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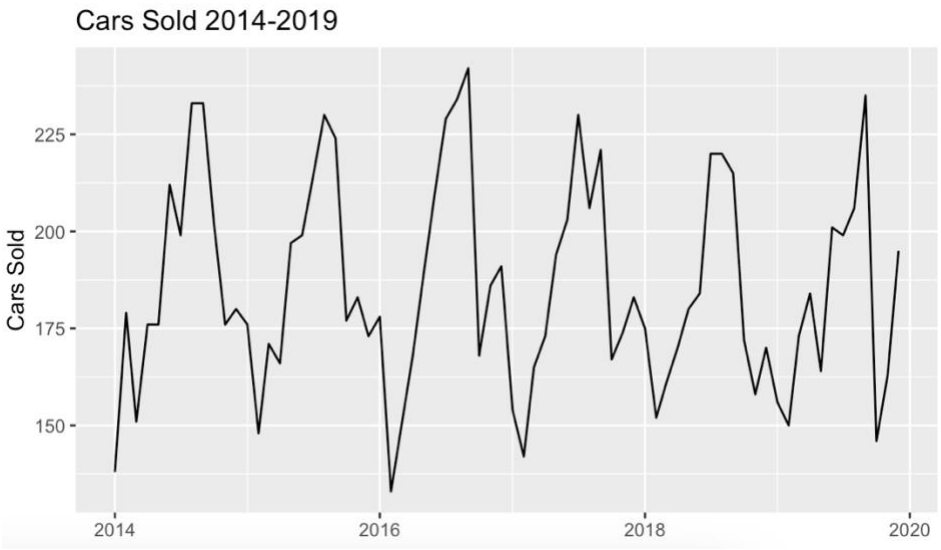
Activity 5

11/14/22

Activity 5: Cars

2.



a. There is a cyclical trend with car sales at A Lot O' Autos, as yes, the first four months (January – April), are typically the months with the least number of cars sold, but then from May to September the sales ramp up, hitting a peak around August or September, then sales have a downward trend for the last 3 months of the year.

3.

a. No, it is not necessary to include a trend model, since over the years, the annual number of cars sold is roughly the same, as there isn't a noticeable increase or decrease trend of cars sold over the 6-year data period.

b. Yes, it is also necessary to include a seasonal component to this regression model, as we can see car sales increase during the summer months but are at their lowest for the first 4 months and last 3 months of the year, during the 6-year period.

4.

a. $\widehat{Sales_t} = 167.29 - 0.14t - 12.02d_{feb} - 0.71d_{march} + 10.43d_{April} + 21.07d_{May} + 39.38d_{June} + 53.2d_{July} + 59.67d_{Aug} + 66.65d_{Sept} + 10.46d_{Oct} + 11.94d_{Nov} + 20.75d_{Dec}$

b. The estimated change in number of cars sold for each additional month decreases 0.14, on average.

c. It is estimated that at A Lot O' Autos, 53.2 more cars are sold in the month of July compared to January, on average.
d. Forecasted Value: January 2020 = 156.8 cars; February 2020 = 144.63 cars
e. Since we have included a trend and seasonal component in our model, to account for the level of sales in each month, and overall trend, it is reasonable to assume that our regression model is fit to predict the car sales for future months, as our data also supports, that over the 6-year period, car sales are lowest in the first 4 months and winter, and higher in the summer months.

5.

a. H_0: $\beta_t = 0$; H_a: $\beta_t < 0$
b. t-stat: -2.039; DF: 59
c. p-value: 0.02298
d. Reject the null
e. At the 5% significance level we reject the null hypothesis and conclude that there is strong evidence that car sales have been decreasing at A Lot O' Autos, after controlling for time (t-stat: -2.039; DF= 59; p-value= 0.02298).

6.

a. We are 95% confidence that car sales are between 45.48 and 73.86 cars higher in August than in January, holding time constant.
b. Yes, this confidence interval supports the notion that car sales are higher in summer months than winter months, as this interval indicates more cars are sold in August than in January.

7. A predictor variable that should be included in this model is inflation in the US. As the price of an item, in this case car, can be very influential into how many people want, or are financially able to buy a car, even a used vehicle. As higher inflation could lead to lower car sales, since in general, car prices would be higher, compared to periods of low inflation, and lower car prices, where sales could be higher.