Homework3

## R Markdown

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When you click the**Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

## Assignment 3  
  
### 1.  
## (i)  
set.seed(123456)  
xi <-runif(500) \*10  
sd(xi)

## [1] 2.83055

mean(xi)

## [1] 4.946002

## (ii)  
ui <-rnorm(500) \*6  
mean(ui)

## [1] 0.2556511

sd(ui)

## [1] 5.976471

sd2 <-sqrt(sum((ui -mean(ui))^2) /499)  
## The reason is that the sample size is just 500.The average of   
## ui will be zero, if the size is infinity.  
  
## (iii)  
yi <-1+2\*xi +ui  
l1 <-lm(yi ~xi)  
l1

##   
## Call:  
## lm(formula = yi ~ xi)  
##   
## Coefficients:  
## (Intercept) xi   
## 0.8488 2.0823

## They are not equal. In the regression of y on x, u and x will be   
## independent, the u(error) will be determined by y and x rather  
## than itself.  
  
## (iv)  
options(digits=8)  
summary(l1)

##   
## Call:  
## lm(formula = yi ~ xi)  
##   
## Residuals:  
## Min 1Q Median 3Q Max   
## -22.60512 -3.93751 0.44713 3.80226 15.77306   
##   
## Coefficients:  
## Estimate Std. Error t value Pr(>|t|)   
## (Intercept) 0.848819 0.538638 1.5759 0.1157   
## xi 2.082255 0.094543 22.0244 <2e-16 \*\*\*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
##   
## Residual standard error: 5.9779 on 498 degrees of freedom  
## Multiple R-squared: 0.49343, Adjusted R-squared: 0.49241   
## F-statistic: 485.07 on 1 and 498 DF, p-value: < 2.22e-16

residuals <-l1$residuals  
sum(residuals)

## [1] 1.0241807e-14

sum(xi \*residuals)

## [1] 5.0948135e-13

## (v)  
sum(ui)

## [1] 127.82553

sum(xi\*ui)

## [1] 961.07887

## They are not 0.  
  
## (vi)  
set.seed(567890)  
  
## (1)  
xii <-runif(500) \*10  
sd(xii)

## [1] 2.7567919

mean(xii)

## [1] 4.9368841

## (2)  
uii <-rnorm(500) \*6  
mean(uii)

## [1] -0.20991761

sd(uii)

## [1] 6.0176233

sd2 <-sqrt(sum((uii -mean(uii))^2) /499)  
## The reason is that the sample size is just 500.The average of   
## ui will be zero, if the size is infinity.  
  
## (3)  
yii <-1+2\*xii +uii  
l2 <-lm(yii ~xii)  
l2

##   
## Call:  
## lm(formula = yii ~ xii)  
##   
## Coefficients:  
## (Intercept) xii   
## 0.25656 2.10807

## Beta = 2.10807, because this beta comes from different sample data.  
  
  
### 2  
set.seed(123456)  
n <-1000  
x <-runif(n)  
e <-rnorm(n)  
v <-rnorm(n, 1, 1)  
y <-4+0.3\*x +e  
  
## (a)  
l3 <-lm(y ~x)  
  
## (b)  
  
library(AER)

## Warning: package 'AER' was built under R version 3.5.2

## Loading required package: car

## Loading required package: carData

## Loading required package: lmtest

## Loading required package: zoo

##   
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':  
##   
## as.Date, as.Date.numeric

## Loading required package: sandwich

## Loading required package: survival

z <-v \*x  
l4 <-ivreg(y ~x|z)  
l4

##   
## Call:  
## ivreg(formula = y ~ x | z)  
##   
## Coefficients:  
## (Intercept) x   
## 3.99710 0.31205

## Estimators of OLS are far away from true.  
## Estimators of IV are close to true.  
## Estimators of OLS are obviously different from those of IV, but their intercepts are close.

