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INST314

HW9

High School GPA and University GPA

Calculate the correlation coefficient. Express the results properly in words. (5 pts)

H0: The true correlation is equal to zero

Ha: The true correlation is not equal to zero.

The two variables were correlated, and the relationship was statistically significant where r(103)= 0.77918 , p = 2.2e-16. The relationship is statistically significant.

Assumptions for Correlation Analysis:

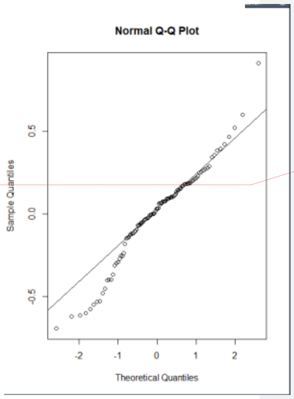
➔ Variables quantitative (variables must be quantitative)

We assume and can see that the data is quantitative as they are ratios/proportions.

➔ Linear Relationship

We assume that they do have a linear relationship.

➔ Normality
Based on the qqplot shown above, we assume that the data is not normally distributed. There was no data transformation done to rectify that.



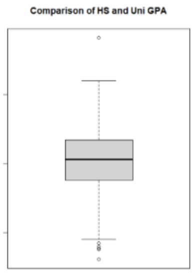
➔ Related pairs

We can assume that the data is not paired.

Commented [SMW1]: Must be paired and a paired t-test..interested in how all the data moves together

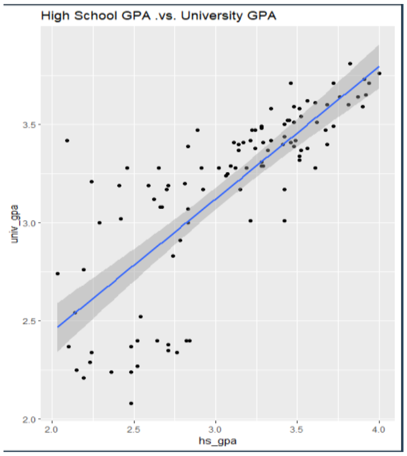
- ➔ No outliers

  We can assume that there are outliers based on the boxplot shown of the residual of the University and High school GPA shown.



Create a scatter plot comparing the two. (5 pts)

The scatterplot is not showing a strong correlation.



Do a simple linear regression. Include an assessment of assumptions and express your results in words and mathematically. (5 pts for assessing each assumption, 5 pts for the regression analysis and 5 pts for the correct reporting of the results)

Y' = 1.09682 + 0.6748x

A = Baseline GPA

X = High school GPA rate

B = Coefficient that shows the trend of how gpa increases

Y = University GPA

This assumes the average expected gpa for university in terms of the high school gpa.

Assumptions of Regression:

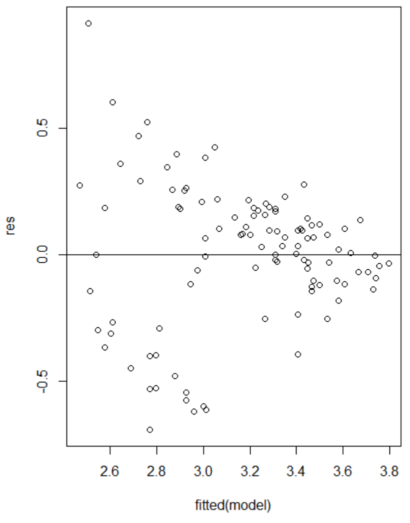
➔ Linearity

There is no linear relationships between the data.

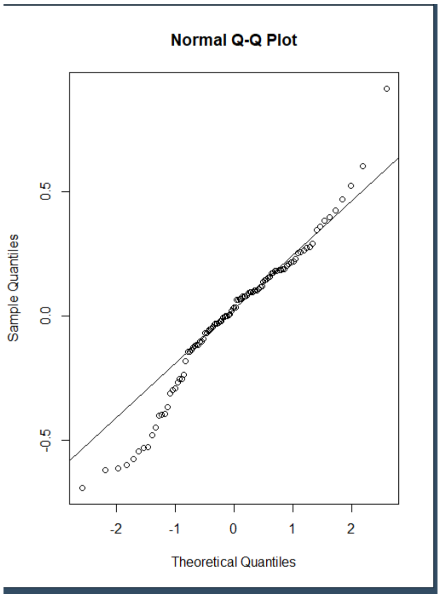
➔ Independence
We can assume that the variables are independent of each other due to the lack of closeness between the variables.

➔ Homoscedasticity

We can assume that there is no homeodascity, due to the lack of variance shown in plot and a skewedness to the right.

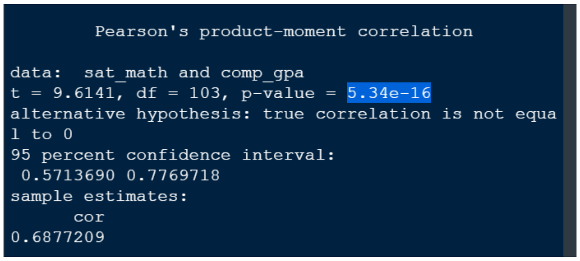


➔ Normality
We can assume that the data is normal due to the QQplot of the residuals indicating normal distribution.



Math SAT and Computer Science GPA

Calculate the correlation coefficient. Express the results properly in words.(5 pts)



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        Pearson's product-moment correlation

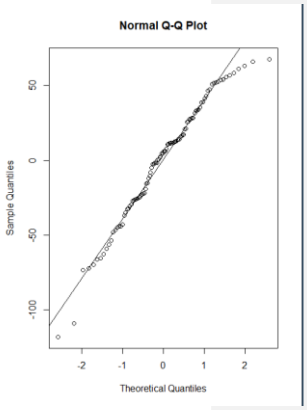
data:  sat_math and comp_gpa
t = 9.6141, df = 103, p-value = 5.34e-16
alternative hypothesis: true correlation is not equa
l to 0
95 percent confidence interval:
 0.5713690 0.7769718
sample estimates:
      cor
0.6877209
```

H0: The true correlation is equal to zero
Ha: The true correlation is not equal to zero.
The two variables were correlated, and the relationship was statistically significant where r(103)= 0.6877209, p = 5.34e-16. The relationship is statistically significant.

Assumptions for Correlation Analysis:

- ➔ Variables quantitative
  We can assume that the variables are quantitative due to the fact that the data we are using are proportions/ratios.
- ➔ Linear Relationship

There is a linear relationship,



- ➔ Normality
  We can assume that the data is not normally distributed,

Based on the qq plot provided, there isn't normal distribution showing

And no data transformation occurred.

- ➔ Related pairs

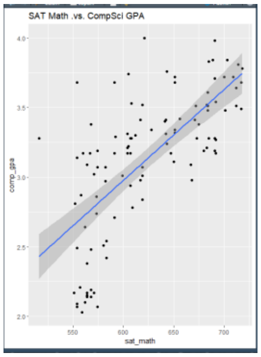
We can assume that there are related pairs.

- ➔ No outliers

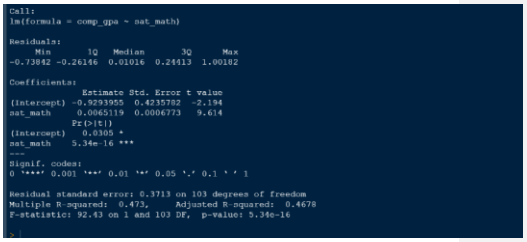
  The assumption of no outliers has been violated.

1. Create a scatter plot comparing the two. (5 pts)

The Scatterplot is shows a not so strong correlation.



Do a simple linear regression. Include an assessment of assumptions and express your results in words and mathematically. (5 pts for assessing each assumption, 5 pts for the regression analysis and 5 pts for the correct reporting of the results)



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Call:
lm(formula = comp_gpa ~ sat_math)

Residuals:
     Min       1Q   Median       3Q      Max 
-0.73842 -0.26146  0.01016  0.24413  1.00182 

Coefficients:
              Estimate Std. Error t value
(Intercept) -0.9293955  0.4235782  -2.194
sat_math     0.0065119  0.0006773   9.614
            Pr(>|t|)    
(Intercept)   0.0305 *  
sat_math    5.34e-16 ***
---
Signif. codes:  
0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3713 on 103 degrees of freedom
Multiple R-squared:  0.473,	Adjusted R-squared:  0.4678 
F-statistic: 92.43 on 1 and 103 DF,  p-value: 5.34e-16

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Y' = 0.0305 + 0.0065119(SAT_Math)

Y = Comp Sci GPA

A = Intercept, baseline comp sci gpa

B = Average increase of math score

X (sat math) = Specific Math SAT score

The line of best fit is attempting to establish a relationship between a computer science gpa,

➔ Linearity

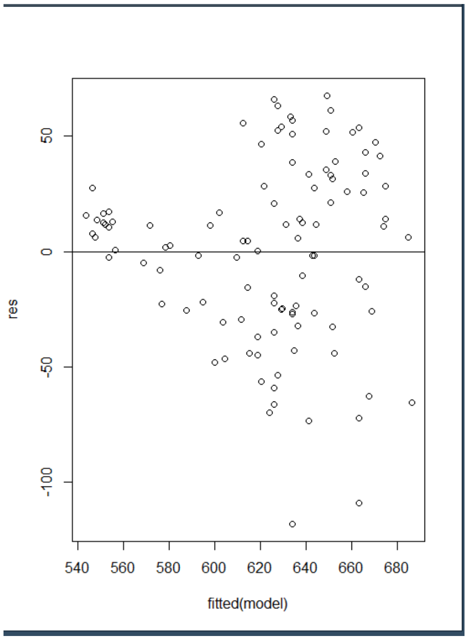
There is no linear relationships between the math and sat seen in the scatterplot in question 2.

➔ Independence

We assume that there is independence between each variable, due to the lack of association among the data, there is not parametric data. The variables are separate of each other.

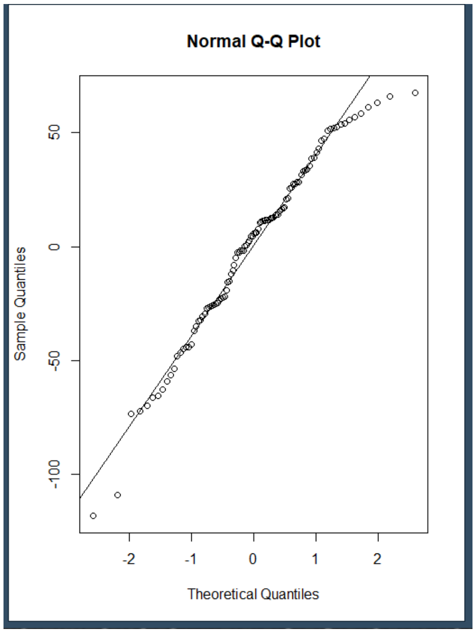
➔ Homoscedasticity

We cannot assume that the data has homeocdascity.



- ➔ Normality

We can assume that the data is not normally distributed. There was no data transformation performed.


Normal Q-Q Plot
Sample Quantiles
Theoretical Quantiles