

Final Exam

Econ 70
Fall 2003

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1. Toby says that there is a 40% probability that each person who enters your store will buy your product. If twelve people enter your store on Monday, what is the probability that half or more of them will buy your product?
2. Acme Products wants to install an elevator to hold 16 people. People's weights are normally distributed with a mean of 160 pounds and with a variance of 900. The probability a full load of people will not exceed the elevator's posted weight limit should be 99%. What should the posted weight limit be?
3. You suspect that 60% of these questions are reruns. If an exam question is a rerun, there is a 70% probability that it will sound familiar. If an exam question is not a rerun, there is a 30% probability that it will sound familiar. If an exam question sounds familiar, what is the probability that it is a rerun and you should waste valuable time looking for it in the study guide?
4. Phil has two blue pairs of socks, three brown pairs of socks, and a college degree. For his first day on the job as a management trainee, he gets up at 5:00 a.m., dresses, and is on the job by 6:30 a.m. Unfortunately, he keeps his socks in a big unsorted pile (because he never had to wear socks in college), and he forgot to check the color of his socks in the early morning darkness. What is the probability that he is wearing two socks of the same color?
5. XYZ Company has 200 employees, and each employee has an independent .005 probability of calling in sick on a given day. What is the probability that they have at least two employees call in sick on a given day?
6. If $X \sim N(2,4)$, what is the probability that X is between 1 and 4?
7. The incomes of 100 recent college graduates have a mean of 31,000 and a standard deviation of 5,000. Give a 95% confidence interval for the expected value of income for all recent college graduates.

When quarterback Oscar Oceans (known to the fans as OO) steps back to throw, there is a 40% probability that his pass will be caught by one of his teammates, there is a 10% probability that his pass will be intercepted by a member of the opposing team, there is a 30% probability that his pass will not be caught at all, and there is a 20% probability that poor OO will be smashed between a pair of 275 pound defensive ends before he has time to pass.

8. If OO's coach lets him attempt to pass eight times in the first quarter, what is the probability that he will throw at least two interceptions?
9. If OO manages to get a pass off without being tackled first and does not throw an interception, what is his probability of a successful completion?

A regression of OUTPUT on LABOR and WAGE yields the results below. OUTPUT is the hourly output produced in each of the 200 factories in your data sample. LABOR is the number of employees in each factory, and WAGE is their hourly wage rate in dollars.

PARAMETER	ESTIMATE	T FOR HO: PARAMETER = 0	STANDARD ERROR OF ESTIMATE
INTERCEPT	100.00	1.00	100.00
LABOR	27.00	3.00	9.00
WAGE	50.00	2.50	20.00

10. Give a 95% confidence interval for the coefficient of labor.
11. Given a 1% Type I error probability, construct the rejection region for testing the null hypothesis that the true coefficient of the wage rate is zero against the alternative that it is not zero.
12. What is your forecast for the hourly output from a factory of this type that employs 20 workers making \$10 per hour?

You have \$5,000,000 to invest for two years. If you invest \$5,000,000 in the stock of a given company, that stock's value in two years will be normally distributed with a mean of \$5,500,000 and a standard deviation of \$400,000. Assume that all stocks are independent. Let V be the value of your portfolio in two years. Let P be the probability that V is greater than \$5,300,000 and you are promoted.

13. If you put all \$5,000,000 into the shares of one company, what is P?
14. If you buy equal amounts of stock in 4 companies, what is P?

Using data for the past 120 months you have estimated the following regression:

$$\text{Sales}_t = 200 - 40 \text{ Price}_t + 40 \text{ Comp}_t,$$

(50) (4) (30)

where the figures in parentheses are standard errors. Sales_t are your sales in units, Price_t is your price in dollars per unit, and Comp_t is your competitor's price in dollars per unit. Your product costs you \$5 per unit. You and your competition both currently charge \$10 per unit.

15. Give a 99% confidence interval for the effect of price on sales.
16. Using a 5% Type I error probability, give the rejection region for testing the null hypothesis that the effect of your competitor's price is zero or negative against the alternative that the effect is positive.

A statistics professor has run the following regression for a sample of 500 students randomly selected from his previous classes:

$$\text{GRADE}_i = 2.50 + 0.20 \text{ HOURS}_i$$

(1.25) (5.00)

where GRADE_i is each student's total score during the semester in the professor's statistics class and HOURS_i is the hours spent studying by a given student during quarter. (The figures in parenthesis are t-ratios.)

17. Give a 90% confidence interval for the coefficient of time spent studying.
18. Using a 10% Type I error probability, give the rejection region for testing the null hypothesis that studying is no help or is even detrimental to academic performance against the alternative hypothesis that studying helps.
19. George is not too ambitious, but would like to raise his expected score by 5 points. How much additional time should he devote to studying for this statistics class?
20. You wish to test your null hypothesis that one-half of all stockholders are Republicans against your alternative hypothesis that 80% of all stockholders are Republicans. You will reject your null hypothesis if your investigation reveals that at least eight of the ten stockholders in your sample are Republicans. What is your probability of committing a Type I error?
21. Given the information in the above question, what is your probability of committing a Type II error?
22. In your closet you find a box containing 8 light bulbs, of which two are defective. If you select 4 bulbs at random, without replacement, what is the probability that your sample includes both defective bulbs?
23. The mean of 100 observations on X is 10 with a standard deviation of 4. The mean of 100 observations on Y is 8 with a standard deviation of 1. Give a 95% confidence interval for the difference between the expected value of X and the expected value of Y.
24. In a sample of 400 voters with at least an eighth-grade education, 300 think that a law prohibiting groups from running newspaper and television ads before elections is an obvious violation of the First Amendment, which states that "Congress shall make no law ... abridging the freedom of speech." Fifty voters think that freedom of speech only applies to unamplified oral speech, and fifty voters think that we need to ditch the First Amendment to save incumbents from undue criticism. The latter group is in favor of modifying the First Amendment to read "Congress shall pass laws determining allowable speech." Give the rejection region for testing the null hypothesis that half or fewer of all voters see restrictions on newspaper and television ads as "abridging freedom of speech" against the alternative that more than half see this as a violation of free speech.