HW 4 경경분

박효선 1585063

2018 년 11 월 15 일

필요한 변수 만들기

```r
attach(ciga.data)

## The following object is masked from package:base:
##
##     T

rtaxso = taxs/cpi-tax/cpi                                        #sale tax
rtax = tax/cpi                                                   #ciga tax
perinc = income/pop/cpi                                         # real per capita state income


log.q = log(packpc[year==1995])-log(packpc[year==1985])        #ln(Q_1995)-ln(Q_1985)
log.p = log(avgprs[year==1995])-log(avgprs[year==1985])        #ln(P_1995)-ln(P_1985)
log.inc = log(perinc[year==1995])-log(perinc[year==1985])      #ln(income_1995)-ln(income_1985)
cigatax = rtax[year==1995]-rtax[year==1985]                    #CigTax_1995-CigTax_1985
saletax = rtaxso[year==1995]-rtaxso[year==1985]               #SalesTax_1995-SalesTax_1985

head(ciga.data)

##   state year  cpi      pop  packpc    income  tax    avgprs     taxs
## 1    AL 1985 1.076  3973000 116.4863  46014968 32.5 102.18167 33.34834
## 2    AR 1985 1.076  2327000 128.5346  26210736 37.0 101.47500 37.00000
## 3    AZ 1985 1.076  3184000 104.5226  43956936 31.0 108.57875 36.17042
## 4    CA 1985 1.076 26444000 100.3630 447102816 26.0 107.83734 32.10400
## 5    CO 1985 1.076  3209000 112.9635  49466672 31.0  94.26666 31.00000
## 6    CT 1985 1.076  3201000 109.2784  60063368 42.0 128.02499 51.48333
##      log_Q    log_I    log_P       CT        T
## 1 4.757774 2.376195 4.553502 30.20447 0.7884122
## 2 4.856198 2.348339 4.546562 34.38662 0.0000000
## 3 4.649403 2.551822 4.614225 28.81041 4.8052211
```

```
## 4 4.608794 2.754509 4.607374 24.16357 5.6728627
## 5 4.727065 2.662089 4.472877 28.81041 0.0000000
## 6 4.693898 2.858686 4.778975 39.03346 8.8135072

names(ciga.data)

##  [1] "state"  "year"   "cpi"    "pop"    "packpc" "income" "tax"
##  [8] "avgprs" "taxs"   "log_Q"  "log_I"  "log_P"  "CT"     "T"
```

Model (1)

```
# Model(1)

# TSLS
model_1 <- ivreg(log.q ~ log.p + log.inc | saletax + log.inc)
coeftest(model_1, vcov = vcovHC)

##
## t test of coefficients:
##
##              Estimate Std. Error t value  Pr(>|t|)
## (Intercept)  0.20855    0.14458  1.4425 0.1560991
## log.p       -0.93801    0.23175 -4.0476 0.0002011 ***
## log.inc      0.52597    0.37225  1.4129 0.1645528
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# 1st Stage
lm.x1 = lm(log.p ~ log.inc + saletax)
# X:담배가격, W:Income, Z(도구변수): Sale tax 1st stage linear regression
summary(lm.x1)$f

##     value    numdf    dendf
## 23.85676  2.00000 45.00000
```

Model (2)

```
# Model(2)

# TSLS
model_2 <- ivreg(log.q ~ log.p + log.inc | cigatax + log.inc)
coeftest(model_2, vcov = vcovHC)

##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.45026    0.16870  2.6690  0.01054 *
## log.p       -1.34251    0.28042 -4.7875 1.86e-05 ***
## log.inc      0.42815    0.32896  1.3015  0.19970
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
# 1st Stage
lm.x2 = lm(log.p ~ log.inc + cigatax)
# X:담배가격, W:Income, Z(도구변수): Ciga tax 1st stage linear regression
summary(lm.x2)$f

##    value    numdf    dendf
## 47.72171  2.00000 45.00000
```

Model (3)

```
# Model(3)

# TSLS
model_3 <- ivreg(log.q ~ log.p + log.inc | saletax + cigatax + log.inc)

coeftest(model_3, vcov = vcovHC)

##
## t test of coefficients:
##
##             Estimate Std. Error t value  Pr(>|t|)
## (Intercept)  0.36654    0.14189  2.5832   0.01311 *
## log.p       -1.20240    0.23221 -5.1782 5.072e-06 ***
## log.inc      0.46203    0.34012  1.3584   0.18109
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

# 1st Stage
lm.x3 = lm(log.p ~ log.inc + saletax + cigatax)

# X:담배가격, W:Income, Z1: Sale tax, Z2: Ciga tax 1st stage linear regression
summary(lm.x3)$f

##    value    numdf    dendf
## 51.36248  3.00000 44.00000

# 도구변수 외생성 검정
u.hat <- model_3$residuals
aux <- lm(u.hat ~ log.inc + saletax + cigatax)
m <- 2
k <- 1
J <- m * summary(aux)$f[1] # ~chisq(df = 2-1)
J

##    value
## 3.287988

1-pchisq(J,1)

##       value
## 0.06978848
```