Econ 57
Gary Smith
Fall 2022

Final Examination Answers

1. Most importantly, we need to know how many people took each medication. Also, these are self-reported adverse events and we don't know how severe they were. [https://www.healthline.com/health-news/is-st-johns-wort-safe-080615]

2. a. H_0: $\pi = 0.5$
   test: one-sample binomial
   b. H_0: $\beta s = 0$
   test: multiple regression
   c. H_0: $\beta = 0$
   test: simple regression
   d. H_0: $\pi_1 = \pi_2$
   test: difference-in-proportions Z-test
   e. H_0: $\pi = 0.5$
   test: one-sample binomial

3. a. H_0: $\pi = 1/6$
   test: one-sample binomial
   b. H_0: $\pi_1 = \pi_2$ (probability of a favorable rating the same for both pictures
   test: difference-in-proportions Z-test
   c. H_0: $\beta = 0$
   test: simple regression
   d. H_0: average grade for student essays = average grade for AI essays
   test: Difference-in-means t-test
   e. H_0: average difference in prices is zero
   test: matched-pair t-test

4. The paradox of luck and skill

5. We need the probability of either 7 heads or 7 tails in a row beginning anywhere in the 10 coin tosses.

6. This is HARKing. Gottman didn't actually predict whether a couple would get divorced. His models "predicted" whether a couple had already gotten divorced—which is a heck of a lot easier when you already know the answer. Gottman data-mined his detailed codings, looking for the variables that were the most highly correlated with divorces that had already happened.

7. 17/61 (28%)

	Actual		
Prediction	Divorced	Married	Total
Divorced	17	44	61
Married	20	123	143
Total	37	167	204

8. a. $\mu = (+\$100)P + (-\$125)(1-P) > 0$ if $P > \$125/\$225 = 0.555$
   b. $\mu = (+\$110)P + (-\$100)(1-P) > 0$ if $P > \$100/\$210 = 0.476$
   c. Wager 2 because $0.50 > 0.476$

9. a. no
   b. no
   c. yes
   d. yes
   e. no

10. Neither! The t-values indicate that there is stronger statistical evidence against the null hypothesis that home runs don't matter than against the null hypothesis that batting averages don't matter, but t-values don't gauge oomph. The coefficient of batting average is larger than the coefficient of home runs, but the units are quite different. The coefficient of H indicates that one more home runs is predicted to increase the salary by \$0.15 million, while the coefficient of batting average indicates that an increase in batting average by 1 (from 0.263 to 1.263, which is impossible) is predicted to increase salary by 13.24. We might, instead, use the means and standard deviations to calculate the elasticities at the mean values of the variables

11. With 4 categories for birth-order, there should be three dummy variables

12. The probabilities are not necessarily independent.

13. The chi-square test is one-sided and the statement should say that the deviations between observed and expected values are *small enough* to be explained plausibly by random sampling error (or: are not large enough to reject sampling error as an explanation).

14. Regression to the mean

15. One model assumes a linear relationship between number of bathrooms and home price—an extra bathroom increase the value of the home by β_2, regardless of how many bathrooms you already have. The other model allows for discontinuities; for example, going from 3 to 4 bathrooms may be different than going from 1 to 2 bathrooms.

16. With 22-2 = 20 degrees of freedom and $t = -2.3898$, the p-value is surely not 0.1917. (In fact, the two-sided p-value is 0.027.) "Substantial" relates to the size of the beta coefficient, not the t-value (which is not less than 2). If the p-value is 0.1917, then the null hypothesis is *not* rejected at the 5% level. If the null hypothesis is rejected, then this indicates that Y *does* depend on X. The results also seem to depend entirely on the two outliers. (The researchers miscalculated the January changes. The two outliers are the correct percent changes but the other values were calculated as fractions; for example, 0.04 instead of 4%.)

17. As explained in class and in *Standard Deviations*, the probability that the prize is behind door 1 is 1/3. not 1/2. [https://www.cartalk.com/radio/puzzler/recycled-monty-hall-puzzler-again]

18. If girl and boy babies are equally likely, we expect 50% of each, no matter what rule the mothers follow. For example, consider 10 women. Six decide to have babies, of which three are boys and three are girls. Of the three mothers who have girl babies, two decide to have a second child, on which one is a boy and one is a girl. Overall, there are four boy babies and four girl babies.

19. Fallacious law of averages

20. The dates on the horizontal axis was not spaced accurately and there is no adjustment for inflation.