Lab2: Data Management

Introduction to Econometrics,Fall 2020

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Section 1

Preparation

Preparation

- Change your own path.

```
global root "D:\Teaching\Stata\lab2\"
cd ${root}
```

- Download data and slides to the current directory.

Section 2

Command

Command

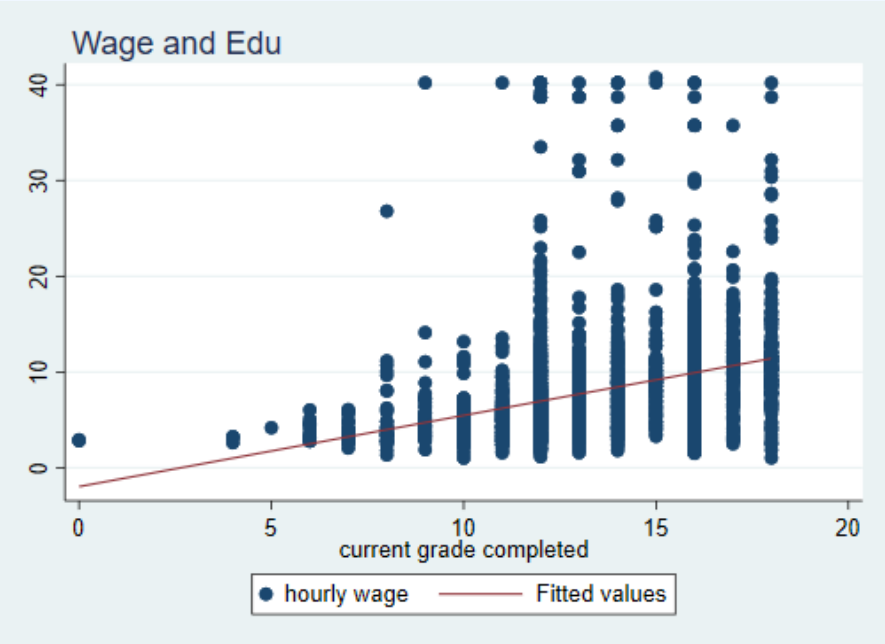
- 1.stata命令的通用格式
  - command varlist [if] [in] [, options]
    - ★ [if] [in] 用于限制样本范围
    - ★ [options] “可选项”，增加了命令的弹性
    - ★ “[ ]” 为可选项，可以不填

```
help sum   //帮助文件的解读

sysuse nlsw88, clear
sum wage hours ttl_exp if race==2, detail
```

Command

- 1.stata命令的通用格式
  - 整条命令“裸露”的逗号只能有一个，“,”前为命令主体，“,”后为选项
  - 选项中可能有子选项，但子选项前的逗号并未“裸露”

```
. twoway (scatter wage grade)                    ///
 (lfit wage grade),                              ///
  title("Wage and Edu", place(left))

. graph export Wage_Edu.png, width(500) replace
```



- 2.变量列举【varlist】

```
. sum age race married never_married grade
```

Variable	Obs	Mean	Std. Dev.	Min	Max
age	2,246	39.15316	3.060002	34	46
race	2,246	1.282725	.4754413	1	3
married	2,246	.6420303	.4795099	0	1
never_marr~d	2,246	.1041852	.3055687	0	1
grade	2,244	13.09893	2.521246	0	18

```
. sum age-grade
```

Variable	Obs	Mean	Std. Dev.	Min	Max
age	2,246	39.15316	3.060002	34	46
race	2,246	1.282725	.4754413	1	3
married	2,246	.6420303	.4795099	0	1
never_marr~d	2,246	.1041852	.3055687	0	1
grade	2,244	13.09893	2.521246	0	18

- 2.变量列举【varlist】
  - 通配符匹配规则【*】【?】

```
. sum s*      // "*"可以表示【任何长度】的字母或数字
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       south |      2,246    .4194123    .4935728         0          1
        smsa |      2,246    .7039181    .4566292         0          1

. sum ?a?e    // "?"只能替代【一个长度】的字母或数字
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        race |      2,246    1.282725    .4754413         1          3
        wage |      2,246    7.766949    5.755523   1.004952   40.74659
```

1.Command

- 3.样本范围的限制【if】【in】【by】

```
. sum in 10/20          // 第10至第20个观察值之间的观察值
```

Variable	Obs	Mean	Std. Dev.	Min	Max
idcode	11	21.09091	6.155559	14	36
age	11	40.09091	1.445998	37	42
race	11	1	0	1	1
married	11	.8181818	.4045199	0	1
never_marr~d	11	.0909091	.3015113	0	1
grade	11	14.63636	1.026911	12	16
collgrad	11	.3636364	.504525	0	1
south	11	0	0	0	0
smsa	11	.9090909	.3015113	0	1
c_city	11	.0909091	.3015113	0	1
industry	11	10.27273	1.678744	6	11
occupation	11	1.636364	1.433369	1	5
union	10	.3	.4830459	0	1
wage	11	9.731538	3.78571	4.180602	16.79548
hours	11	33.72727	13.72655	4	50
ttl_exp	11	14.35198	3.471585	7.384615	17.75
tenure	11	5.757576	3.630782	.9166667	13.83333

1.Command

- 3.样本范围的限制【if】【in】【by】

```
. sum wage in -5/-1    // 倒数第1至第5个
```

Variable	Obs	Mean	Std. Dev.	Min	Max
wage	5	6.654148	4.638684	2.447664	14.32367

```
. sum wage hours if race == 1            // 等于
```

Variable	Obs	Mean	Std. Dev.	Min	Max
wage	1,637	8.082999	5.955069	1.004952	40.19808
hours	1,635	36.90398	11.28842	1	80

```
. sum wage if race ~= 3                  // 不等于(the same as【!=】)
```

Variable	Obs	Mean	Std. Dev.	Min	Max
wage	2,220	7.757769	5.762044	1.004952	40.74659

```
. sum wage if hours >= 40                // 大于等于
```

Variable	Obs	Mean	Std. Dev.	Min	Max
wage	1,487	8.41767	6.281296	1.392914	40.19808

1.Command

- 3.样本范围的限制【if】【in】【by】

```
. bysort race:sum wage   //先对race进行排序，再分组进行描述
```

```
-> race = white
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |      1,637    8.082999    5.955069    1.004952   40.19808
```

```
-> race = black
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |        583    6.844558    5.076187    1.151368   40.74659
```

```
-> race = other
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |         26    8.550781     5.20943     1.80602   25.80515
```

- 3.样本范围的限制【if】【in】【by】

```
. sum wage if (race==2) & (married==1)   // 且
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |        274    6.968853    5.309318   1.344605   40.74659
. sum wage if (race==3)|(married==0)     // 或
    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
        wage |        822    8.092208    6.313993   1.151368   40.19808
```

- 4.命令作用的增减【, options】
  - 多数命令和选项都支持缩写，"_"的部分表示可缩写的程度。

Section 3

Data Management

Data Management

- 1.数学表达式
  - 关系运算符【==】【>】【<】【>=】【<=】【!=】【~=】
  - 逻辑运算符【& (and)】【| (or)】
  - 算术运算符【+ - * / ^】

```
. display 5^2
25

. dis 1-3*2+4/5-9^3
-733.2

. dis 2*_pi
6.2831853

. display cos(_pi)
-1
```

- 2.建立新变量-gen-

```
sysuse nlsw88.dta, clear

generate ttl_exp2 = ttl_exp^2 //生成工作经验二次项

gen ttl_exp3 = ttl_exp^2 if race==2
                        //仅生成黑人妇女的工作经验二次项

gen wwage = wage*hours          //生成周工资
```

- 2.建立新变量-gen-
  - 常用数学函数转换

```
gen ln_wage = ln(wage)                  // 取对数
gen sqrt_hours = sqrt(hours)            // 开根号
gen int_wage = int(wage)                // 取整
gen floor_wage = floor(wage)            // 等价于取整
gen ceil_wage = ceil(wage)              // 取整数上限
list *wage in 1/5
```

- 3.更改旧变量和观察值
  - 变量重命名-rename-

```
rename grade edu_level //rename【旧变量名】【新变量名】
```

- 3.更改旧变量和观察值
  - 修改观察值-replace-

```
replace hours = 40 if (hours > 40)
                   //假如法定工作周时间不超过40小时


sysuse auto, clear
list make in 50/59
replace make="宝马 320i" if (make=="BMW 320i")
                   //文字变量观察值的修改要加【""】
list make in 50/59
```

Data Management

- 4.An Example

```
. sysuse nlsw88.dta, clear
(NLSW, 1988 extract)
. list married if never_married==1

. *生成新变量married2, 并赋值
. gen  married2 = 0 if never_married==1       //未婚
(2,012 missing values generated)
. replace married2 = 1 if married==1          //在婚
(1,442 real changes made)
. replace married2 = 2 if (married==0) & (never_married==0)
                                              //离婚
(570 real changes made)


. label var married2 "婚姻状况2"                  //生成变量标签


. label define marr 0 "未婚" 1 "在婚" 2 "离婚" //生成值标签
. label value married2 marr
```

- 4.An Example

```
. tab married2,m                                          //列表统计
    婚姻状 |
      况2 |      Freq.     Percent        Cum.
----------+-----------------------------------
      未婚 |        234       10.42       10.42
      在婚 |      1,442       64.20       74.62
      离婚 |        570       25.38      100.00
----------+-----------------------------------
     Total |      2,246      100.00
```

Data Management

- 5.变量与样本的保存、删除
  - 变量与样本的保存-keep-

```
sysuse nlsw88.dta, clear

keep wage race ttl_exp    //只保留这三个变量数据
keep in 1/5
```

  - 变量与样本的删除-drop-

```
drop if race==2
drop wage-ttl_exp
drop _all                          //删除内存中的所有变量

drop wage          //由于已经不存在任何变量，所以报错
capture drop wage              //加capture，不会报错
```

- 5.变量与样本的保存、删除
  - Expansions—【capture的作用】
    - ★ 不显示结果（类似于qui）；
    - ★ 将错误代码返回给_rc(系统标量)，若该命令未出错，则_rc值为0，程序会跳出capture段，执行后续命令；
    - ★ 如果既想显示结果，又想不让程序因错误而终止并返回错误值，则使用capture noisely +cmd。
    - ★ 同样适用于其它命令。

- 6.变量的移动、克隆
  - 变量的移动-order-

```
sysuse nlsw88.dta, clear

order wage race ttl_exp
order _all,alpha                    //按字母排序
```

  - 变量的克隆-clonevar-

```
clonevar race2=race
 //把已有变量的标签，数字-文字对应表等都复制过去
gen race3=race
```

- 7.样本的排序-sort-

```
sort wage                          // 默认为升序排列
list wage in 1/10
dis "max = " wage[_N]

gen nag_wage = -wage
sort nag_wage                      // 降序排列

gsort -wage                        // 降序排列
list wage in 1/10
```

Section 4

More About Creating Variables

More About Creating Variables

- 1._n和_N
  - _n是一个变量：1,2,3,...
  - _N是一个单值：样本数

```
sysuse nlsw88.dta, clear
list _n                          // 错误
gen id_n = _n

dis _N                           //单值
gen id_N = _N
```

More About Creating Variables

- 1._n和_N
  - 应用

```
sort wage
gen wage_diff = wage[_N] - wage[1] //range

bysort race: gen gid = _n          //分组
```

More About Creating Variables

- 2.生成虚拟变量
  - 常规操作

```
sysuse nlsw88.dta, clear

gen dum_race2=0
replace dum_race2=1 if race==2
gen dum_race3 = 0
replace dum_race3=1 if race==3
```

More About Creating Variables

- 2.生成虚拟变量
  - -tab-命令

```
sysuse nlsw88.dta, clear
tab race, gen(dum_r)
```

More About Creating Variables

- 2.生成虚拟变量
  - 利用条件生成0-1虚拟变量的函数(可自行学习)
    - ★ cond()
    - ★ inlist()
    - ★ inrange()
    - ★ clip()
    - ★ e.g.inrange(x, a,b)
      1 if a<= x <= b;
      0 otherwise.

More About Creating Variables

- 3.将连续变量转为类别变量
  - 等分样本group（）

```
. sysuse nlsw88.dta, clear
(NLSW, 1988 extract)
. sort wage                          //必须先排序
. gen g_wage = group(5)              //等分为5组
. tab g_wage
```

g_wage	Freq.	Percent	Cum.
1	450	20.04	20.04
2	449	19.99	40.03
3	449	19.99	60.02
4	449	19.99	80.01
5	449	19.99	100.00
Total	2,246	100.00	

More About Creating Variables

- 3.将连续变量转为类别变量
  - 等分样本group（）

```
. tabstat wage, stat(N mean med min max) by(g_wage) f(%4.2f)
Summary for variables: wage
     by categories of: g_wage
```

g_wage	N	mean	p50	min	max
1	450.00	3.12	3.22	1.00	4.03
2	449.00	4.68	4.69	4.03	5.43
3	449.00	6.32	6.27	5.43	7.31
4	449.00	8.73	8.67	7.32	10.27
5	449.00	16.00	12.78	10.32	40.75
Total	2246.00	7.77	6.27	1.00	40.75

More About Creating Variables

- 3.将连续变量转为类别变量
  - 指定区间-recode-

```
sum age

*左开右闭
recode age (min/39 = 1) (39/42 = 2) (42/max = 3),  ///
gen(g_age)

*自行查看结果
list age g_age in 1/50, sepby(g_age)
```

More about creating Variables

- 4.交叉类别变量的生成-xgroup-

```
. tab race
```

race	Freq.	Percent	Cum.
white	1,637	72.89	72.89
black	583	25.96	98.84
other	26	1.16	100.00
Total	2,246	100.00	

```
. tab married
```

married	Freq.	Percent	Cum.
single	804	35.80	35.80
married	1,442	64.20	100.00
Total	2,246	100.00	

More about creating Variables

- 4.交叉类别变量的生成-xgroup-

```
. ssc install xgroup
checking xgroup consistency and verifying not already installed...
all files already exist and are up to date.
. xgroup race married, gen(race_marr2) label lname(race_marr_lab)
.                    //生成一个新的类别变量，取值为1-6，是race和married的组合
. labelbook race_marr_lab
```

```
value label race_marr_lab
```

```
      values                                  labels
       range:  [1,6]                  string length:  [12,13]
           N:  6                    unique at full length:  yes
        gaps:  no                     unique at length 12:  yes
  missing .*:  0                             null string:  no
                                  leading/trailing blanks:  no
                                       numeric -> numeric:  no

  definition
           1   white single
           2   white married
           3   black single
           4   black married
           5   other single
           6   other married
   variables:  race_marr2
```

More About Creating Variables

- 5.-egen-命令
  - 与-gen-的区别
    - ★ sum()函数

```
. sysuse nlsw88.dta, clear
(NLSW, 1988 extract)
. sort wage
. gen sum_wage1 = sum(wage)          // 累加
. egen sum_wage2 = sum(wage)         // 总体加总
```

More About Creating Variables

- 5.-egen-命令
  - 与-gen-的区别
    - ★ sum()函数

```
. list wage sum_wage1 sum_wage2 in 1/10
```

	wage	sum_wa~1	sum_wa~2
1.	1.004952	1.004952	17444.57
2.	1.032247	2.037199	17444.57
3.	1.151368	3.188567	17444.57
4.	1.344605	4.533172	17444.57
5.	1.392914	5.926086	17444.57
6.	1.501798	7.427885	17444.57
7.	1.545893	8.973778	17444.57
8.	1.561996	10.53577	17444.57
9.	1.571983	12.10776	17444.57
10.	1.59261	13.70037	17444.57

More About Creating Variables

- 5.-egen-命令
  - 与-gen-的区别
    - ★ 对缺漏值的处理

```
. clear
. input v1 v2
        v1 v2
         1  5
         2  .
         .  3
         2  4
         4  .
         .  6
    end
. gen mean = (v1+v2)/2
(4 missing values generated)
. egen mean_egen = rmean(v1 v2)
```

More About Creating Variables

- 5.-egen-命令
  - 与-gen-的区别
    - ★ 对缺漏值的处理

```
. list
```

	v1	v2	mean	mean_e~n
1.	1	5	3	3
2.	2	.	.	2
3.	.	3	.	3
4.	2	4	3	3
5.	4	.	.	4
6.	.	6	.	6

More About Creating Variables

- 5.-egen-命令
  - 丰富的特有函数功能

```
help egen       //extended generate

sysuse nlsw88.dta, clear
egen x1 = seq(), from(-1)    //等差数列
egen r2 = fill(2 4)          //间隔2的递增数列
egen avg_w_r = mean(wage), by(race)    //组内均值
egen med_w = median(wage), by(race)    //组内中位数
egen std=sd(wage)
egen max=max(wage)
egen min=min(wage)
```

More About Creating Variables

- 5.-egen-命令
  - 丰富的特有函数功能

```
egen sum=sum(wage)
 //得到wage的列总和
egen per=pc(wage),prop
 //wage中每个观测值的值占列总和的比例
egen per_1=pc(wage)
 //wage中每个观测值的值占列总和的百分数
egen pct=pctile(wage),p(25)
 //生成wage第25百分位上的值

... ...
```

Section 5

Grouping Statistics

Grouping Statistics

- 1.单维分组-bysort-

```
. sysuse nlsw88.dta,clear
(NLSW, 1988 extract)
. bysort race: sum wage
```

-> race = white

Variable	Obs	Mean	Std. Dev.	Min	Max
wage	1,637	8.082999	5.955069	1.004952	40.19808

-> race = black

Variable	Obs	Mean	Std. Dev.	Min	Max
wage	583	6.844558	5.076187	1.151368	40.74659

-> race = other

Variable	Obs	Mean	Std. Dev.	Min	Max
wage	26	8.550781	5.20943	1.80602	25.80515

Grouping Statistics

- 1.单维分组-tabstat-

```
. tabstat wage hours ttl_exp, by(race)   ///
> stat(n mean sd med min max)            ///
> format(%6.2f) columns(statistics)
Summary for variables: wage hours ttl_exp
     by categories of: race (race)
```

race	N	mean	sd	p50	min	max
white	1637.00	8.08	5.96	6.55	1.00	40.20
	1635.00	36.90	11.29	40.00	1.00	80.00
	1637.00	12.47	4.62	12.91	0.12	28.88
black	583.00	6.84	5.08	5.43	1.15	40.75
	581.00	38.12	7.79	40.00	3.00	70.00
	583.00	12.72	4.54	13.60	0.40	26.54
other	26.00	8.55	5.21	7.56	1.81	25.81
	26.00	36.81	11.80	40.00	10.00	60.00
	26.00	12.60	5.61	13.70	2.48	21.22
Total	2246.00	7.77	5.76	6.27	1.00	40.75
	2242.00	37.22	10.51	40.00	1.00	80.00
	2246.00	12.53	4.61	13.13	0.12	28.88

Grouping Statistics

- 1.单维分组-tabulate-

```
. tabulate race, sum(wage)
```

race	Summary of hourly wage Mean	Std. Dev.	Freq.
white	8.0829994	5.9550691	1,637
black	6.8445578	5.0761866	583
other	8.5507813	5.2094301	26
Total	7.766949	5.7555229	2,246

Grouping Statistics

- 2.二维、三维分组

```
bysort race married: sum wage

bysort race married: tabstat wage,by(union)    ///
                     s(n mean sd p50 min max)

bysort race married: tab union, sum(wage)
```

Grouping Statistics

- 3.多维分组

```
. table race married union, by(collgrad) c(mean wage freq) format(%4.2f)
```

college graduate and race	union worker and married			
	nonunion		union	
	single	married	single	married
not college grad				
white	7.10	6.62	8.23	7.56
	215.00	577.00	63.00	131.00
black	5.34	5.32	7.95	7.90
	143.00	155.00	66.00	48.00
other	7.25	6.74	5.29	8.49
	3.00	8.00	2.00	3.00
college grad				
white	10.74	9.85	11.70	9.89
	80.00	179.00	34.00	74.00
black	10.10	8.81	10.78	10.68
	32.00	20.00	16.00	21.00
other	15.15	15.16		7.92
	2.00	3.00		3.00

Grouping Statistics

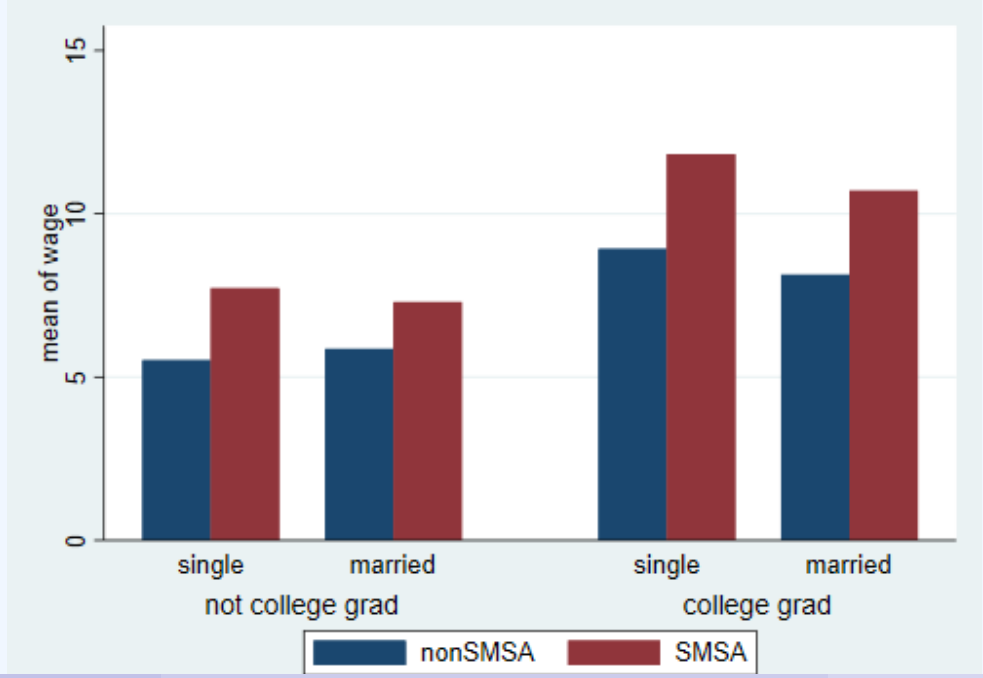
- 4.转换数据为分组统计量-collapse-

```
help collapse

sysuse nlsw88.dta,clear
collapse (mean) wage hours    ///
(count) n_w=wage n_h=hours,   ///
by(industry)
```

Grouping Statistics

- 5.Some Statistical Graphs
  - 柱状图

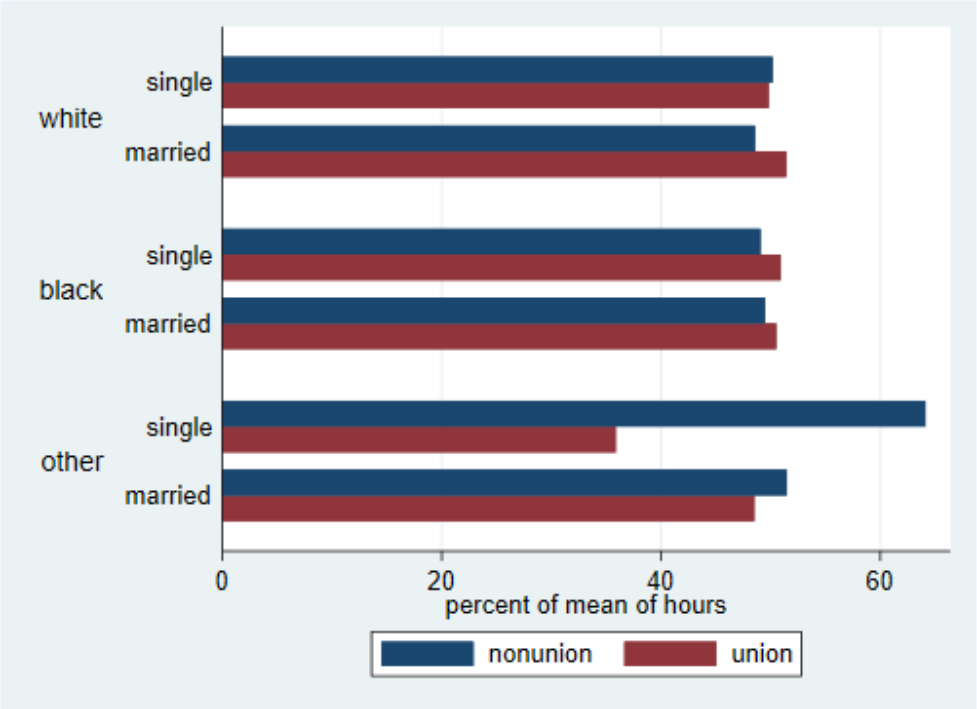
```
. sysuse nlsw88.dta, clear
(NLSW, 1988 extract)
. graph bar (mean) wage, over(smsa) over(married) over(collgrad)


. graph export bar1.png,width(500) replace
(file bar1.png written in PNG format)
```



Grouping Statistics

- 5.Some Statistical Graphs
  - 柱状图

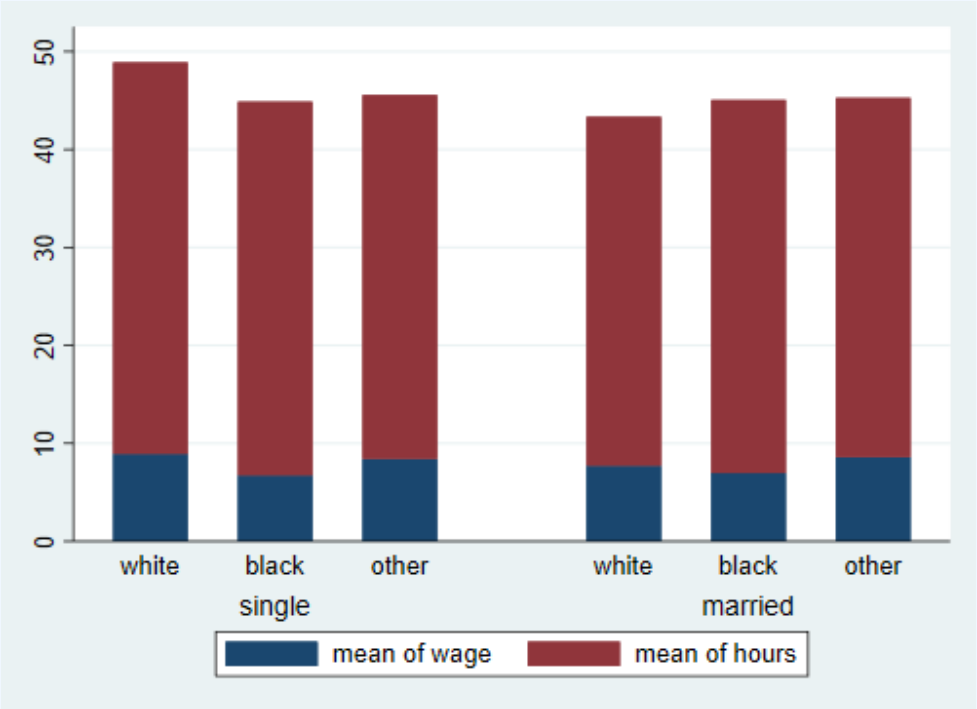
```
. graph hbar (mean) hours, over(union) over(married) ///
>           over(race) percent asyvars


. graph export bar2.png,width(500) replace
(file bar2.png written in PNG format)
```



Grouping Statistics

- 5.Some Statistical Graphs
  - 柱状图

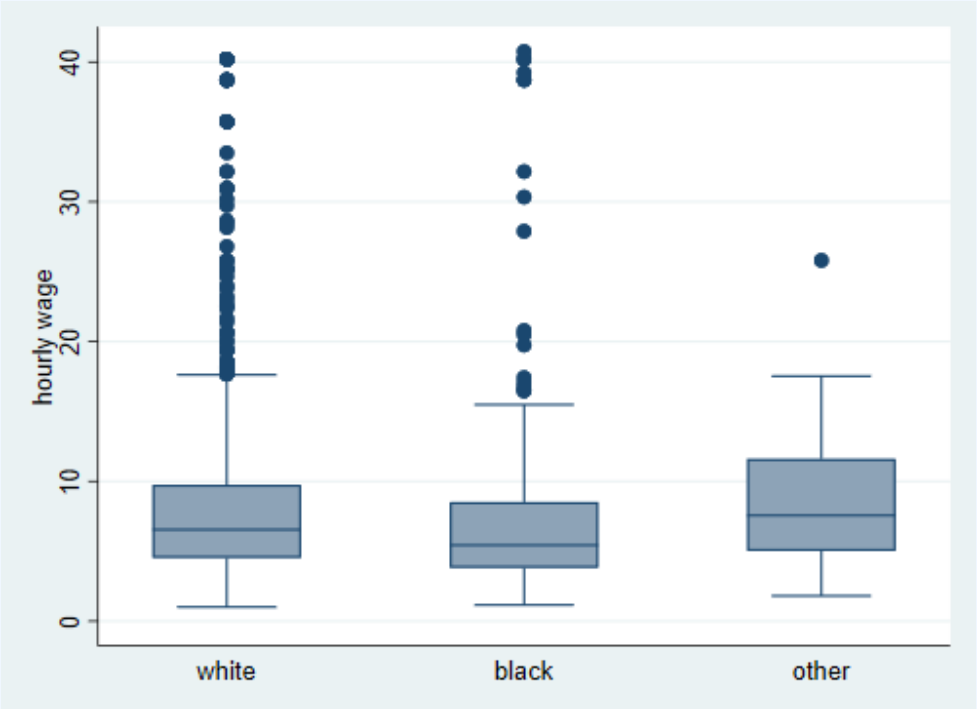
```
. graph bar wage hours, over(race) over(married) stack


. graph export bar3.png,width(500) replace
(file bar3.png written in PNG format)
```



Grouping Statistics

- 5.Some Statistical Graphs
  - 箱形图

```
. graph box wage, over(race)


. graph export box1.png,width(500) replace
(file box1.png written in PNG format)
```



Section 6

Duplicate Observations

Duplicate Observations

- 1.检查重复的样本

```
. sysuse nlsw88.dta, clear
(NLSW, 1988 extract)
```

- -isid-命令

```
cap isid race age
isid idcode
```

Duplicate Observations

- 1.检查重复的样本
  - -duplicates list-命令

```
. duplicates list race married in 1/20
Duplicates in terms of race married
```

group:	obs:	race	married
1	7	white	single
1	14	white	single
1	20	white	single
2	4	white	married
2	5	white	married
2	6	white	married
2	8	white	married
2	9	white	married
2	10	white	married
2	11	white	married

Duplicate Observations

- 1.检查重复的样本
  - -duplicates list-命令

2	12	white	married
2	13	white	married
2	15	white	married
2	16	white	married
2	17	white	married
2	18	white	married
2	19	white	married
3	1	black	single
3	2	black	single
3	3	black	single

Duplicate Observations

- 1.检查重复的样本
  - -duplicates report-命令

```
. duplicates report race married occupation
Duplicates in terms of race married occupation
```

copies	observations	surplus
1	6	0
2	12	6
3	12	8
4	12	9
5	15	12
6	18	15
7	7	6
8	8	7
9	9	8
10	10	9
13	13	12
14	14	13
15	30	28
16	16	15
20	20	19
25	25	24
26	26	25

Duplicate Observations

- 1.检查重复的样本
  - -duplicates report-命令

27	54	52
34	34	33
41	41	40
44	44	43
51	51	50
59	59	58
60	60	59
63	63	62
67	67	66
75	75	74
84	168	166
86	86	85
91	91	90
118	118	117
120	120	119
139	139	138
140	140	139
174	174	173
409	409	408

Duplicate Observations

- 2.标记重复的样本
  - -duplicates tag-命令

```
. duplicates tag race married occupation, gen(rm_dtag) //重复值的个数
Duplicates in terms of race married occupation
. list rm* in 1/20
```

	rm_dtag
1.	66
2.	5
3.	85
4.	119
5.	83
6.	408
7.	90
8.	139
9.	408
10.	173
11.	173
12.	173

Duplicate Observations

- 2.标记重复的样本
  - -duplicates drop-命令

```
. duplicates drop race married occupation, force
Duplicates in terms of race married occupation
(2,188 observations deleted)
```

Section 7

Missing Values

Missing Values

- 1.缺漏值的简介

```
help missing  //缺漏值的简介
```

  - “.”大于任何自然数
  - 有些命令，如sum,regress,generate等，会自动忽略缺漏值
  - 有些命令，如count,keep等会将“.”视为一个无穷大的数值

Missing Values

- 1.缺漏值的简介

```
sysuse auto,clear
sort rep78
list rep78
sum rep78 if rep78>4  //obs=11
count if rep78>4      //obs=16
keep if rep78>4
list rep78
```

Missing Values

- 2.查找缺漏值

```
. sysuse nlsw88.dta,clear
(NLSW, 1988 extract)
. sum
```

Variable	Obs	Mean	Std. Dev.	Min	Max
idcode	2,246	2612.654	1480.864	1	5159
age	2,246	39.15316	3.060002	34	46
race	2,246	1.282725	.4754413	1	3
married	2,246	.6420303	.4795099	0	1
never_marr~d	2,246	.1041852	.3055687	0	1
grade	2,244	13.09893	2.521246	0	18
collgrad	2,246	.2368655	.4252538	0	1
south	2,246	.4194123	.4935728	0	1
smsa	2,246	.7039181	.4566292	0	1
c_city	2,246	.2916296	.4546139	0	1
industry	2,232	8.189516	3.010875	1	12
occupation	2,237	4.642825	3.408897	1	13
union	1,878	.2454739	.4304825	0	1
wage	2,246	7.766949	5.755523	1.004952	40.74659
hours	2,242	37.21811	10.50914	1	80
ttl_exp	2,246	12.53498	4.610208	.1153846	28.88461
tenure	2,231	5.97785	5.510331	0	25.91667

Missing Values

- 2.查看缺漏值

```
. misstable summarize        //查看所有变量
```

			Obs<.			
Variable	Obs=.	Obs>.	Obs<.	Unique values	Min	Max
grade	2		2,244	16	0	18
industry	14		2,232	12	1	12
occupation	9		2,237	13	1	13
union	368		1,878	2	0	1
hours	4		2,242	62	1	80
tenure	15		2,231	259	0	25.91667

Missing Values

- 2.查看缺漏值

```
. misstable sum age-union   //查看指定变量
```

Variable	Obs=.	Obs>.	Obs<.	Obs<. Unique values	Obs<. Min	Obs<. Max
grade	2		2,244	16	0	18
industry	14		2,232	12	1	12
occupation	9		2,237	13	1	13
union	368		1,878	2	0	1

Missing Values

- 3.删除缺漏值

```
. drop if missing(grade,indus,occup,union,hours,tenure)
(398 observations deleted)
. sum
```

Variable	Obs	Mean	Std. Dev.	Min	Max
idcode	1,848	2614.384	1486.31	1	5159
age	1,848	39.21429	3.041416	34	46
race	1,848	1.291667	.4823869	1	3
married	1,848	.6515152	.4766194	0	1
never_marr~d	1,848	.1087662	.31143	0	1
grade	1,848	13.17208	2.550548	0	18
collgrad	1,848	.2478355	.4318727	0	1
south	1,848	.4242424	.4943612	0	1
smsa	1,848	.7083333	.4546527	0	1
c_city	1,848	.2938312	.4556388	0	1
industry	1,848	8.255952	3.042377	1	12
occupation	1,848	4.62013	3.479021	1	13
union	1,848	.2467532	.4312386	0	1
wage	1,848	7.60597	4.173447	1.344605	39.23074
hours	1,848	37.61905	9.957783	1	80
ttl_exp	1,848	12.86178	4.576879	.4038461	28.88461
tenure	1,848	6.582882	5.631957	0	25.91667

Section 8

Outliers

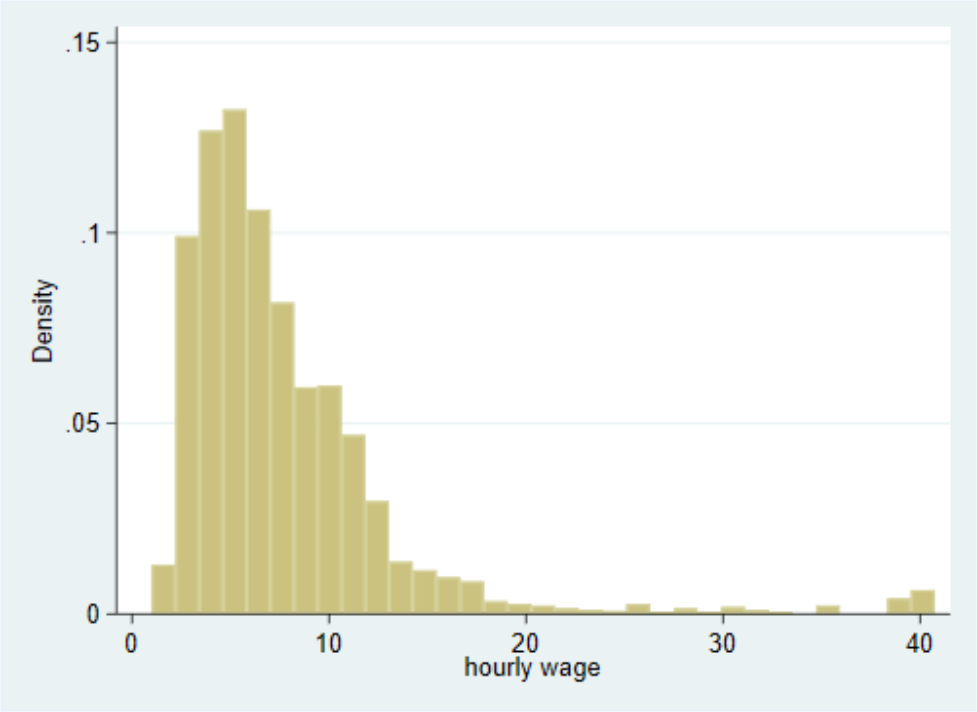
Outliers

- 1.离群值的影响
  - 离群值(outliers)是指在一份数据中,与其他观察值具有明显不同特征的那些观察值。
  - 通常对回归结果的影响却很大。
  - 下图小时工资在20以上的观察值比重较小,是所谓的高薪个体。

Outliers

- 1.离群值的影响

```
. sysuse nlsw88.dta, clear
(NLSW, 1988 extract)
. histogram wage, ylabel(,angle(0))
(bin=33, start=1.0049518, width=1.2042921)
. graph export hi_wage.png,width(500) replace
(file hi_wage.png written in PNG format)
```



Outliers

- 2.查找离群值-
  - -adjacent-命令

```
. ssc install adjacent     //安装外部命令
checking adjacent consistency and verifying not already installed...
all files already exist and are up to date.


. sysuse auto, clear
(1978 Automobile Data)
. adjacent price
```

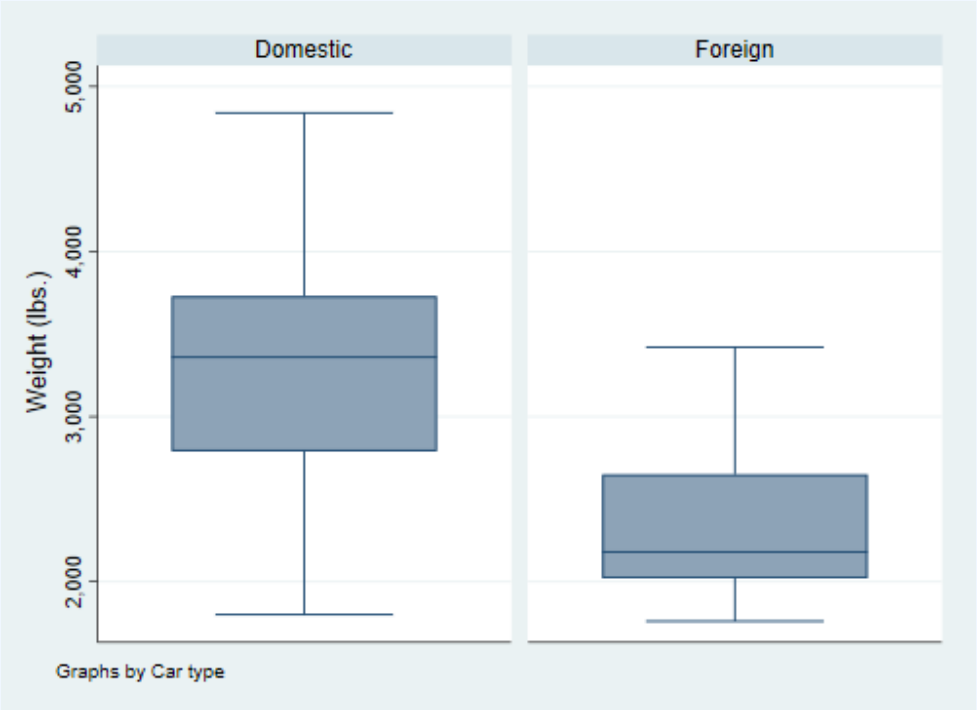
price	lower adjacent	upper adjacent
.	3291	8814

*注:
*四分位间距(interquartile range): iqr = p75-p25
*上界(upper adjacent) = p75 + 1.5*iqr
*下界(lower adjacent) = p25 - 1.5*iqr

Outliers

- 2.查找离群值-
  - 箱型图

```
. graph box weight, by(foreign)
. graph export bo_wei.png,width(500) replace
(file bo_wei.png written in PNG format)
```



Outliers

- 3.删除离群值

```
. sysuse auto, clear
(1978 Automobile Data)
. adjacent price, by(foreign)
```

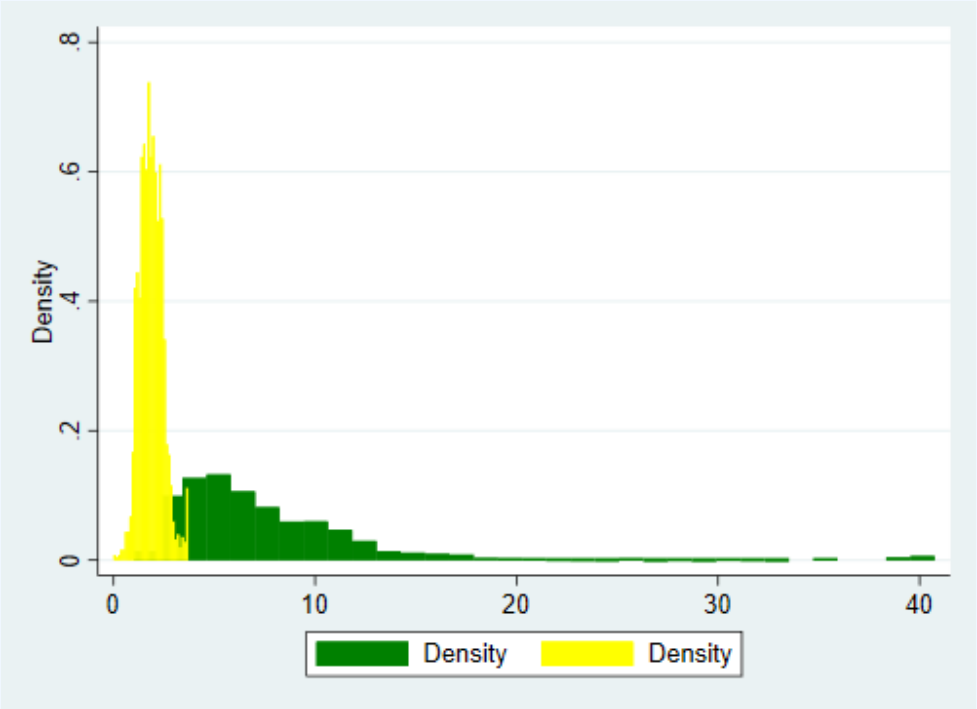
foreign	lower adjacent	upper adjacent
Domestic	3291	8814
Foreign	3748	9735

```
. drop if (price>8814&foreign==0) | (price>9735&foreign==1)
(10 observations deleted)
```

Outliers

- 4.取对数

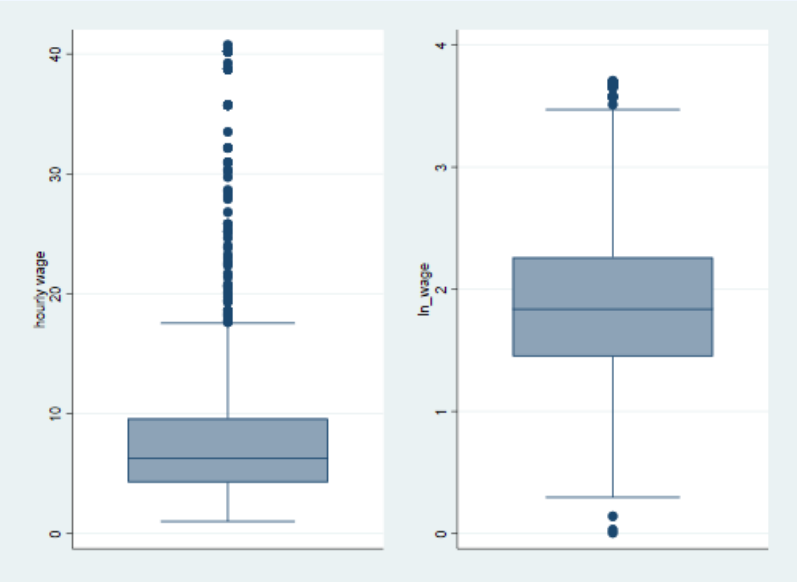
```
. sysuse nlsw88, clear
(NLSW, 1988 extract)
. gen ln_wage = ln(wage)

. twoway (histogram wage,color(green))(histogram ln_wage,color(yellow))
. graph export hi_alwage.png,width(500) replace
(file hi_alwage.png written in PNG format)
```



Outliers

- 4.取对数

```
. graph box wage
. graph save bo_w.gph, replace
(file bo_w.gph saved)

. graph box ln_wage
. graph save bo_lw.gph, replace
(file bo_lw.gph saved)

. cap graph combine bo_w.gph bo_lw.gph, saving(box_wage)
. graph export box_wage.png,width(500) replace
(file box_wage.png written in PNG format)
```



Outliers

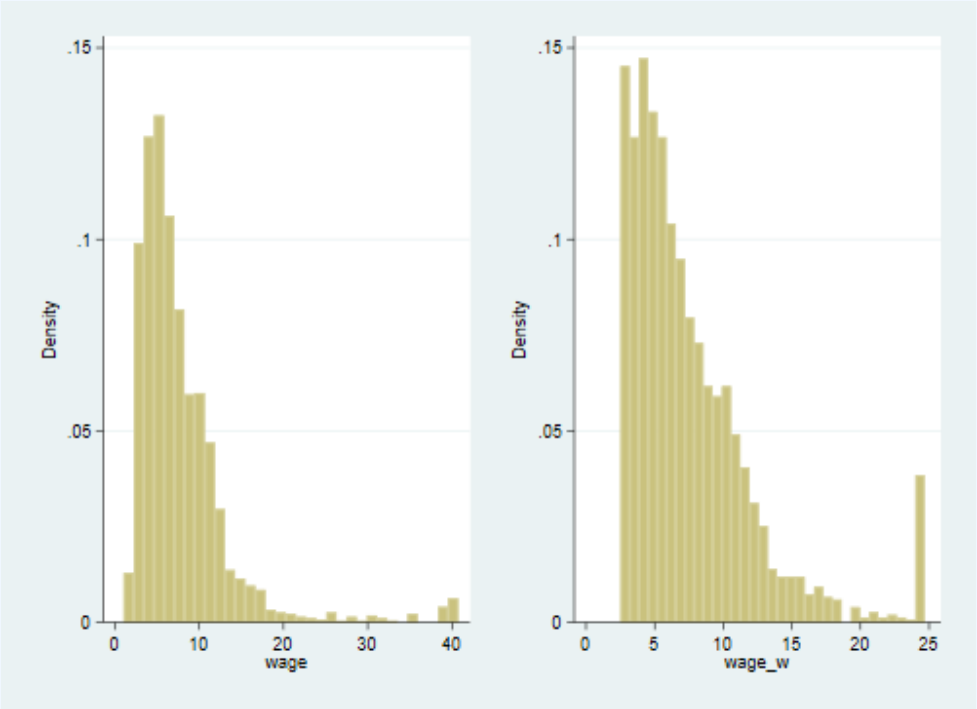
- 5.缩尾
  - 将超出变量特定百分位范围的数值替换为其特定百分位数值的方法。

```
. sysuse nlsw88.dta, clear
(NLSW, 1988 extract)

. ssc install winsor
checking winsor consistency and verifying not already installed...
all files already exist and are up to date.
. winsor wage, gen(wage_w) p(0.025)

. histogram wage, ylabel(,angle(0)) xtitle("wage") name(fig1, replace)
(bin=33, start=1.0049518, width=1.2042921)
. histogram wage_w, ylabel(,angle(0)) xtitle("wage_w") name(fig2, replace)
(bin=33, start=2.5083611, width=.67131721)
```

Outliers

- 5.缩尾

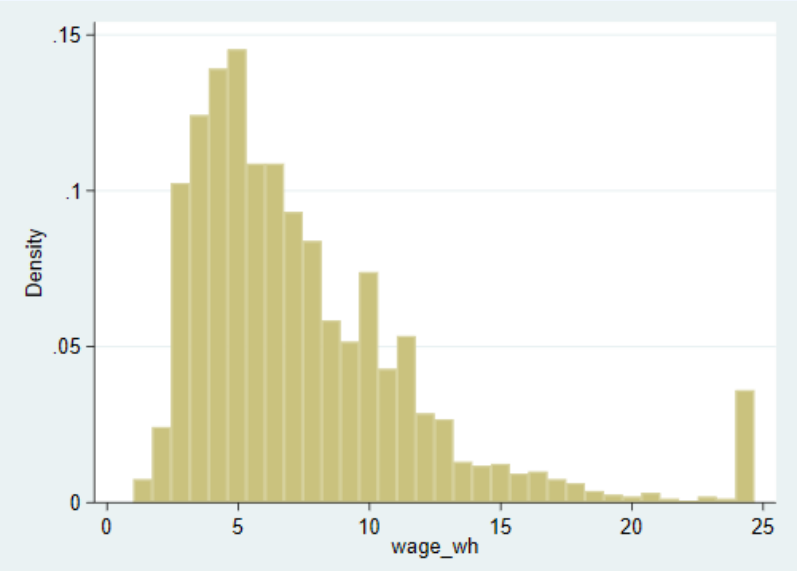
```
. cap graph combine fig1 fig2, saving(1_2)
. graph export 1_2.png,width(500) replace
(file 1_2.png written in PNG format)
```



Outliers

- 5.缩尾
  - 左侧似乎并不存在离群值，右侧缩尾。

```
. sysuse nlsw88.dta, clear
(NLSW, 1988 extract)
. winsor wage, gen(wage_wh) p(0.025) highonly
                                        //highonly或lowonly选项来进行单侧缩尾处理
. histogram wage_wh, ylabel(, angle(0)) xtitle("wage_wh") saving(fig3, replace)
(bin=33, start=1.0049518, width=.71687507)
(file fig3.gph saved)
. graph export 3.png,width(500) replace
(file 3.png written in PNG format)
```



Outliers

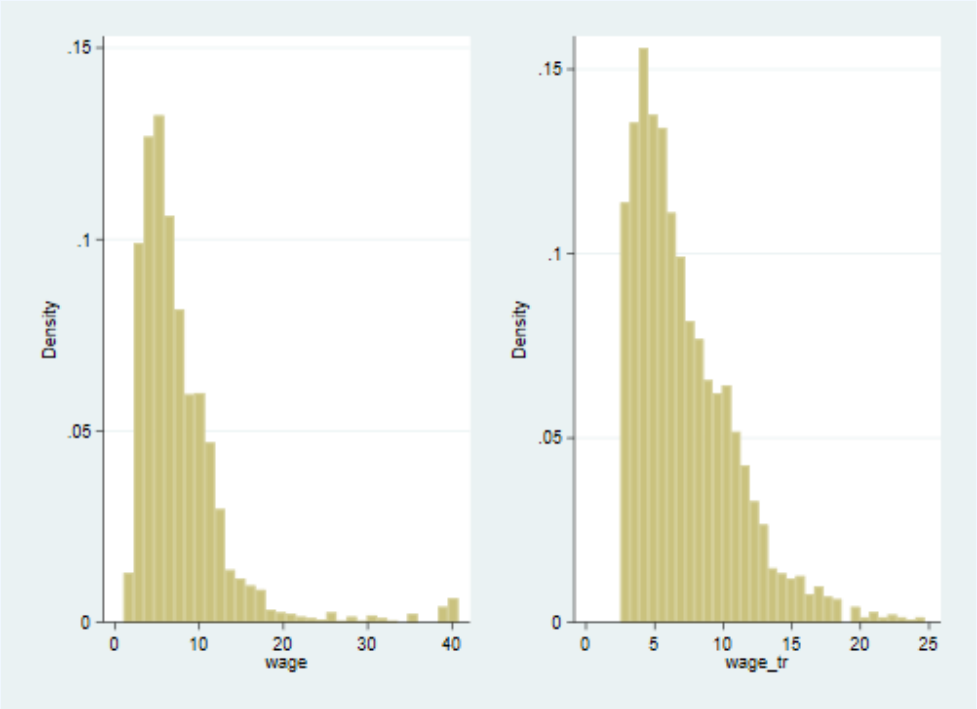
- 6.截尾
  - 将超出变量特定百分位范围的数值予以删除。

```
. sysuse nlsw88.dta, clear
(NLSW, 1988 extract)

. ssc install winsor2
checking winsor2 consistency and verifying not already installed...
all files already exist and are up to date.
. winsor2 wage, cut(2.5 97.5) trim    //trim指定进行截尾处理（否则默认进行缩尾处理）


. histogram wage, ylabel(, angle(0)) xtitle("wage") name(fig4, replace)
(bin=33, start=1.0049518, width=1.2042921)
. histogram wage_tr, ylabel(, angle(0)) xtitle("wage_tr") name(fig5, replace)
(bin=33, start=2.5201283, width=.67096063)
```

Outliers

- 6.截尾

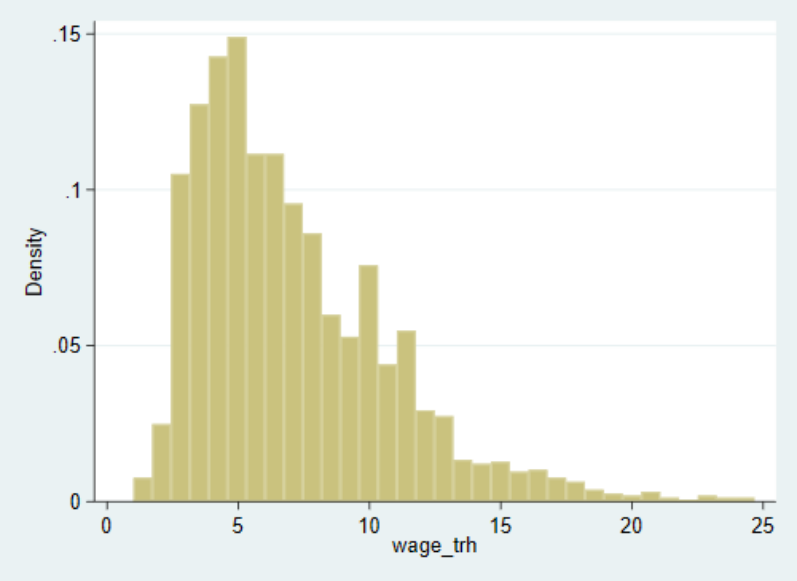
```
. cap graph combine fig4 fig5, saving(4_5)
. graph export 4_5.png,width(500) replace
(file 4_5.png written in PNG format)
```



Outliers

- 6.截尾
  - 右侧截尾

```
. sysuse nlsw88.dta, clear
(NLSW, 1988 extract)
. winsor2 wage, cut(0 97.5) trim  suffix(_trh)
. histogram wage_trh, ylabel(, angle(0)) xtitle("wage_trh") saving(fig6.png, replace)
(bin=33, start=1.0049518, width=.71687507)
(file fig6.png saved)
. graph export 6.png,width(500) replace
(file 6.png written in PNG format)
```



Section 9

Database Append and Merge

Database Append and Merge

- 1.数据纵向合并-append-

```
. clear
. use even,clear      //调用even使用数据
(6th through 8th even numbers)
. list                //看数据
```

	number	even
1.	6	12
2.	7	14
3.	8	16

```
. use odd,clear       //主数据
(First five odd numbers)
. list
```

	number	odd
1.	1	1
2.	2	3
3.	3	5
4.	4	7
5.	5	9

Database Append and Merge

- 1.数据纵向合并-append-

```
. append using even, gen(append_id) //将even加在odd之后
. list
```

	number	odd	append_d	even
1.	1	1	0	.
2.	2	3	0	.
3.	3	5	0	.
4.	4	7	0	.
5.	5	9	0	.
6.	6	.	1	12
7.	7	.	1	14
8.	8	.	1	16

```
. save all,replace                    //对修改后数据进行保存
(note: file all.dta not found)
file all.dta saved
```

Database Append and Merge

- 1.数据纵向合并-append-
  - 两个数据库中的变量名称要相同
  - 两个数据库中的同名变量要具有相同的存储类型

Database Append and Merge

- 2.数据横向合并-merge-
  - 1:1合并(合并关键变量取值完全相同的数据)

```
. use autotech, clear  //autotech主数据
(1978 Automobile Data)
. desc
Contains data from autotech.dta
  obs:            74                          1978 Automobile Data
 vars:             4                          10 Jul 2010 00:06
-------------------------------------------------------------------------------
              storage   display    value
variable name   type    format     label      variable label
-------------------------------------------------------------------------------
make            str18   %18s                  Make and Model
mpg             int     %8.0g                 Mileage (mpg)
weight          int     %8.0g                 Weight (lbs.)
length          int     %8.0g                 Length (in.)
-------------------------------------------------------------------------------
Sorted by: make
```

Database Append and Merge

- 2.数据横向合并-merge-
  - 1:1合并(合并关键变量取值完全相同的数据)

```
. use autocost, clear  //autocost使用数据
(1978 Automobile Data)
. desc
Contains data from autocost.dta
  obs:             74                          1978 Automobile Data
 vars:              3                          10 Jul 2010 00:07
-------------------------------------------------------------------------------
              storage   display    value
variable name   type    format     label      variable label
-------------------------------------------------------------------------------
make            str18   %18s                  Make and Model
price           int     %8.0g                 Price
rep78           int     %8.0g                 Repair Record 1978
-------------------------------------------------------------------------------
Sorted by: make
```

Database Append and Merge

- 2.数据横向合并-merge-
  - 1:1合并(合并关键变量取值完全相同的数据)

```
. use autotech, clear
(1978 Automobile Data)
. merge 1:1 make using autocost    //make是牵引变量
    Result                           # of obs.
    -----------------------------------------
    not matched                             0
    matched                                74  (_merge==3)
    -----------------------------------------

. tabulate _merge
                _merge |      Freq.     Percent        Cum.
-----------------------+-----------------------------------
            matched (3) |         74      100.00      100.00
-----------------------+-----------------------------------
                 Total |         74      100.00
```

Database Append and Merge

- 2.数据横向合并-merge-
  - m:1(或1:m)合并(合并关键变量取值重复的数据)

```
. use cgss13m1, clear   //多的那个(调查对象家庭成员的基本情况)
. desc
Contains data from cgss13m1.dta
  obs:             9
 vars:             4                          13 Jan 2016 10:33
-------------------------------------------------------------------------------
              storage   display    value
variable name   type    format     label      variable label
-------------------------------------------------------------------------------
id              float   %9.0g                 问卷编号
numid           byte    %9.0g                 家庭成员序号
a12             byte    %21.0g     lab1       家庭成员的性别
a14             int     %14.0g     a1402lab   家庭成员的年龄
-------------------------------------------------------------------------------
Sorted by: id
```

Database Append and Merge

- 2.数据横向合并-merge-
  - m:1(或1:m)合并(合并关键变量取值重复的数据)

```
. use cgss13m2, clear   //(调查对象家庭成员的全家收入)
. desc
Contains data from cgss13m2.dta
  obs:             5
 vars:             2                          13 Jan 2016 10:33
-------------------------------------------------------------------------------
              storage   display    value
variable name   type    format     label      variable label
-------------------------------------------------------------------------------
id              float   %9.0g                 问卷编号
a62             long    %42.0g     lab32      您家2011年全年家庭总收入是多少?
-------------------------------------------------------------------------------
Sorted by: id
```

Database Append and Merge

- 2.数据横向合并-merge-
  - m:1(或1:m)合并(合并关键变量取值重复的数据)

```
. use cgss13m1, clear
. merge m:1 id using cgss13m2
    Result                           # of obs.
    -----------------------------------------
    not matched                             0
    matched                                 9  (_merge==3)
    -----------------------------------------

. describe
Contains data from cgss13m1.dta
  obs:             9
 vars:             6                          13 Jan 2016 10:33
-------------------------------------------------------------------------------
              storage   display    value
variable name   type    format     label      variable label
-------------------------------------------------------------------------------
id              float   %9.0g                 问卷编号
numid           byte    %9.0g                 家庭成员序号
a12             byte    %21.0g     lab1       家庭成员的性别
a14             int     %14.0g     a1402lab   家庭成员的年龄
a62             long    %42.0g     lab32      您家2011年全年家庭总收入是多少?
_merge          byte    %23.0g     _merge
-------------------------------------------------------------------------------
```

Database Append and Merge

- 2.数据横向合并-merge-
  - m:1(或1:m)合并(合并关键变量取值重复的数据)

```
. list, sepby(id)        //合并两个数据
```

	id	numid	a12	a14	a62	_merge
1.	3179	1	男	51	30000	matched (3)
2.	3179	2	男	26	30000	matched (3)
3.	3179	3	男	24	30000	matched (3)
4.	3932	1	男	40	8000	matched (3)
5.	3932	2	女	15	8000	matched (3)
6.	3932	3	男	1	8000	matched (3)
7.	5592	1	男	48	9000	matched (3)
8.	6242	1	男	70	30000	matched (3)
9.	10902	1	男	59	130000	matched (3)

Database Append and Merge

- 3.配对合并-joinby-
  - 适用于m：m的交叉匹配合并
  - 比如把父母的数据和孩子的数据进行配对合并

```
. use child, clear
(Data on Children)
. desc
Contains data from child.dta
  obs:             5                          Data on Children
 vars:             4                          30 Apr 2017 20:07
-------------------------------------------------------------------------------
              storage   display    value
variable name   type    format     label      variable label
-------------------------------------------------------------------------------
family_id       int     %8.0g                 Family ID number
child_id        byte    %8.0g                 Child ID number
x1              byte    %8.0g
x2              int     %8.0g
-------------------------------------------------------------------------------
Sorted by: family_id
```

Database Append and Merge

- 3.配对合并-joinby-

```
. list
```

	family_d	child_id	x1	x2
1.	1025	3	11	320
2.	1025	1	12	300
3.	1025	4	10	275
4.	1026	2	13	280
5.	1027	5	15	210

Database Append and Merge

- 3.配对合并-joinby-

```
. use parent, clear
(Data on Parents)
. desc
Contains data from parent.dta
  obs:             6                          Data on Parents
 vars:             4                          30 Apr 2017 20:07
-------------------------------------------------------------------------------
              storage   display    value
variable name   type    format     label      variable label
-------------------------------------------------------------------------------
family_id       int     %8.0g                 Family ID number
parent_id       float   %9.0g                 Parent ID number
x1              float   %9.0g
x3              float   %9.0g
-------------------------------------------------------------------------------
Sorted by:
```

Database Append and Merge

- 3.配对合并-joinby-

```
. list, sep(0)
```

	family_d	parent_d	x1	x3
1.	1030	10	39	600
2.	1025	11	20	643
3.	1025	12	27	721
4.	1026	13	30	760
5.	1026	14	26	668
6.	1030	15	32	684

Database Append and Merge

- 3.配对合并-joinby-

```
. sort family_id
. joinby family_id using child
. list, sepby(fam)
```

	family_d	parent_d	x1	x3	child_id	x2
1.	1025	12	27	721	1	300
2.	1025	12	27	721	4	275
3.	1025	12	27	721	3	320
4.	1025	11	20	643	4	275
5.	1025	11	20	643	1	300
6.	1025	11	20	643	3	320
7.	1026	14	26	668	2	280
8.	1026	13	30	760	2	280