Temple University
Department of Economics
Econometrics I
Economics 8009

Homework
Descriptive Statistics, Probability, and Inference

1. Data on distressed O-rings and temperature on shuttle launches is contained in the following table:

Flight	# Distressed O-rings	Temperature
1	0	66
2	1	70
3	0	69
5	0	68
6	2	67
7	0	72
8	0	73
9	0	70
41B	1	57
41C	1	63
41D	1	70
41G	0	78
51A	0	67
51C	3	53
51D	0	67
51B	0	75
51G	0	70
51F	0	81
51I	0	76
51J	0	79
61A	2	75
61B	0	76
61C	1	58

a. Using the data in the table compute the mean number of distressed O-rings.
b. Compute the variance for the temperature series.
c. Compute the covariance between number of distressed O-rings and temperature.

2. A die is a six sided cube. The faces of the cube are numbered one through six. The plural for the word die is dice. In 1693 Samuel Pepys asked Sir Isaac Newton whether it is more likely to get at least one six when six dice are rolled, or at least two sixes when twelve dice are rolled, or at least three sixes when eighteen dice are rolled. Assume the dice are fair and find the answer to Pepys' question.

3. The qth quantile (or percentile), 0<q<1, of a random variable Y with distribution function F(Y), denoted ξ_q, is defined as the smallest number ξ satisfying $F(\xi) \geq q$. Find $\xi_{0.20}$ corresponding to the p.d.f.

$$f(y) = \begin{cases} 3y^2 & \text{if } 0 < y < 1 \\ 0 & \text{otherwise} \end{cases}$$

4. Let Y be a random variable with pdf

$$f(y) = \begin{cases} \alpha + \beta y^2 & \text{if } 0 \leq y \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

And E(Y) = 2/3. Find α and β.

5. The random variable Y is said to be mean-independent of the random variable X if and only if E(Y|X) = E(Y). Suppose f(y|x) is defined by

f(y=-1|x=-1) = f(y=3|x=-1) = 1/2

f(y=0|x=0) = f(y=4|x=0) = 1/2

f(y=0|x=1) = f(y=2|x=1) = 1/2

and that f(x=-1) = f(x=0) = f(x=1) = 1/3

a. Find E(y|x=-1), E(Y|x=0) and E(Y|x=1).
b. Find E(XY|x=-1), E(XY|x=0) and E(XY|x=1).
c. Find E(X), E(Y) and E(XY)
d. Is Y independent of X?
e. Is Y mean-independent of X?
f. Are X and Y uncorrelated?

6. Suppose that X denotes the annual incomes, in thousands of dollars, and that for a particular group of people X is normally distributed with mean 26 and variance 36. A random sample of 25 persons is drawn from the group. What is the probability that the sample average income is between $25,000 and $29,000?

7. The following table gives data on the number of new business incorporations (Y) and the number of business failures (X) for the United States from 1984 to 1995. In the neighborhood of the observations in the table you can assume that the two variables are normally distributed.

Year	Y	X
1984	634,991	52,078
1985	664,235	57,253
1986	702,738	61,616
1987	685,572	61,111
1988	685,095	57,097
1989	676,565	50,361
1990	647,366	60,747
1991	628,604	88,140
1992	666,800	97,069
1993	706,537	86,133
1994	704,778	71,558
1995	766,988	71,128

a. What is the sample variance of Y?
b. What is the sample variance of X?
c. What is the probability that the sample variance of Y is more than twice as great as the sample variance of X?

8. Use the data for Problem 6.
a. Construct a 90% confidence interval for the population mean of X
b. Construct a 95% confidence interval for the population variance of Y

9. An insurance company wants to test the hypothesis that the average amount claimed by its policyholders over one year is $800 against the alternate hypothesis that it is less than $800. Using a random sample of 81 policy holders it is found that the mean amount claimed is $739.98 and the sample standard deviation is $312.70. Test the hypothesis at the 1% level.