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HW0317

Question 29

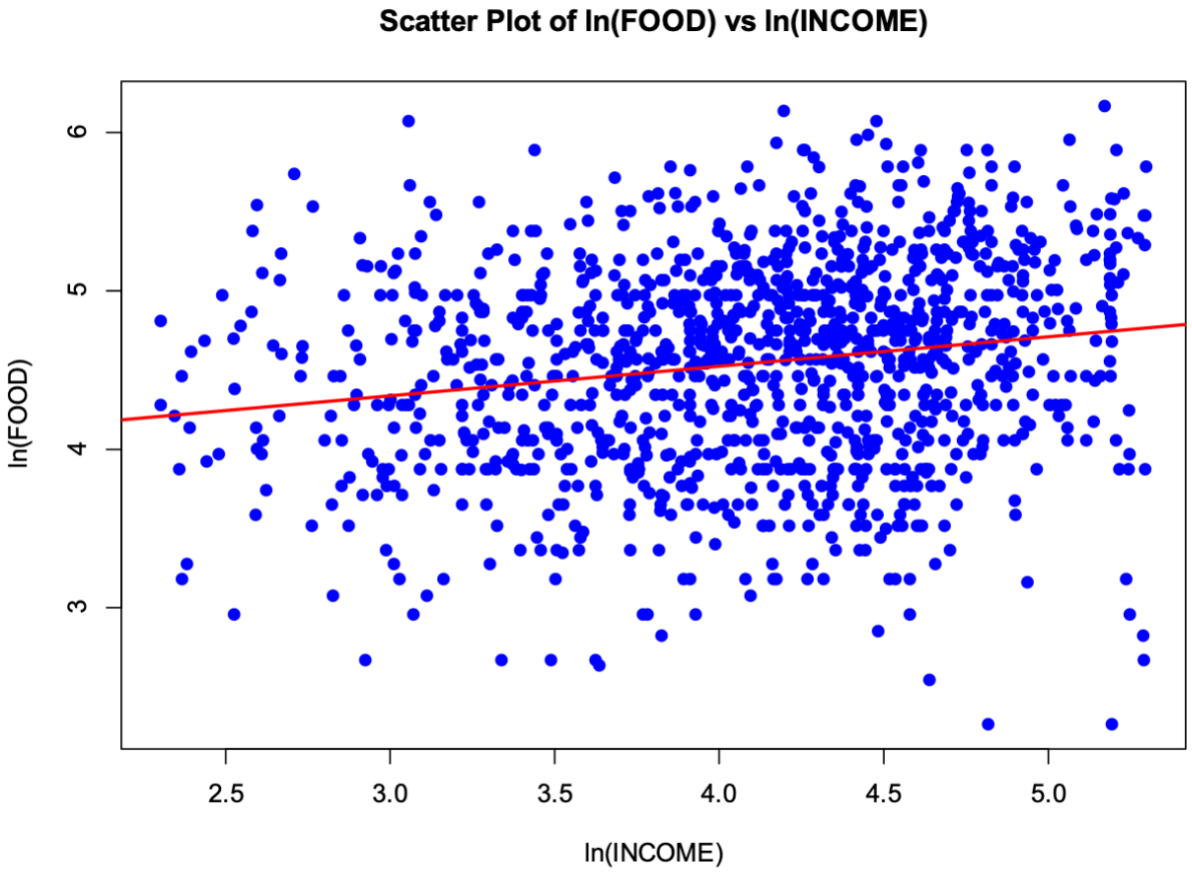
d.

```
> print(results_df)
  Income Fitted_Food Elasticity         SE   CI_Lower   CI_Upper
1     19    95.38155 0.07145038 0.00982475 0.05217475 0.09072601
2     65   111.88114 0.20838756 0.02865423 0.15216951 0.26460562
3    160   145.95638 0.39319883 0.05406661 0.28712305 0.49927462
```

Estimated elasticities are dissimilar and the interval estimates do not overlap.

According to economics principles, the income elasticity for food should decrease when income increase because food is necessary.

e.




```
lm(formula = log(food) ~ log(income), data = cex5_small)

Residuals:
     Min       1Q   Median       3Q      Max
-2.48175 -0.45497  0.06151  0.46063  1.72315

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  3.77893    0.12035  31.400   <2e-16 ***
log(income)  0.18631    0.02903   6.417    2e-10 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.6418 on 1198 degrees of freedom
Multiple R-squared:  0.03323,   Adjusted R-squared:  0.03242
F-statistic: 41.18 on 1 and 1198 DF,  p-value: 1.999e-10
```

```
> print(model_comparison)
                    Model         R2
1                  Linear 0.04228120
2 Log-Log (Generalized R²) 0.03965161
```

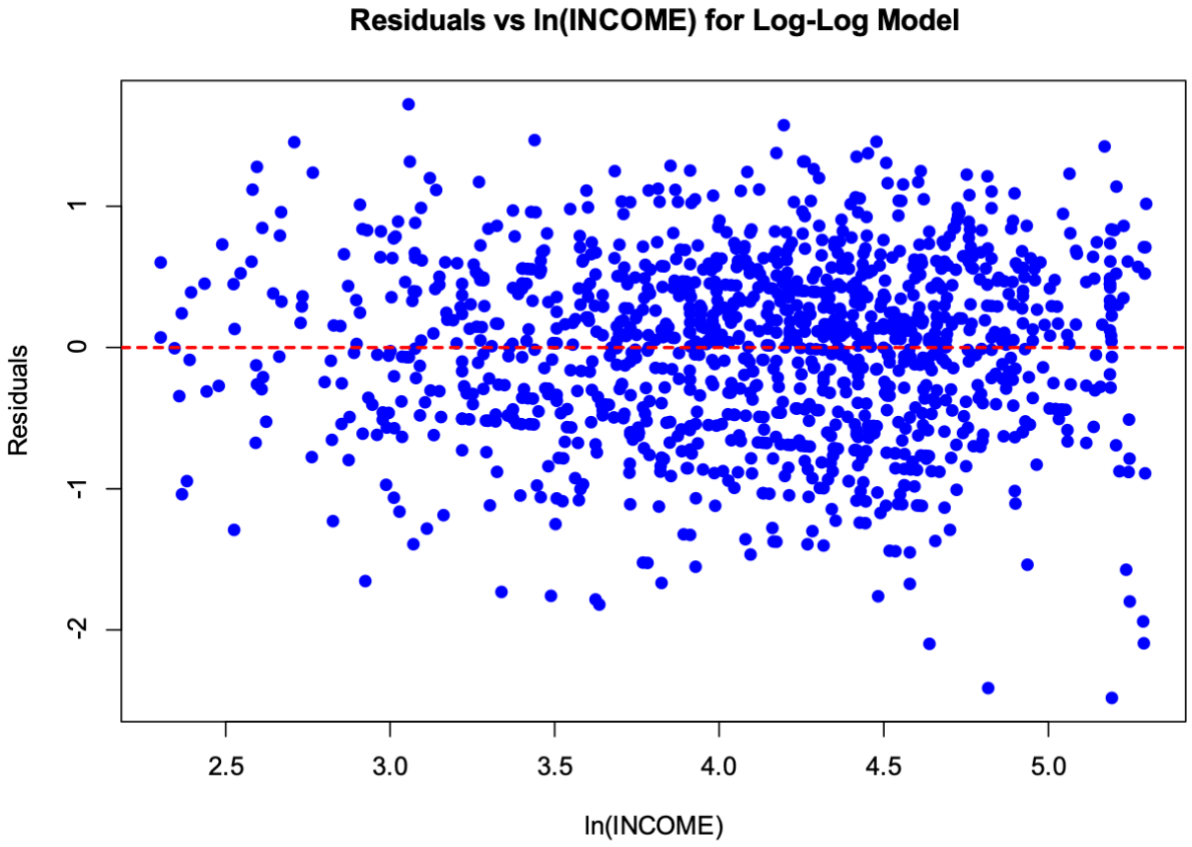
The general R2 of log_log model is smaller than linear one, making the linear model is more appropriate.

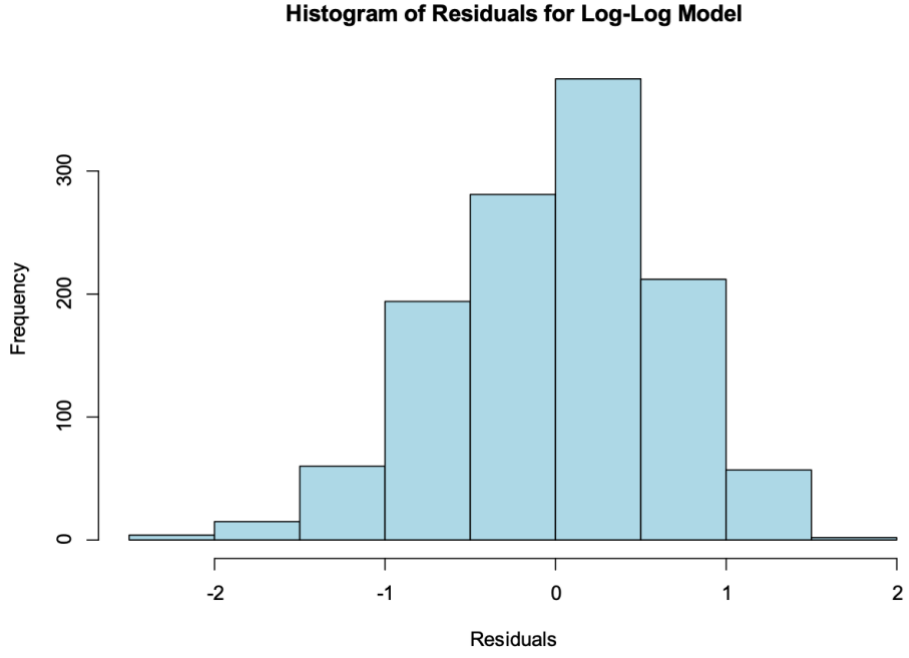
f.

```
> print(comparison_table)
              Model Elasticity   CI_Lower   CI_Upper
1  Linear, INCOME=19 0.07145038 0.05217475 0.09072601
2  Linear, INCOME=65 0.20838756 0.15216951 0.26460562
3 Linear, INCOME=160 0.39319883 0.28712305 0.49927462
4           Log-Log 0.18630536 0.12934324 0.24326749
```

The CI of log_log model is quite similar with linear one at INCOME = 65. There is overlap CI at that point.

g.


Residuals vs ln(INCOME) for Log-Log Model
Residuals
1
0
-1
-2
2.5
3.0
3.5
4.0
4.5
5.0
ln(INCOME)


Histogram of Residuals for Log-Log Model
Frequency
300
200
100
0
-2
-1
0
1
2
Residuals

```
    Jarque Bera Test

data:  log_log_resid
X-squared = 25.85, df = 2, p-value = 2.436e-06
```

The scatters are quite random and no pattern.

The Jarque Bera Test results suggest that null hypothesis is rejected.