

Homework 6

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11/8/2021

Question 1

Part a

```
## Data from the website
x = c(110.5, 105.4, 118.1, 104.5, 93.6, 84.1, 77.8, 75.6)
y = c(5.755, 5.939, 6.010, 6.545, 6.730, 6.750, 6.899, 7.862)

## binds x and y into a dataframe
d = data.frame(c(x,y))

## Creates variable fit_d that shows the slope and the y-intercept
fit_d = lm(y~x, data = d)

print(fit_d)

##
## Call:
## lm(formula = y ~ x, data = d)
##
## Coefficients:
## (Intercept)          x
##    10.13746     -0.03717
```

The least squares estimate is of β_1 is -.037. This value represent the best fit of the trend of the data that reduces the distance from all of the points to the line itself

Part B

```
## Runs an ANOVA test
anovad = anova(fit_d)

print(anovad)

## Analysis of Variance Table
##
```

```
## Response: y
##           Df Sum Sq Mean Sq F value    Pr(>F)
## x           1  2.42357    2.42357    18.455 0.005116 **
## Residuals    6  0.78794    0.13132
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

used to get the t-test p-value

```
summaryd = summary(fit_d)
```

```
print(summaryd)
```

```
##
## Call:
## lm(formula = y ~ x, data = d)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.34626 -0.27605 -0.09448  0.27023  0.53495
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 10.137455   0.842265  12.036   2e-05 ***
## x           -0.037175   0.008653  -4.296  0.00512 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3624 on 6 degrees of freedom
## Multiple R-squared:  0.7547, Adjusted R-squared:  0.7138
## F-statistic: 18.46 on 1 and 6 DF, p-value: 0.005116
```

Both the F-test and the T-test show a P-value $< .01$ confirming the alternative hypothesis. This means that $H_a \neq 0$ is true.

```
confint(fit_d)
```

```
##              2.5 %      97.5 %
## (Intercept)  8.07650745 12.19840320
## x           -0.05834895 -0.01600043
```