812 Section # 14

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1 Definitions and Topics to Review for the Final Exam

1. $\bar{x}$
2. s^2
3. Standard error
4. t-statistic
5. Degrees of freedom
6. 95% confidence intervals
7. χ^2 tests:
   (a) Expected cell counts
   (b) χ^2 statistic
   (c) Degrees of freedom
   (d) R commands
8. How to fill in a partially complete ANOVA table
9. Expectation
10. Variance
11. Correlation
12. Independence
13. Conditional probability
14. Method of Moments estimator
15. Maximum likelihood estimator (in steps)
16. Log rules
17. Derivative rules
18. Power
19. Bias
20. Consistency
21. Binomial distribution equation
22. OLS algebra

Note: This list is not exhaustive, but if you review these things and are comfortable with them, you should feel prepared for the exam.

2 ANOVA

Exercise 1 A certain researcher interested in authoritarian politics and corruption wants to know the extent to which the selectorate can detect corruption physiognomically.[1] This researcher constructs profiles for the 10 members of the Politburo of an authoritarian country, where the information listed in the profile is exactly the same, but the picture varies by member.

The researcher randomly assigns each of the 800 participants in their study to receive one of these 10 profiles (i.e., 1 of 10 possible treatments). Each participant is then asked how sure they are that this individual embezzled state funds. To assess this, participants are asked to rate their certainty on a scale of 0 to 100, where 100 is complete certainty of the individual's corruptness and 0 is complete certainty of their innocence. Assume that these responses are normally distributed and that the rating scale is, for all intents and purposes, unbounded and continuous. The researcher then wants to test whether the average scale rating varied according to the picture presented (i.e., across the 10 treatments) using ANOVA.

The following partially complete ANOVA table shows the sum of squares for the treatments and errors:

	d.f.	S.S.	M.S.	F	p
Treatments	(1)	12.3	(3)	(5)	(8)
Error	(2)	67.41	(4)		
Total		79.71			

1. What are the degrees of freedom for the treatment?
2. What are the degrees of freedom for the error?
3. What is the mean square for treatments?
4. What is the mean square for error?
5. What is the F-statistic?
6. At the 95% significance level, what is the critical value of an F distribution with these degrees of freedom? [Note that F tests are 1-tailed by default]
7. Can we reject the null hypothesis of no treatment effect at the 95% significance level?
8. What is the resulting p-value for this test?

3 Fun with R

Many thanks to Emily Sellars for past years' section materials!

[1] Yes, this is someone's actual research. Pretty neat, huh?