```
. use https://github.com/scunning1975/causal-inference-class/raw
```

1. Download Hansen_dwi.dta from github at the following address.

https://github.com/treasureramirez/RDD

2. In the writing subdirectory, place your assignment. For the first part of this assignment, read Hansen's paper in the /articles directory of the main class github entitled "Hansen AER".Briefly summarize this paper. What is his research question? What data does he use? What is his research design, or "identification strategy"? What are his conclusions?*

Hansen's study aimed to answer the following question: what are the effects of harsher punishments and sanctions on driving under the influence (DUI)? In terms of the data, Hansen took advantage of administrative records on 512,964 DUI stops from the state of Washington (WA) and used them to exploit discrete thresholds that determine both the current as well as potential future punishments for drunk drivers (1995-2011). In WA, if a person's blood alcohol content (BAC) is measured as above .08 it is considered a DUI while a DUI above 0.15 is considered an aggravated DUI or DUI that results in higher fines, increased jail time, and a longer license suspension period. The data restricts attention to those above the legal drinking age given that different cutoffs apply to those under 21.Hansen's main results are based on a local-linear regression discontinuity design. The specific cutoffs for DUI and aggravated DUI allow for the usage of a regression discontinuity design. By utilizing a local linear regression discontinuity design, Hansen is able to estimate the effect of having a BAC above the DUI or aggravated DUI threshold on recidivism. Hansen further investigates several mechanisms including deterrence, incapacitation, and rehabilitation. In order to provide evidence regarding these alternative mechanisms, Hansen examines the degree to which sanctions/punishments change at the thresholds, multiple time periods for recidivism, and alternative alcohol-related crimes.In conclusion, this paper offers evidence concerning the effectiveness of punishments and sanctions in reducing recidivism among drunk drivers. Hansen finds evidence that a BAC above either the 0.08 DUI threshold or the 0.15 aggravated DUI is associated with reduced repeat drunk driving both in the short and long term. Evidence from the paper also provides policy valuation for the effectiveness of current BAC thresholds in reducing drunk driving.*

3. In the United States, an officer can arrest a driver if after giving them a blood alcohol content (BAC) test they learn the driver had a BAC of 0.08 or higher. We will only focus on the 0.08 BAC cutoff. We will be ignoring the 0.15 cutoff for all this analysis. Create a dummy equaling 1 if bac1>= 0.08 and 0 otherwise in your do file or R file*

```
. generate D = 0

. replace D=1 if bac1>=0.08
(191,548 real changes made)
```

4. If people were able to manipulate their BAC, then you could use a McCrary density test. The McCrary test provides a formal test for manipulation of the assignment variable in an RD. The marginal density of X should be continuous without manipulation so evidence would be shown through discontinuities around the threshold. Given the histogram, I dont see any evidence for manipulation or sorting on the running variable.*

```
. histogram bac1, frequency
(bin=53, start=0, width=.0084717)
```

5. The second thing we need to do is check for covariate balance. Recreate Table 2 Panel A but only white male, age and accident (acc) as dependent variables. Use your equation 1) for this. Are the covariates balanced at the cutoff? It's okay if they are not exactly the same as Hansen's:

The covariates appear to be balanced at the cutoff.

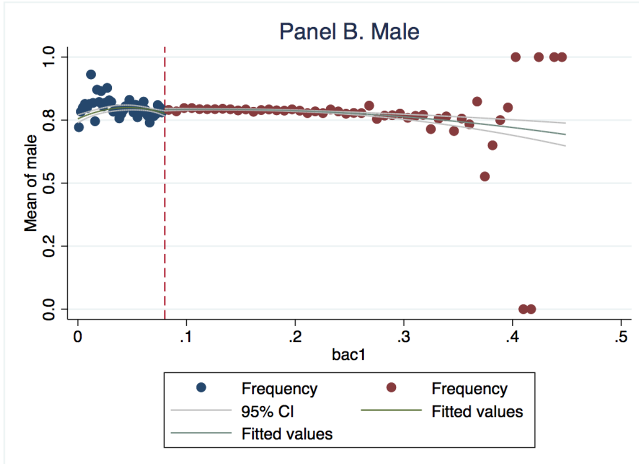
```
. quietly eststo: xi: reg male i.D*bac1

. quietly eststo: xi: reg white i.D*bac1

. quietly eststo: xi: reg aged i.D*bac1

. quietly eststo: xi: reg acc i.D*bac1

. esttab, title(Table 2 Panel A)

Table 2 Panel A
----------------------------------------------------------------
----------------------------------------------------------------
                      (1)             (2)             (3)
>            (6)             (7)             (8)             (9)
             recidivism      recidivism      recidivism
>     recidivism            male           white            aged
----------------------------------------------------------------
----------------------------------------------------------------
D                -0.0218***      -0.0266***
>
                  (-3.89)         (-6.58)
>

bac1                0.216           0.331***       -0.150
>          2.939           0.218*          0.154          -56.36
                   (1.07)          (4.42)         (-0.39)
>         (1.79)          (2.01)          (1.68)         (-18.55)

_ID_1                                             -0.0623
>                        0.0307***       0.00271          -7.787
                                                  (-1.78)
>                         (4.22)          (0.44)         (-38.12)

_IDXbac1_1                                          0.523
>                        -0.311**        0.0170           83.40
                                                   (1.16)
>                        (-2.83)          (0.18)          (26.99)

0.D
>              0

>            (.)

1.D
>          0.108

>         (1.28)

bac1_sq
>         -24.61

>        (-1.79)

0.D#c.bac1
>              0

>            (.)

1.D#c.bac1
>         -4.083

>        (-1.93)

0.D#c.bac1~q
>              0

>            (.)

1.D#c.bac1~q
>          31.87*

>         (2.11)

_cons               0.101***       0.0953***        0.127***
>         0.0338           0.773***        0.835***        38.57
                   (7.02)         (17.59)          (4.68)
>         (0.71)        (117.99)        (150.44)        (209.84)
----------------------------------------------------------------
----------------------------------------------------------------
N                   46957           89967           46957
>          89967          214558          214558          214558
----------------------------------------------------------------
----------------------------------------------------------------
t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

. eststo clear
```

6. Recreate Figure 2 panel A-D. You can use the -cmogram- command in Stata to do this. Fit both linear and quadratic with confidence intervals. Discuss

what you find and compare it with Hansen's paper: All look relatively similar, so balance test is satisfied.

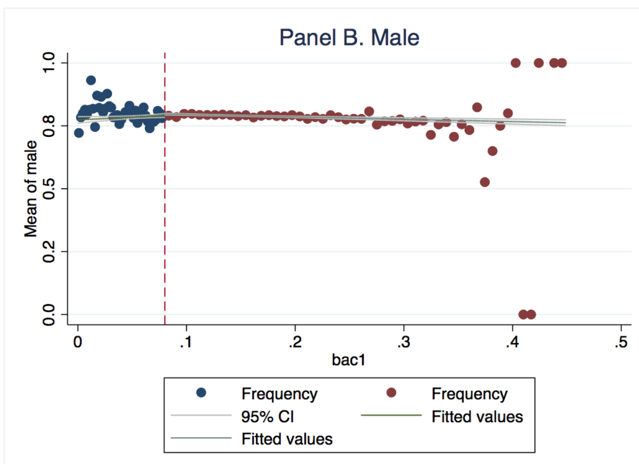
do linear coefficients first

```
. quietly cmogram acc bac1, cut(0.08) title(Panel A. Accident at
> d lineat(.08)

. graph export Figure1.png , replace
(file /Users/treasureramirez/Desktop/Figure1.png written in PNG
```



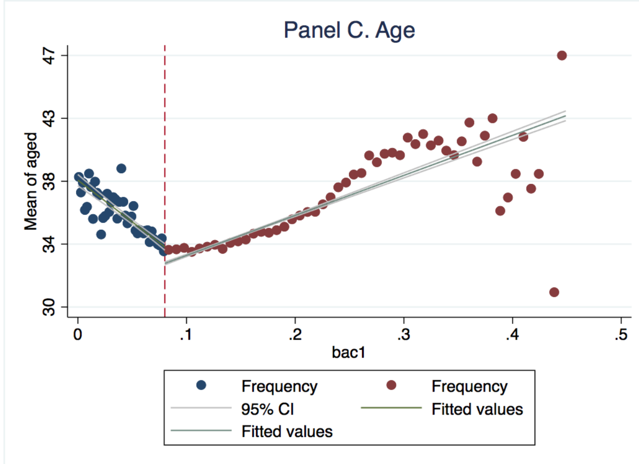
Linear Fit Accident

```
. quietly cmogram male bac1, cut(0.08) title(Panel B. Male) scat
> )

.     graph export Figure2.png , replace
(file /Users/treasureramirez/Desktop/Figure2.png written in PNG
```



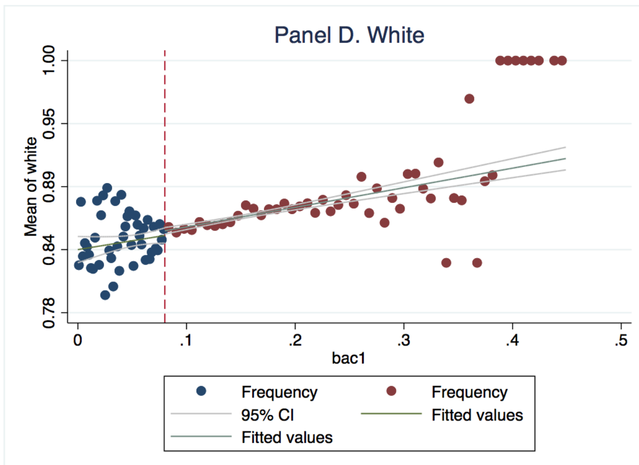
Linear Fit Male

```
. quietly cmogram aged bac1, cut(0.08) title(Panel C. Age) scat

.     graph export Figure3.png , replace
(file /Users/treasureramirez/Desktop/Figure3.png written in PNG
```



Linear Fit Aged

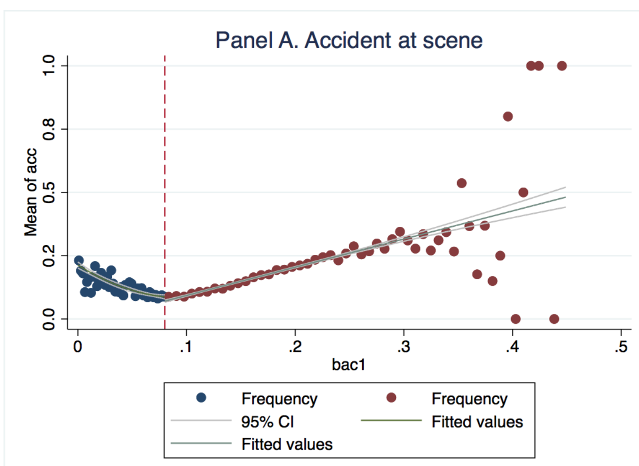
```
. quietly cmogram white bac1, cut(0.08) title(Panel D. White) sc
> 08)

.     graph export Figure4.png , replace
(file /Users/treasureramirez/Desktop/Figure4.png written in PNG
```



Linear Fit White

quadratic next

```
. quietly cmogram acc bac1, cut(0.08) title(Panel A. Accident at
> d lineat(.08)

.     graph export Figure5.png , replace
(file /Users/treasureramirez/Desktop/Figure5.png written in PNG
```



Quadratic Fit Accident

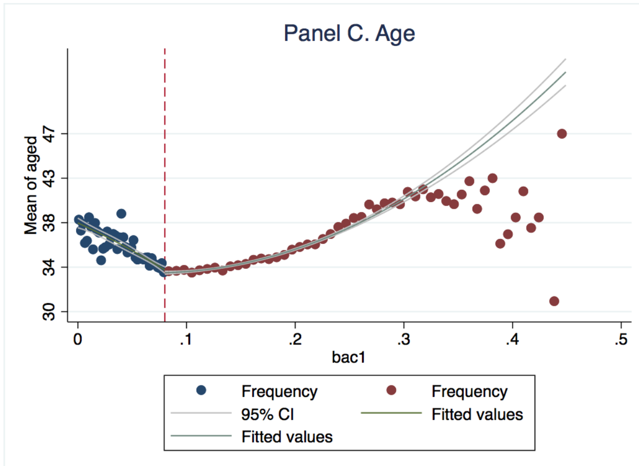
```
. quietly cmogram male bac1, cut(0.08) title(Panel B. Male) scat
> )
```

```
,

.     graph export Figure1.png , replace
(file /Users/treasureramirez/Desktop/Figure1.png written in PNG
```

Quadratic Fit Male

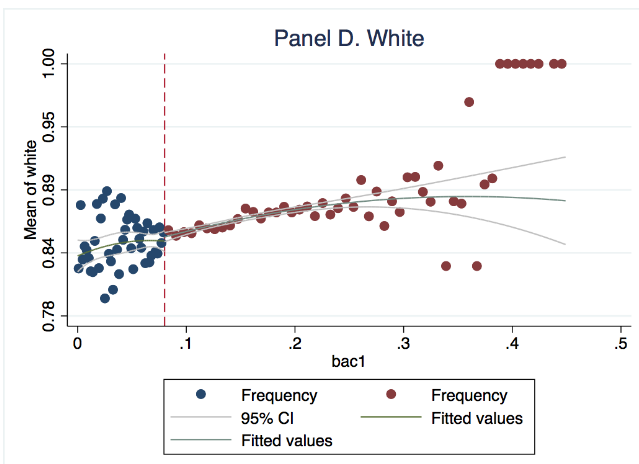
Quadratic Fit Male

```
. quietly cmogram aged bac1, cut(0.08) title(Panel C. Age) scat

.     graph export Figure7.png , replace
(file /Users/treasureramirez/Desktop/Figure7.png written in PNG
```



Quadratic Fit Accident

```
. quietly cmogram white bac1, cut(0.08) title(Panel D. White) sc
> 08)

. graph export Figure8.png , replace
(file /Users/treasureramirez/Desktop/Figure8.png written in PNG
```



Quadratic Fit White

7. Estimate equation (1) with recidivism (recid) as the outcome. This corresponds to Table 3 column 1, but since I am missing some of his variables, your sample size will be the entire dataset of 214,558. Nevertheless, replicate Table 3, column 1, Panels A and B. Note that these are local linear regressions and Panel A uses as its bandwidth 0.03 to 0.13. But Panel B has a narrower bandwidth of 0.055 to 0.105. Your table should have three columns and two A and B panels associated with the different bandwidths.: Column 1: control for the bac1 linearly Column 2: interact bac1 with cutoff linearly Column 3: interact bac1 with cutoff linearly and as a quadratic For all analysis, estimate uncertainty using heteroskedastic robust standard errors. [ed: But if you want to show off, use Kolesár and Rothe's 2018 "honest" confidence intervals (only available in R).]

the model is recidivism= beta_0 + b_1 D + b_2 bac1 + b_3 D*bac_1

column 1

```
. eststo clear

. quietly eststo: reg recidivism D bac1 if bac1>0.055 & bac1<0.1

. quietly eststo: reg recidivism D bac1 if bac1>0.03 & bac1<0.13
```

column 2

```
. quietly eststo: xi: reg recidivism i.D*bac1 if bac1>0.055 & ba

. quietly eststo: xi: reg recidivism i.D*bac1 if bac1>0.03 & bac
```

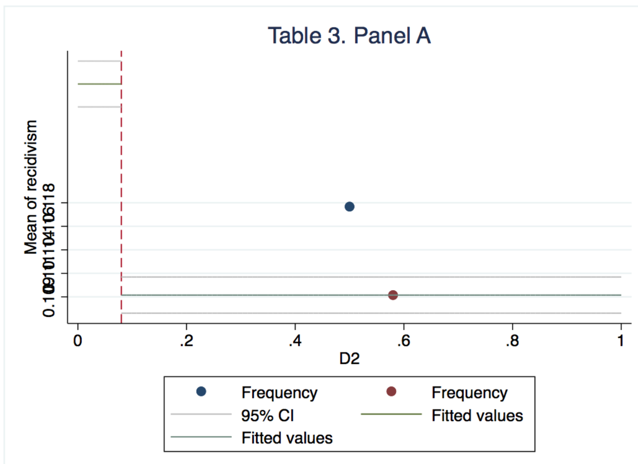
column 3 adds a quadratic interaction term to Hansen's model. the dependent variable, our outcome is still recidivism now the independent variables are: D , bac1, bac1_sq , interaction term D*bac1 , and second interaction term D*bac1_sq

```
. gen bac1_sq = bac1^2

. quietly eststo: xi: reg recidivism D##c.(bac1 bac1_sq) if bac1

. quietly eststo: xi: reg recidivism D##c.(bac1 bac1_sq) if bac1

. esttab, title(Table 3 Column 1)

Table 3 Column 1
------------------------------------------------------------------------
----------------
                      (1)             (2)             (3)             
>           (6)
             recidivism      recidivism      recidivism      r
>    recidivism
------------------------------------------------------------------------
----------------
D                 -0.0218***      -0.0266***
>
                  (-3.89)         (-6.58)
>

bac1                0.216           0.331***       -0.150
>         2.939
                   (1.07)          (4.42)         (-0.39)
>        (1.79)

_ID_1                                             -0.0623
>
                                                  (-1.78)
>

_IDXbac1_1                                          0.523
>
                                                   (1.16)
>

0.D
>             0

>           (.)

1.D
>         0.108


>        (1.28)

bac1_sq
>        -24.61

>       (-1.79)

0.D#c.bac1
>             0

>           (.)

1.D#c.bac1
>        -4.083

>       (-1.93)

0.D#c.bac1~q
>             0

>           (.)

1.D#c.bac1~q
>         31.87*

>        (2.11)
```

```
_cons                      0.101***        0.0953***        0.127***
>         0.0338
                          (7.02)          (17.59)          (4.68)
>         (0.71)
--------------------------------------------------------------------
----------------
N                          46957           89967            46957
>          89967
--------------------------------------------------------------------
----------------
t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001
```

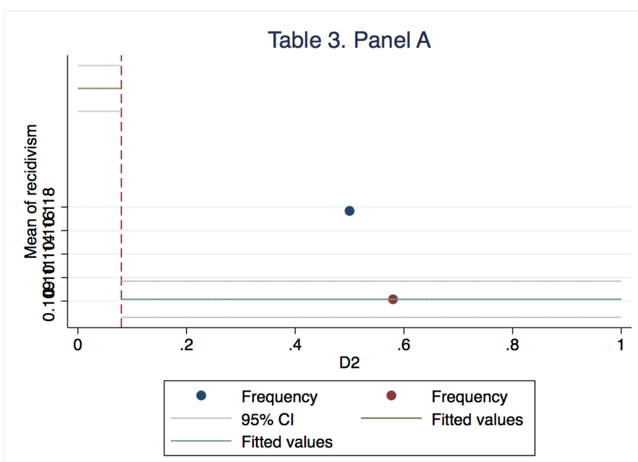
8. Recreate the top panel of Figure 3 according to the following rule: Fit linear fit using only observations with less than 0.15 bac on the bac1 Fit quadratic fit using only observations with less than 0.15 bac on the bac1

```
. generate D2= 0

. replace D2 = 1 if bac1<0.15
(124,642 real changes made)

. quietly cmogram recidivism D2, cut(0.08) title(Table 3. Panel
> eat(.08)

. graph export Table3.png , replace
(file /Users/treasureramirez/Desktop/Table3.png written in PNG :
```



Linear Fit Accident

```
. quietly cmogram recidivism D2, cut(0.08) title(Table 3. Panel
> eat(.08)

.     graph export Table3.png , replace
(file /Users/treasureramirez/Desktop/Table3.png written in PNG :
```



Quadratic Fit Accident

9. Discuss what you learned from this exercise. What was the hypothesis you tested and what did you find? How confident are you in Hansen's original conclusion? Why/why not. This assignment was very challenging for me. Al-

though i’ve worked on several research projects, i’ve never personally worked with code. This all seems pretty abstract to me still but I know it’ll come easier with practice. The hypothesis I was testing was looking at whether or not there were causal effects of harsher punishments and sanctions on DUIs. I’m pretty confident in Hansen’s conclusion given our results from the density/balance tests.