Introduction to Excel for Statistical Analysis

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Feel free to ask questions at any point during the presentation!

Workshop Agenda

- Objectives
- About Excel
- Important Vocabulary and Functions
- Demonstration
- Activity: Practice Excel

Slides, handouts, and data available at

http://bit.ly/dti-dev-econ-fall2019

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Workshop Objectives

- Understand the data structures of Excel
- Learn how to use basic Excel functions, such as =ADD and =SUM
- Learn how to analyze your data with pivot tables and charts
- Learn more advanced calculations like regression models

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Excel

Excel is a program that is used to create and edit spreadsheets. In Excel, data are organized into rows and columns; data can be presented and analyzed using Excel's functions, such as pivot tables, charts, formulas, and more.

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Why Excel?

Excel is an excellent way to store, organize, and analyze data. It is particularly useful for quantitative analysis because most of its functions are designed for numerical data.

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Important Vocabulary

- **Workbook**: the overall Excel file that you are creating
- **Sheet**: the different sheets inside the workbook that can be renamed
- **Row**: the horizontal and numerical (horizontal) rows
- **Column**: the vertical and alphabetical (vertical) columns
- **Cell**: the boxes that each have an ID based on its row and column placement (A1, A2, A3, etc).

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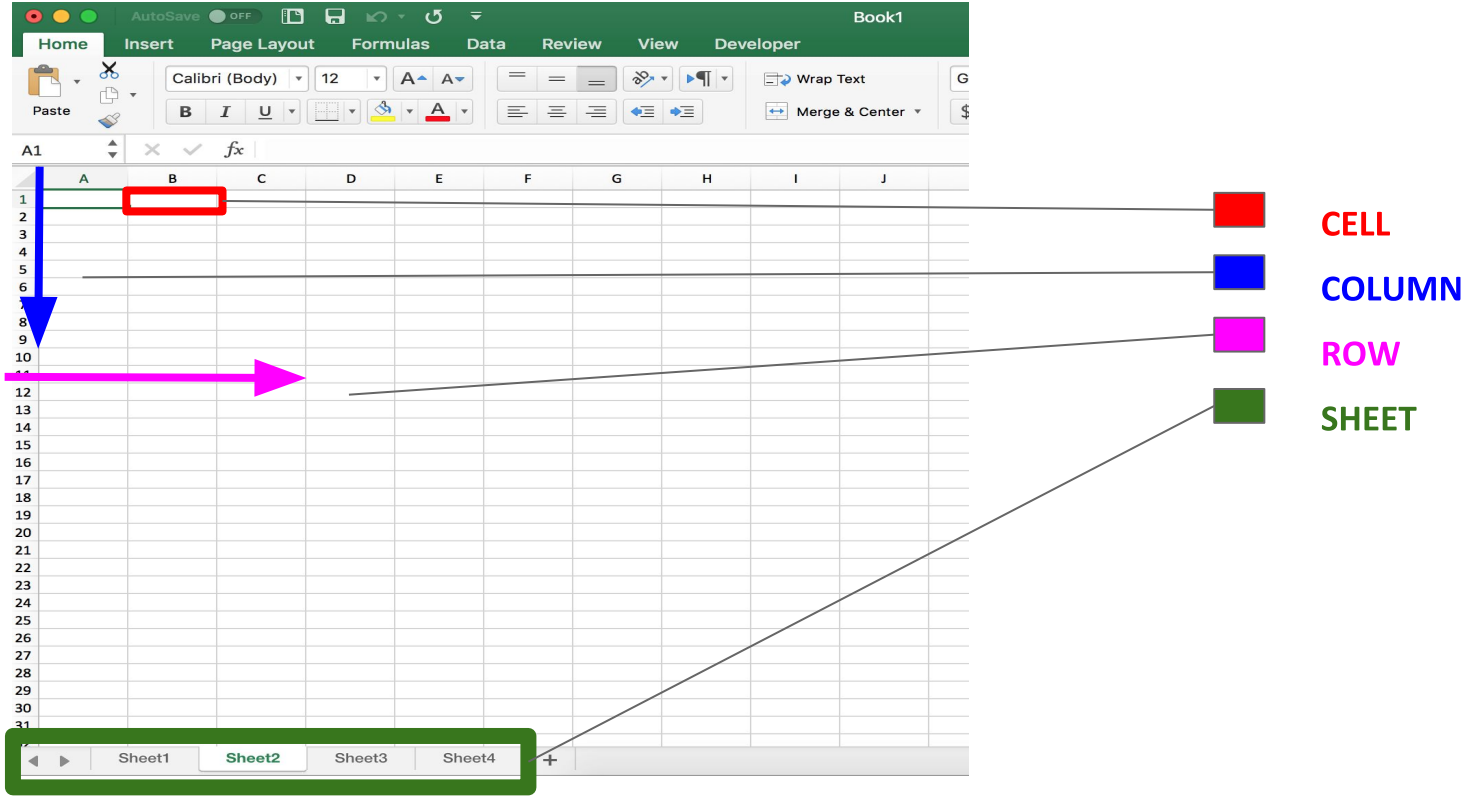
Anatomy of Excel



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Important Excel Features

- Function: Used to calculate and analyze numerical data using mean, median, standard deviation, addition, subtraction, and other forms of arithmetic
- Pivot Tables: Used to analyze and calculate numerical data and present different results based on functions and data chosen
- Charts: Used to visualize data with bar charts, scatter plots, and other formats.

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How to Select Data

If you have a long dataset, it can be hard to drag your mouse down to the bottom of the dataset. Click

SHIFT + COMMAND/CONTROL + DOWN ARROW (or whatever direction)

The end of the data will be selected in the direction of the arrow you choose.

Basic Calculations

Using **pivot tables** or **functions**, you can find the:

- Average (Mean)
- Mode & Median
- Standard deviation
- Min/max values
- Correlation
- Results to other basic calculations such as addition, subtraction, division, multiplication

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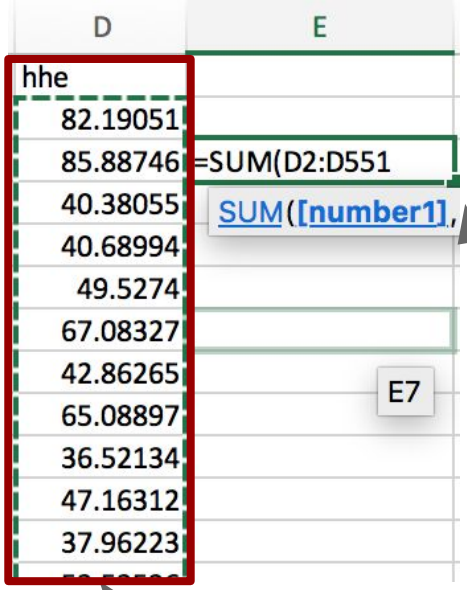
Functions for Excel

- In an empty cell, type = and then the proper calculation:
  - Correlation: CORREL(
  - Sum: SUM(
  - Average: AVERAGE(
  - Standard Deviation: STDEV(
- Select the range to calculate. If you are still in the function cell, the range will be automatically added for you as you select
  - Example: CORREL(B2:B20,C2:C20). B2:B20 is one range of values, while C2:C20 is another range.



The selected data (D column from rows 2–551)

The function (SUM) with the selected data

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Your Turn!

Use the data emailed to you (also available the bit.ly link below) to calculate these for the “agehh”:

- Average
- Sum
- Median

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Pivot Tables for Calculations

- Select the data you want to be calculated (which can be more than one variable)
- Go to “Insert” > “Table” > “Pivot Table”
- Choose a new worksheet or add to your existing sheet. Creating a new worksheet is cleaner
- Go to “Pivot Table Analyze” to edit the table:
  - Go to “Field Settings” and choose the calculation (or right click the top of the table)

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Example of Pivot Tables

Row Labels	Average of hhe
34	67.40711229
99	72.46467868
Grand Total	70.05543796

Sum of hhe
38530.49088

Pivot table with **one** variable (looking at the average, but you can look at other calculations)

Pivot table with **two** variables (comparing one variable's values to another variable's values). This pivot table shows the average "hhe" for each of the variables in the "local" row.

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Your Turn! Create your own pivot table

Find the average variables of the column “agehh” for each of the variables in the “eduhh” columns.

- Select the two columns (Shift+Command/Cntrl+Down Arrow)
- Click “Insert” then “Pivot Table”
- Use the PivotTable Fields to select both the “agehh” and “eduhh” columns
- Make “educhh” the pivot table’s rows and make the values the average of “agehh”

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More Advanced Calculations - LINEST

LINEST is a statistical function that uses the least squares method to calculate a regression line. OLS Equation:

y = a + bx1…bxn

- y = expected value
- a = intercept
- bx1…bxn = beta-coefficient (b) * value (x)

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LINEST Excel Syntax

=LINEST(y_values, x_values, constant, additional_statistics)

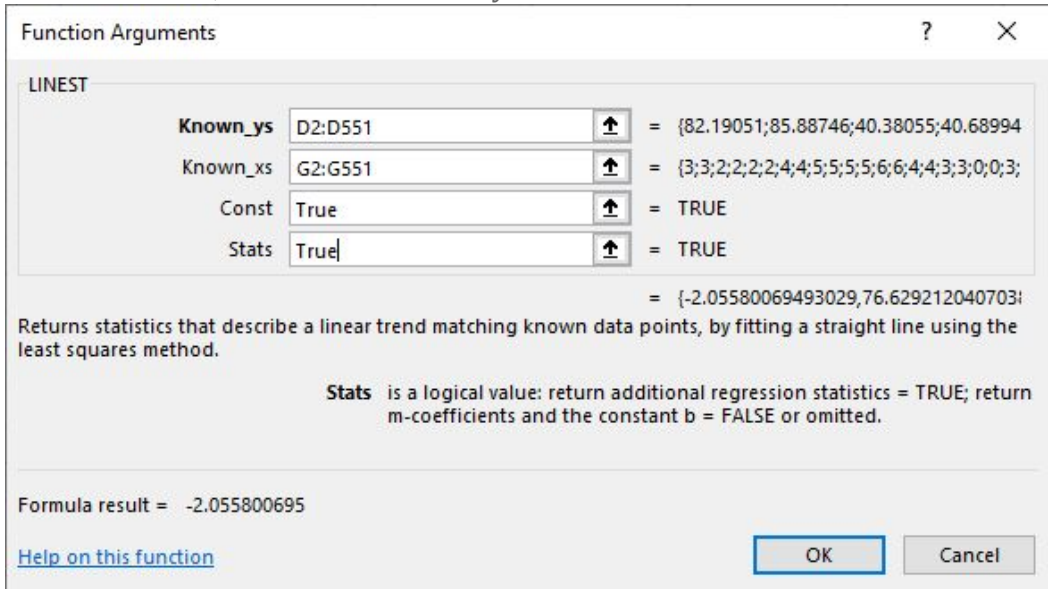
- Note: x_values, constant, and additional_statistics are OPTIONAL, but we almost always use them.

What is the relationship between variable

"hhe" and variable "educhh?"

LINEST Steps

1. Select multiple rows + columns (2x2)
2. =Linest(D2:D551, G2:G551, TRUE, TRUE)
3. Control+Shift+Enter
4. =-2.0558007, 76.629212



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Example

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L2 {=LINEST(D2:D551, G2:G551,TRUE,TRUE)}

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	hhid	round	local	hhe	treatcom	agehh	educhh	hhsize	pscore	takeup			
2	15681	1	34	82.19051	1	53	3	3	865	0		-2.0558007	76.629212
3	15681	0	34	85.88746	1	52	3	3	865	0		0.50672529	2.07296412
4	15680	1	34	40.38055	1	51	2	7	602	1			
5	15680	0	34	40.68994	1	50	2	7	602	1			
6	15679	1	34	49.5274	1	43	2	5	653	1			
7	15679	0	34	67.08327	1	42	2	5	653	1			
8	15678	1	34	42.86265	1	29	4	3	619	1			
9	15678	0	34	65.08897	1	28	4	3	619	1			
10	15677	1	34	36.52134	1	46	5	6	525	1			
11	15677	0	34	47.16312	1	45	5	6	525	1			
12	15676	1	34	37.96223	1	27	5	4	686	1			
13	15676	0	34	53.53526	1	26	5	4	686	1			
14	15675	1	34	51.61393	1	22	6	3	622	1			
15	15675	0	34	58.82847	1	21	6	3	622	1			
16	15672	1	34	36.73437	1	41	4	7	635	1			
17	15672	0	34	39.0182	1	40	4	7	635	1			
18	15671	1	34	87.8801	1	53	3	2	735	1			
19	15671	0	34	85.22186	1	52	3	2	735	1			
20	15670	1	34	44.85114	1	31	0	5	549	1			
21	15670	0	34	44.4139	1	30	0	5	549	1			
22	15667	1	34	23.31059	1	45	3	2	667	1			
23	15667	0	34	74.36211	1	44	3	2	667	1			
24	15666	1	34	34.17051	1	42	0	4	594	1			
25	15666	0	34	59.11292	1	41	0	4	594	1			
26	15665	1	34	43.7287	1	36	3	6	513	1			
27	15665	0	34	43.28144	1	35	3	6	513	1			
28	15664	1	34	33.48979	1	32	0	5	542	1			

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Alternative Excel Regression Method

- Use the “Analysis ToolPak” Add-in
  - Then Data → Data Analysis → Regression

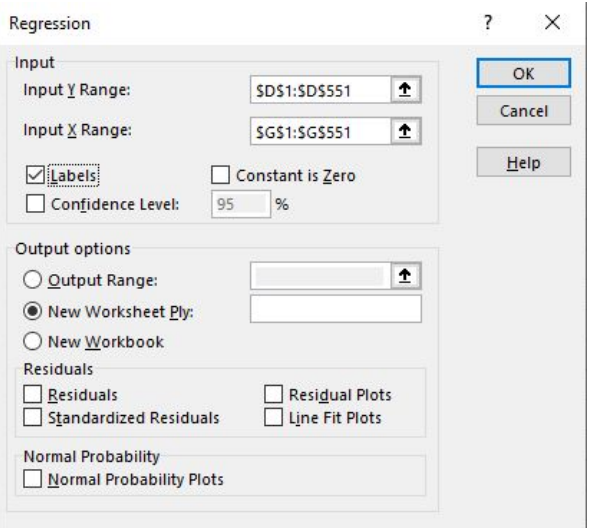
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.170762315
R Square	0.029159768
Adjusted R Square	0.027388162
Standard Error	30.32197098
Observations	550

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	15133.23292	15133.23292	16.45950844	5.69217E-05
Residual	548	503843.2142	919.4219238		
Total	549	518976.4472			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	76.62921204	2.072964121	36.96600981	5.6084E-151	72.55728372	80.70114036	72.55728372	80.70114036
educhh	-2.055800695	0.506725288	-4.057031975	5.69217E-05	-3.051162374	-1.060439016	-3.051162374	-1.060439016



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Multivariate LINEST

What is the relationship between “hhe” and “educhh” + “hhsize”

Similar syntax: =LINEST(D2:D551, G2:H551, TRUE, TRUE)

Select rows & columns - you need 1 more column than the number of variables because of the constant

Then press “Control+Shift+Enter”

The return of statistics is in **reverse order**

Example

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L2 {=LINEST(D2:D551, G2:H551, TRUE, TRUE)}

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	hhid	round	local	hhe	treatcom	agehh	educhh	hhsize	pscore	takeup				
2	15681	1	34	82.19051	1	53	3	3	865	0		-6.3286871	-2.2021333	111.548207
3	15681	0	34	85.88746	1	52	3	3	865	0		0.50135545	0.44647912	3.31452688
4	15680	1	34	40.38055	1	51	2	7	602	1				
5	15680	0	34	40.68994	1	50	2	7	602	1				
6	15679	1	34	49.5274	1	43	2	5	653	1				
7	15679	0	34	67.08327	1	42	2	5	653	1				
8	15678	1	34	42.86265	1	29	4	3	619	1				
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16	15672	1	34	36.73437	1	41	4	7	635	1				
17	15672	0	34	39.0182	1	40	4	7	635	1				
18	15671	1	34	87.8801	1	53	3	2	735	1				

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Add-In Example

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.498168082
R Square	0.248171438
Adjusted R Square	0.245422522
Standard Error	26.70788953
Observations	550

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	128795.1314	64397.5657	90.27974178	1.3137E-34
Residual	547	390181.3158	713.3113634		
Total	549	518976.4472			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	111.548207	3.314526878	33.65433774	2.3048E-135	105.0374477	118.0589663	105.0374477	118.0589663
educhh	-2.202133341	0.446479123	-4.932220179	1.08015E-06	-3.079156886	-1.325109797	-3.079156886	-1.325109797
hhsize	-6.328687118	0.501355454	-12.62315403	3.069E-32	-7.313504805	-5.343869431	-7.313504805	-5.343869431

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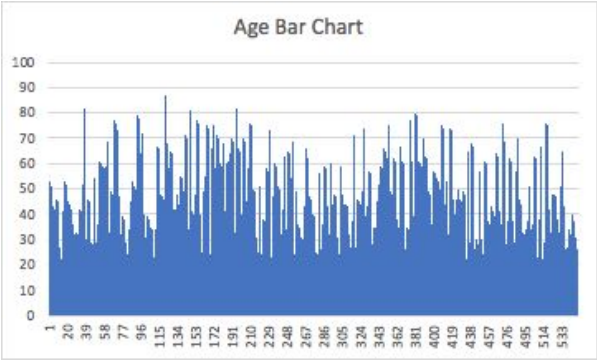
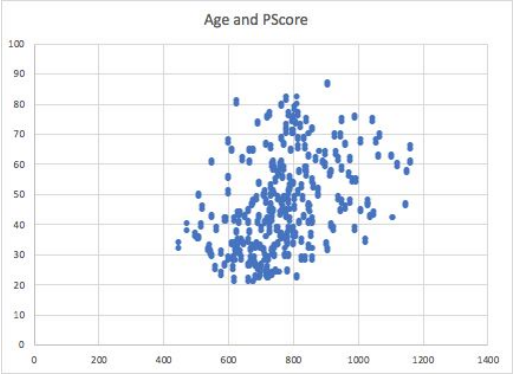
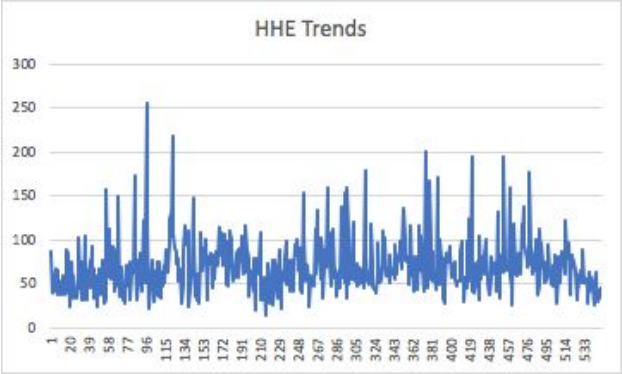
Charts

- Scatter plots: comparing **two** variables
- Bar charts/histograms: count of **one** variable
- Line charts: tracing **trends** of one or two variables







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Inserting a Chart

- Similar to a pivot table, click the columns and variables you would like to include
  - For multiple columns, you may need to move the columns next to each other to be able to select multiple columns.
- Go to “Insert” and then “Charts” (often, “recommended charts” will suggest the option that you want)
- Use the “Chart Design” and “Format” toolbar at the top and/or the side toolbar to play with the formatting of the chart

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Your Turn!

Create two charts.

- Histogram for “hhe”
- Scatterplot for “agehh” and “eduhh”

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Group Discussion

- First, does anyone have questions?
- How was using Excel? What are some easy features?
- What are some more difficult features, or aspects that you think will be challenging to work with?
- How might you use Excel in the future?

Feel free to ask questions at any point during the presentation!

Thank you!

If you have any questions, contact us at:

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Office Hours: **Tuesdays from 1–3PM in 401 Nightingale Hall**

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