

Midterm Exam 1

This exam is 60 minutes long, although you will be given 70 minutes to complete it. Points are allocated in proportion to the time allocated. Answer all questions in your bluebook. Make certain you write your name, your student ID number, and your TA's name on your bluebook.

Be sure to show your work, "boxing in" your final answer; partial credit will be awarded.

1. (6 minutes) An investor believes the rate of return for on a proposed investment can be best described by a normal distribution with mean 10% and standard deviation 2%. What is the probability that the rate of return for the investment will be at least 7.5%?
2. (8 minutes) A manufacturer of 35-mm cameras knows that a shipment of 30 cameras sent to a large discount store contains eight defective cameras. The manufacturer also knows that the store will choose two of the cameras at random, test them, and accept the shipment if neither is defective. Find the probability that both the cameras selected are defective.
3. (8 minutes) An automobile manufacturer has determined that 30% of all gas tanks that were installed on its 1988 compact model are defective. If 15 of these cars are independently sampled, what is the probability that more than half need new gas tanks?
4. (8 minutes) The number of hurricanes that are formed during each hurricane season can be modeled using the Poisson probability distribution. History suggests that the average number of hurricanes formed during a year is 6.0 hurricanes. Find the probability of between three and seven hurricanes being formed during a randomly selected year.
5. (4 minutes) In a pool of 6 students, 4 students are not US citizens. What is the probability of choosing 4 non-US citizen students out of the pool of 6 students?
6. (4 minutes) It is generally believed that the life length of a light bulb follows an exponential distribution. Suppose we know that the expected life length for a certain type of bulb is 1 year. What's the exact probability that such a bulb's life length exceeds 4 years?

7. (12 minutes total) Consider this table of the probabilities of quarterly growth rates of GDP (*GDP_GROWTH*) and of payroll employment (*PAYEMPL_GROWTH*) (both annualized).

Tabulation of *GDP_GROWTH* and *PAYEMPL_GROWTH*

Date: 02/23/04 Time: 20:35

Sample: 1953:2 2003:4

Included observations: 203

Tabulation Summary

Variable	Categories			
<i>GDP_GROWTH</i>	2			
<i>PAYEMPL_GROWTH</i>	2			
Product of Categories	4			
		<i>PAYEMPL_GROWTH</i>		
		[-0.5, 0)	[0, 0.5)	Total
Proportion of Total				
<i>GDP_GROWTH</i> [-0.2, 0)		0.0985	0.0591	0.1576
<i>GDP_GROWTH</i> [0, 0.2)		0.1133	0.7291	0.8424
Total		0.2118	0.7882	1.0000

- 7.1 (2 minutes) What is the unconditional probability of negative payroll employment growth.
- 7.2 (7 minutes) What is the conditional probability of negative payroll employment growth this quarter if this quarter's growth rate is positive?
- 7.3 (3 minutes) Is the quarterly growth rate of GDP independent of the quarterly growth rate of payroll employment?
8. (10 minutes) At a psychiatric clinic the social workers are so busy that, on the average, only 60% of the potential new patients that telephone are able to talk immediately with a social worker when they call. The other 40% are asked to leave their phone numbers. About 75% of the time a social worker is able to return the call on the same day, and the other 25% of the time the caller is contacted on the following day. Experience at the clinic indicates that the probability a caller will actually visit the clinic for consultation is 0.8 if the caller was able speak to a social worker, whereas it is 0.6 and 0.4, respectively, if the patient's call was returned the same day or the following day.
- 8.1 (5 minutes) What percentage of people that telephone visit the clinic for consultation?
- 8.2 (5 minutes) What percentage of patients that visit the clinic did not have to have their telephone calls returned?