CEQ INSTITUTE
COMMITMENT TO EQUITY
Tulane University

Introduction to Stata

Training Workshop on the
Commitment to Equity Methodology

CEQ Institute, Asian Development Bank,
and The Ministry of Finance

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What is Stata?

- A programming language to do statistics
- Strongly influenced by economists
- Open source, sort of
  - You can see how Stata codes many of its commands
  - You can add your own commands to Stata
  - You can publish commands for others to use
- An acceptable way to manage data

How Stata Works

- You can work interactively, through a user interface
- For serious work, it is much better to write programs
  - Stata calls these “do files”
  - Allows reproduction of your results
  - Allows identification and rectification of errors
  - We still run these “do files” interactively, mostly
- Stata does everything in RAM, except reading data (from other places) and saving data (to other places)
  - To do anything, you must load data into RAM

Where Your Computer Stores "Data" (Stuff)

- RAM (random access memory)
  - very fast
  - "forgets" what it had when the power goes out
- Disks (hard drives, usb drives, dvd's, etc)
  - Much slower
  - But stable – they remember what's recorded on them when the power goes out
- Internet ("the cloud", file servers, etc)
  - Slower still
  - But vast
- To work in Stata, you must "load" or "read" data stored on a disk or the internet into the RAM

Three Topics for Today

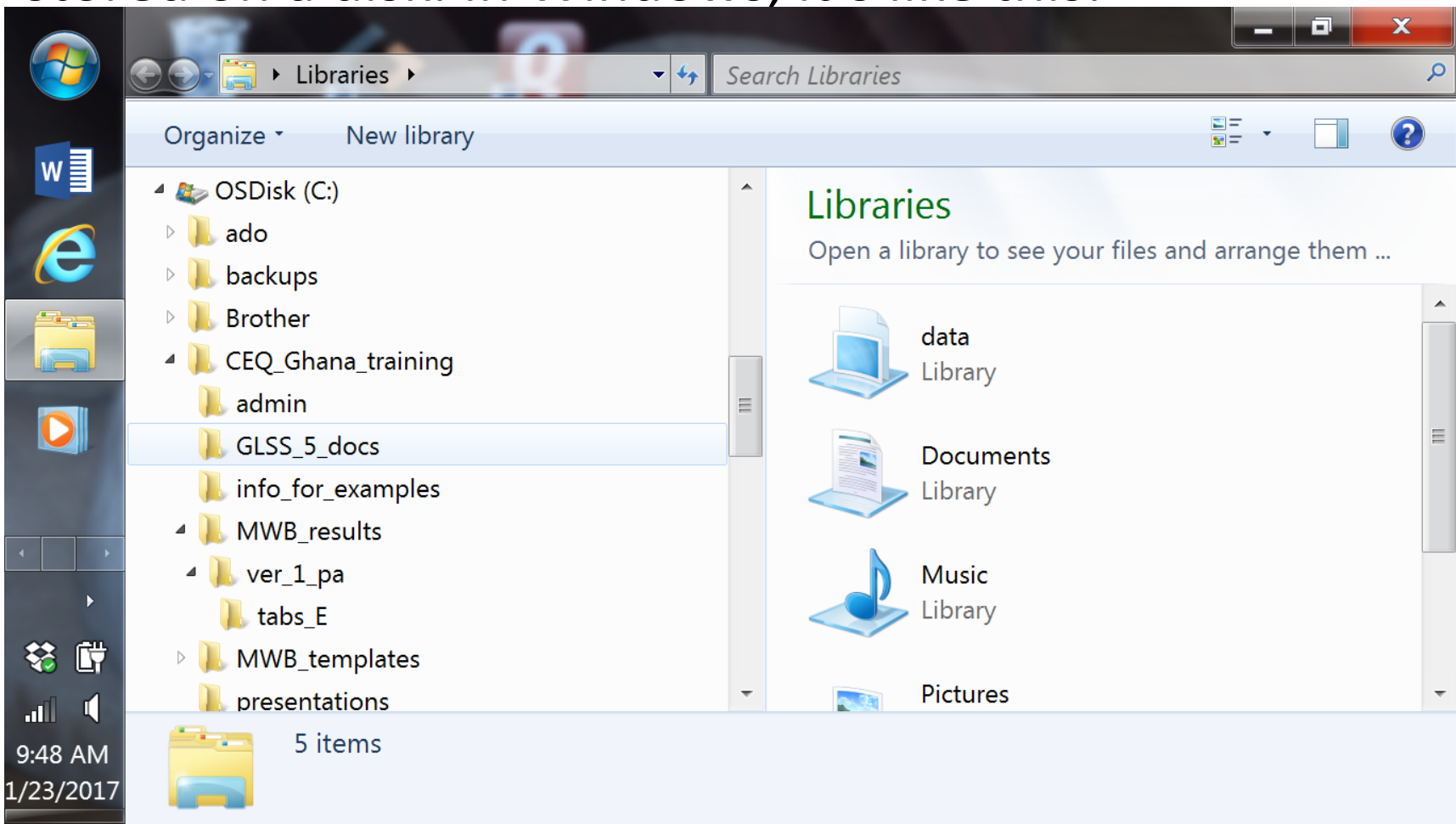
- Statistics
  - Stata is really good at generating sophisticated statistical analyses
  - But we will mostly skip this
- Data management
  - This is about getting data into the RAM (and Stata) and then getting (other) data out to permanent storage
  - And about manipulating data – creating new variables, modifying existing ones
  - And about manipulating data*sets*
    - Mostly, merging two different datasets
- Programming
  - How to keep a permanent record of what you're doing
  - How to manipulate data efficiently

How to Load Data into Stata

- Many options
  - Type them in by hand (ugh)
  - Manually copy from Excel or Word or a text processor and paste into Stata's data editor window
  - Read them from a comma- or space-delimited file
  - Read them from an Excel spreadsheet
  - Read them from a Stata dataset (Stata extension is .dta)
- We will focus on the last two, which are the most common
- Stata has commands for each
  - use <dataset path and filename> for Stata datasets
  - Import excel <spreadsheet path and filename>

An Aside on (Sub-)Directories and Paths

- Windows (or Mac OS) must organize its many files stored on a disk. In Windows, it's like this:



An Aside on (Sub-)Directories and Paths

- The sub-directories, or folders, help you (and Windows) keep files organized
- To read a file, you need to tell Stata where it is
  - Requires a path (subdirectory) …
  - … and filename
- For example:
  - use c:\CEQ_Timor_training\stata\data\??.dta
    - This is a Stata command to read the Stata dataset ??.dta into the RAM so Stata can work on it
  - import excel using "c:\CEQ_Timor_training\info_for_examples\inc_dist.xlsx", sheet("Gini") cellrange(B4:F15) firstrow
    - This is a Stata command to read part of an Excel spreadsheet

Loading Data from Excel – Let's Try It

- First, check that the Excel file is on your disk:
  - dir "c:\CEQ_Timor_training\info_for_examples\"
- Now go look at that spreadsheet (with Excel)
- Import the data:
  - import excel using "c:\CEQ_Timor_training\info_for_examples\small_data.xlsx" , sheet("HH_1") cellrange(A3:E8) firstrow
- See what you imported:
  - list *, clean
  - describe
- Put some labels on the variables
  - label var hhid "Unique household id"
  - etc

Labeling and Saving Data

- Label the dataset:
  - label data “Practice dataset #1, household data”
- Sort the data:
  - important for us to be able to merge later
  - sort hhid
- Describe the data again
- Save the data:
  - first, check the default (sub)directory:
    - pwd (“present working directory”)
  - now save:
    - save “c:\CEQ_Timor_training\info_for_examples\HH_1”
- And load the data again (now a Stata dataset)
  - use “c:\CEQ_Timor_training\info_for_examples\HH_1”

Manipulating Data

- Create a new variable, income per capita
  - generate income_pc = income/hhsize
  - label var income_pc “HH Income per capita”
- Create a new variable, conditional on some criterion
  - generate income_pa = income/hhsize if income>500
  - list what you got
  - generate poor = (income_pc<500)
  - list what you got
- Label the values of a variable
  - label define poorstatus 0 “Non-Poor” 1 “Poor”
  - label values poor poorstatus
- Save the data again …

Structure of (Almost) All Stata Commands

- verb variable(s) <if …> [weights], options
- verb is the command
- variable(s) are the variables to operate on
- if … is to subset the command to only some observations
- [weights] are to apply different weight to each observation
  - Stata has several types of weighting schemes
- options are command-specific, and always come after a comma, at the end

Merging Data: one-to-one merges

- Sometimes we merge datasets that have one record (row of data) for each value of the variable we are merging on (for example, hhid):

Dataset 1			Dataset 2	
id	income		id	HH size
1	100	↔	1	4
2	50	↔	2	3
3	80	↔	3	6
4	200	↔	4	3
5	70	↔	5	2

- command syntax is:
  - merge 1:1 <merge variable> using <name of dataset 2>
  - to work dataset 1 must be loaded into RAM
  - to work, both datasets must be sorted by the merge variable

Merging Data: one-to-one

- This merge also works as a one-to-one merge:
  - merge 1:1 id using dataset2

Dataset 1			Dataset 2	
id	income		id	HH size
1	100		1	4
3	80		2	3
5	70		3	6
			4	3
			5	2

Result		
id	income	HH size
1	100	4
2	.	3
3	80	6
4	.	3
5	70	2

- Note that Stata leaves missing value codes where it found no data

Merging Data: one-to-one

- This merge does not work:
  - merge 1:1 id using dataset2

Dataset 1			Dataset 2	
id	income		id	HH size
1	100		3	6
2	50		1	4
3	80		4	3
4	200		5	2
5	70		2	3

- What went wrong?

Merging Data: one-to-one

- This merge works, but is wrong:
  - merge using dataset2

Dataset 1			Dataset 2	
id	income		id	HH size
1	100	↔	3	6
2	50	↔	1	4
3	80	↔	4	3
4	200			
5	70			

→

Result		
id	income	HH size
1	100	6
2	50	4
3	80	3
4	200	.
5	70	.

- What went wrong?
- This is the most dangerous merge mistake!
  - Avoid it by always using 1:1 or n:1 or 1:n in your merge command
- Note what happens to “id” – no overwrite

Merging Data: one-to-one

- This merge does not work:
  - merge 1:1 id using dataset2

id	income		id	HH size
1	100		2	4
2	50		2	3
3	80		3	6
4	200		4	3
5	70		5	2

- What went wrong?

Merging Data: one-to-one and n-to-one

- Some datasets may have multiple observations for each unique observation in another dataset
  - household-level data vs. individual-level data
  - Stata will do an “n-to-one” or “one-to-n” merge here
- Load the individual-level data from the spreadsheet
  - import excel using "c:\CEQ_Timor_training\info_for_examples\small_data.xlsx", sheet(“indiv") cellrange(A3:D20) firstrow
  - sort hhid pid
  - save "c:\CEQ_Timor_training\info_for_examples\indiv”
- Now merge in household data
  - merge n:1 hhid using "c:\CEQ_Timor_training\info_for_examples\HH_1”

Merging Data – Practice

- Load and save the data in tabs HH_1 and HH_2
  - import excel using "c:\CEQ_Timor_training\info_for_examples\small_data.xlsx", sheet("HH_1") cellrange(A3:E8) firstrow
  - save "c:\CEQ_Timor_training\info_for_examples\HH_1"
  - import excel using "c:\CEQ_Timor_training\info_for_examples\small_data.xlsx", sheet("HH_2") cellrange(A3:C8) firstrow
  - save "c:\CEQ_Timor_training\info_for_examples\HH_2"
  - use "c:\CEQ_Timor_training\info_for_examples\HH_1", clear
- Merge the data
  - merge using "c:\CEQ_Timor_training\info_for_examples\HH_2"
  - oops
  - merge hhid using "c:\CEQ_Timor_training\info_for_examples\HH_2"

Merging Data - Practice

- Load the second dataset again
  - use "c:\CEQ_Timor_training\info_for_examples\HH_2”, clear
  - sort hhid
  - save "c:\CEQ_Timor_training\info_for_examples\HH_2”, replace
- Now load the first dataset again
  - use "c:\CEQ_Timor_training\info_for_examples\HH_1”, clear
  - merge hhid using "c:\CEQ_Timor_training\info_for_examples\HH_2”
- Check results
  - list, clean
  - desc

Aggregating or "collapsing" data

- Sometimes we would like to add up several rows of data for each household, like this:
- the "collapse" command can do this

hhid	item	cons
1	food	80
1	housing	30
1	clothing	10
1	services	30
2	food	200
2	housing	100
2	clothing	60
2	services	80
3	food	220
3	housing	150
3	clothing	80
3	services	100
4	food	2000
4	housing	3500
4	clothing	1500
4	services	1755
5	food	1000
5	housing	2000
5	clothing	500
5	services	255

hhid	cons
1	150
2	440
3	550
4	8755
5	3755

Collapsing Data - Practice

- Load the third dataset
  - use "c:\CEQ_Timor_training\info_for_examples\HH_3”, clear
  - sort hhid
- list what you have
- collapse (sum) cons, by(hhid)
- list what you have
- try it again, after reloading the data, using
  - collapse cons, by(hhid)
- try it again, after reloading the data, using
  - collapse (sum) cons

Programming – Writing "do files"

- It is very bad form to do research with interactive or point-and-click commands
- Programs (do files):
  - keep a record of what you have done
  - allow you (and others) to cross-check your work
  - make it very easy to make small changes to your research
- Goal: Let's write a do-file to do this:
  - read all the data, both HH and individual, in the spreadsheet
  - clean the error in hhid
  - merge them together
  - create HH income per capita and per adult equivalent
  - tabulate average HH income per capita by area of residence

Programming – Writing "do files"

- Stata has an internal text editor, like a word processor
  - start it with ctrl-9, or the "window" menu
- Enter the commands we have learned, in order
- run them: ctrl-D or the "tools" menu
- Add comments
  - very important for good programming
  - help you remember what you are doing
- Locals and globals – place-keepers
  - for example, use a global for the path
  - or a local for a specific value
  - or a local with a list of variables

Programming – locals and globals

- Locals and globals are "place-keepers" you can use in your do-files
  - globals stay active until you close Stata
  - locals stay active only until your do-file finishes running
  - for example, use a global for the path
    - global datadir c:\CEQ_Timor_training\info_for_examples\
    - then this: use ${datadir}HH_1
    - is the same as: use c:\CEQ_Timor_training\info_for_examples\HH_1
    - in general, programmers do not like to use globals
  - or a local for a specific value
    - local schoolfee 500
    - Then these two are the same:
      - generate cost = in_school*500
      - generate cost = in_school*`schoolfee'
  - or a local with a list of variables

Programming – locals and globals

- Use a local for a list of variables
  - local vnames “ hhid income hhsize ”
  - then summarize `vnames’ is the same as

    summarize hhid income hhsize
- There are other uses for locals, to come later

Programming – Looping

- Looping is when you ask the computer to do the same operation many times.
- Stata has several ways to loop, but the foreach command is easiest
- Looping with foreach
  - foreach <local> in <list> {
    - … do something to every item in the list …
    - }

For example:

```
foreach nn in hhsize eqscale {
        generate income_`nn' = income/`nn'
        }
```

Or:

```
local namelist " hhsize eqscale "
foreach nn of local namelist {
        generate income_`nn' = income/`nn'
        }
```

Exercise

- Write a do-file to:
  - read and merge all the data, both HH and individual, in the spreadsheet: c:\CEQ_Timor_training\info_for_examples\small_data.xlsx
  - clean the error in hhid
  - merge them together
  - allow adding an arbitrary value to HH income *if the HH is rural*
  - create HH income per capita and per adult equivalent
  - tabulate average HH income per capita by area of residence
  - find out how many secondary graduates there are per HH
- Comment it nicely
- Use a local and a global
- Use a loop when you can