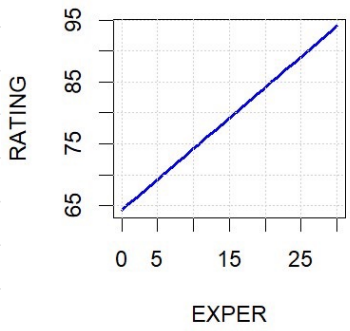
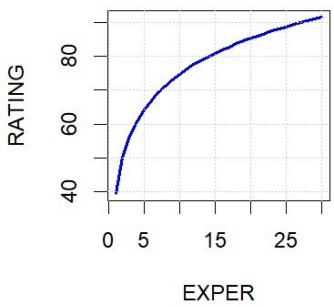
4.4

(a)



(b)



因 $\ln(0)$ 不被定義，所以 model 2 無法估 no experience.

(c)

(i) 10 years

(ii) 20 years

marginal effect 都是 0.990，(β_1)

因迴歸模型是線性的

(d) (i) 10 years

$$\text{marginal effect} = \frac{\partial Y}{\partial X} = 15.312 \times \frac{1}{X}$$

$$= \frac{15.312}{10} = 1.5312 \quad \#$$

(ii) 20 years

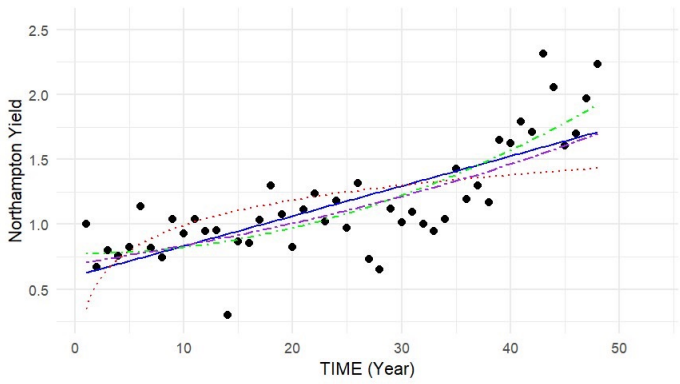
$$\text{marginal effect} = \frac{\partial Y}{\partial X} = 15.312 \times \frac{1}{20} = 0.7656 \quad \#$$

(e) 用 model (ii) 較好，因其 R^2 較高 ※

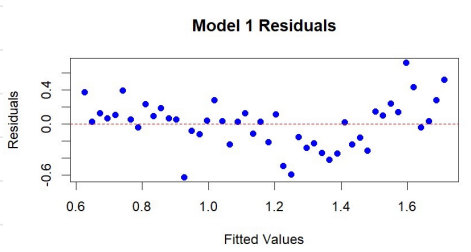
(f) model (ii) 更適合，在經濟學中邊際報酬遞減，因此隨著經驗增加，邊際效果應遞減，非絕對常數 ※

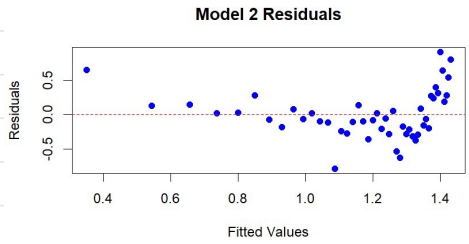
4.28

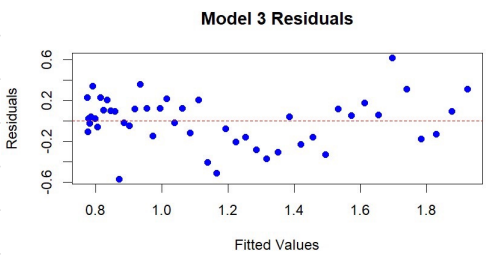
(a) (i)

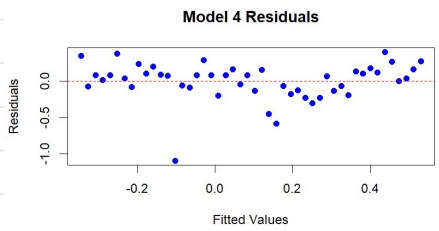


(ii)









(iii)

model 1: p-value 0.6792

model 2: p-value 0.1856

model 3: p-value 0.886

model 4: p-value 0.00007205 (殘差不常態)

R^2: model 1: 0.5778

2: 0.3386

3: 0.6890

4: 0.5074.

因此是 model 3:

因其殘差常態且 R^2 高。

(b) when time increase by 1,
the yield increase by 0.0004986181

(c) 見 R

(d) yes, the interval contain the true value.

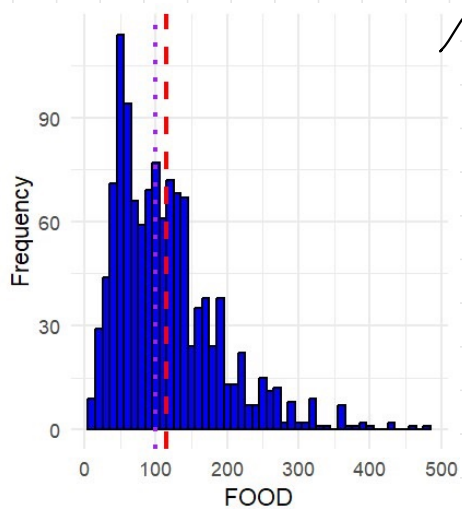
4.29

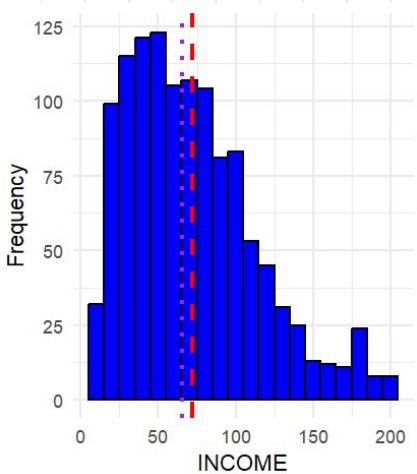
(a)

Variable	Mean	Median	Min	Max	Std_Dev
1 food	114.44311	99.80	9.63	476.67	72.65750
2 income	72.14264	65.29	10.00	200.00	41.65228

>

mean > median



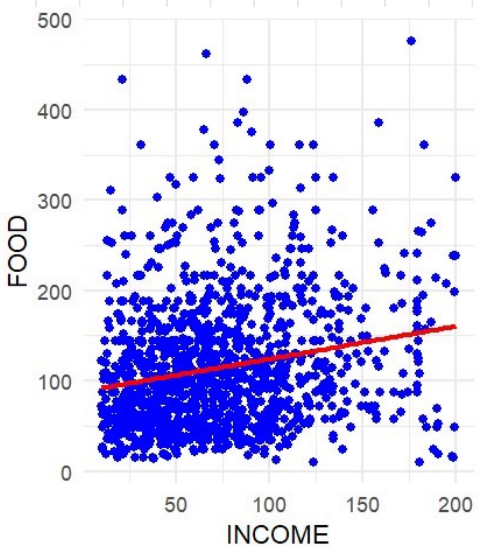


None of them looks like bell-shaped and symmetric.

Jarque Bera test:

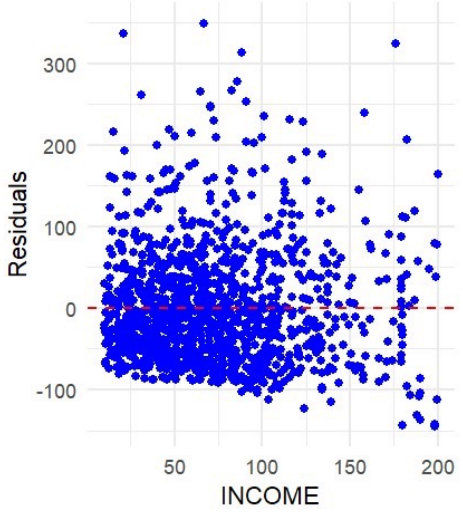
food & income 皆 reject Null，資料非常態，根據檢定結果資料可能為右偏or厚尾

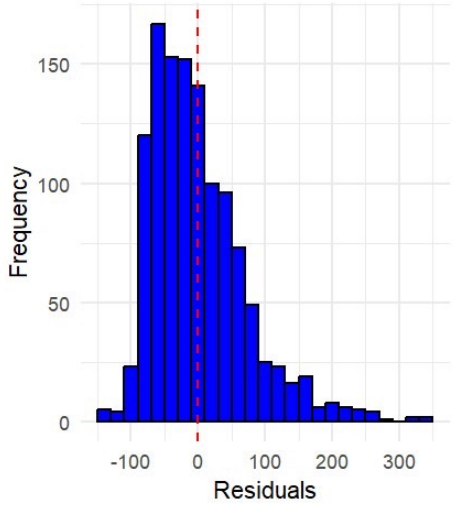
(b) food = 88.5665 + 0.3587 income



95% C.I. = [0.262, 0.455]，沒有很寬，因此還算精確

cc) 殘差圖看起來無明顯 pattern





Jarque Bera test

p-value < 2.2e-16.

random error 符合常態較重要，因這樣能符合 OLS 的模型假設

(d)

```
  income Elasticity Lower_Bound
1     19 0.07145038  0.05217475
2     65 0.20838756  0.15216951
3    160 0.39319883  0.28712305
  Upper_Bound
1  0.09072601
2  0.26460562
3  0.49927462
>
```

3單性在不同 income 間有顯著差異.

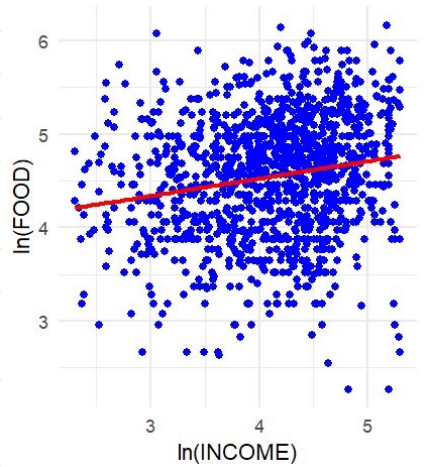
結果顯示 food 在高收入時，對收入變動更敏感.

信賴區間無重疊，

經濟學中，食品為必需品，隨著 income 个，

food 3單性應降低（食品的邊際效用↓）

(e)



$R^2 = 0.042281$

Generalised $R^2 = 0.033323$

linear model is better than log-model

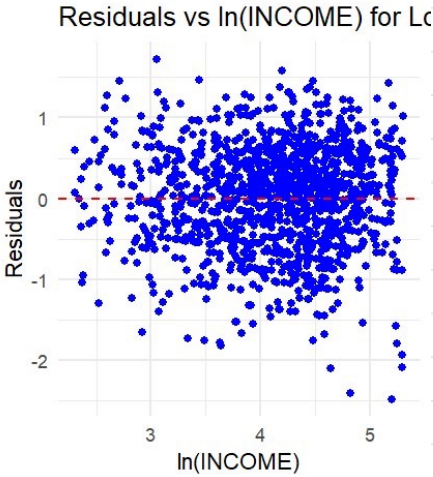
(f)

```
                    Model
log(income) Log-Log Model
            Elasticity Lower_Bound
log(income)  0.1863054   0.1293432
            Upper_Bound
log(income)   0.2432675
>
```

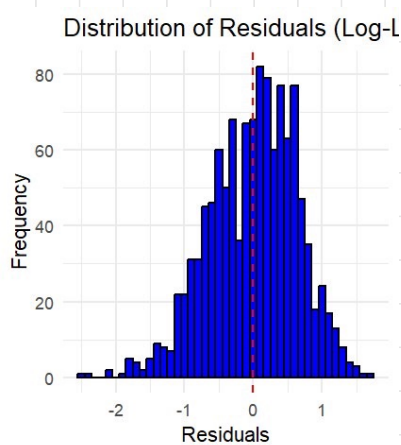
沒有到很 similar 因 95%. C.I 沒有到

totally overlap 來

(g)



沒有很明顯 pattern

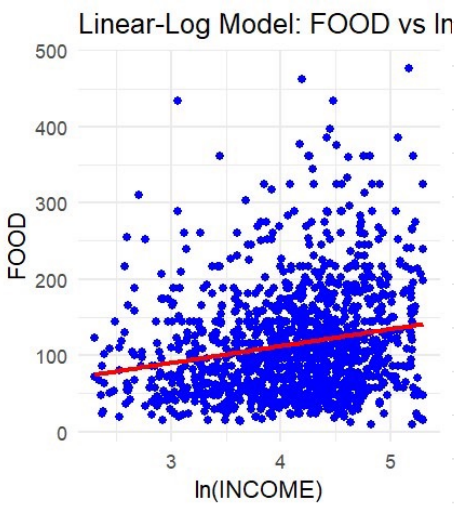


Jarque Bera Test:

p-value: 2.436e-06

代表 errors 非常態

(h)



linear-log: $R^2 = 0.038$

linear: $R^2 = 0.042$

log-log: $R^2 = 0.0332$

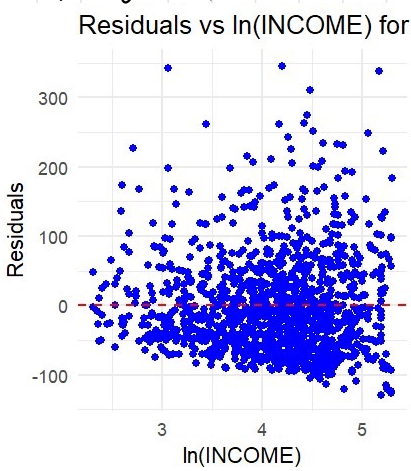
以 R^2 来看, linear model fit the data better.

(i)

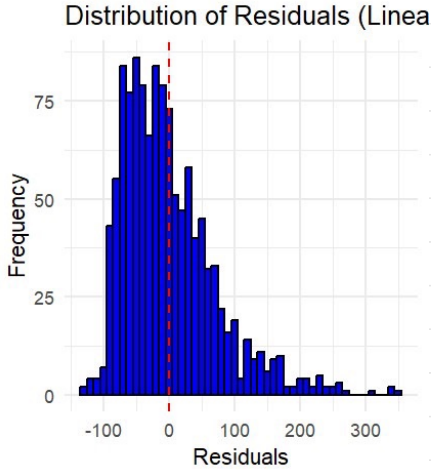
```
  INCOME Elasticity Lower_Bound
1     19  0.2495828   0.1784009
2     65  0.1909624   0.1364992
3    160  0.1629349   0.1164652
  Upper_Bound
1   0.3207648
2   0.2454256
3   0.2094046
>
```

elasticity of food expenditure is dissimilar to the other models, 因 C.I. 冇 overlap.

(j) 看起來沒有對稱於0



圖形右偏



Jarque Bera test: p-value < 2.2e-16

↳ errors 仍不是常態

(k) log-log，首先是殘差圖看起來最隨機，

且從 skewness、kurtosis 來看，殘差的非常態看起來最小，