```
* Causal Inference and Research Design
* Assignment 4
* Autor: Diana Perez

clear all
set more off
cap log close
cls
graph set window fontface "Calibri"


*******************************************************************************
** ASSIGNMENT 3                                                              **
*******************************************************************************
global path "C:\Users\Diana\Documents\GitHub\RDD"
cd "${path}"

* I. Github repo and summary
* ------------------------------------------------------------------------------

*) 1. Saving data
use                                                                             ///
"https://github.com/scunning1975/causal-inference-class/raw/master/hansen_dwi", ///
clear

compress
save "${path}\Data\Hansen_dwi.dta", replace

* II. Replication
* ------------------------------------------------------------------------------
use "${path}\Data\Hansen_dwi.dta", clear

*) 3. Eligibility variable
gen eligibility=bac1>=0.08 if !missing(bac1)
gen bac1_ajust=bac1-0.08
gen bac2_ajust=bac1_ajust*bac1_ajust

    * Labels
    label var male "Male"
    label var white "White"
    label var aged "Age"
    label var acc "Accident"
    label var bac1_ajust "DUI"

*) 4. Testing Manipulation on the RV

    * Packages
    net install rddensity,                                                      ///
        from("https://sites.google.com/site/rdpackages/rddensity/stata") replace
    net install lpdensity,                                                      ///
        from("https://sites.google.com/site/nppackages/lpdensity/stata") replace

    * Cattaneo et al.
    rddensity bac1_ajust /*P-value: 0.0276 */

    * Figure 1
    hist bac1, freq bin(450) bc(gs9) lc(gs9) graphregion(fcolor(white))         ///
        ti("BAC histogram", color(black) size(vlarge) lwidth(vvthick))          ///
        xti("BAC", size(vlarge) lwidth(vvthick))                                ///
        yti("Frequency", size(medium) lwidth(vvthick))                          ///
        addplot(pci  0 0.08 2000 0.08, lc(black))                               ///
        xlabel(0(0.1)0.4) xvarformat(%2.1f) yvarformat(%9.0gc)                  ///
        ylabel(, angle(0)) legend(off)
```

```
64
65      gr export "${path}\Figures\Figure 01.pdf", replace as(pdf)
66
67  *) 5. Table 2. Covariance continuity
68
69      * Editing e(N)
70      cap program drop changeN
71      program define changeN, eclass
72          /* This program edits the e(N). It replace it for any scalar named nobs.*/
73
74          ereturn scalar N = nobs
75      end
76
77      * Regressions and table
78      local bw=0.05
79      local n=0
80
81      global covs male white aged acc
82
83      foreach var of varlist $covs {
84
85          local ++n
86          local vlab: variable label `var'
87
88          * Estimation
89          rdrobust `var' bac1_ajust, kernel(uniform) h(`bw' `bw') p(1) vce(hc0)
90          est store rdrob
91          * Output
92          if "`n'"=="1" local comp="replace"
93          else local comp="append"
94
95          if "`n'"=="3" local j=1
96          else local j=3
97
98          scalar nobs=e(N_h_l)+e(N_h_r)
99          local nobs=string(e(N_h_l)+e(N_h_r),"%9.0gc")
100         changeN
101
102         qui sum `var' if bac1_ajust>=-`bw' & bac1_ajust<0
103         local mu=string(r(mean), "%5.`j'f")
104
105         outreg2 using "${path}\Tables\Table2.tex", `comp' nocons nor2 decm(.)   ///
106             dec(3)                                                              ///
107             addstat(Mean at (0.079), `mu')                                      ///
108             addtext(Controls,No)                                                ///
109             label nonotes                                                       ///
110             addn("Standard errors are in parentheses."                          ///
111             "*** Significant at the 1 percent level."                           ///
112             "** Significant at the 5 percent level."                            ///
113             "* Significant at the 10 percent level.")
114
115     }
116
117 *) 6. Figure 2.
118 local cut=0.08
119 local cut2=0.15
120
121 local bw=0.05
122 local bw2=`cut2'-`cut'
123
124 local bwl=`cut'-`bw'
125 local bwu=`cut'+`bw'
126 local bwl2=`cut2'-`bw'
```

```
127  local bwu2=`cut2'+`bw'
128
129  local nbinl=35
130  local nbinr=40
131
132  global covs acc male aged white
133
134  foreach j of numlist 1/2{
135
136      local n=0
137      foreach var of  varlist $covs {
138
139          local ++n
140          local vlab: variable label `var'
141
142          if "`var'"=="acc" {
143              local lti="Panel A. Accident at scene"
144              local yax="ylabel(0.05(0.05)0.25) yscale(range(0.03 0.26))"
145          }
146          else if "`var'"=="male" {
147              local lti="Panel B. Male"
148              local yax="ylabel(0.74(0.02)0.82) yscale(range(0.73 0.83))"
149          }
150          else if "`var'"=="aged" {
151              local lti="Panel C. Age"
152              local yax="ylabel(34(1)39) yscale(range(33.5 40))"
153              *local yax=" "
154          }
155          else if "`var'"=="white" {
156              local lti="Panel D. White"
157              local yax="ylabel(0.8(0.02)0.9) yscale(range(0.79 0.91))"
158          }
159
160          if "`n'"=="3" local l=0
161          else local l=2
162
163          * 2nd cutoff and above
164          cap drop rdplot_*
165          rdplot `var' bac1 if inrange(bac1,`bwl2',`bwu2'), binselect(es)          ///
166              c(`cut2') genvars p(`j')  kernel(uniform) h(`bw' `bw2')              ///
167              nbins(`nbinr' `nbinr')
168          cap drop v2rdplot_mean_y v2rdplot_mean_x v2rdplot_hat_y
169          rename (rdplot_mean_y rdplot_mean_x rdplot_hat_y)                        ///
170              (v2rdplot_mean_y v2rdplot_mean_x v2rdplot_hat_y)
171
172          * origin to 2nd cutoff
173          cap drop rdplot_*
174          rdplot `var' bac1 if inrange(bac1,`bwl',`cut2'), binselect(es)           ///
175              c(`cut') genvars p(`j')  kernel(uniform) h(`bw' `bw')                ///
176              nbins(`nbinl' `nbinr')
177
178          replace rdplot_mean_y=v2rdplot_mean_y if inrange(bac1,`cut2',`bwu2')
179          replace rdplot_mean_x=v2rdplot_mean_x if inrange(bac1,`cut2',`bwu2')
180          replace rdplot_hat_y=v2rdplot_hat_y if inrange(bac1,`cut2',`bwu2')
181
182          * Confidence intervals
183          cap drop ep2
184          cap drop sd
185          cap drop rdplot_ci_l
186          cap drop rdplot_ci_r
187
188          gen ep2=(rdplot_mean_y-rdplot_hat_y)^2
189          sum ep2 if inrange(bac1,`bwl',`cut')
```

```
190         gen sd=r(mean)*r(N)/(r(N)-2) if inrange(bac1,`bwl',`cut')
191         sum ep2 if inrange(bac1,`cut',`cut2')
192         replace sd=r(mean)*r(N)/(r(N)-2) if inrange(bac1,`cut',`cut2')
193         sum ep2 if inrange(bac1,`cut2',`bwu2')
194         replace sd=r(mean)*r(N)/(r(N)-2) if inrange(bac1,`cut2',`bwu2')
195
196         gen rdplot_ci_l=rdplot_hat_y-1.96*sd
197         gen rdplot_ci_r=rdplot_hat_y+1.96*sd
198
199         * Graphs
200         if `j'==1 local q="l"
201         else local q="q"
202
203         tw (`q'fit rdplot_hat_y rdplot_mean_x if inrange(bac1,`bwl',`cut'),     ///
204             lcolor(black) lwidth(medthick) lpattern(solid) xvarformat(%2.1f)    ///
205             yvarformat(%3.`l'f))                                                ///
206             (`q'fit rdplot_ci_r rdplot_mean_x if inrange(bac1,`bwl',`cut'),     ///
207             lcolor(black%15) lwidth(vvthick) lpattern(solid))                   ///
208             (`q'fit rdplot_ci_l rdplot_mean_x if inrange(bac1,`bwl',`cut'),     ///
209             lcolor(black%15) lwidth(vvthick) lpattern(solid))                   ///
210             (`q'fit rdplot_hat_y rdplot_mean_x if inrange(bac1,`cut',`cut2'),   ///
211             lcolor(black) lwidth(medthick) lpattern(solid))                     ///
212             (`q'fit rdplot_ci_r rdplot_mean_x if inrange(bac1,`cut',`cut2'),    ///
213             lcolor(black%15) lwidth(vvthick) lpattern(solid))                   ///
214             (`q'fit rdplot_ci_l rdplot_mean_x if inrange(bac1,`cut',`cut2'),    ///
215             lcolor(black%15) lwidth(vvthick) lpattern(solid))                   ///
216             (`q'fit rdplot_hat_y rdplot_mean_x if inrange(bac1,`cut2',`bwu2'),  ///
217             lcolor(black) lwidth(medthick) lpattern(solid))                     ///
218             (`q'fit rdplot_ci_r rdplot_mean_x if inrange(bac1,`cut2',`bwu2'),   ///
219             lcolor(black%15) lwidth(vvthick) lpattern(solid))                   ///
220             (`q'fit rdplot_ci_l rdplot_mean_x if inrange(bac1,`cut2',`bwu2'),   ///
221             lcolor(black%15) lwidth(vvthick) lpattern(solid))                   ///
222             (scatter rdplot_mean_y rdplot_mean_x, msymbol(circle_hollow)        ///
223             mcolor(gs9%80)),                                                    ///
224             xline(`cut', lcolor(black) lw(medium))                              ///
225             xline(`cut2', lcolor(black) lw(medium))                             ///
226             xti("BAC", size(medlarge) lwidth(vvthick))                          ///
227             yti(" ", size(medium))                                              ///
228             ti("`lti'", color(black) size(medlarge) lwidth(vvthick)             ///
229             j(left) placement(nwest))                                           ///
230             xlabel(0.05 0.1 0.15 0.2) xscale(range(0.03 0.21)) `yax'            ///
231             graphregion(fcolor(white))                                          ///
232             legend(order (1 10) label (1 "Fitted") label (10 "`vlab'"))         ///
233             name(G`n'_`j', replace) xsize(7) ysize(7)
234
235     }
236
237     gr combine G1_`j' G2_`j' G3_`j' G4_`j', col(2) graphregion(color(white))    ///
238         ysize(14) xsize(12)
239     gr export "${path}\Figures\Figure 02_P`j'.pdf", replace as(pdf)
240 }
241
242 *) Table 3
243 mat MAT_tabla=J(8,6,.)
244 mat MAT_tabla_s=J(8,6,0)
245
246 global controls aged white i.year male
247
248 local n=1
249 foreach j of numlist 0.05 0.03{
250
251     * BAC
252     qui reg recid eligibility bac1_ajust                                    ///
```

```
253         ${controls} if inrange(bac1_ajust,-`j',`j'), r
254
255     mat MAT_tabla[`n'+1,1]=_b[eligibility]
256     mat MAT_tabla[`n'+1,2]=_se[eligibility]
257     local N=string(e(N),"%5.0gc")
258     mat MAT_tabla[`n'+3,1]=`N'
259
260     local p=string(ttail(e(df_r),abs(_b[eligibility]/_se[eligibility]))*2,      ///
261         "%6.4f")
262     matrix MAT_tabla_s[`n'+1,1] = (`p' <= 0.1) + (`p' <= 0.05) + (`p' <= 0.01)
263
264
265     qui sum recid if e(sample)
266     mat MAT_tabla[`n'+2,1]=r(mean)
267
268     * BAC x Elegibility
269     qui reg recid eligibility bac1_ajust eligibility#c.bac1_ajust               ///
270         ${controls} if inrange(bac1_ajust,-`j',`j'), r
271
272     mat MAT_tabla[`n'+1,3]=_b[eligibility]
273     mat MAT_tabla[`n'+1,4]=_se[eligibility]
274     local N=string(e(N),"%5.0gc")
275     mat MAT_tabla[`n'+3,3]=`N'
276
277     local p=string(ttail(e(df_r),abs(_b[eligibility]/_se[eligibility]))*2,      ///
278         "%6.4f")
279     matrix MAT_tabla_s[`n'+1,3] = (`p' <= 0.1) + (`p' <= 0.05) + (`p' <= 0.01)
280
281     qui sum recid if e(sample)
282     mat MAT_tabla[`n'+2,3]=r(mean)
283
284     * BAC2 x Eligibility
285     qui reg recid eligibility bac1_ajust bac2_ajust eligibility#c.bac1_ajust    ///
286         eligibility#c.bac2_ajust                                                ///
287         ${controls} if inrange(bac1_ajust,-`j',`j'), r
288
289     mat MAT_tabla[`n'+1,5]=_b[eligibility]
290     mat MAT_tabla[`n'+1,6]=_se[eligibility]
291     local N=string(e(N),"%5.0gc")
292     mat MAT_tabla[`n'+3,5]=`N'
293
294     local p=string(ttail(e(df_r),abs(_b[eligibility]/_se[eligibility]))*2,      ///
295         "%6.4f")
296     matrix MAT_tabla_s[`n'+1,5] = (`p' <= 0.1) + (`p' <= 0.05) + (`p' <= 0.01)
297
298     qui sum recid if e(sample)
299     mat MAT_tabla[`n'+2,5]=r(mean)
300
301     local n=`n'+4
302
303 }
304
305 frmttable using "${path}\Tables\Table3", replace tex                           ///
306     statmat(MAT_tabla) annotate(MAT_tabla_s) asymbol("*","**","***")            ///
307     substat(1) noblankrows                                                      ///
308     ct("","Linear","Linear diferenciated","Quadratic diferenciated")            ///
309     rt("{\i Panel A}. BAC $\in$ [0.03,0.13]"\""\"DUI"\""\"Mean"\""\             ///
310     "Observations"\""\                                                          ///
311     "{\i Panel B}. BAC $\in$ [0.055,0.105]"\""\"DUI"\""\"Mean"\""\              ///
312     "Observations")                                                             ///
313     sdec(3,3,3\3,3,3\3,3,3\3,3,3\3,3,3\0,0,0\                                   ///
314     3,3,3\3,3,3\3,3,3\3,3,3\3,3,3\3,3,3\0,0,0)
315
```

```
316  *) Figure 3
317  local cut=0.08
318  local cut2=0.15
319
320  local bw=0.05
321  local bw2=`cut2'-`cut'
322
323  local bwl=`cut'-`bw'
324  local bwu=`cut'+`bw'
325
326  local nbinl=35
327  local nbinr=40
328
329  foreach j of numlist 1/2{
330
331          if "`j'"=="1" local lti="{it: Panel A.} Linear polynomial"
332          else if "`j'"=="2" local lti="{it: Panel B.} Quadratic polynomial"
333          local yax="ylabel(0.08(0.02)0.16) yscale(range(0.07 0.17))"
334
335          * origin to 2nd cutoff
336          cap drop rdplot_*
337          rdplot recid bac1 if inrange(bac1,`bwl',`cut2'), binselect(es)          ///
338              c(`cut') genvars p(`j')  kernel(uniform) h(`bw' `bw')               ///
339              nbins(`nbinl' `nbinr')
340
341          * Confidence intervals
342          cap drop ep2
343          cap drop sd
344          cap drop rdplot_ci_l
345          cap drop rdplot_ci_r
346
347          gen ep2=(rdplot_mean_y-rdplot_hat_y)^2
348          sum ep2 if inrange(bac1,`bwl',`cut')
349          gen sd=r(mean)*r(N)/(r(N)-2) if inrange(bac1,`bwl',`cut')
350          sum ep2 if inrange(bac1,`cut',`cut2')
351          replace sd=r(mean)*r(N)/(r(N)-2) if inrange(bac1,`cut',`cut2')
352
353          gen rdplot_ci_l=rdplot_hat_y-1.96*sd
354          gen rdplot_ci_r=rdplot_hat_y+1.96*sd
355
356          * Graphs
357          if `j'==1 local q="l"
358          else local q="q"
359
360          tw (`q'fit rdplot_hat_y rdplot_mean_x if inrange(bac1,`bwl',`cut'),     ///
361              lcolor(black) lwidth(medthick) lpattern(solid) xvarformat(%2.1f)    ///
362              yvarformat(%3.2f))                                                  ///
363              (`q'fit rdplot_ci_r rdplot_mean_x if inrange(bac1,`bwl',`cut'),     ///
364              lcolor(black%15) lwidth(vvthick) lpattern(solid))                   ///
365              (`q'fit rdplot_ci_l rdplot_mean_x if inrange(bac1,`bwl',`cut'),     ///
366              lcolor(black%15) lwidth(vvthick) lpattern(solid))                   ///
367              (`q'fit rdplot_hat_y rdplot_mean_x if inrange(bac1,`cut',`cut2'),   ///
368              lcolor(black) lwidth(medthick) lpattern(solid))                     ///
369              (`q'fit rdplot_ci_r rdplot_mean_x if inrange(bac1,`cut',`cut2'),    ///
370              lcolor(black%15) lwidth(vvthick) lpattern(solid))                   ///
371              (`q'fit rdplot_ci_l rdplot_mean_x if inrange(bac1,`cut',`cut2'),    ///
372              lcolor(black%15) lwidth(vvthick) lpattern(solid))                   ///
373              (scatter rdplot_mean_y rdplot_mean_x, msymbol(circle_hollow)        ///
374              mcolor(gs9%80)),                                                    ///
375              xline(`cut', lcolor(black) lw(medium))                              ///
376              xti("BAC", size(medlarge) lwidth(vvthick))                          ///
377              yti(" ", size(medium))                                              ///
378              ti("`lti'", color(black) size(medlarge) lwidth(vvthick)             ///
```

```
379             j(left) placement(nwest))                                       ///
380             xlabel(0.05 0.1 0.15) xscale(range(0.03 0.16)) `yax'            ///
381             graphregion(fcolor(white))                                      ///
382             legend(off)                                                     ///
383             name(G_`j', replace) xsize(8) ysize(5)
384
385     gr export "${path}\Figures\Figure 03_P`j'.pdf", replace as(pdf)
386 }
387
388
389
390
391
392
393
394
395
396
```