

Stat 101L: Lecture 16

Goal 3 – Straighten Up

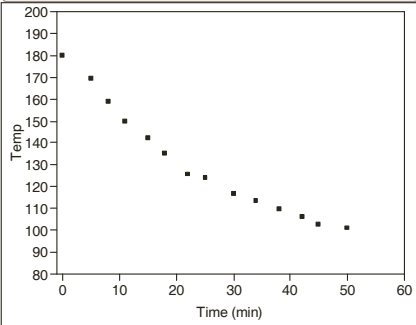
*What is the relationship between the temperature of coffee and the time since it was poured?

–Y, temperature (°F)

–X, time (minutes)

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Bivariate Fit of Temp By Time (min)



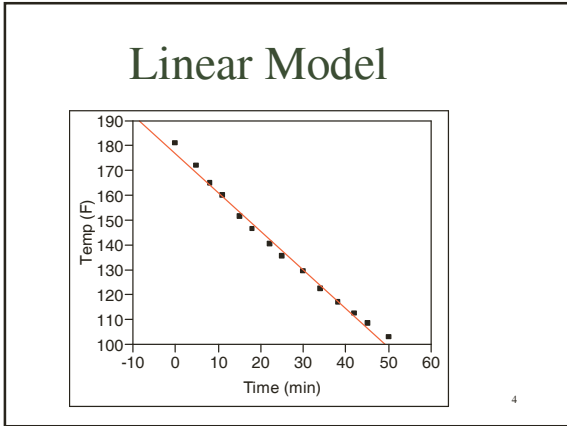
2

Cooling Coffee

*There is a general negative association – as time since the coffee was poured increases the temperature of the coffee decreases.

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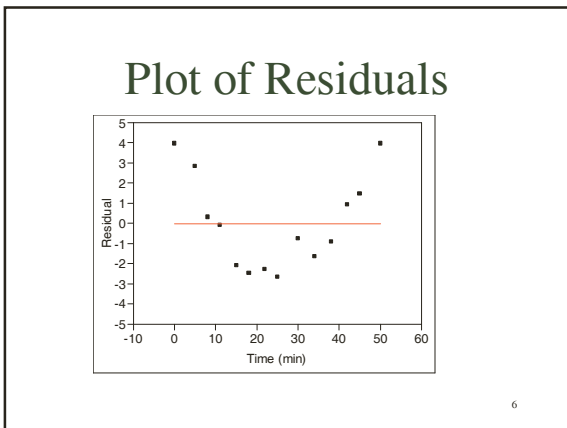


Linear Model Fit

* Summary

- Predicted Temp = $176.7 - 1.56 * \text{Time}$
- On average, temperature decreases 1.56 °F per minute.
- $R^2 = 0.99$, 99% of the variation in temperature is explained by the linear relationship with time.

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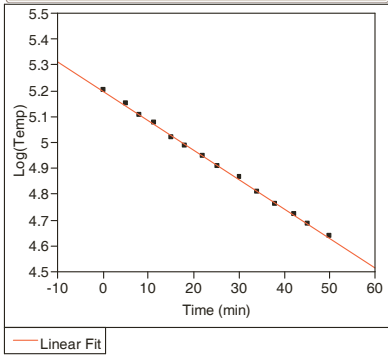
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Curved Pattern

- * There is a clear pattern in the plot of residuals versus time.
 - Under predict, over predict, under predict.
- * The linear fit is very good, but we can do better.

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Bivariate Fit of Log(Temp) By Time (min)



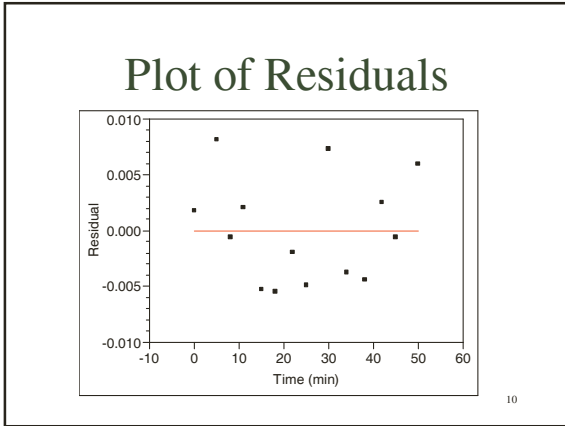
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Log(Temp) by Time

- * Summary
 - Predicted $\text{Log}(\text{Temp}) = 5.1946 - 0.0114 * \text{Time}$
 - On average, log temperature decreases 0.0114 log($^{\circ}\text{F}$) per minute.

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Interpretation

- * There is a random scatter of points around the zero line.
- * The linear model relating $\text{Log}(\text{Temp})$ to Time is the best we can do.

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Original Scale?

- * Predicted $\text{Log}(\text{Temp}) = 5.1946 - 0.0114 * \text{Time}$
- * Predicted Temp =
 $180.3 * e^{-0.0114 * \text{Time}}$
 - Predicted temp at time=0, 180.3 °F
 - The predicted temp in one more minute is the predicted temp now multiplied by $e^{-0.0114} = 0.98866$

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JMP

*Method 1

- Create a new column in JMP,
Log(Temp): Cols – Formula –
Transcendental – Log.

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JMP

*Method 1 (continued)

- Fit Y by X
 - *Y – Log(Temp)
 - *X – Time
- Fit Linear

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JMP

*Method 2

- Fit Y by X
 - *Y – Temp
 - *X – Time
- Fit Special
 - *Transform Y – Log

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