STAT 608 HW 1

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1)

```r
playbill <- read.csv("playbill.csv")
```

```r
playbill_slr <- lm(data = playbill, formula = CurrentWeek ~ LastWeek)
slr_data <- summary(playbill_slr)
slr_data
```

```

Call:
lm(formula = CurrentWeek ~ LastWeek, data = playbill)

Residuals:
   Min     1Q Median     3Q    Max 
-36926  -7525  -2581   7782  35443 

Coefficients:
             Estimate Std. Error t value Pr(>|t|)    
(Intercept) 6.805e+03  9.929e+03   0.685    0.503    
LastWeek    9.821e-01  1.443e-02  68.071   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 18010 on 16 degrees of freedom
Multiple R-squared:  0.9966,	Adjusted R-squared:  0.9963 
F-statistic:  4634 on 1 and 16 DF,  p-value: < 2.2e-16
```

a)

```r
B_1 <- slr_data$coefficients[2,"Estimate"]
B_1_se <- slr_data$coefficients[2,"Std. Error"]
n = length(playbill)
lower <- B_1 - B_1_se*qt(1-0.05/2, df = n - 2)
upper <- B_1 + B_1_se*qt(1-0.05/2, df = n - 2)
c(lower,upper)
```

```
[1] 0.7987662 1.1653968
```

The 95% confidence interval for β_1 is (0.799, 1.165) The suggested value of 1 for β_1 is reasonable because it is within our confidence interval.

b)

We are testing the hypothesis: $H_0 : \beta_0 = 10000, H_1 : \beta_0 \neq 10000$. To do this we have the T statistic:

$T = \frac{\hat{\beta_0} - 10000}{SE(\beta_0)}$ and its absolute value needs to be greater than $t_{n-2}(\alpha/2)$ to reject the null hypothesis.

```r
t_quantile_rejection <- qt(0.05/2,df = n - 2)
B_0_hat <- slr_data$coefficients[1,"Estimate"]
B_0_hat_se <- slr_data$coefficients[1,"Std. Error"]
T_statistic_B_0 <- (B_0_hat - 10000)/B_0_hat_se
T_statistic_B_0
```

```
[1] -0.3217858
```

In this case our T statistic equals to -0.322 whose absolute value is far lower than -12.706.

```r
lower_B_0 <- B_0_hat - B_0_hat_se*qt(1-0.05/2, df = n - 2)
upper_B_0 <- B_0_hat + B_0_hat_se*qt(1 - 0.05/2, df = n -2)
c(lower_B_0,upper_B_0)
```

```
[1] -119359.1  132968.8
```