**Homework 3**

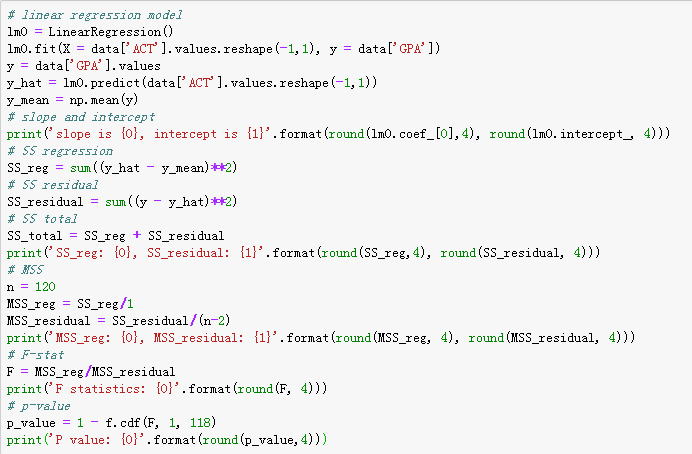
**Name**: Quan Yuan **UNI**: qy2205

**2.2**

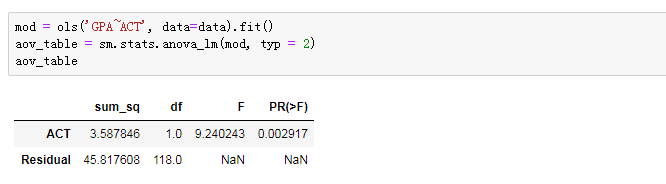
No, we cannot make that conclusion. Since when , there exists a negative correlation between X and Y.

**2.23**

(a) ANOVA Table







**Table 1: ANOVA Table**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **df** | **SS** | **MSS** | **F-stat** | **p-value** |
| **Regression** | 1 | 3.5878 | 3.5878 | 9.2402 | 0.0029 |
| **Residual** | 118 | 45.8176 | 0.3883 |  |  |
| **Total** | 119 | 49.4055 |  |  |  |

(b)

MSR in ANOVA Table is 3.5878, MSE is 0.3883.

So, when ,

(c)

Alternatives:

F-test:

Decision rule:

So

(d)

The absolute magnitude of the reduction is

The relative reduction is

The name of latter is called coefficient of determination.

(e)

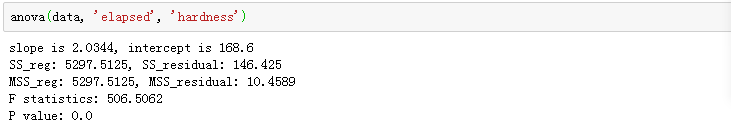
Since slope is 0.0388, r should be positive

(f)

has more clear-cut operational interpretation. It shows the proportionate reduction of total variation associated with the use of predictor variable X.

**2.26**

(a) ANOVA table





**Table 2: ANOVA Table**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **df** | **SS** | **MSS** | **F-stat** | **p-value** |
| **Regression** | 1 | 5297.513 | 5297.513 | 506.506 | 0.0 |
| **Residual** | 14 | 146.425 | 10.459 |  |  |
| **Total** | 15 | 5443.938 |  |  |  |

(b)

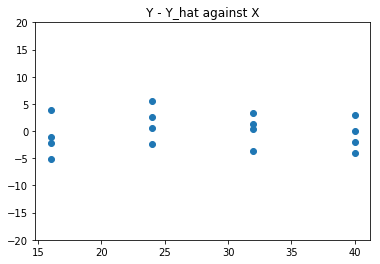
Alternatives:

F-test:

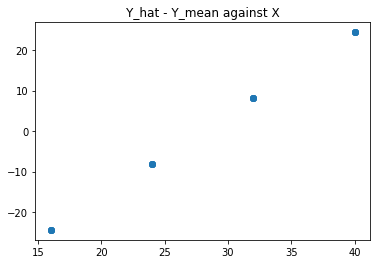
Decision rule:

So

(c)



**Figure 1: Y – Y\_hat against X**



**Figure 2: Y\_hat – Y\_mean against X**

From the plot, we can see that SSR appear to be the larger proportion of SSTO, it implies that is close to 1 than to 0.

(d)

*Since ,* should be positive*.*

**2.56**

(a)

(b)

It would be worse since the distance between are small, which makes MSR small and F-statistics equal to 1.

No. Since the confidence interval is

Since the mean of X = 6, 7, 8, 9, 10 and the mean of X = 1, 4, 10, 11, 14 are the same. So the confidence intervals for two observations are of the same.

**2.61**

According to 1.10 (a)

According to 2.51

So based on the formula above, we could see whether is regressed on or is regressed on , the results are the same.

**2.66**

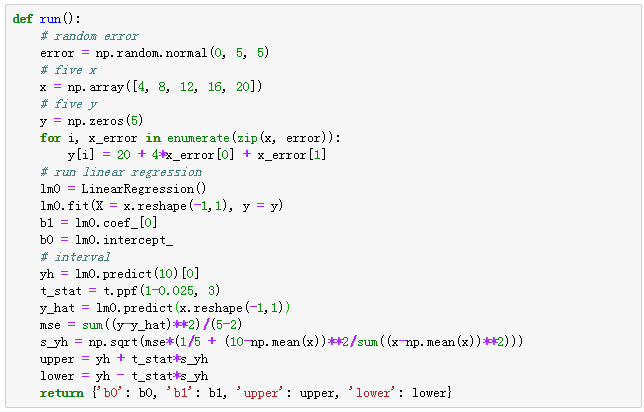
(a)

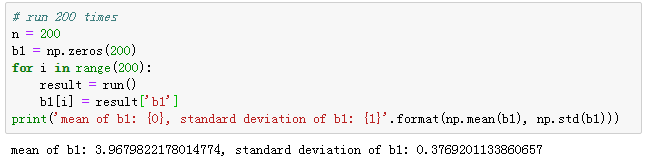
Confidence interval for , confidence limits are:



C:\Users\ADMINI~1\AppData\Local\Temp\WeChat Files\13c4868ca1202a07f5a361cde531f10.png

(b) & (c)

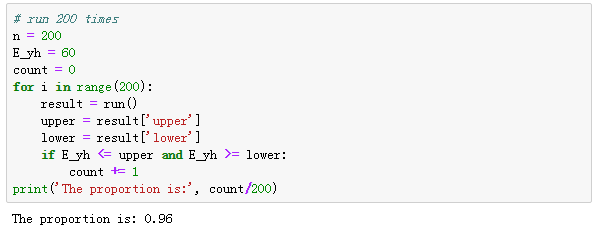




Based on the program output, the results consistent with theoretical expectations.

(d)

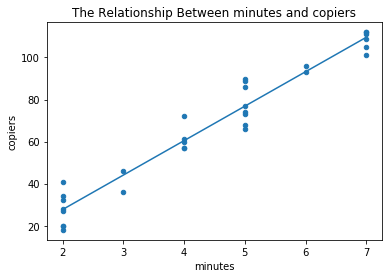
The proportion is 96% and the result consistent with theoretical expectations.



**2.68**

(a)

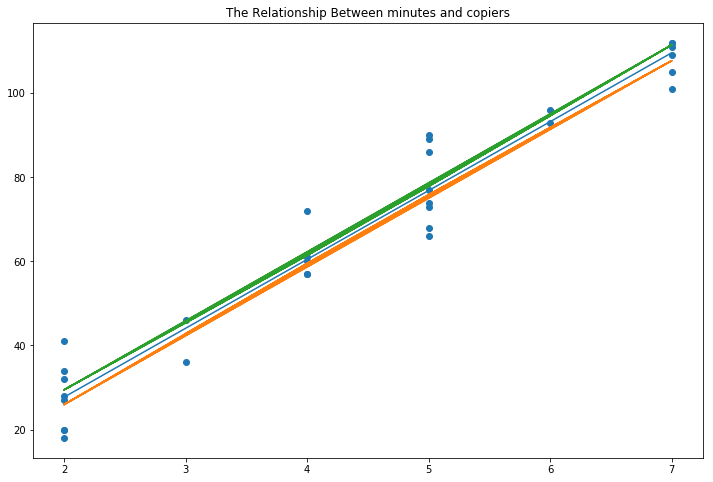
With the class we developed in homework 1, the result is showing below.



(b)

The confidence band for regression line is

Where:



Yes, the confidence band suggest that the true regression relation has been precisely estimated since all three lines are close to each other.

