Exam 2: Chapters 4–7 Coverage

Question: What are the things we need to prove/know/memorize/etc?

Remember, you can create and bring a one-page double sided formula sheet!

Calculations and derivations

You should be able to calculate or derive the following. Also, interpret what they mean and do not mean!

- Single variable regression coefficients (β_0 and β_1) from raw data points or components
- R^2 and $\bar{R}^2$ - calculate and discuss their meaning and significance
- TSS, ESS, SSR, SER (from components, not from data points - that would take forever)
- Build confidence intervals from components
- Conduct a single-restriction hypothesis test. Set up hypotheses, calculate t-statistic, calculate p-value, determine critical value, interpret
- Conduct a multiple-restriction joint hypothesis test (under homoskedasticity). Set up hypotheses. Calculate a F-test statistic, identify a critical value, interpret the results (reject or do not reject null hypothesis)
    - Including joint tests of overall significance
    - *You may find it useful to be able to use both the SSR-based and R^2-based formula*

Empirical interpretation

- You could see any of the following and be asked to identify key elements (coefficients, standard deviations, R2, F-statistics, SSR, ESS, TSS, t-statistics, p-values, etc) that are present or can be easily calculated:
    - Raw Stata regression output
    - An estimated regression equation
    - A population model
- You could be asked to discuss the circumstances under which estimates might be biased and/or reflect a causal relationship
- Interpret the results of the various hypothesis tests we have discussed: single parameter (i.e., $\beta_1 = 0$), one restriction with two parameters (i.e., $\beta_1 = \beta_2$), multiple restrictions (i.e., $\beta_1 = \beta_2 = 0$)
    - Including special test of joint (overall) significance of a regression
- Interpret coefficients in terms of appropriate units for both continuous and binary variables

- Reflect on economic vs. statistical significance

Theoretical interpretation

- You will need to know the least-squares assumptions (single or multiple variable regression) as well as those needed for the Gauss-Markov Theorem
    - You will need to be able to reflect on and discuss circumstances in which specific assumptions may or may not be violated, as well as their implications for interpretation (biasedness, efficiency, BLUE)
    - Special emphasis on zero conditional mean assumption and omitted variable bias
- Discuss the relationship between variance, coefficients, and things like the standard error of β_1 (i.e., how does increasing sample size affect $\hat{\beta}_1$? How does it affect its standard error?
- Discuss about when heteroskedasticity might arise and how it could affect your estimation strategies
- Discuss omitted variable bias, use the formula for OVB with two independent variables and interpret impacts. (i.e. what circumstances will lead to a positive bias? negative?)