Final Exam Study Guide 115

Vinny Paris

December 2025

The guide is broken into two parts. The "new" stuff and the "old" stuff which reflects the exam's makeup. To be upfront there will be a test of a regression coefficient and I do want you to be able to interpret an ANOVA table.

1 Testing Regression Coefficients

- Explain why we test coefficients at all
  - What does it imply if our p-value is large?
  - What does it imply if our p-value is small?
- Be able to write out the null and alternative hypothesis
- Check the assumptions (more in multiple regression section)
- Interpret R's output on testing regression coefficients.
  - What does a low p-value mean?
  - What does a p-value mean generally?
- Explain when testing regression coefficients can be better than a standard t-test
  - Lurking variables aren't accounted for in t-tests if they exist

2 Multiple Linear Regression (MLR)

- Explain why we use MLR over simple linear regression
  - SLR only allows for one explanatory variable which is too limiting
  - MLR allows us to better understand the system as a whole since we can account for differing effects
- How do we interpret the coefficent of a quantitative (numeric) explanatory variable?

- How do we interpret the coefficent of a indicator (eg a nominal/categorical explanatory variable)?
- Assumptions
  - Random
  - Population is normal or n is large
  - IID
    - There is where homoskedasticity assumption is (need same spread to be identically distributed)
    - Also where "linear" from SLR went....if the model doesn't fit the reisduals won't have the same scattering around the 0 line
  - NOTE: Both IID and the "pop is normal" reference the residuals!
  - Justify/explain why we color residuals by explanatory variables

3 ANOVA

- You WILL NOT be expected to fill out an ANOVA table
  - You WILL be expected to read an ANOVA table and interpret it's output
- Identify the null and alternative hypothesis
  - Including limitations of what they indicate (doesn't identify which mean is higher/lower/different)
- Explain where the ANOVA fits in a statistical analysis
- Which of the three typs of ANOVA should you use?
  - Type 3...almost always type 3

4 Old Stuff

- What is a p-value?
- What is the difference between standard deviation and standard error?
- What does a confidence of 95% mean?
- What are the four main challenges colorblind people face?

- How can we make graphics more accessible?
- Be sure to know how to read the different graphs we have seen early in the semester
- Permutation test basics
- How does a hypothesis test work?
- Read and interpret a confidence interval for some statistic.
- Understand why we use log() in linear modeling and other transformations
  - To help correct failed assumptions
  - Log helps fix the cone shape in residual vs predicted graphs
- Make predictions using SLR, MLR, or log-log models
  - Not as scary as it sounds I promise
- Be comfortable using indicators in regression
  - Eg make a prediction that uses an indicator variable
  - Eg make indicator variables in a data set
- Correlation
  - Pearson vs Spearman
  - Interpretations