Simple Linear Regression

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Math 221C, BYU-I
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Outline

1. Introduction
2. Linear Equations
3. Interpreting Regression Output
4. Application Activity
5. Regression Pitfalls

Why bother with regression?

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Pick one of the Big 5 Personality traits (extraversion, agreeableness, openness, conscientiousness, neuroticism)

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Consider a particular outcome (Career success, Life span, Mental health issues)

Public Health Significance of Neuroticism

- Predicting hours of TV viewed by children using hours of TV viewed by parents

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- Marriage and divorce

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- Predicting number of children using multiple factors

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- Does the BYU-I learning model improve learning?

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Counterpoints:

- Simple Linear regression is a surprisingly powerful tool.
- That being said, it is also foundational to other more sophisticated regression methods such as multiple regression.

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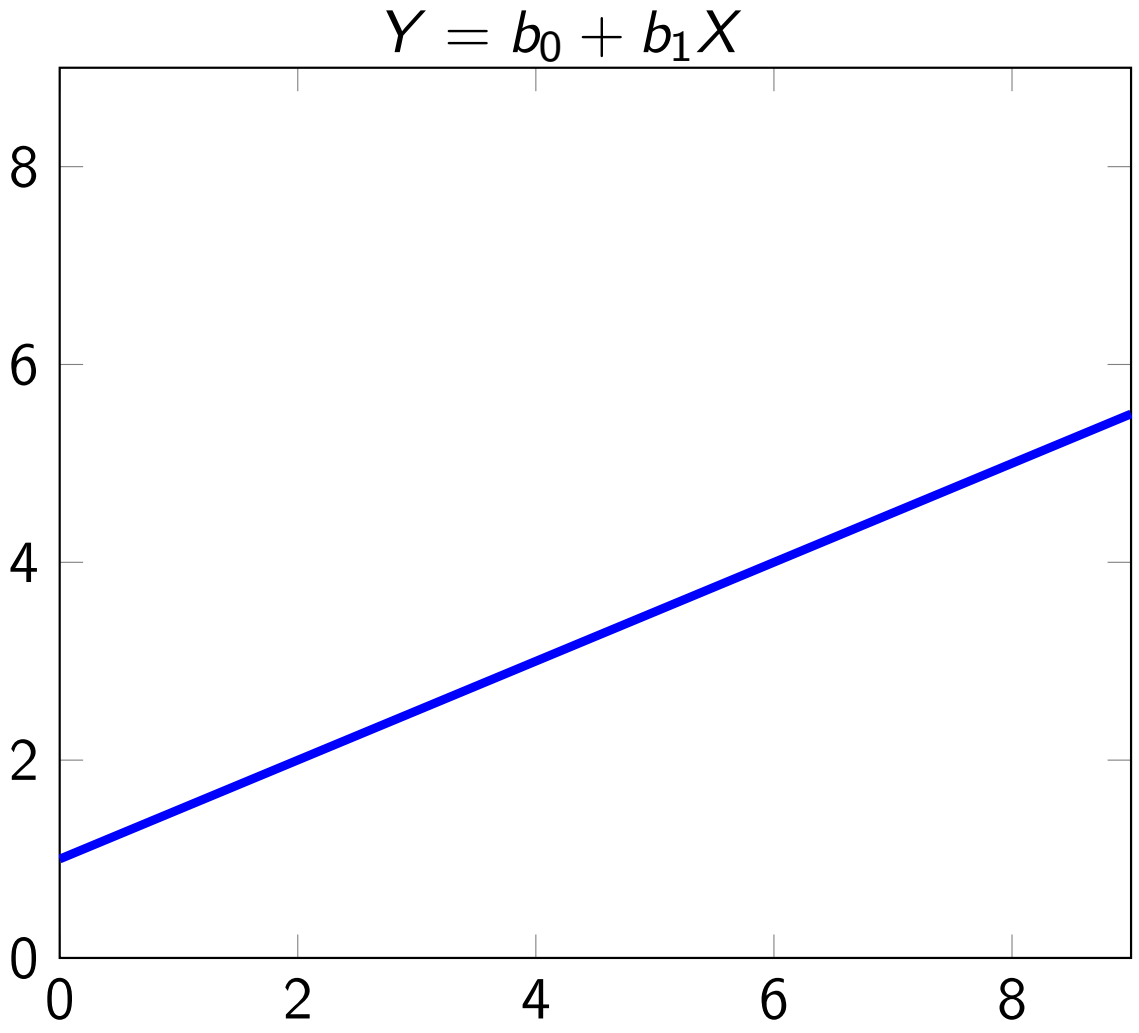
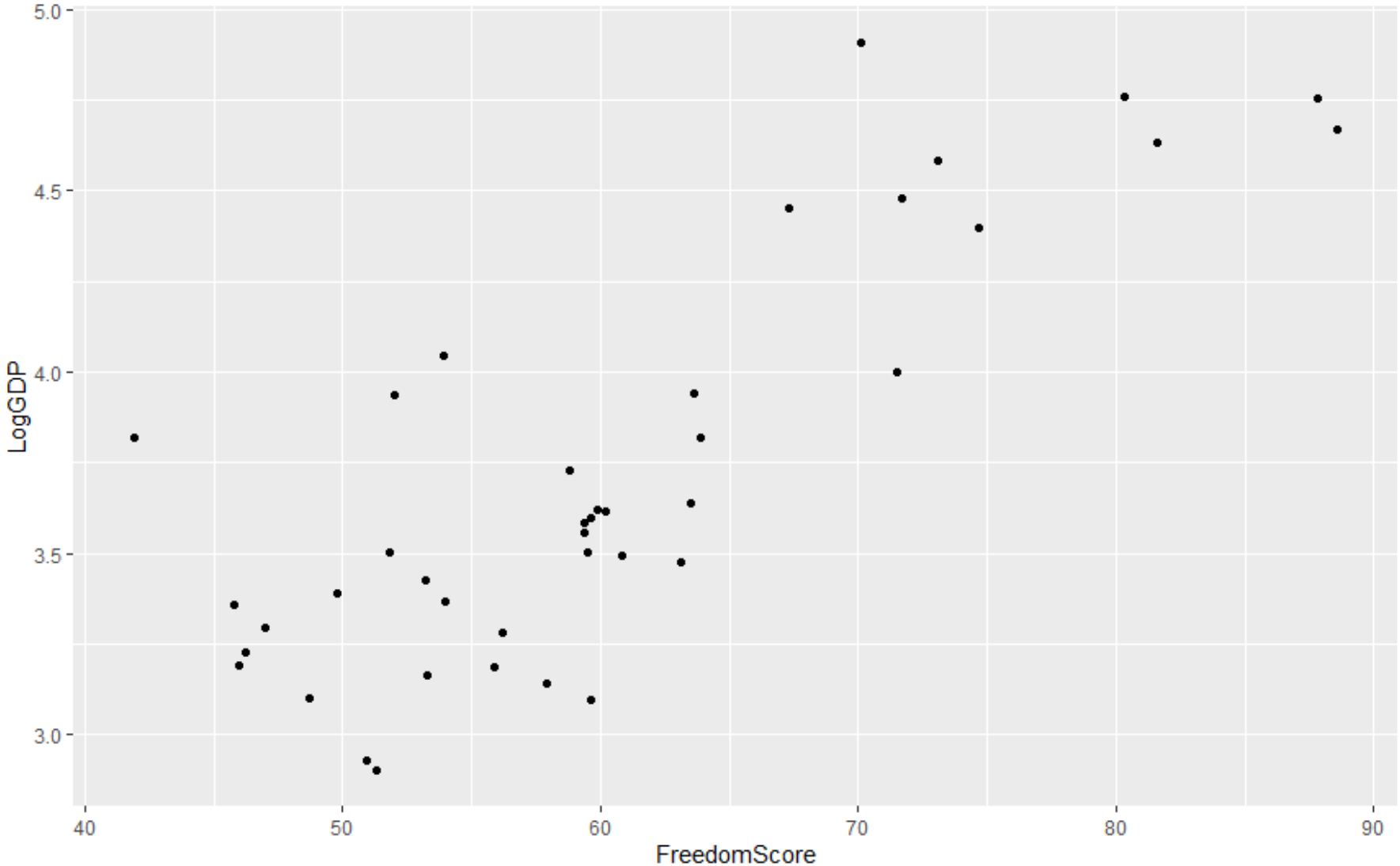
Linear Equation Review



Scatterplot



Linear Equation Prepare Question

The first requirement of simple regression is that a linear equation can be used to describe the relationship between X and Y. To check this requirement *after* collecting data, you can make a scatterplot and look for a "hot dog" shape. How would you go about making an educated guess *before* collecting any data about whether this requirement is satisfied by X and Y?

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- Suppose you want to predict someones weight using height as the explanatory variable. You measure height in inches. You calculate the regression output and conduct a hypothesis test for the regression slope. You find sufficient evidence to reject the null hypothesis $\beta_1 = 0$ at a .05 level of significance. What would happen if you took your data and converted height from inches to feet and redid the regression analysis? What would change? What wouldn't change?

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- Would you expect anything to be different if you had *measured* height in feet to begin with?

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Hypothesis Testing Assumptions

1. Linear Relation
2. Normal Error Term
3. Constant Variance
4. X's are known constants
5. Observations are independent

GitHub link

https://github.com/sextonw/Math-221C

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Prepare Question

Suppose you have a dataset with one response variable Y and many explanatory variables (e.g. $X_1, X_2, X_3, \ldots X_{60}$). You conduct a simple regression hypothesis test with Y and X_1, then do the same thing with Y and X_2, and then with Y and X_3, and so on until you find a statistically significant relationship at the .05 level with one of the explanatory variables, say X_{22}. You are very excited by this finding and share your results. Why might this be a bad idea?