Stata to R :: CHEAT SHEET

Introduction

This cheat sheet summarizes common `Stata` commands for econometric analysis and provides their equivalent expression in R.

References for importing/cleaning data, manipulating variables, and other basic commands include Hanck et al. (2019), *Econometrics with R*, and Wickham and Grolemund (2017), *R for Data Science*.

Example data comes from Wooldridge *Introductory Econometrics: A Modern Approach*. Download `Stata` data sets here. R data sets can be accessed by installing the `wooldridge` package from CRAN.

All R commands written in base R, unless otherwise noted.

Setup

Note: While it is common to create a `log` file in `Stata` to store the commands and output of `Stata` sessions, the equivalent does not exist in R. A more savvy version in R is to create a R-markdown file to capture code and output.

```
ssc install outreg2 // install `outreg2` package. Note: unlike R packages, Stata packages do not have to be loaded each time once installed.
```

```
install.packages("wooldridge") # install `wooldridge` package

data(package = "wooldridge") # list datasets in `wooldridge` package

load(wage1) # load `wage1` dataset into session

?wage1 # consult documentation on `wage1` dataset
```

Summarize Data

example data: `wage1`

Where Stata only allows one to work with one data set at a time, multiple data sets can be loaded into the R environment simultaneously, and hence must be specified with each function call. *Note:* R does not have an equivalent to Stata's `codebook` command.

```
browse // open browser for loaded data

describe // describe structure of loaded data
summarize // display summary statistics for all variables in dataset
list in 1/6 // display first 6 rows

tabulate educ // tabulate `educ` variable frequencies
tabulate educ female // cross-tabulate `educ` and `female` frequencies
```

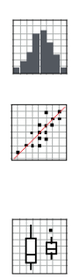
```
view(wage1) # open browser for loaded `wage1` data

str(wage1) # describe structure of `wage1` data
summary(wage1) # display summary statistics for `wage1` variables
head(wage1) # display first 6 (default) rows data
tail(wage1) # display last 6 rows

table(wage1$educ) #tabulate `educ` frequencies
table("yrs_edu" = wage1$educ, "female" = wage1$female) # tabulate `educ` frequencies name table columns
```

Tip: The {AER} package will automatically load other useful dependent packages, including: {car}, {lmtest}, {sandwich} which are used for many of the commands listed in this cheat sheet.

Basic plots

example data: `wage1`

```
hist(wage) // histogram of `wage`
hist(wage), by(nonwhite) //
scatter(wage educ) // scatter plot of `wage` by `educ`
twoway (scatter wage educ) (lfit wage educ) // scatter plot with fitted line
graph box wage, by(nonwhite) // boxplot of wage by `nonwhite`
```



```
hist(wage1$wage) # histogram of `wage`

plot(y = wage$1wage, x = wage1$educ) # scatter plot
abline(lm(wage1$wage~wage1$educ), col="red") # add fitted line to scatterplot

boxplot(wage1$wage~wage1$nonwhite) # boxplot of `wage` by `nonwhite`
```

Estimate Models, 1/2

OLS *example data:* `wage1`

```
reg wage educ // simple regression of `wage` by `educ` (Results printed automatically).

reg wage educ if nonwhite==1 // add condition with if statement

reg wage educ exper, robust // multiple regression using HC1 robust standard errors
reg wage educ exper, cluster(numdep) // use clustered standard errors
```

Tip: An alternate way to compute robust standard errors in R for any models not covered by {estimatr} package is load the {AER} package and run:

```
coeftest(mod1, vcov. = vcovHC, type = "HC1")
```

```
mod1 <- lm(wage ~ educ, data = wage1) # simple regression of `wage` by `educ`, store results in `mod1`
summary(mod1) # print summary of `mod1` results

mod2 <- lm(wage ~ educ, data = wage1[wage1$nonwhite==1, ]) # add condition with if statement`
mod3 <- estimatr::lm_robust(wage ~ educ + exper, data = wage1, se_type = "stata") # multiple regression with HC1 (Stata default) robust standard errors, use {estimatr} package
mod4 <- estimatr::lm_robust(wage ~ educ + exper, data = wage1, clusters = numdep) # use clustered standard errors.
```

MLE (Logit/Probit/Tobit) *example data:* `mroz`

```
logit inlf nwifeinc educ // estimate logistic regression

probit inlf nwifeinc educ // estimate logistic regression

tobit hours nwifeinc educ, ll(0) // estimate tobit regression, lower-limit of y censored at zero
```

```
mod_log <- glm(inlf~nwifeinc + educ + family=binomial(link="logit"), data=mroz) # estimate logistic regression

mod_pro <- glm(inlf~nwifeinc + educ + family=binomial(link="probit"), data=mroz) # estimate logistic regression

mod_tob <- AER::tobit(hours ~ nwifeinc + educ, left = 0, data = mroz) # estimate tobit regression, lower-limit of y censored at zero, use {AER} package
```

Postestimation, 1/2

example data: `wage1`

Note: Postestimation commands in `Stata` apply to the most recently run estimation commands.

```
reg wage educ // estimation used for the following post-estimation commands
predict yhat // get predicted values from last estimation, store as `yhat`
predict e, res // get residuals from last estimation, store as `e`
```

```
mod1 <- lm(wage ~ educ, data = wage1) # estimation used for the following post-estimation commands
yhat <- predict(mod1) # get predicted values

e <- residuals(mod1) # get residual values
```

stata ⇔ R

Create/Edit Variables

example data: `wage1`

Note: where `Stata` only allows one to work with one data set at a time, multiple data sets can be loaded into the R environment simultaneously, hence the data set must be specified for each command.

```
gen exper2 = exper^2 // create `exper` squared variable
egen wage_avg = mean(wage) // create average wage variable

drop tenursq // drop `tenursq` variable

keep wage educ exper nonwhite // keep selected variables

tab numdep, gen(numdep) // create dummy variables for `numdep`

recode exper (1/20 = 1 "1 to 20 years") (21/40 = 2 "21 to 40 years") (41/max = 3 "41+ years"), gen(experlvl) // recode `exper` and gen new variable
```

```
wage1$exper2 <- wage1$exper^2 # create `exper` squared variable
wage1$wage_avg <- mean(wage1$wage) # create average wage variable

wage1$tenursq <- NULL #drop `tenursq`

wage1 <- wage1[ , c("wage", "educ", "exper", "nonwhite")] # keep selected variables

wage1 <- fastDummies::dummy_cols(wage1, select_columns = "numdep") # create dummy variables for `numdep`, use {fastDummies} package

wage1$experlvl <- 3 # recode `exper`
wage1$experlvl[wage1$exper < 41] <- 2
wage1$experlvl[wage1$exper < 21] <- 1
```

Statistical tests / diagnostics

example data: `wage1`

```
reg lwage educ exper // estimation used for examples below
estat hettest // Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
estat ovtest // Ramsey RESET test for omitted variables
ttest wage, by(nonwhite) // independent group t-test, compare means of same variable between groups
```

```
mod <-lm(lwage ~ educ exper, data = wage1) # estimate used for examples below
lmtest::bptest(mod) # Breusch-Pagan / Cook-Weisberg test for hetero-skedasticity using the {lmtest} package
lmtest::resettest(mod) # Ramsey RESET test
t.test(wage ~ nonwhite, data = wage1) # independent group t-test
```

Interactions, categorical/continuous variables

example data: `wage1`

In `Stata`, it is common to use special operators to specify the treatment of variables as continuous (`c.`) or categorical (`i.`). Similarly, the `#` operator denotes different ways to return the interaction of those variables. Here we show some common uses of these operators as well as their R equivalents.

```
reg lwage i.numdep // treat `numdep` as a factor variable
reg lwage c.educ#c.exper // return interaction term only
reg lwage c.educ##c.exper // return full factorial specification
reg lwage c.exper##i.numdep // return full, interact continuous and categorical
```

```
lm(lwage ~ as.factor(numdep), data = wage1) # treat `numdep` as factor
lm(lwage ~ educ:exper, data = wage1) # return interaction term only
lm(lwage ~ educ*exper, data = wage1) # return full factorial specification
lm(wage ~ exper*as.factor(numdep), data = wage1) # return full, interact continuous and categorical
```

Estimate Models, 2/2

Panel/Longitudinal

example data: `murder`

```
xtset id year // set `id` as entities (panel) and `year` as time variable
xtdescribe // describe pattern of xt data
xtsum // summarize xt data
xtreg mrdrte unem, fe // fixed effects regression
```

```
plm::is.pbalanced(murder$id, murder$year) # check panel balance with {plm} package
modfe <- plm::plm(mrdrte ~ unem, index = c("id", "year"),model = "within", data = murder) # estimate fixed effects ("within") model
summary(modfe) # display results
```

Instrumental Variables (2SLS)

example data: `mroz`

```
ivreg lwage (educ = fatheduc), first // show results of first stage regression
etest first // test IV and endogenous variable
ivreg lwage(educ = fatheduc) // show results of 2SLS directly
```

```
modiv <-AER::ivreg(lwage ~ educ | fatheduc, data = mroz) # estimate 2SLS with {AER} package
summary(modiv, diagnostics = TRUE) # get diagnostic tests of IV and endogenous variable
```

Post-estimation, 2/2

example data: `wage1`

Note: Postestimation commands in `Stata` apply to the most recently run estimation commands.

```
reg lwage educ exper##exper // estimation used for following post-estimation commands
estimates store mod1 // stores in memory the last estimation results to `mod1`

margins // get average predictive margins
margins, dydx(*) // get average marginal effects for all variables
marginsplot // plot marginal effects

margins, dydx(exper) // average marginal effects of experience
margins, at(exper=(1(10)51)) // average predictive margins over `exper` range at 10-year increments

estimates use mod1 // loads `mod1` back into working memory
estimates table mod1 mod2 // display table with stored estimation results
```

```
mod1 <- lm(lwage ~ educ + exper + I(exper^2), data = wage1) # Note: in R, mathematical expressions inside a formula call must be isolated with `I()`

margins::prediction(mod1) # get average predictive margins with {margins} package
m1 <- margins::margins(mod1) # get average marginal effects for all variables
plot(m) # plot marginal effects

summary(m) # get detailed summary of marginal effects
margins::prediction(mod1, at = list(exper = seq(1,51,10))) # predictive margins over `exper` range at 10-year increments

stargazer::stargazer(mod1, mod2, type = "text") # use {stargazer} package, with `type=text` to display results within R. *Note*: `type= ` also can be changed for LaTex and HTML output.
```