HW 4 경경분

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2018년 11월 15일

### 필요한 변수 만들기

attach(ciga.data)

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