**HOMEWORK 5**

*Inference for Simple Linear Regression*

Reading: This assignment focuses on content from your textbook, *STAT2: Modeling with Regression and ANOVA*, Chapter 2 Sections 1-2, and 4. Read these sections of your textbook.

Notes:

* For questions requiring you to use JMP, you must provide a copy of your output at the end of your assignment or embedded within your assignment. No credit will be given if you do not include your output, even if your answer is correct.
* You are required to use your own words in answering all homework questions. You cannot copy information from the book or other sources.
* Round all numbers to 2 decimal places unless otherwise specified.
* For all questions requiring calculations, show your work in order to receive credit.

Answer the following which are based on the problems presented in your book, Question 2.17 – Dementia, on page 78, and 2.42 – Dementia: regression intervals.

1. Question 2.17 – Dementia

Chart, scatter chart

Description automatically generated

Table

Description automatically generated with low confidence

Chart

Description automatically generatedChart, scatter chart

Description automatically generated

Ho: β1 = 0

Ha: β1 ≠ 0

Test statistic = 3.18

*p­­*-value = 0.005

Conclusion: There is strong evidence of a linear relationship between MMSE and APC.

1. Make sure to include all graphs used to check the 4 conditions:

Linearity: Linearity is met. There is a positive, weak linear relationship between MMSE and APC.

Independence: Independence is met because there is a random sample.

Normality: Based on the QQ plot, the data is within the bounds recommended by JMP and is moderately normal. Based on the residual by predicted plot, there is moderate to weak normality because the histogram included is skewed left.

Equal Variance: There is moderate constant variance based on the residual by predicted plot. The points are above equal above and below the mean of zero, with slightly more points below the mean of 0.

1. Slope = 1.344

Standard error = 0.422

* 1. 95% Confidence interval (not 90%) = [0.457, 2.232]
  2. Include 0? How does this relate to answer to part a?

Generally, a confidence interval tells you the actual coefficient value can lie within the range given. I believe that if the interval includes 0, it means that the actual coefficient value can be zero which means that the predictor has no relationship with the response variable. Or in other words it is insignificant in influence on the response variable. Our confidence interval includes 0, so we can make that assumption.

* 1. In addition to the book questions, provide an interpretation of the confidence interval:

We are 95% confidence that the slope of this model is between 0.457 to 2.232.

1. Question 2.42 – Dementia: regression intervals

Graphical user interface, text

Description automatically generated with medium confidence

Chart, scatter chart

Description automatically generated

1. Predicted MMSE = -3.78
2. 95% confidence interval = [-4.8136, -2.7470]
3. 95% prediction interval = (-7, 4.5)
4. Why is c wider?

The prediction interval is wider because prediction intervals will have to account for uncertainty in estimating the population mean, and also random variation, so the confidence intervals will always be narrower than the prediction intervals.

1. In addition to the book questions, provide interpretations of the intervals:

95% confidence interval interpretation:

We are 95% confident that the mean MMSE score for and APC measurement of -1 is between -4.81 and -2.75.

95% prediction interval interpretation:

We are 95% confidence that the MMSE score for when the APC measurement is -1 is between -8.38 and 1.03.

1. Fill in the ANOVA table below for the model used to predict MMSE using APC. You may use JMP for the calculations. Don’t forget to include your JMP output for credit.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Df | SS | MS | F | *p*-value |
| Model | 1 | 48.27809 | 48.2781 | 10.1260 | 0.0052 |
| Error | 18 | 85.81956 | 4.7678 | X | X |
| Total | 19 | 134.09766 | X | X | X |