```
                                                                      ___  ____  ____  ____  ____(R)
                                                                     /__    /   ____/   /   ____/
                                                                    ___/   /   /___/   /   /___/
                                                                      Statistics/Data Analysis

                                                                    User: proposition-99 outcome log
                                                                     Project: SCM

  ___  ____  ____  ____  ____ (R)
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/   16.0   Copyright 1985-2019 StataCorp LLC
  Statistics/Data Analysis             StataCorp
                                       4905 Lakeway Drive
      Special Edition                  College Station, Texas 77845 USA
                                       800-STATA-PC        http://www.stata.com
                                       979-696-4600        stata@stata.com
                                       979-696-4601 (fax)

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                       Peking University

Notes:
      1.  Unicode is supported; see help unicode_advice.
      2.  Maximum number of variables is set to 5000; see help set_maxvar.
      3.  New update available; type -update all-

 1 . do "C:\Users\17775\Desktop\合成控制法-原理\SCM的数据与软件实现\Proposition-99_zhuo.do"

 2 . //////******do-switches******//////
   > //////*（1表示开  0表示关）*//////
   > local A     1 //前期检查

 3 . local B     1 //合成控制法主步骤

 4 . local C     1 //安慰剂检验1：保留所有州的安慰剂检验

 5 . local D     0 //安慰剂检验2：删除RMSPE两倍于Califonia的州的安慰剂检验

 6 . local E     1 //安慰剂检验3：画出直方图（39个州原始情况）

 7 .
 8 .
 9 . if `A' == 1 {
10 . //////******前期检查******//////
   > *California和美国其它地区的香烟销售情况对比描述图
11 . use "C:\Users\17775\Desktop\合成控制法-原理\SCM的数据与软件实现\smoking.dta",clear //（打开smoking.dta所在位置）
   (Tobacco Sales in 39 US States)
12 . collapse (mean) cigsale, by(year state)
13 . gen str2 state_str = string(state)
14 . gen is_california = (state_str == "California")
15 . egen total_cigsale = total(cigsale) if !is_california, by(year)
16 . egen mean_cigsale = mean(cigsale) if !is_california, by(year)
17 . replace cigsale = mean_cigsale if state_str == "1"
   (31 real changes made)
18 . xtset state year
         panel variable:  state (strongly balanced)
          time variable:  year, 1970 to 2000
                  delta:  1 unit
19 . // 绘制 California和rest of the U.S.的cigsale 随年份的 xtline图，并叠加显示
20 . xtline cigsale if state_str == "3" | state_str == "1", overlay xtitle("year") ytitle("per-capita cigarette sales(i
   > e U.S.") label(2 "California"))
21 . graph save "C:\Users\17775\Desktop\合成控制法-原理\SCM的数据与软件实现\Trens in per-capita cigarette sales_Califor
   > gph", replace //（打开Trens in per-capita cigarette sales_California vs the rest of the United states.gph所在位置）
   (file C:\Users\17775\Desktop\合成控制法-原理\SCM的数据与软件实现\Trens in per-capita cigarette sales_California vs t
   > d)
```

```
22 . }

23 .
24 . if `B' == 1 {
25 . //////******合成控制法******//////
   > *步骤一：合成California与真实California对比
26 . use "C:\Users\17775\Desktop\合成控制法-原理\SCM的数据与软件实现\smoking.dta",clear //（打开smoking.dta所在位置）
   (Tobacco Sales in 39 US States)
27 . xtset state year
         panel variable:  state (strongly balanced)
          time variable:  year, 1970 to 2000
                  delta:  1 unit
28 . synth cigsale ///
   >                 retprice lnincome age15to24 beer ///
   >                 cigsale(1975) cigsale(1980) cigsale(1988) ///
   >                 , ///
   >                 trunit(3) trperiod(1989) ///
   >                 xperiod(1980(1)1988) mspeperiod(1980(1)1988) resultperoid(1980(1)2000) ///
   >                 keep("C:\Users\17775\Desktop\合成控制法-原理\smoking_synth.dta")replace fig //（保存smoking_synth.
```

Synthetic Control Method for Comparative Case Studies

First Step: Data Setup

```
control units: for 38 of out 38 units missing obs for predictor beer in period 1980 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1981 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1982 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1983 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1980 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1981 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1982 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1983 -ignored for averaging
```

Data Setup successful

```
               Treated Unit: California
             Control Units: Alabama, Arkansas, Colorado, Connecticut, Delaware, Georgia, Idaho, Illinois, Indiana,
                            Maine, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New
                            Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tenn
                            Virginia, West Virginia, Wisconsin, Wyoming
```

```
         Dependent Variable: cigsale
  MSPE minimized for periods: 1980 1981 1982 1983 1984 1985 1986 1987 1988
Results obtained for periods: 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1
                            1994 1995 1996 1997 1998 1999 2000
```

```
                 Predictors: retprice lnincome age15to24 beer cigsale(1975) cigsale(1980) cigsale(1988)
```

```
Unless period is specified
predictors are averaged over: 1980 1981 1982 1983 1984 1985 1986 1987 1988
```

Second Step: Run Optimization

Optimization done

Third Step: Obtain Results

Loss: Root Mean Squared Prediction Error

RMSPE	**1.615886**

Unit Weights:

Co_No	Unit_Weight
Alabama	**0**
Arkansas	**0**
Colorado	**.49**
Connecticut	**.063**
Delaware	**0**
Georgia	**0**
Idaho	**0**
Illinois	**0**
Indiana	**0**
Iowa	**0**
Kansas	**0**
Kentucky	**0**
Louisiana	**0**
Maine	**0**
Minnesota	**0**
Mississippi	**0**
Missouri	**0**
Montana	**0**
Nebraska	**0**
Nevada	**.148**
New Hampshire	**0**
New Mexico	**0**
North Carolina	**0**
North Dakota	**0**
Ohio	**0**
Oklahoma	**0**
Pennsylvania	**0**
Rhode Island	**0**
South Carolina	**0**
South Dakota	**0**
Tennessee	**0**
Texas	**0**
Utah	**.299**
Vermont	**0**
Virginia	**0**
West Virginia	**0**
Wisconsin	**0**
Wyoming	**0**

Predictor Balance:

	Treated	Synthetic
retprice	**89.42222**	**87.54473**
lnincome	**10.07656**	**9.911694**
age15to24	**.1735324**	**.1756983**
beer	**24.28**	**23.05796**
cigsale(1975)	**127.1**	**124.1664**
cigsale(1980)	**120.2**	**120.2888**
cigsale(1988)	**90.1**	**90.4026**

```
29 . mat list e(V_matrix)

symmetric e(V_matrix)[7,7]
                  retprice       lnincome      age15to24           beer  cigsale(1975)  cigsale(1980)  cigsale(198
     retprice      .00037896
     lnincome              0      .00077672
    age15to24              0              0      .00019223
         beer              0              0              0      .00058542
cigsale(1975)              0              0              0              0      .03736891
cigsale(1980)              0              0              0              0              0      .79129458
cigsale(1988)              0              0              0              0              0              0      .169403
```

```
30 . graph save Graph "C:\Users\17775\Desktop\合成控制法-原理\Trends in cigsale_California vs. synthetic California.gph
   > _California vs. synthetic California.gph所在位置）
   (file C:\Users\17775\Desktop\合成控制法-原理\Trends in cigsale_California vs. synthetic California.gph saved)
31 .
32 .
33 . *步骤二：计算真实值与合成值之差
34 . use "C:\Users\17775\Desktop\合成控制法-原理\SCM的数据与软件实现\smoking_synth.dta", clear //（打开smoking_synth.dt
   (Tobacco Sales in 39 US States)
35 . gen effect= _Y_treated - _Y_synthetic
   (7 missing values generated)
36 . sort _time
37 . label variable _time "year"
38 . label variable effect "gap in per-capita cigarette sales (in packs)"
39 . line effect _time, xline(1989,lp(dash)) yline(0,lp(dash))
40 . save "C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_California.dta", replace  //（保存smoking_synth_Califor
   file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_California.dta saved
41 . graph save Graph "C:\Users\17775\Desktop\合成控制法-原理\cigsale gap between California and synthetic California.g
   > een California and synthetic California.gph所在位置）
   (file C:\Users\17775\Desktop\合成控制法-原理\cigsale gap between California and synthetic California.gph saved)
42 . }

43 .
44 .
45 . if `C' == 1 {
46 . *步骤三：安慰剂检验
47 . ********************************************************************************
48 . **安慰剂检验1：保留所有州的安慰剂检验
49 . use "C:\Users\17775\Desktop\合成控制法-原理\smoking.dta",clear //（打开smoking.dta所在位置）
   (Tobacco Sales in 39 US States)
50 . xtset state year
          panel variable:  state (strongly balanced)
           time variable:  year, 1970 to 2000
                   delta:  1 unit
51 .
52 . ***（1）对每一个州进行合成控制估计
53 . forval i=1/39{
     2. qui synth cigsale retprice lnincome age15to24 beer cigsale(1975) cigsale(1980) cigsale(1988),trunit(`i') trperi
   > C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_`i'",replace) //（保存smoking_synth_`i'.dta所在位置）
     3. }
   control units: for 38 of out 38 units missing obs for predictor beer in period 1980 -ignored for averaging
   control units: for 38 of out 38 units missing obs for predictor beer in period 1981 -ignored for averaging
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treated unit: for 1 of out 1 units missing obs for predictor beer in period 1980 -ignored for averaging
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treated unit: for 1 of out 1 units missing obs for predictor beer in period 1980 -ignored for averaging
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treated unit: for 1 of out 1 units missing obs for predictor beer in period 1982 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1983 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1980 -ignored for averaging
```

```
control units: for 38 of out 38 units missing obs for predictor beer in period 1981 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1982 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1983 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1980 -ignored for averaging
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treated unit: for 1 of out 1 units missing obs for predictor beer in period 1982 -ignored for averaging
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control units: for 38 of out 38 units missing obs for predictor beer in period 1983 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1980 -ignored for averaging
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control units: for 38 of out 38 units missing obs for predictor beer in period 1980 -ignored for averaging
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control units: for 38 of out 38 units missing obs for predictor beer in period 1982 -ignored for averaging
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control units: for 38 of out 38 units missing obs for predictor beer in period 1982 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1983 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1980 -ignored for averaging
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treated unit: for 1 of out 1 units missing obs for predictor beer in period 1982 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1983 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1980 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1981 -ignored for averaging
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treated unit: for 1 of out 1 units missing obs for predictor beer in period 1980 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1981 -ignored for averaging
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control units: for 38 of out 38 units missing obs for predictor beer in period 1980 -ignored for averaging
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control units: for 38 of out 38 units missing obs for predictor beer in period 1982 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1983 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1980 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1981 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1982 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1983 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1980 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1981 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1982 -ignored for averaging
control units: for 38 of out 38 units missing obs for predictor beer in period 1983 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1980 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1981 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1982 -ignored for averaging
treated unit: for 1 of out 1 units missing obs for predictor beer in period 1983 -ignored for averaging
```

```
54 .
55 . forval i=1/39{
  2. use "C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_`i'", clear //（打开smoking_synth_`i'.dta所在位置）
  3. rename _time years
  4. gen tr_effect_`i' = _Y_treated - _Y_synthetic
  5. keep years tr_effect_`i'
  6. drop if missing(years)
  7. save "C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_`i'", replace //（保存smoking_synth_`i'.dta所在位置）
  8. }
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_1.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_2.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_3.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_4.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_5.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_6.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_7.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_8.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_9.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_10.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_11.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_12.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_13.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_14.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_15.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
```

```
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_16.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_17.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_18.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_19.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_20.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_21.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_22.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_23.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_24.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_25.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_26.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_27.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_28.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_29.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_30.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_31.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_32.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_33.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
```

```
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_34.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_35.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_36.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_37.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_38.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_39.dta saved
56 .
57 . ***（2）匹配到一张表
58 . use "C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_1", clear //（打开smoking_synth_1.dta所在位置）
(Tobacco Sales in 39 US States)
59 . forval i=2/39{
  2. qui merge 1:1 years using "C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_`i'", nogenerate //（打开smokin
  3. }
60 .
61 . ***（3）处理效应图
62 . local lp1
63 . forval i=1/2 {
  2.    local lp1 `lp1' line tr_effect_`i' years, lpattern(dash) lcolor(gs12) ||
  3. }
64 . local lp2
65 . forval i=4/39 {
  2.    local lp2 `lp2' line tr_effect_`i' years, lpattern(dash) lcolor(gs12) ||
  3. }
66 . twoway `lp1' `lp2' || line tr_effect_3 years, ///
> lcolor(black) legend(off) xline(1989, lpattern(dash)) yline(0,lp(dash))
67 . graph save Graph "C:\Users\17775\Desktop\合成控制法-原理\cigsale gaps in California and placebos in 38 control sta
> ps in California and placebos in 38 control states.gph所在位置）
(file C:\Users\17775\Desktop\合成控制法-原理\cigsale gaps in California and placebos in 38 control states.gph saved)
68 . }

69 .
70 . if `D' == 1 {
71 . ********************************************************************************
72 . **安慰剂检验2：删除RMSPE两倍于Califonia的州的安慰剂检验
73 . use "C:\Users\17775\Desktop\合成控制法-原理\smoking.dta",clear //（打开smoking.dta所在位置）
74 . xtset state year
75 .
76 . ***（1）对每一个州进行合成控制估计
77 . tempname resmat
78 .   forval i=1/39{
  2.   qui synth cigsale retprice lnincome age15to24 beer cigsale(1975) cigsale(1980) cigsale(1988),trunit(`i') trpe
> ("C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_`i'",replace)  //（保存smoking_synth_`i'.dta所在位置）
  3.   matrix `resmat' = nullmat(`resmat') \ e(RMSPE) //矩阵用来存放每个州进行合成控制的RMSPE值
  4.   local names `"`names' `"`i'"'"'
  5.   }
```

```
 79 .   mat colnames `resmat' = "RMSPE" //矩阵的列名为RMSPE
 80 .   mat rownames `resmat' = `names' //矩阵的行名为names
 81 .   matlist `resmat' , row("Treated Unit")
 82 .
 83 . forval i=1/39{
      2. use "C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_`i'", clear //（打开smoking_synth_`i'.dta所在位置）
      3. rename _time years
      4. gen tr_effect_`i' = _Y_treated - _Y_synthetic
      5. keep years tr_effect_`i'
      6. drop if missing(years)
      7. save "C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_`i'", replace //（保存smoking_synth_`i'.dta所在位置）
      8. }
 84 .
 85 . ***（2）匹配到一张表
 86 . use "C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_1", clear //（打开smoking_synth_1.dta所在位置）
 87 . forval i=2/39{
      2. qui merge 1:1 years using "C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_`i'", nogenerate //（打开smokin
      3. }
 88 .
 89 . ***（3）删除拟合不好的州
 90 . drop tr_effect_6  //删除Delaware
 91 . drop tr_effect_13 //删除Kentucky
 92 . drop tr_effect_22 //删除New Hampshire
 93 . drop tr_effect_24 //删除North Carolina
 94 . drop tr_effect_29 //删除Rhode Island
 95 . drop tr_effect_34 //删除Utah
 96 . drop tr_effect_35 //删除Vermont
 97 . drop tr_effect_39 //删除Wyoming
 98 .
 99 . ***（4）处理效应图
100 . local lp1
101 . forval i=1/2 {
      2.    local lp1 `lp1' line tr_effect_`i' years, lpattern(dash) lcolor(gs12) ||
      3. }
102 . local lp2
103 . forval i=4/5 {
      2.    local lp2 `lp2' line tr_effect_`i' years, lpattern(dash) lcolor(gs12) ||
      3. }
104 . local lp3
105 . forval i=7/12 {
      2.    local lp2 `lp2' line tr_effect_`i' years, lpattern(dash) lcolor(gs12) ||
      3. }
106 . local lp4
107 . forval i=23/23 {
      2.    local lp2 `lp2' line tr_effect_`i' years, lpattern(dash) lcolor(gs12) ||
      3. }
108 . local lp5
109 . forval i=25/28 {
      2.    local lp2 `lp2' line tr_effect_`i' years, lpattern(dash) lcolor(gs12) ||
      3. }
110 . local lp6
111 . forval i=30/33 {
      2.    local lp2 `lp2' line tr_effect_`i' years, lpattern(dash) lcolor(gs12) ||
      3. }
112 . local lp7
113 . forval i=36/38 {
      2.    local lp2 `lp2' line tr_effect_`i' years, lpattern(dash) lcolor(gs12) ||
      3. }
114 . twoway `lp1' `lp2' `lp3' `lp4' `lp5' `lp6' `lp7'|| line tr_effect_3 years, ///
    > lcolor(black) legend(off) xline(1989, lpattern(dash)) yline(0,lp(dash))
```

```
115 . graph save "C:\Users\17775\Desktop\合成控制法-原理\cigsale gaps in California and placebos in 29 control states.gp
    > lifornia and placebos in 29 control states.gph所在位置）
116 . }

117 .
118 . if `E' == 1 {
119 . ********************************************************************************
120 . **安慰剂检验3：画出直方图（39个州原始情况）
121 . use "C:\Users\17775\Desktop\合成控制法-原理\smoking.dta",clear //（打开smoking.dta所在位置）
    (Tobacco Sales in 39 US States)
122 . xtset state year
           panel variable:  state (strongly balanced)
            time variable:  year, 1970 to 2000
                    delta:  1 unit
123 .
124 . ***（1）对每一个州进行合成控制估计
125 . tempname resmat
126 .   forval i=1/39{
      2.   qui synth cigsale retprice lnincome age15to24 beer cigsale(1975) cigsale(1980) cigsale(1988),trunit(`i') trpe
    > ("C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_`i'",replace)  //（保存smoking_synth_`i'.dta所在位置）
      3.   matrix `resmat' = nullmat(`resmat') \ e(RMSPE) //（矩阵用来存放每个州进行合成控制的RMSPE值）
      4.   local names `"`names' `"`i'"'"'
      5.   }
    control units: for 38 of out 38 units missing obs for predictor beer in period 1980 -ignored for averaging
    control units: for 38 of out 38 units missing obs for predictor beer in period 1981 -ignored for averaging
    control units: for 38 of out 38 units missing obs for predictor beer in period 1982 -ignored for averaging
    control units: for 38 of out 38 units missing obs for predictor beer in period 1983 -ignored for averaging
    treated unit: for 1 of out 1 units missing obs for predictor beer in period 1980 -ignored for averaging
    treated unit: for 1 of out 1 units missing obs for predictor beer in period 1981 -ignored for averaging
    treated unit: for 1 of out 1 units missing obs for predictor beer in period 1982 -ignored for averaging
    treated unit: for 1 of out 1 units missing obs for predictor beer in period 1983 -ignored for averaging
    control units: for 38 of out 38 units missing obs for predictor beer in period 1980 -ignored for averaging
    control units: for 38 of out 38 units missing obs for predictor beer in period 1981 -ignored for averaging
    control units: for 38 of out 38 units missing obs for predictor beer in period 1982 -ignored for averaging
    control units: for 38 of out 38 units missing obs for predictor beer in period 1983 -ignored for averaging
    treated unit: for 1 of out 1 units missing obs for predictor beer in period 1980 -ignored for averaging
    treated unit: for 1 of out 1 units missing obs for predictor beer in period 1981 -ignored for averaging
    treated unit: for 1 of out 1 units missing obs for predictor beer in period 1982 -ignored for averaging
    treated unit: for 1 of out 1 units missing obs for predictor beer in period 1983 -ignored for averaging
    control units: for 38 of out 38 units missing obs for predictor beer in period 1980 -ignored for averaging
    control units: for 38 of out 38 units missing obs for predictor beer in period 1981 -ignored for averaging
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127 .   mat colnames `resmat' = "RMSPE" //矩阵的列名为RMSPE
128 .   mat rownames `resmat' = `names' //矩阵的行名为names
129 .   matlist `resmat' , row("Treated Unit")

    Treated Unit |      RMSPE
    -------------+-----------
               1 |   2.710146
               2 |   2.512085
               3 |    2.03785
               4 |   6.041637
               5 |   5.216902
               6 |   10.04986
               7 |    1.38767
               8 |   2.711447
               9 |   3.307534
              10 |   6.374926
              11 |   3.994193
              12 |   4.027571
              13 |   26.14307
              14 |    2.24033
              15 |   4.162081
              16 |   4.473659
              17 |   2.520064
              18 |   2.108559
              19 |   2.356012
```

```
          20 |  2.435563
          21 |   7.71803
          22 |  59.03776
          23 |   2.42456
          24 |  10.73793
          25 |  4.562296
          26 |  3.594593
          27 |    3.2714
          28 |  2.960468
          29 |  12.75254
          30 |  1.784269
          31 |  3.154256
          32 |  2.658026
          33 |  2.678193
          34 |  24.36728
          35 |  9.442087
          36 |  5.924654
          37 |  3.208769
          38 |  2.957548
          39 |  10.68497
130 .
131 . forval i=1/39{
  2. use "C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_`i'", clear //（打开smoking_synth_`i'.dta所在位置）
  3. rename _time years
  4. gen tr_effect_`i' = _Y_treated - _Y_synthetic
  5. keep years tr_effect_`i'
  6. drop if missing(years)
  7. save "C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_`i'", replace //（保存smoking_synth_`i'.dta所在位置）
  8. }
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_1.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_2.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_3.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_4.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_5.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_6.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_7.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_8.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_9.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_10.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
```

```
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_11.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_12.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_13.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_14.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_15.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_16.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_17.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_18.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_19.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_20.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_21.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_22.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_23.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_24.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_25.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_26.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_27.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_28.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
```

```
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_29.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_30.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_31.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_32.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_33.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_34.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_35.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_36.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_37.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_38.dta saved
(Tobacco Sales in 39 US States)
(7 missing values generated)
(7 observations deleted)
file C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_39.dta saved
. 
. ***（2）匹配到一张表
. use "C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_1", clear //（打开smoking_synth_1.dta所在位置）
(Tobacco Sales in 39 US States)
. forval i=2/39{
  2. qui merge 1:1 years using "C:\Users\17775\Desktop\合成控制法-原理\smoking_synth_`i'", nogenerate //（打开smokin
  3. }
. 
. //*如需使用删除后的数据，只要需要将（1）（2）更换为安慰剂检验2：（1）（2）（3）*//
. 
. ***（3）画出直方图
. reshape long tr_effect_, i(year) j(state)
(note: j = 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38

Data                               wide   ->   long
-----------------------------------------------------------------------------
Number of obs.                       31   ->    1209
Number of variables                  40   ->       3
j variable (39 values)                    ->   state
xij variables:
tr_effect_1 tr_effect_2 ... tr_effect_39  ->   tr_effect_
-----------------------------------------------------------------------------
```

```
141 . gen te2=tr_effect^2
142 . bys state:egen ex_mspe=mean(te2) if year<1989
    (468 missing values generated)
143 . bys state:egen post_mspe=mean(te2) if year>=1989
    (741 missing values generated)
144 . bys state:egen a=min(ex_mspe)
145 . bys state:egen b=min(post_mspe)
146 . gen ratio=b/a
147 . duplicates drop state,force

    Duplicates in terms of state

    (1,170 observations deleted)
148 . histogram ratio, bin(20) frequency fcolor(gs13) lcolor(black) ylabel(0(2)20) xtitle("post/pre-Proposition 99 MSPE"
    > )
    (bin=20, start=.08973168, width=4.2547805)
149 . graph save Graph "C:\Users\17775\Desktop\合成控制法-原理\post_pre-Proposition 99 MSPE.gph" , replace //（保存post_
    (file C:\Users\17775\Desktop\合成控制法-原理\post_pre-Proposition 99 MSPE.gph saved)
150 .
151 . //////******参考******//////
    > *Scott Cunningham_Casual Inference: mixtape中合成控制部分的编码
152 . *知乎回答：合成控制法:Synthetic control.https://zhuanlan.zhihu.com/p/594463125.
153 . *知乎回答：合成控制法（SCM）安慰剂检验怎么玩？.https://zhuanlan.zhihu.com/p/133744885.
154 . *微信推文：从加州控烟案例学会合成控制法的Stata操作.https://mp.weixin.qq.com/s?__biz=MzU4ODU3NjM2MA==&mid=224748372
    > 3c4f27&chksm=fddbe256caac6b40be67cf610d86a56466004dca889304bf414f905f369816ae9cc6114c0eb6&scene=21#wechat_redirect
155 .
156 . **如果对此份do文档有任何建议，请赐教，电子邮箱是zhuoc1025@gmail.com。
157 . }

158 .
    end of do-file

159 .
```