Business 320, Fall Winter 2000, Midterm, Solutions

name ________________________________________________

You may use a calculator and one side of a “cheat sheet”.

You have 1.25 hours.

I pledge my honor that I have not violated the Honor Code during this examination.

Signature____________________________________________________

There are 3 questions.
Each part of each question is worth 2 points.

question 1, 11 parts, 22 points _____
question 2, 9 parts, 18 points_____ 
question 3, 6 parts, 12 points _____

Total __________________________


Question 1

For 672 football games we have the point spread and the difference between the number of points scored by the favorite team and the number of points scored by the underdog.

Below is a scatter plot with diff = the difference in the scores on the vertical axis and spread = the point spread.

(a) the average spread value is:
(1) 10.01 (2) 4.67 (3) .194 (4) 20.22

(b) the average diff value is:
(1) –8.74 (2) 4.74 (3) 20.22 (4) –37.44

(c) the standard deviation of the spreads is:
(1) 3.07 (2) 21.44 (3) -13.48 (4) .167

(d) the standard deviation of the diff values is:
(1) 2.21 (2) 54.78 (3) .146 (4) 14.31
Below is the histogram of either diff or spread. Which one is it?

circle one:  diff  spread

(h) Give an interval which should contain approximately 95% of the diff numbers.

\[ 4.74 \pm 2\times 14.31 = 4.74 \pm 28.62 \]

(i) the correlation between diff and spread is:

(1) .94  (2) .0023  (3) -.36  (4) .25

(j) What is the covariance between the diff numbers and the spread numbers?

\[ 3.07\times 14.31\times .25 = 11 \]

Let error = diff – spread.

(k) What is the average of the error numbers?

\[ 4.74 - 4.67 = .07 \]

(l) What is the variance of the error numbers?

\[ 3.07^2 + 14.31^2 - 2\times 11 = 192.201 \]

What is the standard deviation of the error numbers?

\[ \sqrt{192.201} = 13.86 \]
Question 2

The marketing department of a wine distributor is interested in the relationship between gender and wine preference. For a randomly chosen customer in defined market segment let
R = 1 if red wine is preferred over white and 0 otherwise.
G = 1 if female and 0 otherwise.

The following joint distribution for (R,G) has been determined:

<table>
<thead>
<tr>
<th></th>
<th>G=0</th>
<th>G=1</th>
</tr>
</thead>
<tbody>
<tr>
<td>R=0</td>
<td>0.2</td>
<td>0.3</td>
</tr>
<tr>
<td>R=1</td>
<td>0.3</td>
<td>0.2</td>
</tr>
</tbody>
</table>

(a) What is the marginal distribution of R?
Bernoulli(.5)

(b) What is the conditional distribution of R given G=0?

Pr(R=0|G=0) = 2/5  Pr(R=1|G=0) = 3/5 or Bernoulli(3/5)

(c) What is the expected value of R?
.5

• What is the variance of R?
.25
(e) Are $R$ and $G$ independent?

no

(f) Is the correlation between $R$ and $G$ negative, 0, or positive?

negative

Suppose about to randomly sample 100 customers (with replacement). Let $N$ be the number of customers in the sample who are female and prefer red wine.

(g) What is the distribution of $N$?

Binomial(100,.2)

(h) What is the expected value of $N$?

$20 = 100 \times .2$

• What is the variance of $N$?

$16 = 100 \times .2 \times .8$
Question 3

Match the probability model description with the time series of observed values on the next page.

(a) random walk with increments iid $-2 + 2 \cdot \text{Bernoulli}(0.7)$ matches plot ___E_____

note: this question is wrong. It should be $-1 + 2 \cdot \text{Bernoulli}(0.7)$ so that you have $\Pr(\text{Inc} = 1) = 0.7$ $\Pr(\text{Inc} = -1) = 0.3$
so either E (the closest match) or “none” is acceptable.

(b) random walk with iid $N(-1,16)$ increments matches plot ___F_____

(c) iid normal $N(0,16)$ matches plot ____D_____

(d) random walk with iid $N(5,100)$ increments matches plot ___C____

(e) iid $N(0,1)$ matches plot _____B_____

(f) iid Bernoulli(.5) matches plot ____A_____
