PS2_Econometrics

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```
library(systemfit, quietly=T)
library(wooldridge, quietly=T)
library(AER, quietly=T)

data('mroz')
oursample = subset(mroz, !is.na(wage))
```

2(a) IV Regression on Equation (i)

```
eqn1 <- ivreg(hours ~ log(wage) + educ + age + kidslt6 + nwifeinc | age + kidslt6 + nwifeinc + exper + I
summary(eqn1)
```

```
##
## Call:
## ivreg(formula = hours ~ log(wage) + educ + age + kidslt6 + nwifeinc |
##     age + kidslt6 + nwifeinc + exper + I(exper^2), data = oursample)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -29373  -5278  -1115   5750  30659
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  47311.62  339337.93   0.139    0.889
## log(wage)     7546.53   44575.36   0.169    0.866
## educ         -4414.98   31846.65  -0.139    0.890
## age            -78.72     537.64  -0.146    0.884
## kidslt6       2878.62   23190.44   0.124    0.901
## nwifeinc       200.60    1586.88   0.126    0.899
##
## Residual standard error: 9397 on 422 degrees of freedom
## Multiple R-Squared: -143.8,  Adjusted R-squared: -145.5
## Wald test: 0.07358 on 5 and 422 DF,  p-value: 0.9961
```

2(a) IV Regression on Equation (ii)

```
eqn2 <- ivreg(log(wage) ~ hours + educ + exper + I(exper^2) | age + kidslt6 + nwifeinc + exper + I(exper
summary(eqn2)
```

```
##
```

```
## Call:
## ivreg(formula = log(wage) ~ hours + educ + exper + I(exper^2) |
##     age + kidslt6 + nwifeinc + exper + I(exper^2), data = oursample)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3.77193 -0.29542  0.03734  0.38417  2.55386
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -1.5253954  0.7216517  -2.114 0.035121 *
## hours        0.0002192  0.0002748   0.798 0.425606
## educ         0.1747365  0.0493463   3.541 0.000443 ***
## exper        0.0258892  0.0213417   1.213 0.225775
## I(exper^2)  -0.0005090  0.0004960  -1.026 0.305315
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.7109 on 423 degrees of freedom
## Multiple R-Squared: 0.04282, Adjusted R-squared: 0.03377
## Wald test: 7.831 on 4 and 423 DF,  p-value: 4.271e-06
```

2(b) After imposing exclusion restriction

```
eqn1 = hours ~ log(wage) + educ + age + kidslt6 + nwifeinc
eqn2 = log(wage) ~ hours + educ + exper + I(exper^2)
eqn_system = list(eqn1, eqn2)
```

```
systemfit(formula = eqn_system, inst = ~ age + kidslt6 + nwifeinc + + exper + I(exper^2), data = oursamp
```

```
##
## systemfit results
## method: 2SLS
##
## Coefficients:
## eq1_(Intercept)   eq1_log(wage)        eq1_educ         eq1_age     eq1_kidslt6
##     4.73116e+04     7.54653e+03    -4.41498e+03    -7.87195e+01     2.87862e+03
##    eq1_nwifeinc eq2_(Intercept)       eq2_hours        eq2_educ       eq2_exper
##     2.00597e+02    -1.52540e+00     2.19162e-04     1.74737e-01     2.58892e-02
##  eq2_I(exper^2)
##    -5.09031e-04
```

```
systemfit(formula = eqn_system, inst = ~ age + kidslt6 + nwifeinc + + exper + I(exper^2), data = oursamp
```

```
##
## systemfit results
## method: 3SLS
##
## Coefficients:
## eq1_(Intercept)   eq1_log(wage)        eq1_educ         eq1_age     eq1_kidslt6
##     5.10463e+03     1.68064e+03    -4.99643e+02     4.60779e+00    -3.58674e+02
##    eq1_nwifeinc eq2_(Intercept)       eq2_hours        eq2_educ       eq2_exper
```

```
##     2.00582e+01    -1.52540e+00     2.19162e-04     1.74737e-01     2.58892e-02
##  eq2_I(exper^2)
##    -5.09031e-04
```

2(c) Analyze the results obtained in (a) and (b) and comment on your results, in particular the significance of the coefficients.

For equation 1:
2SLS and 3SLS produce different coefficients. All coefficients show impact on work hours
- Intercepts of 2SLS are higher than intercepts of 3SLS
- Coefficients for log(wage) in 2SLS is higher which means wage has more impact on hours in 2SLS
- Education has negative coefficient in both 2SLS and 3SLS. The effect in 3SLS is higher.
- Age is 2SLS has a stronger effect while it's negative. Age has positive effect in 3SLS
- Having kids in 2SLS has a very high positive impact while that in 3SLS is negative
- Non-wife income in both 2SLS and 3SLS have positive impact while the impact in 2SLS is higher

For equation 2:
Both 2SLS and 3SLS coefficients are the same however, 3SLS is more efficient.
- The intercepts are negative
- Hours worked has very small positive impact on log(wage)
- Education has small positive impact on log(wage)
- Similarly, experience has small positive impact on log(wage)
- The square of experience has small negative impact on log(wage)