/No field that looks at the number in stock and determines if there are 10 or less in stock, it displays a value of “Yes”, otherwise it will display “No”.
- **Inventory Value:** Multiplies the MSRP * Number in Stock to get a total retail value of all the harmonicas in stock right now.

Simple enough, right?

So, why go to all this trouble? Why take the time to set up your master data like this? After all, it took additional time to create this table and time equals money, right? Right! With this table, you can slice and dice the data by column headings in any which-way you like. This prevents re-work and saves a lot of time if you want different views of the same data set.

Create the pivot table

Simply select your data range (in this case, the whole table) and go to Insert → Pivot Table.



Now that we have a blank canvas on which to paint beautiful pivot art, what can we do with it? Here are three potential questions we ask with this data in pivot form:

How many harmonicas do I have in stock by key?

Is it time to reorder certain models and keys?

What is the total value of my inventory by harmonica model?

Let's look at how we would do this?

Answering the business questions

How many harmonicas do I have in stock by key?

Creating this pivot is as simple as dragging the “Available Keys” field to your row label, “Model Name” to your column label and dragging the “Number of In Stock” to your values area. Be sure the field settings are set to “Sum” (not Count) the “Number of In Stock” in order to get a total number of harmonicas you have in stock. One quick note here: Models like the *Promaster* and the *Fabulous* have two variations (i.e. “Model Numbers”) and this view does not distinguish between the model numbers. You could drag the “Model Number” field under the “Model Name” field and see this level of detail if you so desire. In this case, we have a total of 4,848 harmonicas distributed among a number of different models below.

Available Keys	Model Name	Number of In Stock
1	Harmonica	100
2	Harmonica	100
3	Harmonica	100
4	Harmonica	100
5	Harmonica	100
6	Harmonica	100
7	Harmonica	100
8	Harmonica	100
9	Harmonica	100
10	Harmonica	100
11	Harmonica	100
12	Harmonica	100
13	Harmonica	100
14	Harmonica	100
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91	Harmonica	100
92	Harmonica	100
93	Harmonica	100
94	Harmonica	100
95	Harmonica	100
96	Harmonica	100
97	Harmonica	100
98	Harmonica	100
99	Harmonica	100
100	Harmonica	100
Grand Total		4,848

Is it time to reorder certain models and keys?

Similar to the previous table, but we we flipped the columns and rows to represent the “Keys” in the columns this time. In the rows, we added the following fields in this order “Low Inventory”, “Model Name”, “Model Number”. We then added the sum of the “Number In Stock” to the values area to show the number we of each harmonica type we have on-hand. The picture below separated the harmonica models into a categories of low stock (less or equal to 10) or adequate stock levels (greater than 10). In

this case, we would want to re-order any harmonicas in the “Yes” category.

The screenshot shows an Excel spreadsheet with a pivot table. The pivot table is located in the range B5:K15. The pivot table has two rows of data, one for each manufacturer (Seydel and Hohner), and columns for different harmonica types (Diapason, Reeds, Body, Cover, Case, Mouthpiece, Ligature, Strap, Bows, Tuning, Maintenance, Accessories, Total). The values are summed for each manufacturer across all categories.

What is the total value of my inventory by harmonica model?

Finally, to get to the inventory value by model and model number we add those fields to the rows and take the sum of the “Inventory Value” and add it to the pivot table values area. This will give us the total dollar value of each harmonica model on-hand. In this case, the total retail value of all our harmonica inventory is: \$862,106.03.

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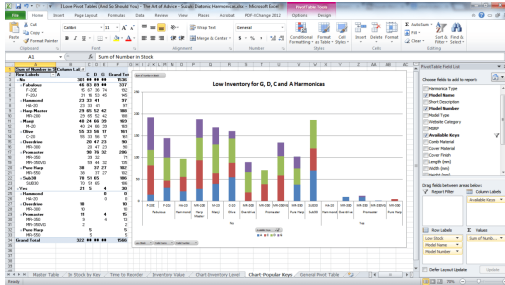
You will notice in each of the examples above, we can also filter the entire table by “Manufacturer” and “Harmonica Type”, so if we ever expand our inventory to carry other manufacturers (such as [Seydel](#) and [Hohner](#)) or other harmonica types (such as Chromatic and Tremolo), we would not have to modify this table at all; we would simply indicate the manufacturer and harmonica type when we input the data.

Additional insights

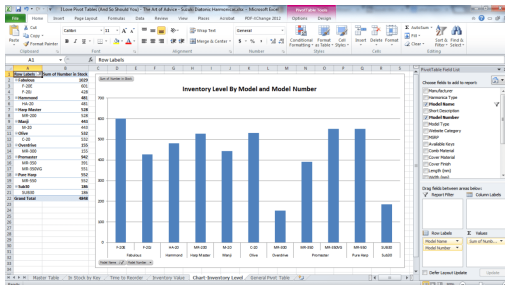
By now you must be thinking pivot tables sure are cool, but wait! Pivot charts are *even cooler!* Anything

you can do with a pivot table, you can turn into a pivot chart. Below are some examples of pivot charts and data visualizations you can do with our harmonica data set.

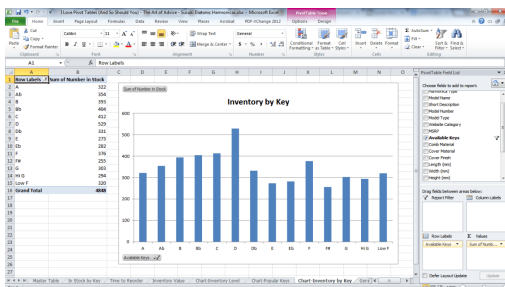
Low Inventory for harmonicas in the keys of G, D, C and A by model and model number



Inventory level by harmonica model and model number



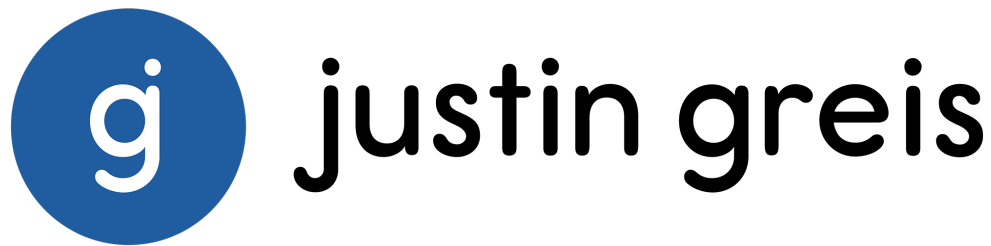
Harmonica inventory by key



For those of you who want to play with the data set, you can [download it here](#). I hope you have as much

fun with it as I did. I encourage you to play with your data and spread the gospel of the normalized data set and especially the pivot table.

After all, I ♥ pivot tables and so should you!



hi, i'm justin
(nice to meet you)

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