```
      name:  <unnamed>
       log:  C:\Users\XuQi\Documents\第九章.smcl
  log type:  smcl
 opened on:  15 Jul 2024, 10:15:54
```

```
. do "C:\Users\XuQi\Desktop\第9章.do", nostop

. ****精确断点
. use "C:\Users\XuQi\Desktop\rdrobust_senate.dta", clear

.
. *图形分析
. rdplot vote margin
```

RD Plot with evenly spaced mimicking variance number of bins using spacings estimators.

Cutoff c = 0	Left of **c**	Right of **c**
Number of obs	595	702
Eff. Number of obs	595	702
Order poly. fit (p)	4	4
BW poly. fit (h)	100.000	100.000
Number of bins scale	1.000	1.000

Number of obs   =   **1297**
Kernel   =   **Uniform**

Outcome: vote. Running variable: margin.

	Left of **c**	Right of **c**
Bins selected	15	35
Average bin length	6.667	2.857
Median bin length	6.667	2.857
IMSE-optimal bins	8	9
Mimicking Var. bins	15	35
Rel. to IMSE-optimal:		
Implied scale	1.875	3.889
WIMSE var. weight	0.132	0.017
WIMSE bias weight	0.868	0.983

```
.
. *计算最优带宽
. rdbwselect vote margin, all
```

Bandwidth estimators for sharp RD local polynomial regression.

Cutoff c =	Left of **c**	Right of **c**
Number of obs	595	702
Min of margin	-100.000	0.036
Max of margin	-0.079	100.000
Order est. (p)	1	1
Order bias (q)	2	2

Number of obs =   **1297**
Kernel   = **Triangular**
VCE method   =   **NN**

Outcome: vote. Running variable: margin.

| | BW est. (h) | | BW bias (b) | |
Method	Left of **c**	Right of **c**	Left of **c**	Right of **c**
mserd	17.754	17.754	28.028	28.028
msetwo	16.170	18.126	27.104	29.344
msesum	18.365	18.365	31.319	31.319
msecomb1	17.754	17.754	28.028	28.028
msecomb2	17.754	18.126	28.028	29.344
cerrd	12.407	12.407	28.028	28.028
certwo	11.299	12.667	27.104	29.344
cersum	12.834	12.834	31.319	31.319
cercomb1	12.407	12.407	28.028	28.028
cercomb2	12.407	12.667	28.028	29.344

.
. *参数估计和统计推断
. rdrobust vote margin

Sharp RD estimates using local polynomial regression.

Cutoff c = 0	Left of **c**	Right of **c**			
Number of obs	595	702	Number of obs =		**1297**
Eff. Number of obs	360	323	BW type	=	**mserd**
Order est. (p)	1	1	Kernel	=	**Triangular**
Order bias (q)	2	2	VCE method	=	**NN**
BW est. (h)	17.754	17.754			
BW bias (b)	28.028	28.028			
rho (h/b)	0.633	0.633			

Outcome: vote. Running variable: margin.

Method	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Conventional	7.4141	1.4587	5.0826	0.000	4.5551	10.2732
Robust	-	-	4.3110	0.000	4.0937	10.9193

.
. *稳健性检验
. rdrobust vote margin, bwselect(cerrd)   //改变最优带宽的计算方法

Sharp RD estimates using local polynomial regression.

Cutoff c = 0	Left of **c**	Right of **c**			
Number of obs	595	702	Number of obs =		**1297**
Eff. Number of obs	284	248	BW type	=	**cerrd**
Order est. (p)	1	1	Kernel	=	**Triangular**
Order bias (q)	2	2	VCE method	=	**NN**
BW est. (h)	12.407	12.407			
BW bias (b)	28.028	28.028			
rho (h/b)	0.443	0.443			

Outcome: vote. Running variable: margin.

Method	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Conventional	7.6316	1.6801	4.5424	0.000	4.3387	10.9244
Robust	-	-	4.1735	0.000	4.07422	11.2892

. rdrobust vote margin, kernel(uniform)   //使用矩形核

Sharp RD estimates using local polynomial regression.

Cutoff c = 0	Left of **c**	Right of **c**			
Number of obs	595	702	Number of obs =		**1297**
Eff. Number of obs	271	235	BW type	=	**mserd**
Order est. (p)	1	1	Kernel	=	**Uniform**
Order bias (q)	2	2	VCE method	=	**NN**
BW est. (h)	11.597	11.597			
BW bias (b)	22.944	22.944			
rho (h/b)	0.505	0.505			

Outcome: vote. Running variable: margin.

Method	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Conventional	7.2025	1.6129	4.4656	0.000	4.04127	10.3637
Robust	-	-	4.0999	0.000	3.96341	11.2235

```
.
. *矩形核条件下通过regress命令再现rdrobust的结果
. gen d=1 if margin>=0 & margin<.
(640 missing values generated)

. replace d=0 if margin<0
(640 real changes made)

.
. reg vote c.margin##d if margin<=11.597 & margin>=-11.597
```

Source	SS	df	MS			
Model	12291.5156	3	4097.17187			
Residual	44599.4682	502	88.8435621			
Total	56890.9838	505	112.655413			

	Number of obs	=	506
	F(3, 502)	=	46.12
	Prob > F	=	0.0000
	R-squared	=	0.2161
	Adj R-squared	=	0.2114
	Root MSE	=	9.4257

vote	Coefficient	Std. err.	t	P>|t|	[95% conf. interval]	
margin	.239721	.1801027	1.33	0.184	-.114127	.593569
1.d	7.202475	1.63353	4.41	0.000	3.993076	10.41187
d#c.margin						
1	-.0122117	.2557008	-0.05	0.962	-.5145873	.4901639
_cons	45.59707	1.140196	39.99	0.000	43.35693	47.83722

```
.
. tab class, gen(class)
```

Senate class	Freq.	Percent	Cum.
1	455	32.73	32.73
2	448	32.23	64.96
3	487	35.04	100.00
Total	1,390	100.00	

```
. rdrobust vote margin, covs(class2 class3 termshouse termssenate population)   //纳入协变量
```

Covariate-adjusted Sharp RD estimates using local polynomial regression.

Cutoff c = 0	Left of **c**	Right of **c**
Number of obs	491	617
Eff. Number of obs	314	283
Order est. (p)	1	1
Order bias (q)	2	2
BW est. (h)	18.016	18.016
BW bias (b)	28.999	28.999
rho (h/b)	0.621	0.621

Number of obs =	1108
BW type =	mserd
Kernel =	Triangular
VCE method =	NN

Outcome: vote. Running variable: margin.

Method	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Conventional	6.8812	1.4072	4.8901	0.000	4.12322	9.63924
Robust	-	-	4.2193	0.000	3.75923	10.2815

Covariate-adjusted estimates. Additional covariates included: 5

```
.
```

. rdrobust termshouse margin   //检验协变量在断点处是否连续

Sharp RD estimates using local polynomial regression.

Cutoff c = 0	Left of **c**	Right of **c**			
Number of obs	491	617	Number of obs =		1108
			BW type =		mserd
Eff. Number of obs	282	257	Kernel =		Triangular
Order est. (p)	1	1	VCE method =		NN
Order bias (q)	2	2			
BW est. (h)	15.657	15.657			
BW bias (b)	25.431	25.431			
rho (h/b)	0.616	0.616			

Outcome: termshouse. Running variable: margin.

Method	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Conventional	-.17257	.42515	-0.4059	0.685	-1.00585	.660715
Robust	-	-	-0.5809	0.561	-1.26941	.689003

. rdrobust vote margin, c(25)   //伪断点检验
Mass points detected in the running variable.

Sharp RD estimates using local polynomial regression.

Cutoff c = 25	Left of **c**	Right of **c**			
Number of obs	1000	297	Number of obs =		1297
			BW type =		mserd
Eff. Number of obs	251	135	Kernel =		Triangular
Order est. (p)	1	1	VCE method =		NN
Order bias (q)	2	2			
BW est. (h)	17.640	17.640			
BW bias (b)	33.326	33.326			
rho (h/b)	0.529	0.529			
Unique obs	1000	260			

Outcome: vote. Running variable: margin.

Method	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Conventional	-.56145	2.1831	-0.2572	0.797	-4.84023	3.71733
Robust	-	-	0.0875	0.930	-4.57207	4.99919

Estimates adjusted for mass points in the running variable.

. rddensity margin //检验配置变量是否连续
Computing data-driven bandwidth selectors.

Point estimates and standard errors have been adjusted for repeated observations.
(Use option *nomasspoints* to suppress this adjustment.)

RD Manipulation test using local polynomial density estimation.

c = 0.000	Left of c	Right of c			
Number of obs	640	750	Number of obs =		1390
			Model =		unrestricted
Eff. Number of obs	408	460	BW method =		comb
Order est. (p)	2	2	Kernel =		triangular
Order bias (q)	3	3	VCE method =		jackknife
BW est. (h)	19.841	27.119			

Running variable: margin.

Method	T	P>|T|
Robust	-0.8753	0.3814

P-values of binomial tests. (H0: prob = .5)

Window Length / 2	<c	>=c	P>|T|
0.430	8	12	0.5034
0.861	17	25	0.2800
1.291	25	34	0.2976
1.722	45	47	0.9170
2.152	51	55	0.7709
2.583	66	65	1.0000
3.013	79	71	0.5678
3.444	94	86	0.6020
3.874	105	94	0.4785
4.305	115	107	0.6386

```
.
.
. *多项式回归法
. gen margin2=margin^2

. gen margin3=margin^3

. gen margin4=margin^4

.
. qui reg vote c.margin##d if margin<=50 & margin>=-50

. est store m1

.
. qui reg vote (c.margin c.margin2)##d if margin<=50 & margin>=-50

. est store m2

.
. qui reg vote (c.margin c.margin2 c.margin3)##d if margin<=50 & margin>=-50

. est store m3

.
. qui reg vote (c.margin c.margin2 c.margin3 c.margin4)##d if margin<=50 & margin>=-50

. est store m4

.
. esttab m1 m2 m3 m4, aic bic keep(1.d)
```

	(1) vote	(2) vote	(3) vote	(4) vote
1.d	5.729***	7.703***	8.189***	6.999**
	(5.37)	(5.15)	(4.21)	(2.91)
N	1127	1127	1127	1127
AIC	8576.9	8576.8	8578.3	8581.6
BIC	8597.1	8607.0	8618.6	8631.8

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

```
.
. rdrobust vote margin, h(50) p(2) kernel(uniform)    //通过rdrobust实现多项式回归法
```

Sharp RD estimates using local polynomial regression.

Cutoff c = 0	Left of c	Right of c		Number of obs =	1297
				BW type =	Manual
Number of obs	595	702		Kernel =	Uniform
Eff. Number of obs	565	562		VCE method =	NN
Order est. (p)	2	2			
Order bias (q)	3	3			
BW est. (h)	50.000	50.000			
BW bias (b)	50.000	50.000			
rho (h/b)	1.000	1.000			

Outcome: vote. Running variable: margin.

Method	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Conventional	7.7031	1.3703	5.6215	0.000	5.01738	10.3889
Robust	-	-	4.6771	0.000	4.75704	11.62

.
. ****模糊断点
. use "C:\Users\XuQi\Desktop\retirement.dta", clear

.
. *图形分析
. rdplot retire age, c(60)
Mass points detected in the running variable.

RD Plot with evenly spaced mimicking variance number of bins using polynomial regression.

Cutoff c = 60	Left of **c**	Right of **c**		Number of obs	=	31641
				Kernel	=	**Uniform**
Number of obs	17009	14632				
Eff. Number of obs	17009	14632				
Order poly. fit (p)	4	4				
BW poly. fit (h)	5.000	5.000				
Number of bins scale	1.000	1.000				

Outcome: retire. Running variable: age.

	Left of **c**	Right of **c**
Bins selected	308	323
Average bin length	0.016	0.015
Median bin length	0.016	0.015
IMSE-optimal bins	12	11
Mimicking Var. bins	308	323
Rel. to IMSE-optimal:		
Implied scale	25.667	29.364
WIMSE var. weight	0.000	0.000
WIMSE bias weight	1.000	1.000

. rdplot health age, c(60)
Mass points detected in the running variable.

RD Plot with evenly spaced mimicking variance number of bins using polynomial regression.

Cutoff c = 60	Left of **c**	Right of **c**		Number of obs	=	31641
				Kernel	=	**Uniform**
Number of obs	17009	14632				
Eff. Number of obs	17009	14632				
Order poly. fit (p)	4	4				
BW poly. fit (h)	5.000	5.000				
Number of bins scale	1.000	1.000				

Outcome: health. Running variable: age.

	Left of **c**	Right of **c**
Bins selected	290	321
Average bin length	0.017	0.016
Median bin length	0.017	0.016
IMSE-optimal bins	5	4
Mimicking Var. bins	290	321
Rel. to IMSE-optimal:		
Implied scale	58.000	80.250
WIMSE var. weight	0.000	0.000
WIMSE bias weight	1.000	1.000

.
. *计算最优带宽
. rdbwselect health age, all c(60) fuzzy(retire)
Mass points detected in the running variable.

Bandwidth estimators for fuzzy RD local polynomial regression.

Cutoff c =	Left of **c**	Right of **c**		
			Number of obs =	31641
			Kernel =	Triangular
Number of obs	17009	14632	VCE method =	NN
Min of age	55.000	60.000		
Max of age	59.917	65.000		
Order est. (p)	1	1		
Order bias (q)	2	2		
Unique obs	60	61		

Outcome: health. Running variable: age. Treatment Status: retire.

	BW est. (h)		BW bias (b)	
Method	Left of **c**	Right of **c**	Left of **c**	Right of **c**
mserd	1.589	1.589	3.092	3.092
msetwo	1.613	1.441	2.521	2.464
msesum	1.438	1.438	2.279	2.279
msecomb1	1.438	1.438	2.279	2.279
msecomb2	1.589	1.441	2.521	2.464
cerrd	0.947	0.947	3.092	3.092
certwo	0.961	0.858	2.521	2.464
cersum	0.856	0.856	2.279	2.279
cercomb1	0.856	0.856	2.279	2.279
cercomb2	0.947	0.858	2.521	2.464

Estimates adjusted for mass points in the running variable.

.
. *参数估计和统计推断
. rdrobust health age, c(60) fuzzy(retire)
Mass points detected in the running variable.

Fuzzy RD estimates using local polynomial regression.

Cutoff c = 60	Left of **c**	Right of **c**		
			Number of obs =	31641
			BW type =	mserd
Number of obs	17009	14632	Kernel =	Triangular
Eff. Number of obs	4696	5116	VCE method =	NN
Order est. (p)	1	1		
Order bias (q)	2	2		
BW est. (h)	1.589	1.589		
BW bias (b)	3.092	3.092		
rho (h/b)	0.514	0.514		
Unique obs	60	61		

First-stage estimates. Outcome: retire. Running variable: age.

Method	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Conventional	.08847	.02108	4.1971	0.000	.047155	.129779
Robust	-	-	3.3356	0.001	.032345	.124509

Treatment effect estimates. Outcome: health. Running variable: age. Treatment Status: retire.

Method	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Conventional	-.32084	.16117	-1.9906	0.047	-.63673	-.004941
Robust	-	-	-1.9458	0.052	-.699906	.002536

Estimates adjusted for mass points in the running variable.

```
. 
. *换用矩形核
. rdrobust health age, c(60) fuzzy(retire) kernel(uniform)
Mass points detected in the running variable.

Fuzzy RD estimates using local polynomial regression.

      Cutoff c = 60 │ Left of c   Right of c          Number of obs =      31641
─────────────────────┼────────────────────────        BW type       =      mserd
      Number of obs   │    17009        14632          Kernel        =    Uniform
 Eff. Number of obs   │     3785         4243          VCE method     =         NN
      Order est. (p)  │        1            1
      Order bias (q)  │        2            2
        BW est. (h)   │    1.252        1.252
        BW bias (b)   │    2.969        2.969
         rho (h/b)    │    0.422        0.422
        Unique obs    │       60           61

First-stage estimates. Outcome: retire. Running variable: age.

        Method │    Coef.    Std. Err.      z      P>|z|    [95% Conf. Interval]
───────────────┼────────────────────────────────────────────────────────────────
  Conventional │   .08996     .02108     4.2681    0.000    .048647      .131266
        Robust │        -          -     3.4258    0.001    .033683      .123756


Treatment effect estimates. Outcome: health. Running variable: age. Treatment Status: retire.

        Method │    Coef.    Std. Err.      z      P>|z|    [95% Conf. Interval]
───────────────┼────────────────────────────────────────────────────────────────
  Conventional │  -.29349     .15762    -1.8619    0.063   -.602423      .015451
        Robust │        -          -    -1.8177    0.069   -.647953      .024406

Estimates adjusted for mass points in the running variable.


. 
. *矩形核条件下通过ivregress命令再现rdrobust的结果
. gen z=1 if age>=60 & age<.
(17,009 missing values generated)

. replace z=0 if age<60
(17,009 real changes made)


. 
. replace age=age-60      //配置变量对中
(31,641 real changes made)


. 
. ivregress 2sls health (retire=z) age c.age#z if age>=-1.252 & age<=1.252

Instrumental variables 2SLS regression         Number of obs    =      8,028
                                                Wald chi2(3)     =      31.59
                                                Prob > chi2      =     0.0000
                                                R-squared        =          .
                                                Root MSE         =    .31553


        health │ Coefficient  Std. err.      z      P>|z|    [95% conf. interval]
───────────────┼────────────────────────────────────────────────────────────────
        retire │  -.2934861   .1593392    -1.84    0.065   -.6057853    .0188131
           age │   .0119949   .0239413     0.50    0.616   -.0349293    .0589191
               │
        z#c.age │
             1 │   .0082678   .0184432     0.45    0.654   -.0278803    .0444159
               │
         _cons │   1.100541   .1106045     9.95    0.000    .8837602    1.317322

Endogenous: retire
Exogenous:  age 1.z#c.age z
```

```
.
. *多项式回归
. gen age2=age^2

. gen age3=age^3

. gen age4=age^4

.
. qui reg health c.age##z if age<=3 & age>=-3

. est store m1

.
. qui reg health (c.age c.age2)##z if age<=3 & age>=-3

. est store m2

.
. qui reg health (c.age c.age2 c.age3)##z if age<=3 & age>=-3

. est store m3

.
. qui reg health (c.age c.age2 c.age3 c.age4)##z if age<=3 & age>=-3

. est store m4

.
. esttab m1 m2 m3 m4, aic bic keep(1.z)
```

	(1) health	(2) health	(3) health	(4) health
1.z	-0.0328***	-0.0258*	-0.0284	-0.0401
	(-3.77)	(-1.97)	(-1.62)	(-1.80)
N	18405	18405	18405	18405
AIC	7330.6	7333.1	7336.8	7339.9
BIC	7361.9	7380.0	7399.3	7418.1

t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

```
.
. ivregress 2sls health (retire=z) age c.age#z if age<=3 & age>=-3
```

Instrumental variables 2SLS regression

Number of obs =	18,405
Wald chi2(3) =	127.49
Prob > chi2 =	0.0000
R-squared =	.
Root MSE =	.30355

health	Coefficient	Std. err.	z	P>|z|	[95% conf. interval]
retire	-.2343489	.0639179	-3.67	0.000	-.3596257 -.1090722
age	.0051383	.0065482	0.78	0.433	-.0076959 .0179725
z#c.age					
1	.0033769	.0051373	0.66	0.511	-.006692 .0134458
_cons	1.05926	.0446121	23.74	0.000	.9718218 1.146698

Endogenous: **retire**
Exogenous: **age 1.z#c.age z**

```
.
end of do-file

. log close
      name:  <unnamed>
       log:  C:\Users\XuQi\Documents\第九章.smcl
  log type:  smcl
 closed on:  15 Jul 2024, 10:16:48
```