Week 1: Introduction to Stata

Marcelo Coca Perraillon

University of Colorado
Anschutz Medical Campus

Health Services Research Methods I
HSMP 7607
2019

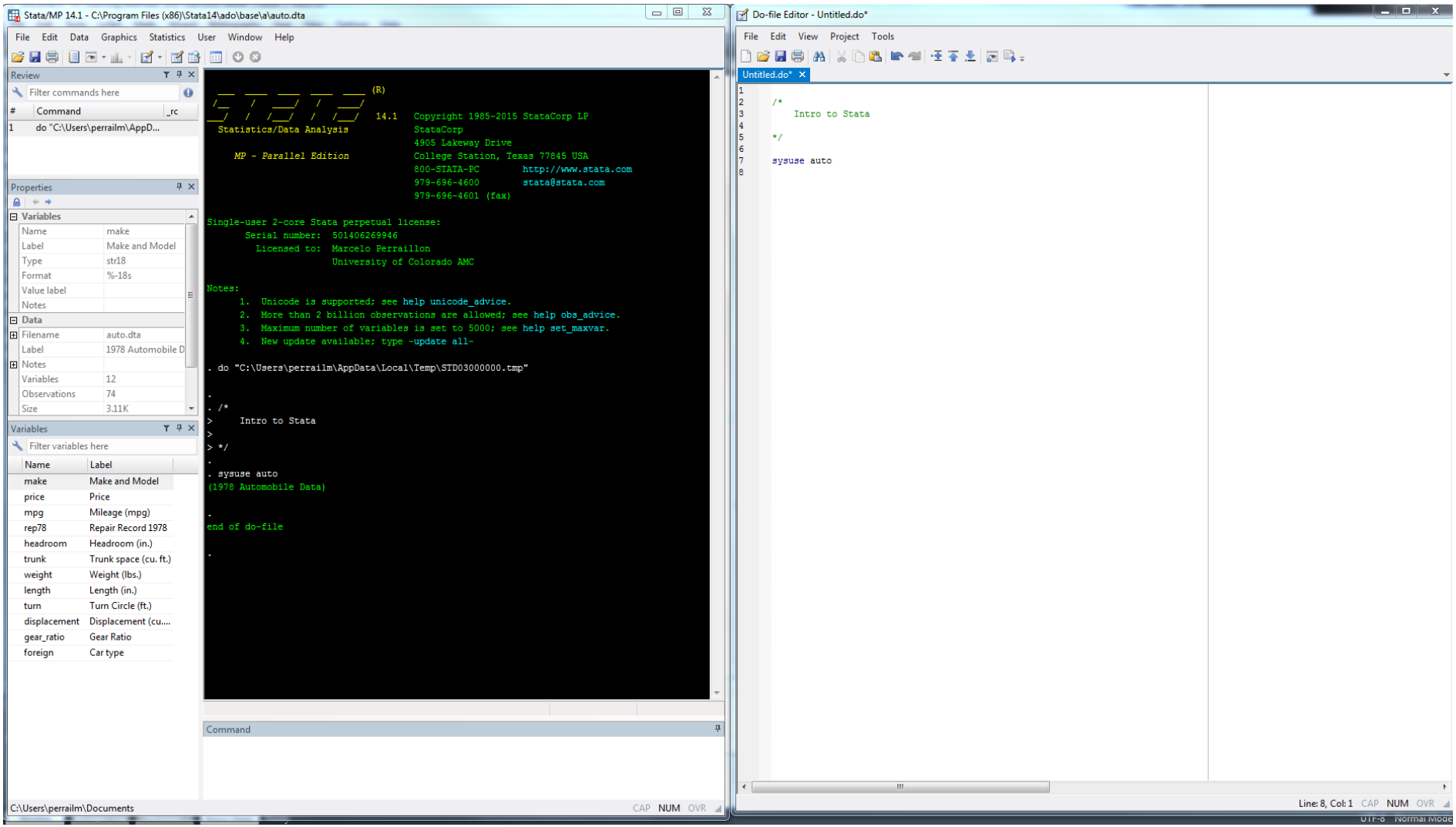
Outline

- Log files, comments
- Exploring a dataset
- Exploring variables
- Graphs
- Other useful code

The big picture

- Today's class is an **overview** of Stata to get you started
- Go over chapters 1 and 2 of Cameron and Trivedi (posted)
- I'll introduce more commands and tricks during the semester as part of the lecture examples and homeworks
- Remember, I'll always answer Stata questions
- Tips:
  - Go over the code I use in class for slides
  - Use Stata help and explore command options
  - Use the menus as it will write code

A good way of working with Stata (if you have a large monitor)



Interacting with Stata

- You can enter code in interactive mode in the command window
- You can use DOS or Unix commands, like: pwd, ls, cd, dir, cls
- Useful for quick checks and to get help but as a rule, just **don't do it**
- **Always** write a "do file" with comments to preserve your work. Select the text in the do-file editor and press **Control+D** to run the code (or use the menu)
- Do files are text files with a ".do" extension (a collection of Stata code and notes)
- Today's do file file is called **IntroToStata.do**
- We're going to use the omnipresent auto data: **auto.dta**

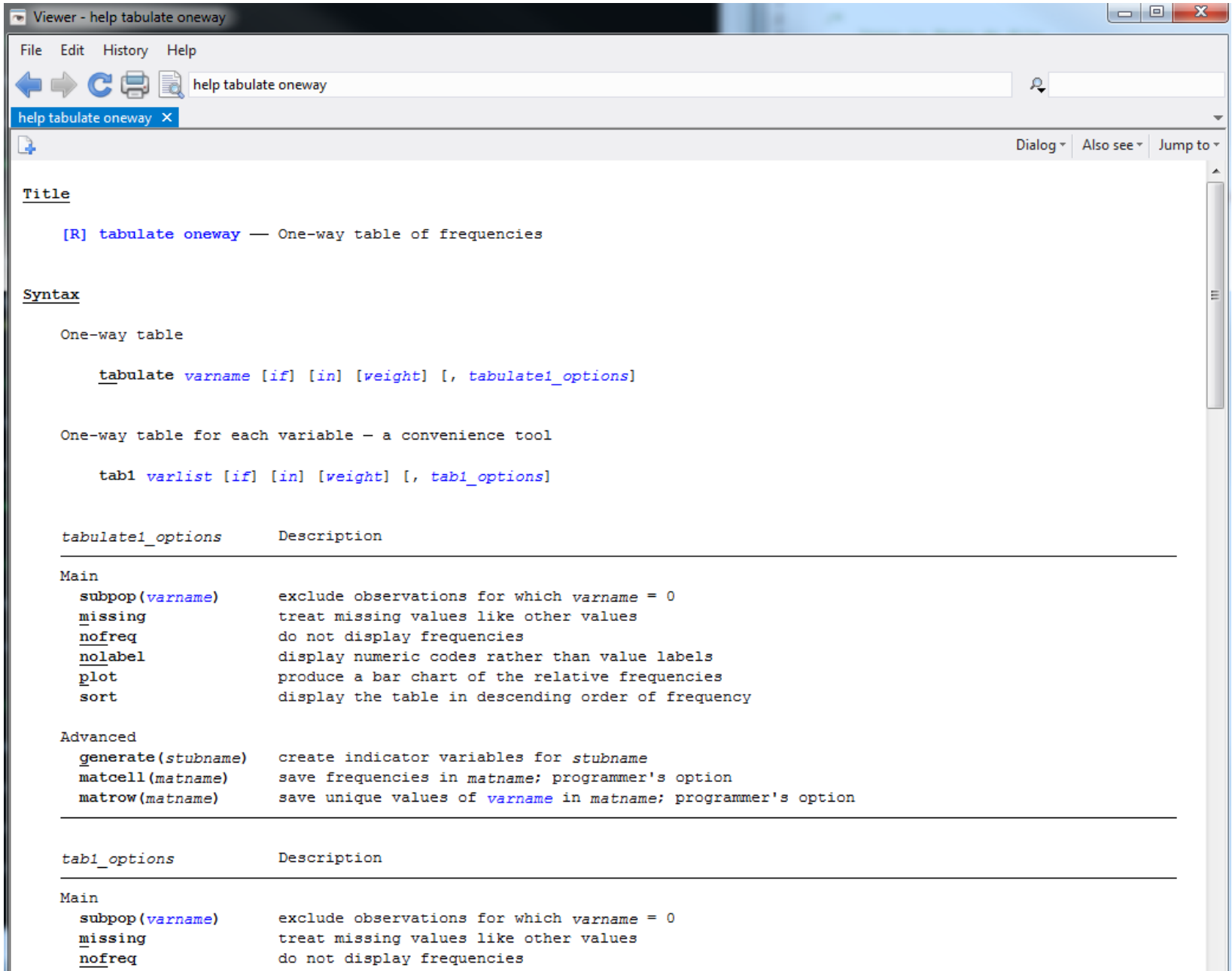
An example do file

```
/*
Intro to Stata do file
Updated 1/20/2019
*/

// ---- Preliminaries
* Change directory
cd "H:\Teaching\Methods 2019\Lectures\stata"
set more off
set scheme s1mono
set seed 1234567
log using introtostata.log, text replace

// ----- Load data
use auto.dta, clear
* could type: sysuse auto

// ----- Explore data

* Close log
log close
```

Importing data and syntax structure

- All homeworks and examples will use data in Stata format (extension .dta).
- Stata has many ways of importing data. Type "help import"
- **Stata documentation is extensive and outstanding**. You can access the PDF documentation by clicking on the blue text (for example, [D] Import)
- Or by using the menu: Help and then PDF documentation
- Stata syntax is **consistent**
- In general there is a command name followed by selection of variables and then a comma followed by options (sometimes there is a prefix before the command)
- For example: `help tabulate oneway`

Syntax



Title

[R] tabulate oneway — One-way table of frequencies

Syntax

One-way table

tabulate *varname* [*if*] [*in*] [*weight*] [, *tabulate1_options*]

One-way table for each variable — a convenience tool

tab1 *varlist* [*if*] [*in*] [*weight*] [, *tab1_options*]

tabulate1_options	Description
Main	
subpop(*varname***)**	exclude observations for which *varname* = 0
missing	treat missing values like other values
nofreq	do not display frequencies
nolabel	display numeric codes rather than value labels
plot	produce a bar chart of the relative frequencies
sort	display the table in descending order of frequency
Advanced	
generate(*stubname***)**	create indicator variables for *stubname*
matcell(*matname***)**	save frequencies in *matname*; programmer's option
matrow(*matname***)**	save unique values of *varname* in *matname*; programmer's option

tab1_options	Description
Main	
subpop(*varname***)**	exclude observations for which *varname* = 0
missing	treat missing values like other values
nofreq	do not display frequencies

Explore the dataset

- Always a good place to start
  1. List all variables using the command `describe`
  2. Understand more about the storage type by using the command `coodebook`
  3. Use the data editor/browser to actually see the data
  4. Check for **missing values**
  5. Sometimes it helps to change the order: `order foregin` (now variable foreign is the first variable in the dataset)
- Be careful about how the data is stored versus how it is displayed
- Variables can have labels; values of variables can also have labels

Consistency is very important at Stata Corp

- Being **organized and consistent** is very important for Stata
- This leads to some quirks from the user perspective although they are not quirks from Stata's perspective
- For example, if you want to create new variable called newvariable to be equal to one, you can't just type "newvariable = 1"
- Why not? Well because Stata always expects a command first so there has to be a command that is used to create or generate a variable. So the syntax is "generate newvaraible = 1" or "gen newvariable = 1"
- What about if you want to replace some of the values of a variable that has already being defined? Well, that's a different operation so you can't just type "gen newvariable = 2" because newvariable already exists. See, **it's pretty logical**
- The correct syntax is "replace newvariable = 2"

Labels

- The variable `foreign` is a numeric variable with values 1 or 0

```
. sum price if foreign == "Domestic"
type mismatch
r(109);
. label list origin
origin:
           0 Domestic
           1 Foreign
. sum price if foreign == 0

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       price |         52    6072.423    3097.104        3291      15906
```

Explore the data

- For **numeric** variables, use the summarize command
- For **categorical variables**, tabulate (tab or tab1)
- The command tabstat is a useful to get summary statistics **by group**
- Examples:

```
tab foreign
sum price
sum price, det
by foreign, sort: sum price
tabstat price, by(foreign) stats(N mean sd min max)
tabstat price, by(foreign) stats(N mean median sd range min max)
```

Using results

- Most Stata commands **save results in variables** so you can use them later
- For example, if you type `help summarize`, the last item in the help window is a a list of stored results
- Another way of obtaining the list is by typing `return list` or `ereturn list`
- Stata is always well organized, which is great for Stata but sometimes confusing for users (e.g. types of commands)

```
. qui sum weight
. return list
scalars:
                  r(N) =  74
              r(sum_w) =  74
               r(mean) =  3019.45945945946
                r(Var) =  604029.8407997037
                 r(sd) =  777.1935671373662
                r(min) =  1760
                r(max) =  4840
                r(sum) =  223440
```

Using results II

- You can use the results for calculations. For example, obtaining the range or the variance (and `display` works as a calculator)
- You can store results into variables

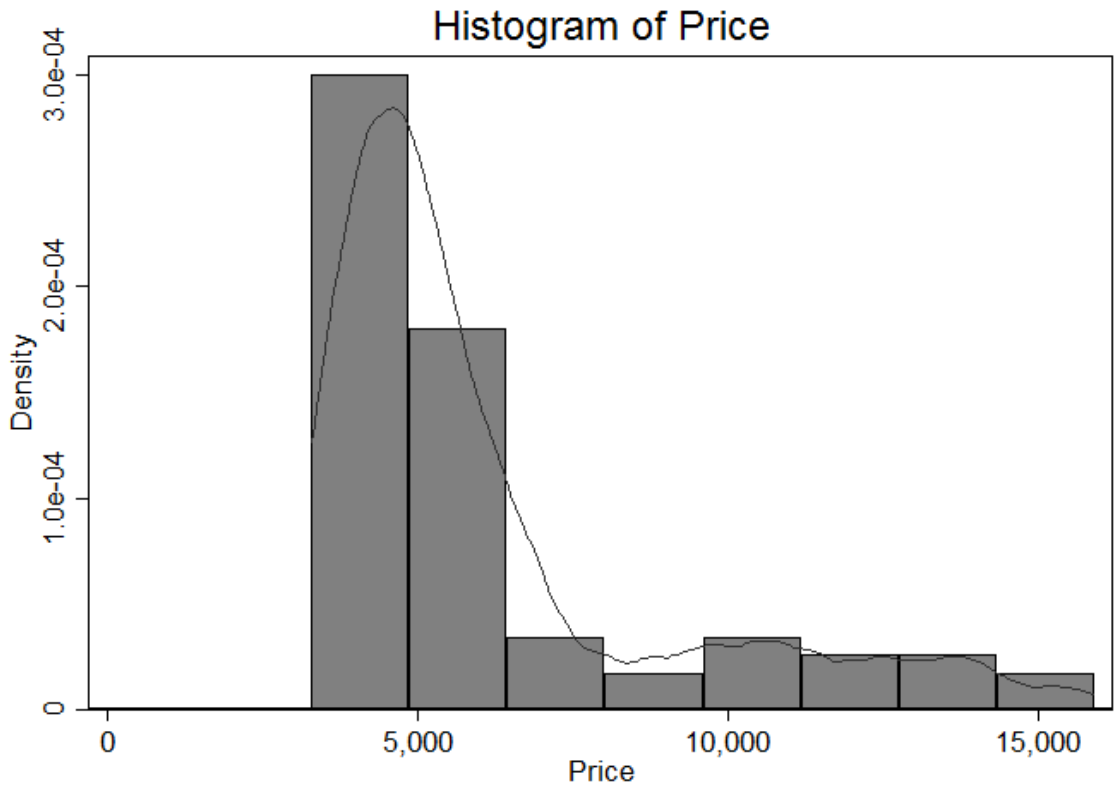
```
. *range
. display r(max) - r(min)
3080
. * variance
. di r(sd)^2
604029.84
. * store
. scalar variance = r(sd)^2
. di variance
604029.84
. di 2+ 2
4
```

Graphs

- Making graphs is a quick way of learning about your data
- Useful graphs: histograms, two-way relationships, overlays, scatterplot matrix
- We will use a lot of graphs in this class. **Get used to working with graphs with Stata**
- You know, a picture is worth 1,000 words...

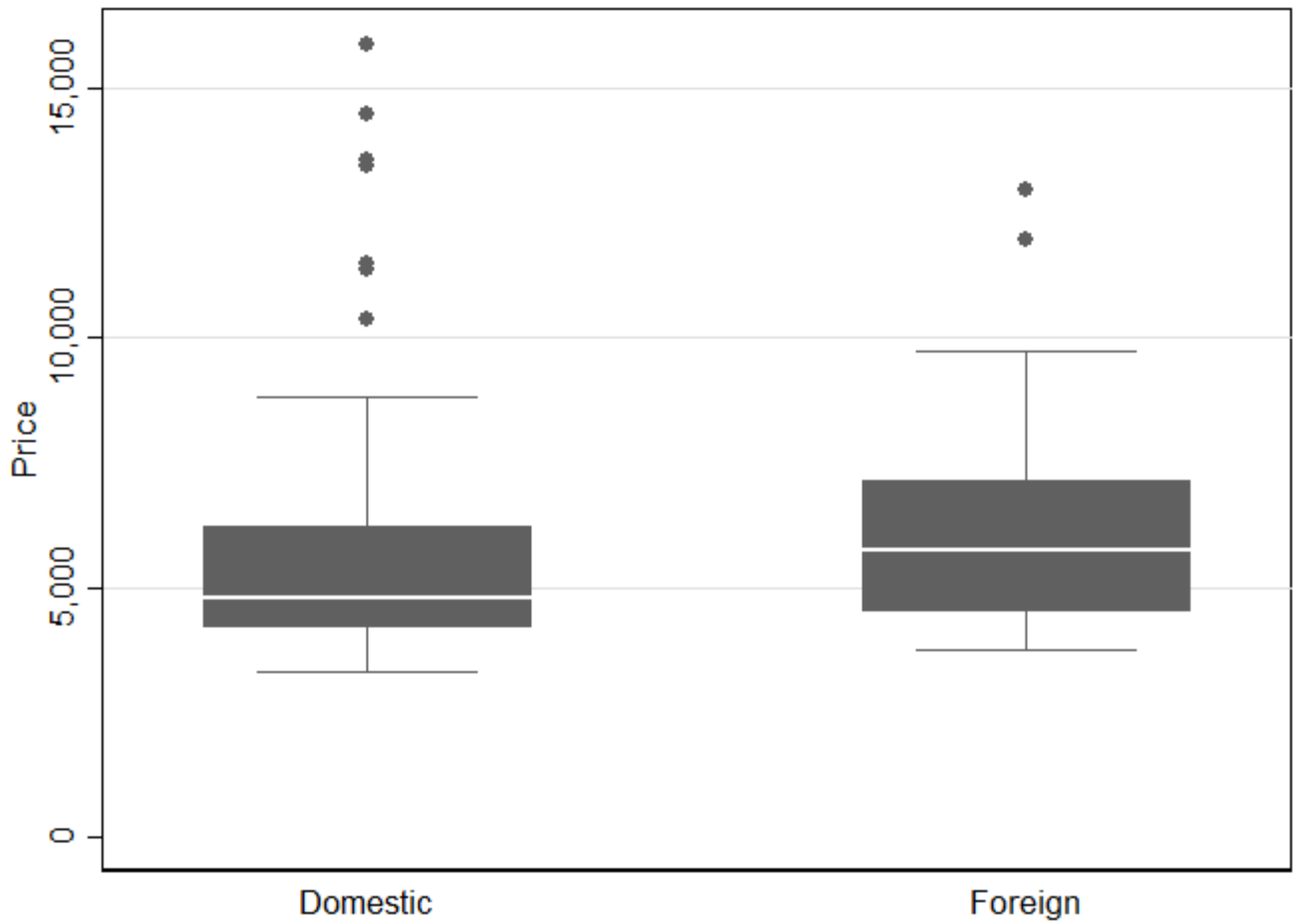
Histograms

```
hist price, kdensity title("Histogram of Price") ///
     saving(histprice.gph, replace)
graph export histprice.png, replace
```



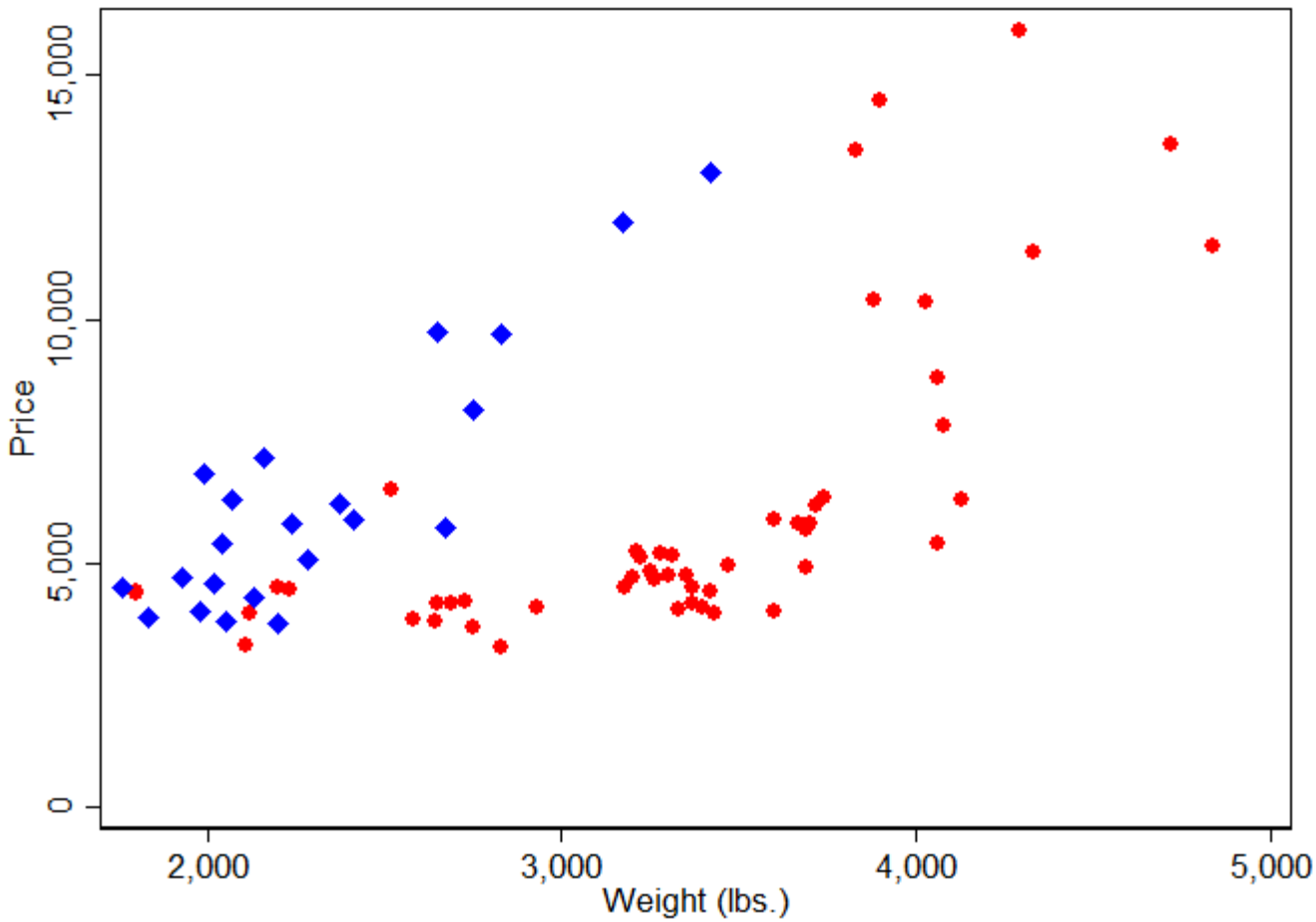
Box plot

```
graph box price, over(foreign)
* Type "help graph box" to learn about box plots
```



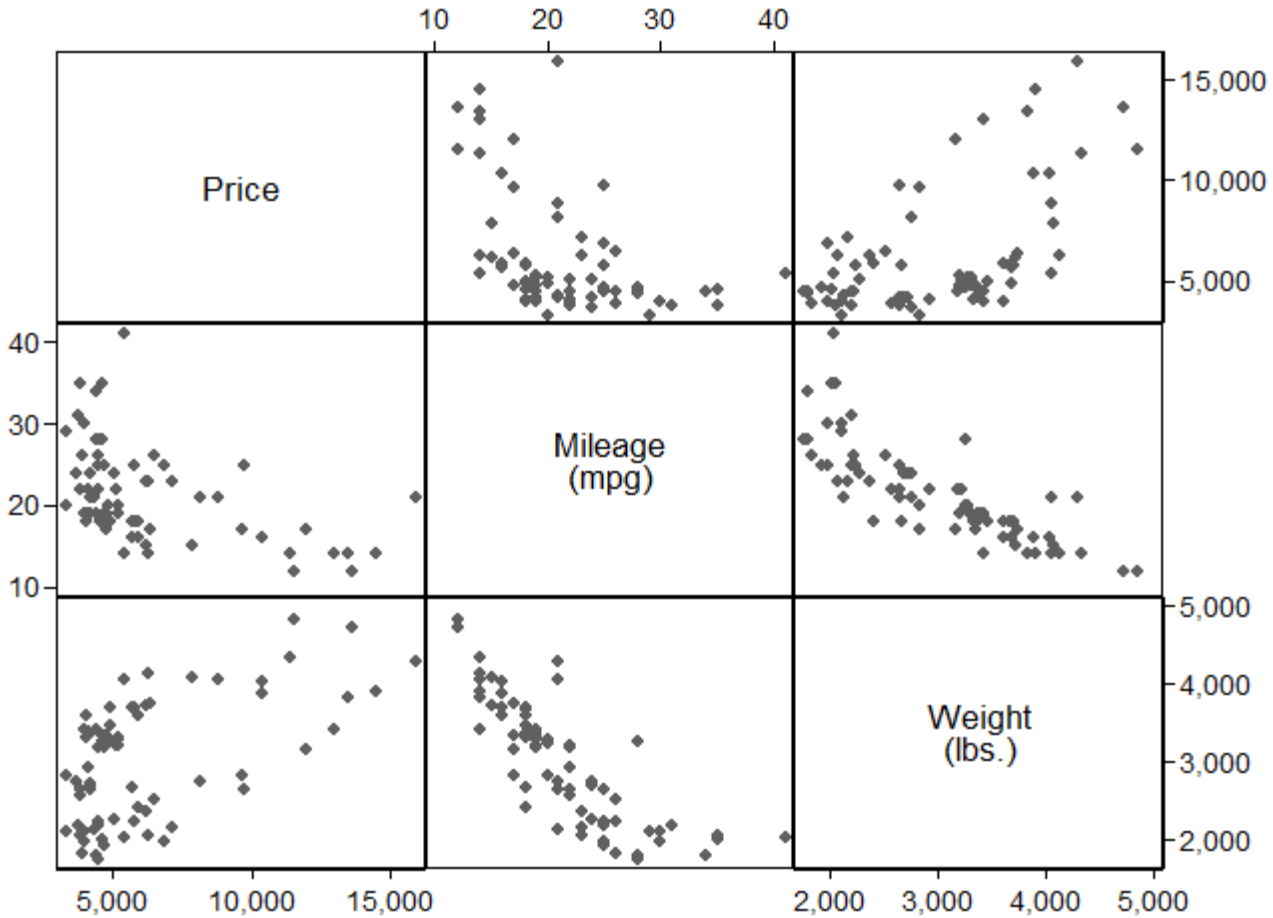
Two-way plots

```
graph twoway scatter price weight
graph twoway (scatter price weight if foreign == 0, color(red)) ///
      (scatter price weight if foreign == 1, color(blue) legend(off))
```



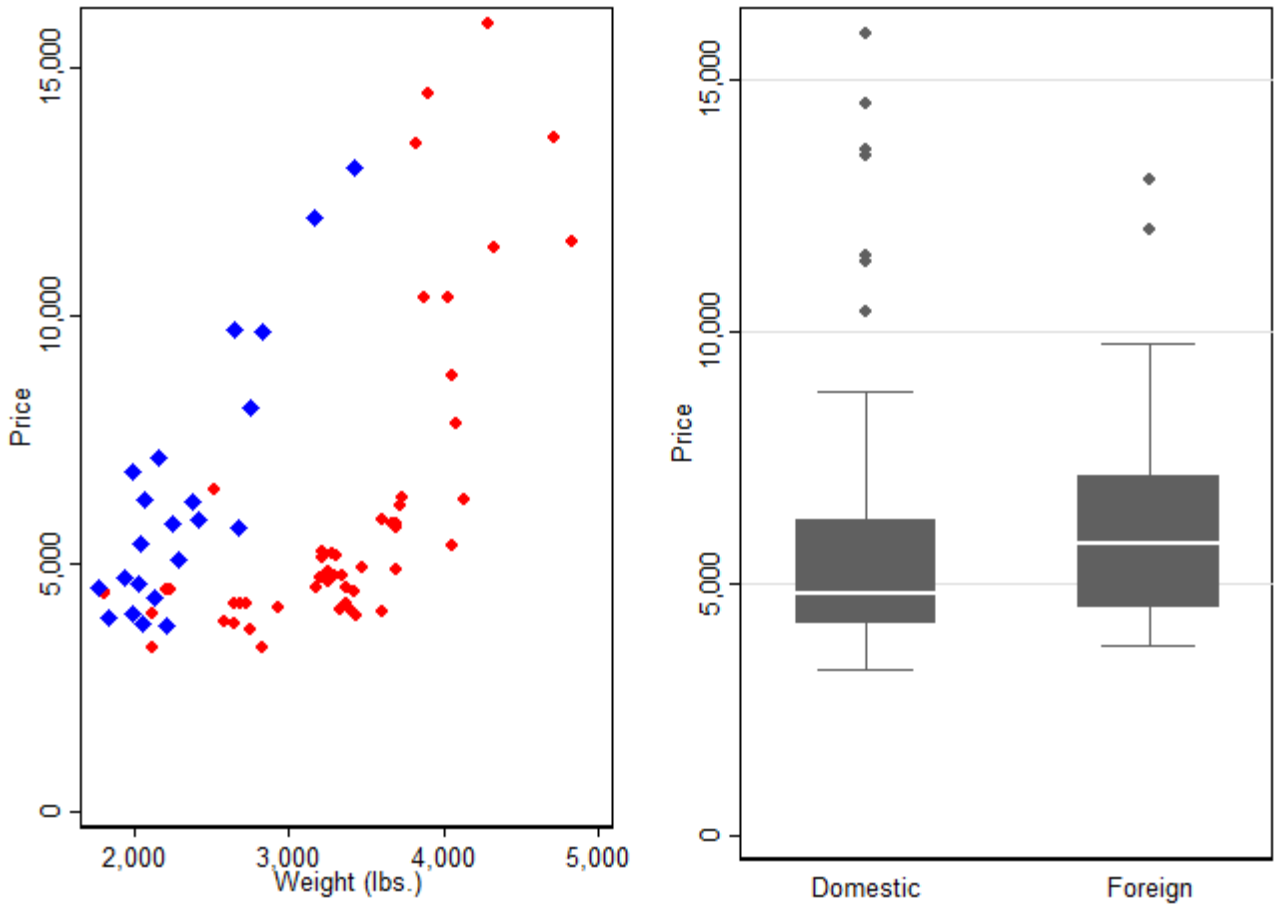
Scatterplot matrix

```
graph matrix price mpg weight
```



Combining graphs

```
graph combine scat.gph boxprice.gph, col(2) saving(combo.gph, replace)
graph export combo.png, replace
```



Useful commands

```
* Rename variables
rename oldname newname
* Generate/transform variables
gen newvarname = log(varname)
gen lage = log(age)
gen profession = "lawyer" if profcode == 24 & code2 ~= 4   // note the double equal
* If the variable already exists, we need to use replace
gen indicator = 1 if age <=20
replace indicator = 0 if age > 20
* Careful with missing values: they are +infinity in Stata
* Egen stands for "extended generate"
egen meanage = mean(age)    // meanage is a constant with the mean of age
* Sorting and "by" commands
sort state
by state: sum unemploymentrate
* Special variables
gen obsnumber = _n   // see http://www.ats.ucla.edu/stat/stata/notes/countn.htm
* Dropping variables
drop var1 var2
* Dropping all except the listed variables
keep var1 var2
```

Programming

- "Macros" in Stata are variables that store a string or characters or numbers that can be used later

```
global myvars price weight length gear_ratio
sum $myvars
local myvars price weight length gear_ratio
sum `myvars'
```

- Loops saves you typing

```
foreach var in $myvars {
   sum `var'
}
forvalues i=1(2)10 {
  di `i'
}
```

- Loops can be nested. See:
  https://www.ssc.wisc.edu/sscc/pubs/stata_prog1.htm

Other commands to explore, etc

- list, count, rename, clear, drop, keep, encode, decode, reshape
- notes, esample
- Simulations: Check out the simulate command (we won't use it but it's super helpful)
- If interested, Stata has a matrix algebra language, called Mata
- The newer versions have more and more Bayesian models – maybe we have time to squeeze a bit of Bayesian stats; it's cool

Miscellaneous

- Many resources online. UCLA's online help is excellent (see their Starter Kit): `http://www.ats.ucla.edu/stat/stata/`
- Check out the answer keys to problem sets for more tricks and other ways of doing things
- Play with Stata (won't explode)
- Use the help files and examples
- Google (aka the oracle) is your friend
- **ASK QUESTIONS!**