```
# HW2
# b05703029 陳怡蓁

# 1.
# (1)
HWdata <- read.csv("C:\\Users\\ASUS\\Downloads\\HW2\\HWdata.csv")
dim ( HWdata )
# (2)
sorted_Old <- HWdata[order(HWdata$Old),]
head( sorted_Old ) #前六低
tail( sorted_Old ) #前六高
# (3)
attach( HWdata)
length(which (Old>10 | Life<50) )
# (4)
rank <- length( Old > 12) +1
rank

# 2.
# (1)
估計式 : Life = B0 + B1 * Old
H0 : B1 = 0 ; H1 : B1 != 0
Let alpha = 0.05

code :
    regg <- lm(Life~Old)
    summary( regg )
    regg

result :
Residuals:
     Min       1Q   Median       3Q      Max
-23.4717  -5.1569   0.4173   5.9287  17.8986

  Coefficients:
              Estimate Std. Error t value Pr(>|t|)
  (Intercept)  57.7588     1.1056   52.24   <2e-16 ***
  Old           1.3426     0.1222   10.99   <2e-16 ***
```

Signif. codes:

0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 8.157 on 162 degrees of freedom

Multiple R-squared: 0.4271, Adjusted R-squared: 0.4235

F-statistic: 120.8 on 1 and 162 DF, p-value: < 2.2e-16

估計式 : Life = 57.759 + 1.343*Old

檢定 : p-value for B_1 < 2e-16, which is significantly less that 0.05 -> reject H0

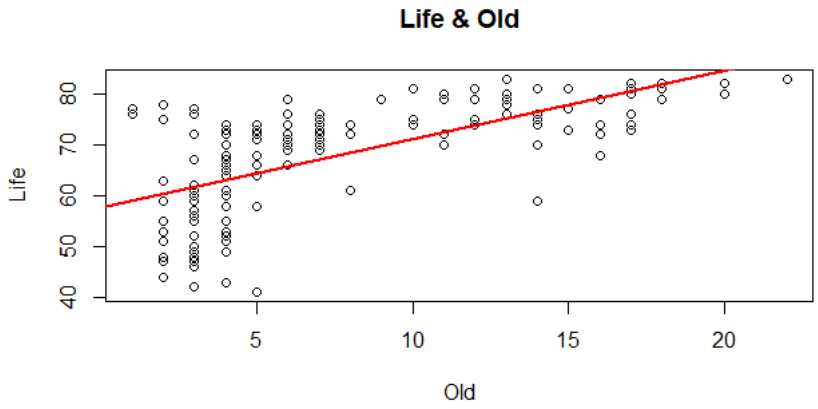
-> B_1 異於 0

(2)

code :

```
plot(x=Old,y=Life,main="Life & Old")
```

graph :

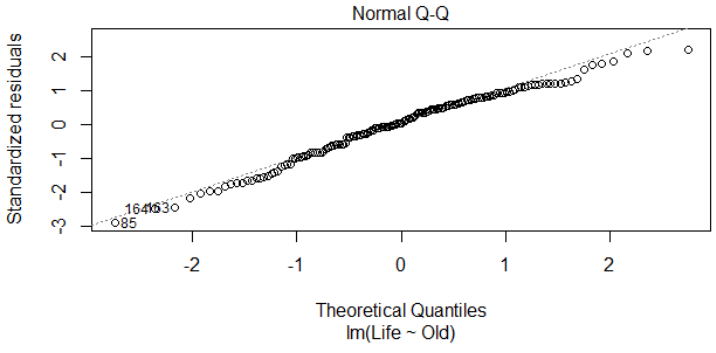


(3)

code :

```
plot(regg)
```

graph :



QQ plot 基本上非常符合 QQline，符合常態分佈，因此適合使用迴歸分析。

(4)

code :

```
regg2 <- lm(Life~log(Old))
summary( regg2 )
regg2

plot(x=log(Old),y=Life,main="Life & Old")
abline(regg2,col="red",lwd=2)

plot(regg2)
```

test :

估計式 : Life = B_0 + B_1 * log(Old)

H0 : B_1 = 0 ; H1 : B_1 != 0

Let alpha = 0.05

summary :

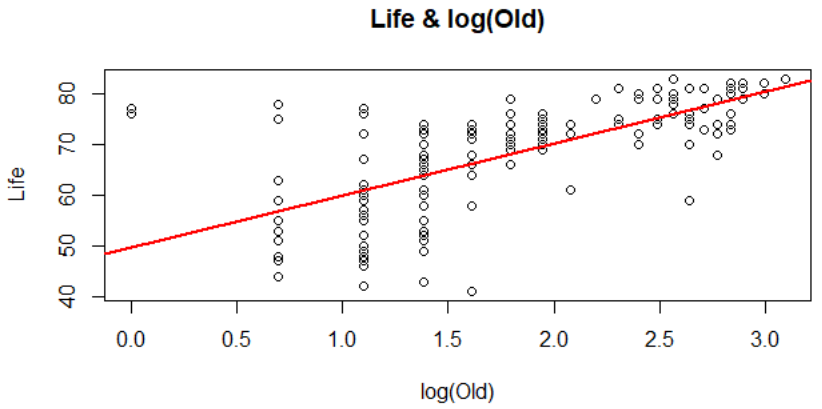
```
Residuals:
    Min      1Q  Median      3Q     Max
-25.164  -4.186   1.118   4.368  27.422

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  49.5775     1.6669   29.74   <2e-16 ***
log(Old)     10.3057     0.8806   11.70   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 7.933 on 162 degrees of freedom
Multiple R-squared:  0.4581,       Adjusted R-squared:  0.4548
F-statistic:   137 on 1 and 162 DF,  p-value: < 2.2e-16
```

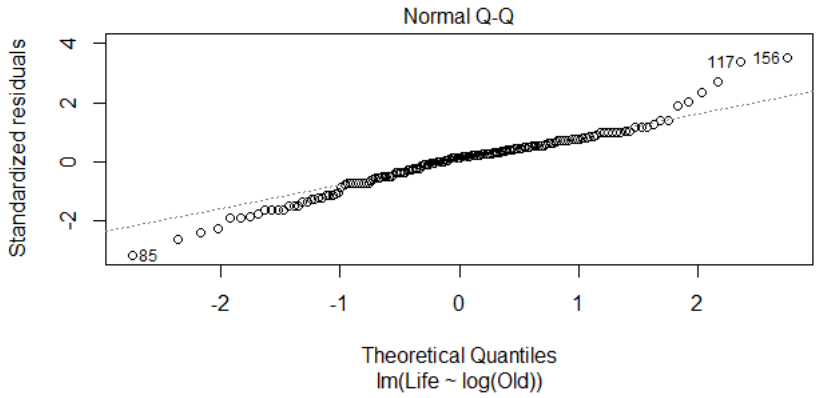
估計式 : Life = 49.578 + 10.301*log(Old)

檢定 : p-value for B_1 < 2e-16, which is significantly less that 0.05 -> reject H0

-> B_1 異於 0

graph :





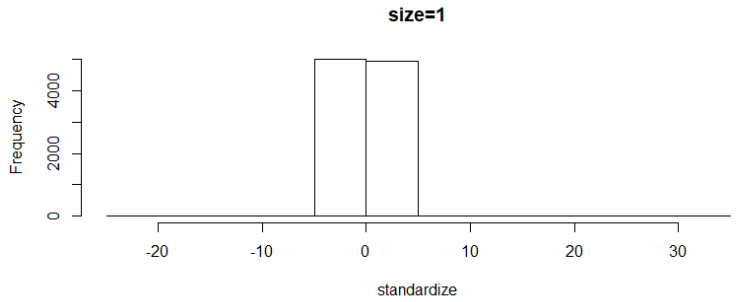
QQ plot 基本上非常符合 QQline，符合常態分佈，因此適合使用迴歸分析。

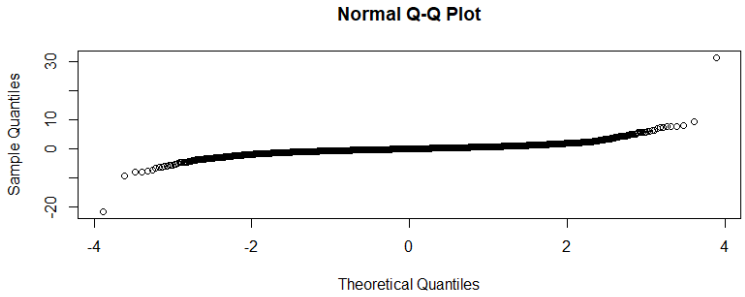
(5)

若以 QQ Plot 來看，雖然說兩者大部分都符合 QQline，應該都適合使用迴歸分析，但若細究，取完 log 之後偏離 QQline 的資料點較多，沒取 log 偏離的資料較少，因此我會選擇不取 log 的 Old 作為自變數。

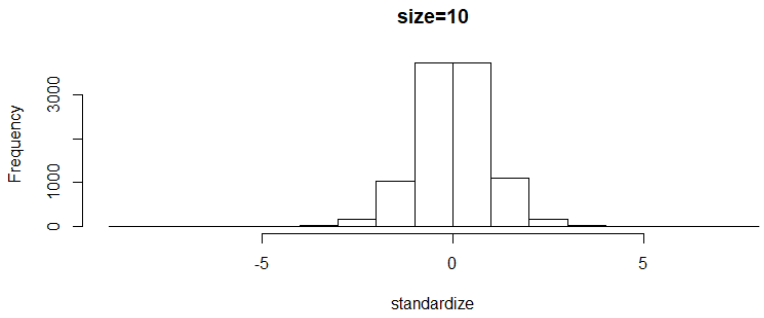
3.

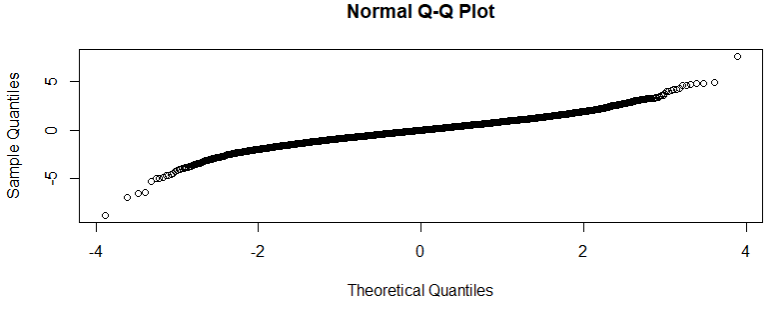
```
n <- 1
sample.means <- rep(0,10000)
standardize <- rep(0,10000)
for(i in 1:10000){
   sample.means[i] <- mean(rt(n,3))
   standardize[i] <- sample.means[i]/(sqrt(3)/sqrt(n))
}
hist(standardize,main="size=1")
qqnorm(standardize)
```



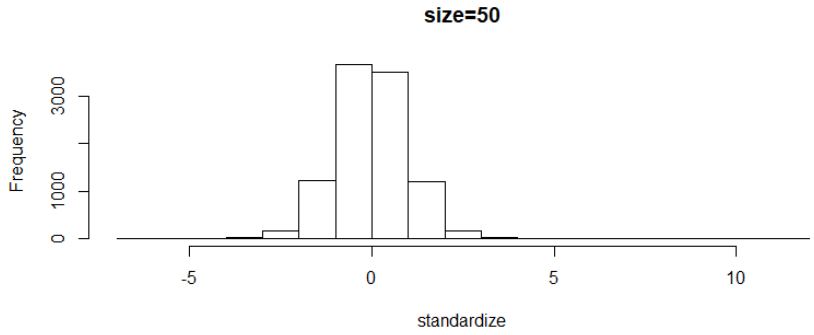


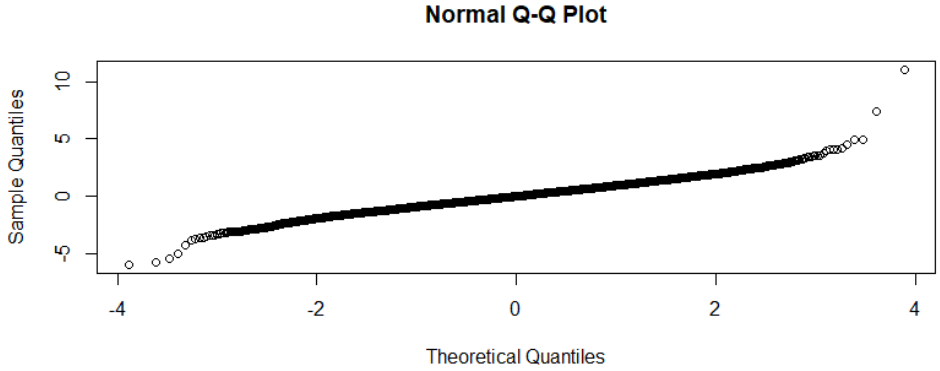

```
n <- 10
sample.means <- rep(0,10000)
standardize <- rep(0,10000)
for(i in 1:10000){
   sample.means[i] <- mean(rt(n,3))
   standardize[i] <- sample.means[i]/(sqrt(3)/sqrt(n))
}
hist(standardize,main="size=10")
qqnorm(standardize)
```



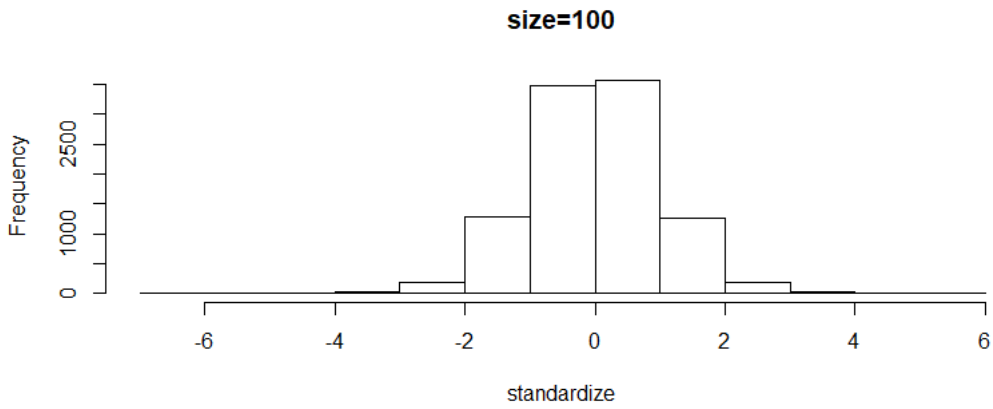


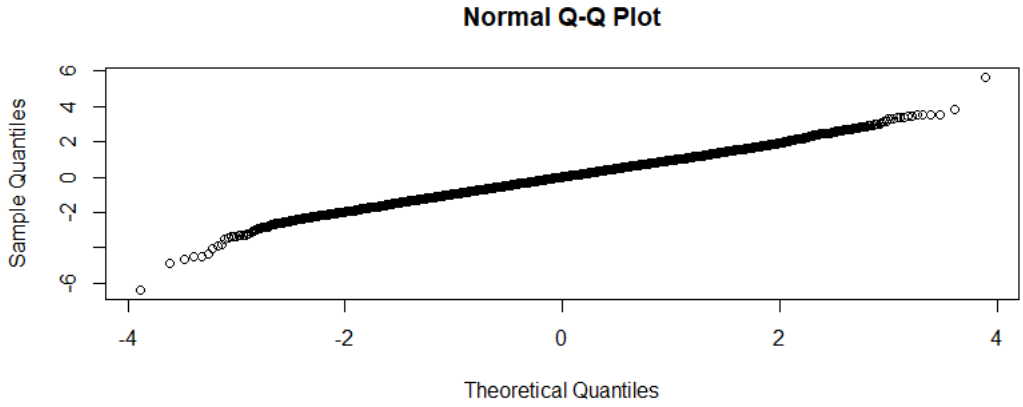
```
n <- 50
sample.means <- rep(0,10000)
standardize <- rep(0,10000)
for(i in 1:10000){
   sample.means[i] <- mean(rt(n,3))
   standardize[i] <- sample.means[i]/(sqrt(3)/sqrt(n))
}
hist(standardize,main="size=10")
qqnorm(standardize)
```






```
n <- 100
sample.means <- rep(0,10000)
standardize <- rep(0,10000)
for(i in 1:10000){
   sample.means[i] <- mean(rt(n,3))
   standardize[i] <- sample.means[i]/(sqrt(3)/sqrt(n))
}
hist(standardize,main="size=10")
qqnorm(standardize)
```


size=100
Frequency
0
1000
2500
-6
-4
-2
0
2
4
6
standardize


Normal Q-Q Plot
Sample Quantiles
-6
-2
0
2
4
6
-4
-2
0
2
4
Theoretical Quantiles