**LINEAR REGRESSION**: Homework 

*Professor Jingchen Liu*

Fan Yang

UNI: fy2232

# Problem 1 (2.2)

No, this conclusion does not imply that *X* and *Y* have no linear association. This result only tells us that *X* and *Y* are negative correlated, which means when *X* grows, value of *Y* decreases.

# Problem 2 (2.23)

## (a)



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | DF | SS | MS | F |
| Regression | 1 | 3.588 | 3.5878 | 9.239763 |
| Error | 118 | 45.818 | 0.3883 |  |
| Total | 119 | 49.406 |  |  |

## (b)



So  is estimated by *MSR*



So  is estimated by *MSE*

When , *MSR* and *MSE* estimate the same quantity.

## (c)





if , then conclude 

else , reject 

While , so we can reject  and conclude 

## (d)

While , so we can reject  and conclude 

**pass**

## (e)





## (f)

I think  has the more clear-cut operational interpretation. Because  equals to

Explained variation divided by Total variation, which represents the percentage of variation can be explained by our linear model.

# Problem 3 (2.26)

## (a)



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | DF | SS | MS | F |
| Regression | 1 | 5297.5 | 5297.5 | 506.51 |
| Error | 14 | 146.4 | 10.5 |  |
| Total | 15 | 5443.9 |  |  |

## (b)



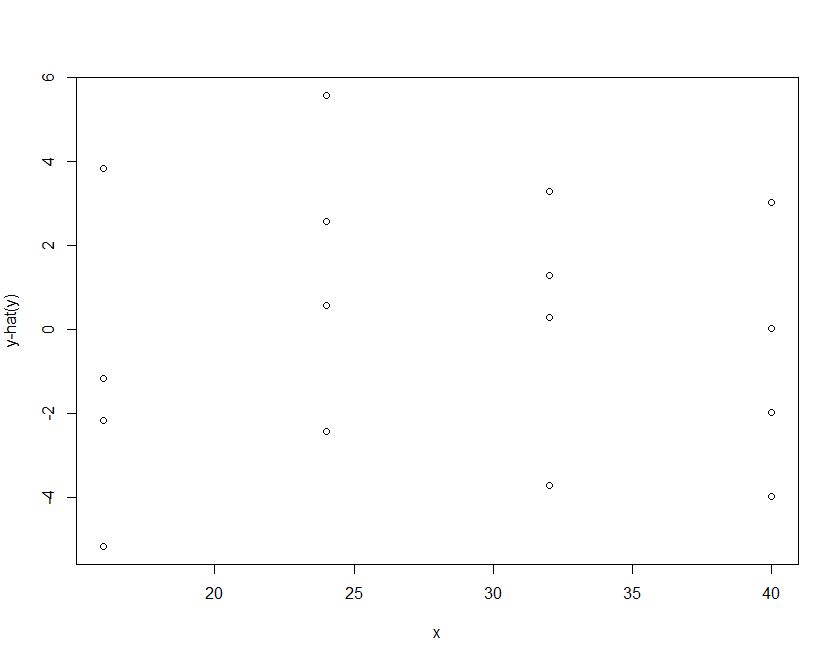


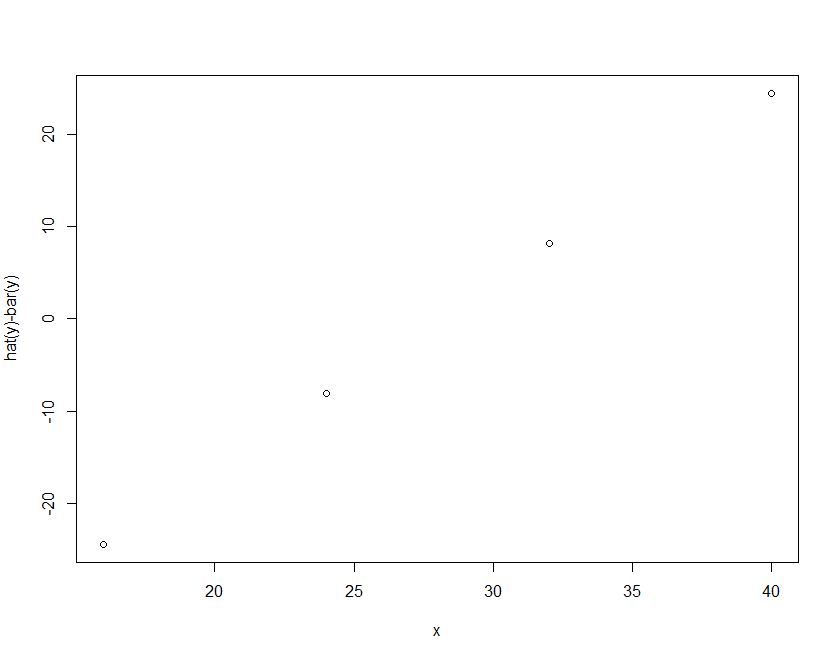
if , then conclude 

else , reject 

While , so we can reject  and conclude 

## (c)





From the graph we can say that SSR appear to be the larger component of SST.

While  so  is large.

# Problem 4 (2.56)

## (a)







## (b)

Denote *E* as A wins, *F* as they played 2 games and game ends.







# Problem 5 (2.61)



As for this fraction, the denominator and numerator each has same expression for X and Y, which means X and Y have symmetric expressions. Therefore, the ratio is the same whether  is regressed on  or  is regressed on .

# Problem 6 (2.66)

## (a)





So ****

When 

The 95 percent confidence interval is



which is





## (b)



## (c)







So, the theoretical expectation of  should be 0.3952847. The result differs from the theoretical expectation a little.

**PASS**

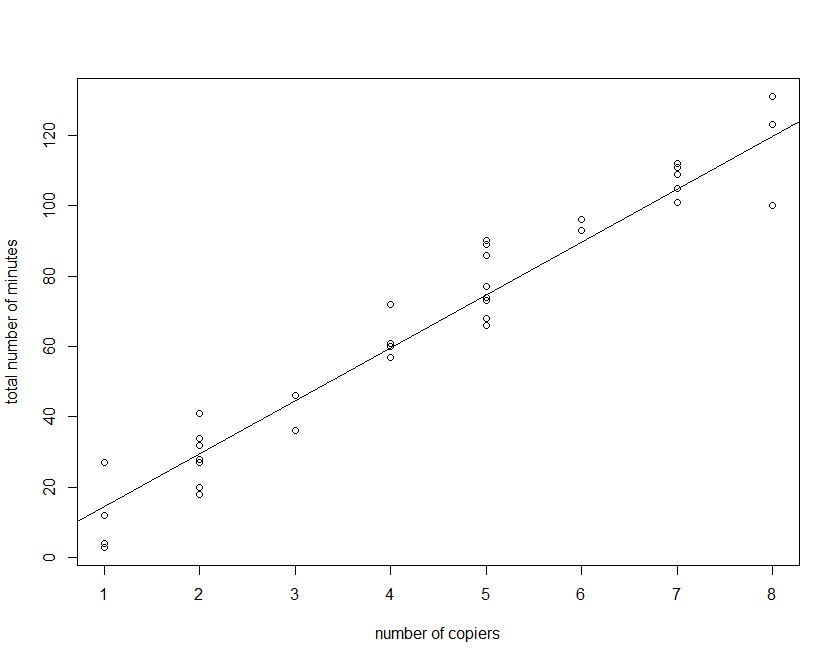
## (d)



From the results above, we find 100% of the 200 confidence intervals include. This result is consistent with theoretical expectations.

# Problem 7 (2.68)

## (a)



## (b)

