CH2 – C1

colnames(X401k)<-c("prate","mrate","totpart","totelg","age","totemp","sole","ltotemp")

s<-summary(X401k)

```
     prate            mrate           totpart           totelg            age            totemp            sole       
 Min.   :  3.00   Min.   :0.0100   Min.   :   50.0   Min.   :   51.0   Min.   : 4.00   Min.   :    58   Min.   :0.0000  
 1st Qu.: 78.03   1st Qu.:0.3000   1st Qu.:  156.2   1st Qu.:  176.0   1st Qu.: 7.00   1st Qu.:   261   1st Qu.:0.0000  
 Median : 95.70   Median :0.4600   Median :  276.0   Median :  330.0   Median : 9.00   Median :   588   Median :0.0000  
 Mean   : 87.36   Mean   :0.7315   Mean   : 1354.2   Mean   : 1628.5   Mean   :13.18   Mean   :  3567   Mean   :0.4876  
 3rd Qu.:100.00   3rd Qu.:0.8300   3rd Qu.:  749.5   3rd Qu.:  890.5   3rd Qu.:18.00   3rd Qu.:  1804   3rd Qu.:1.0000  
 Max.   :100.00   Max.   :4.9100   Max.   :58811.0   Max.   :70429.0   Max.   :51.00   Max.   :140000   Max.   :1.0000  
    ltotemp      
 Min.   : 4.060  
 1st Qu.: 5.565  
 Median : 6.377  
 Mean   : 6.686  
 3rd Qu.: 7.498  
 Max.   :11.880  
```

result<-lm(X401k$prate~X401k$mrate)

result

```
Call:
lm(formula = X401k$prate ~ X401k$mrate)

Coefficients:
(Intercept)  X401k$mrate
     83.075        5.861
```

summary(result)

```
Call:
lm(formula = X401k$prate ~ X401k$mrate)

Residuals:
    Min      1Q  Median      3Q     Max 
-82.303  -8.184   5.178  12.712  16.807 

Coefficients:
            Estimate Std. Error t value Pr(>|t|)    
(Intercept)  83.0755     0.5633  147.48   <2e-16 ***
X401k$mrate   5.8611     0.5270   11.12   <2e-16 ***
---
Signif. codes:  0 ?***?0.001 ?**?0.01 ?*?0.05 ?.?0.1 ? ?1

Residual standard error: 16.09 on 1532 degrees of freedom
Multiple R-squared:  0.0747,    Adjusted R-squared:  0.0741 
F-statistic: 123.7 on 1 and 1532 DF,  p-value: < 2.2e-16
```

(i) Average participation rate is 87.36 and average match rate is 0.7315

(ii) $\widehat{Prate} = 83.0755 + 5.8611\text{mrate}$

Sample size is 1533, R-squared is 0.0747

(iii) 83.0755 means that when mrate is 0, estimating Prate as 83.0755

5.8611 means when mrate increase 1, the Prate increase 5.8611

(iv) When mrate is 3.5, Prate is 103.58935. This is not a reasonable prediction, because this assumes that 103% employee are expected to participate.

(iv) According to R-squared, only about 7% is determined by mrate and other 93% is determined by unobserved factors.

Ch2 – C5

rdchem <- read_excel("C:/Users/kaihu/Desktop/Quantitative Finance/Econometrics/Homework/Homework2/Dataset/rdchem.xls",

+ col_names = c("rd","sales","profits","rdintens","profmarg","salessq","lsales","lrd"))

View(rdchem)

result <- lm(rdchem$lrd~rdchem$lsales)

result

```
Call:
lm(formula = rdchem$lrd ~ rdchem$lsales)

Coefficients:
  (Intercept)  rdchem$lsales
       -4.105          1.076
```

summary(result)

```
Call:
lm(formula = rdchem$lrd ~ rdchem$lsales)

Residuals:
     Min       1Q   Median       3Q      Max
-0.90406 -0.40086 -0.02178  0.40562  1.10439

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)   -4.10472    0.45277  -9.066 4.27e-10 ***
rdchem$lsales  1.07573    0.06183  17.399  < 2e-16 ***
---
Signif. codes:  0 ?**?0.001 ?*?0.01 ??0.05 ??0.1 ??1

Residual standard error: 0.5294 on 30 degrees of freedom
Multiple R-squared:  0.9098,    Adjusted R-squared:  0.9068
F-statistic: 302.7 on 1 and 30 DF,  p-value: < 2.2e-16
```

(i) $\log(\text{rd}) = \beta_0 + \beta_1 * \log(sales)$

(ii) The estimated elasticity is 1.07573, which means sales increase 1%, then R&D spending would increase 1.07573% correspondingly.

CH3 – C3

ceosal <- read.table("C:/Users/kaihu/Desktop/Quantitative Finance/Econometrics/Homework/Homework2/Dataset/ceosal2.txt",header = TRUE)

View(ceosal)

result <- lm(ceosal$LSALARY~ceosal$LSALES+ceosal$LMKTVAL)

result

```
Call:
lm(formula = ceosal$LSALARY ~ ceosal$LSALES + ceosal$LMKTVAL)

Coefficients:
   (Intercept)   ceosal$LSALES  ceosal$LMKTVAL
        4.6209          0.1621          0.1067
```

summary(result)

```
Call:
lm(formula = ceosal$LSALARY ~ ceosal$LSALES + ceosal$LMKTVAL)

Residuals:
     Min       1Q   Median       3Q      Max
-2.28060 -0.31137 -0.01269  0.30645  1.91210

Coefficients:
               Estimate Std. Error t value Pr(>|t|)
(Intercept)     4.62092    0.25441  18.163  < 2e-16 ***
ceosal$LSALES   0.16213    0.03967   4.087 6.67e-05 ***
ceosal$LMKTVAL  0.10671    0.05012   2.129   0.0347 *
---
Signif. codes:  0 ?**?0.001 ?*?0.01 ??0.05 ??0.1 ??1

Residual standard error: 0.5103 on 174 degrees of freedom
Multiple R-squared:  0.2991,    Adjusted R-squared:  0.2911
F-statistic: 37.13 on 2 and 174 DF,  p-value: 3.727e-14
```

result2 <- lm(ceosal$LSALARY~ceosal$LSALES+ceosal$LMKTVAL+ceosal$PROFITS)

summary(result2)

```
Call:
lm(formula = ceosal$LSALARY ~ ceosal$LSALES + ceosal$LMKTVAL +
    ceosal$PROFITS)

Residuals:
     Min       1Q   Median       3Q      Max
-2.27002 -0.31026 -0.01027  0.31043  1.91489

Coefficients:
               Estimate Std. Error t value Pr(>|t|)
(Intercept)    4.687e+00  3.797e-01  12.343  < 2e-16 ***
ceosal$LSALES  1.614e-01  3.991e-02   4.043 7.92e-05 ***
ceosal$LMKTVAL 9.753e-02  6.369e-02   1.531    0.128
ceosal$PROFITS 3.566e-05  1.520e-04   0.235    0.815
---
Signif. codes:  0 ?**?0.001 ?*?0.01 ??0.05 ??0.1 ??1

Residual standard error: 0.5117 on 173 degrees of freedom
Multiple R-squared:  0.2993,    Adjusted R-squared:  0.2872
F-statistic: 24.64 on 3 and 173 DF,  p-value: 2.53e-13
```

Result3 <- lm(ceosal$LSALARY~ceosal$LSALES+ceosal$LMKTVAL+ceosal$PROFITS+ceosal$ceoten)

Summary(result3)

```
Call:
lm(formula = ceosal$LSALARY ~ ceosal$LSALES + ceosal$LMKTVAL +
    ceosal$PROFITS + ceosal$CEOTEN)

Residuals:
     Min       1Q   Median       3Q      Max
-2.48792 -0.29369  0.00827  0.29951  1.85524

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)    4.558e+00  3.803e-01  11.986  < 2e-16 ***
ceosal$LSALES  1.622e-01  3.948e-02   4.109 6.14e-05 ***
ceosal$LMKTVAL 1.018e-01  6.303e-02   1.614   0.1083
ceosal$PROFITS 2.905e-05  1.503e-04   0.193   0.8470
ceosal$CEOTEN  1.168e-02  5.342e-03   2.187   0.0301 *
---
Signif. codes:  0 ?***?0.001 ?**?0.01 ??0.05 ??0.1 ??1

Residual standard error: 0.5062 on 172 degrees of freedom
Multiple R-squared:  0.3183,    Adjusted R-squared:  0.3024
F-statistic: 20.08 on 4 and 172 DF,  p-value: 1.387e-13
```

cor(ceosal$LMKTVAL,ceosal$PROFITS)

```
[1] 0.7768976
```

(i) $\log(\text{salary}) = 4.62092 + 0.16213 * \log(sales) + 0.10671 * \log(mktval)$

Sample Size = 177, R-squared = 0.2991

(iii) $\log(\text{salary}) = 4.62092 + 0.16213 * \log(sales) + 0.10671 * \log(mktval) + 0.0000profit$

Sample Size = 177, R-squared = 0.2993

Because profit sometimes would be less than 0, thus, it cannot be included in log. However, according to R-squared, these is still approximately 70% salary is explained by other factors.

(iv) $\log(\text{salary}) = 4.62092 + 0.16213 * \log(sales) + 0.10671 * \log(mktval) + 0.0000profit + 0.01168ceoten$

Sample Size = 177, R-squared = 0.3183

The CEO tenure increase 1 year, then salary increase 1% correspondingly.

(v) Their correlation coefficient is 0.7768976 and they are highly correlated. So for OLS estimators, it's hard to calculate the right independent effect of marketvalue and profits on salary.