Introduction to Excel for Statistical Analysis

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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.
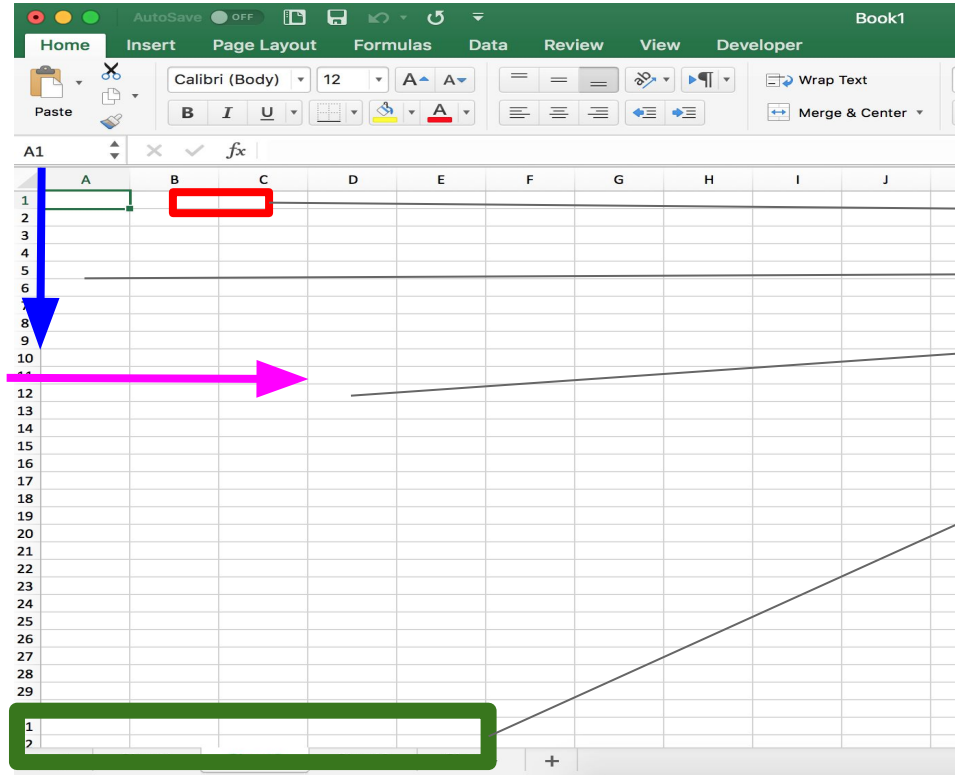
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Important Vocabulary

- **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

CELL

COLUMN

ROW

SHEET

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Important Excel Features

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

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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.

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Basic Calculations

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

- Average
- 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

What is the relationship between variable
"hhe" and variable "educhh?"

=Linest(A2:A551, B2:B551, TRUE, TRUE)

=-2.0558007

Function Arguments   ?   ×

LINEST

Known_ys	A2:A551	= {82.19051;85.88746;40.38055;40.689...
Known_xs	B2:B551	= {3;3;2;2;2;2;4;4;5;5;5;6;6;4;4;3;3;0;0;...
Const	True	= TRUE
Stats	True	= TRUE

= {-2.05580069493029,76.6292120407...

Returns statistics that describe a linear trend matching known data points, by fitting a straight line using the least squares method.

Known_ys is the set of y-values you already know in the relationship y = mx + b.

Formula result =   -2.0558007

Help on this function   OK   Cancel

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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

Regression   ?   ×

Input

Input Y Range: $A$1:$A$551   ↑   [OK]

Input X Range: $B$1:$B$551   ↑   [Cancel]

☑ Labels   ☐ Constant is Zero   [Help]

☐ Confidence Level: [95] %

Output options

○ Output Range: [   ] ↑

● New Worksheet Ply: [   ]

○ New Workbook

Residuals

☐ Residuals   ☐ Residual Plots
☐ Standardized Residuals   ☐ Line Fit Plots

Normal Probability

☐ Normal Probability Plots

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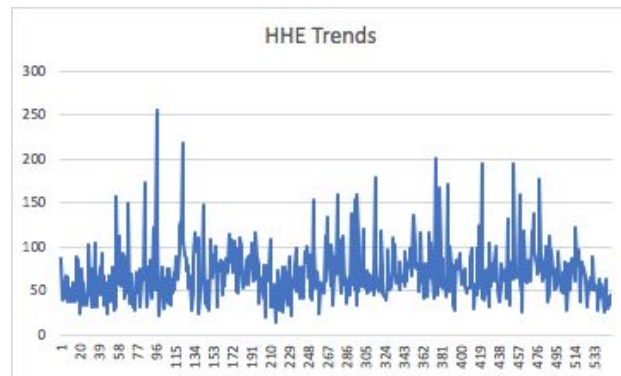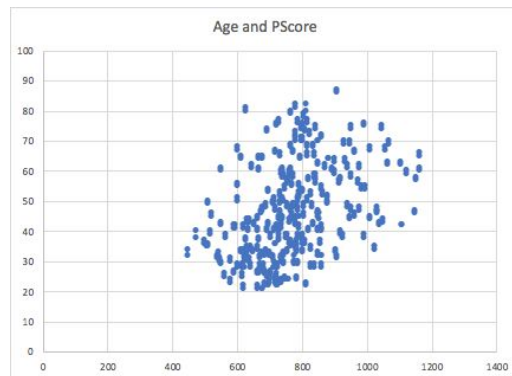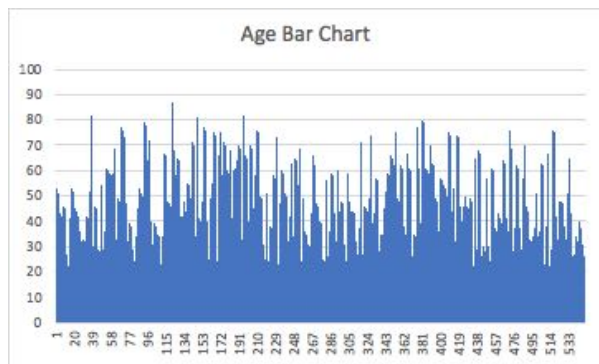
Charts

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

Age Bar Chart

Age and PScore

HHE Trends

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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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