In this discussion, you will work with a cars data set that includes two variables:

* Miles per gallon (coded as mpg in the data set)
* Weight of the car (coded as wt in the data set)

1. You created a scatterplot of miles per gallon against weight; check to make sure it was included in your attachment. Does the graph show any trend? If yes, is the trend what you expected? Why or why not? See Step 2 in the Python script.
2. What is the coefficient of correlation between miles per gallon and weight? What is the sign of the correlation coefficient? Does the coefficient of correlation indicate a strong correlation, weak correlation, or no correlation between the two variables? How do you know? See Step 3 in the Python script.
3. Write the simple linear regression equation for miles per gallon as the response variable and weight as the predictor variable. How might the car rental company use this model? See Step 4 in the Python script.
4. What is the slope coefficient? Is this coefficient significant at a 5% level of significance (alpha=0.05)? (Hint: Check the P-value, P is greater than the absolute value of t, for weight in the Python output.) See Step 4 in the Python script.
5. The scatterplot shows a negative trend, whereas the weight of the car increases, the miles per gallon decreases. This trend is expected because heavier cars generally tend to have lower fuel efficiency.
6. The coefficient of correlation between miles per gallon and weight is -0.861287, which is a strong negative correlation. The sign of the correlation coefficient is negative, indicating that as the weight of the car increases, the miles per gallon decreases.
7. The simple linear regression equation for miles per gallon as the response variable and weight as the predictor variable is mpg = 37.989 - 5.619 \* weight The car rental company can use this model to predict the miles per gallon of a car given its weight.
8. The slope coefficient is -5.619, which indicates that for every one unit increase in weight, the miles per gallon decreases by 5.619 units. The P-value for weight in the Python output is 0, which means that the coefficient is significant at a 5% level of significance (alpha=0.05).

mpg wt

mpg 1.000000 -0.861287

wt -0.861287 1.000000

Cars data frame (showing only the first five observations)

|  | **Unnamed: 0** | **mpg** | **cyl** | **disp** | **hp** | **drat** | **wt** | **qsec** | **vs** | **am** | **gear** | **carb** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **10** | Merc 280C | 17.8 | 6 | 167.6 | 123 | 3.92 | 3.440 | 18.90 | 1 | 0 | 4 | 4 |
| **14** | Cadillac Fleetwood | 10.4 | 8 | 472.0 | 205 | 2.93 | 5.250 | 17.98 | 0 | 0 | 3 | 4 |
| **12** | Merc 450SL | 17.3 | 8 | 275.8 | 180 | 3.07 | 3.730 | 17.60 | 0 | 0 | 3 | 3 |
| **11** | Merc 450SE | 16.4 | 8 | 275.8 | 180 | 3.07 | 4.070 | 17.40 | 0 | 0 | 3 | 3 |
| **1** | Mazda RX4 Wag | 21.0 | 6 | 160.0 | 110 | 3.90 | 2.875 | 17.02 | 0 | 1 | 4 | 4 |

OLS Regression Results

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Dep. Variable: mpg R-squared: 0.742

Model: OLS Adj. R-squared: 0.733

Method: Least Squares F-statistic: 80.45

Date: Wed, 01 Feb 2023 Prob (F-statistic): 1.00e-09

Time: 13:13:40 Log-Likelihood: -75.264

No. Observations: 30 AIC: 154.5

Df Residuals: 28 BIC: 157.3

Df Model: 1

Covariance Type: nonrobust

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coef std err t P>|t| [0.025 0.975]

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Intercept 37.9890 2.035 18.665 0.000 33.820 42.158

wt -5.6186 0.626 -8.969 0.000 -6.902 -4.335

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Omnibus: 4.395 Durbin-Watson: 1.878

Prob(Omnibus): 0.111 Jarque-Bera (JB): 3.458

Skew: 0.831 Prob(JB): 0.177

Kurtosis: 3.050 Cond. No. 12.8

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Notes:

[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

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|  |  |  |  |  |  |  |  |  |  |  |  |  |

Chart, scatter chart

Description automatically generated