Business Statistics Midterm, Summer 2023

This is a preview of the published version of the quiz

Started: Jul 27 at 9:56am

Quiz Instructions

You have 2 hours to complete the test.

You can start it any time you want the the availability window, but once you start,

you have to finish it in two hours (it may not take that long!).

The test is open book, open notes, open internet, you just can't interact with a person or AI.

Each question is worth 1 point.

I will NOT be available for questions during the exam.

Good luck!

Question 1 — 1 pts

Question 1, Debt level and default

Let X denote the debt level of a customer where can take on the values 1, 2, or 3.

Let Y be 1 if the customer defaults on their account and 0 otherwise.

The joint distribution of (X,Y) for a randomly chosen customer is given by

			x	
		1	2	3
	0	.08	.25	.08
y				
	1	.02	.25	.32

So, for example P(X=3,Y=1) = .32

What is P(X=1) ?

Question 2 1 pts

P(Y=1) is

Question 3 1 pts

P(Y=1 | X=1) is

- .02
- .08
- .8
- .2

Question 4 1 pts

P(Y=1 | X=3) is

Question 5 — 1 pts

X and Y are independent

- ○ True
- ○ False

Question 6 — 1 pts

P(X=3 | Y=1) is

Question 7 — 1 pts

X is a Bernoulli random variable

- ○ True
- ○ False

Question 8 — 1 pts

Y is a Bernoulli random variable

- ○ True
- ○ False

Question 9 — 1 pts

X is normally distributed.

- ○ True
- ○ False

Question 10 — 1 pts

E(X) is

Question 11 — 1 pts

Var(X) is

Question 12 — 1 pts

The correlation between X and Y is

- ○ .4

- .97
- -.32
- 0

Question 13 1 pts

Question 2, Whitewater Rafting

You are about to go whitewater rafting but you are not very experienced and you

are concerned that the level of the river may be dangerous but you are not sure about it.

Let D be the random variable which is 1 if the river is at a dangerous level and 0 otherwise.

You believe P(D=1) = .4.

You are watching rafts run a difficult rapid on the stretch you are thinking of doing and you

think rafts are more likely to flip in the rapid if the river is at a dangerous level (D=1).

Let F be the random variable which is 1 if the next raft flips and 0 otherwise.

You believe

P(F=1 | D=1) = .9

P(F=1 | D=0) = .2.

What is P(D=1,F=1) ?

- .90
- .40

- .36
- .48

Question 14 — 1 pts

What is P(D=0,F=1) ?

Question 15 — 1 pts

What is P(F=1) ?

Question 16 — 1 pts

What is P(D=1|F=1) ?

Question 17 — 1 pts

What is P(D=1 | F=0) ?

Question 18

1 pts

Suppose that given D, whether successive rafts flip is IID.

So, if F1 is 1 if the first raft you see flips and 0 otherwise and F2 is 1 if the second raft you see flips and

0 otherwise, then F1,F1 are iid Bernoulli(p) where p is .2 if D=0 and .9 if D=1 , as above.

What is P(F1=1,F2=1 | D=1) ?

Question 19

1 pts

What is P(D=1 | F1=1,F2=1) ?

Question 20

1 pts

What is P(D=1 | F1=0,F2=1) ?

Question 21 — 1 pts

Question 3, Normal Portfolio

Suppose we have two assets with uncertain returns R1 ~ N(3,9), R2 ~ N(8,36).

The correlation between R1 and R2 is .45.

Suppose we also have a riskless asset which gives return rf = 2 for sure.

What is E(R1) ?

Question 22 — 1 pts

What is the standard deviation of R1?

Question 23 — 1 pts

What is P(R1>0) ?

Question 24 — 1 pts

What is P(R2 >0)

Question 25 1 pts

Let P be the return on the portfolio such that

P = .15 R1 + .85 R2

What is E(P) ?

Question 26 1 pts

What is Var(P) ?

Question 27 1 pts

Let P1 = .5 rf + .5 P, that is, half your money in P and half your money in the riskless asset.

What is E(P1)

Question 28 — 1 pts

What is the standard deviation of P1 ?

Question 29 — 1 pts

Question 4, Simple Linear Regression, 2 IQ Tests

n=250 individuals were given 2 different IQ tests.

Let x be the score from the first test and y be the score on the second test.

Below is the regression output from the simple linear regression of y on x.

If we know the score on the first test is x=110, what is the plug in prediction for the score on the second test?

```
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 13.70648    3.48877   3.929 0.000111 ***
x            0.86885    0.03451  25.177  < 2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 10.78 on 248 degrees of freedom
Multiple R-squared:  0.7188,    Adjusted R-squared:  0.7177
F-statistic: 633.9 on 1 and 248 DF,  p-value: < 2.2e-16
```

Question 30 — 1 pts

What is the upper end of the 95% plug in predictive interval for the score on the second test

given the score on the first test is x=110 ?

Question 31 1 pts

What is the upper end for the (approximate) 95% confidence interval for the slope ?

Question 32 1 pts

If we test the null hypothesis that the true slope is equal to 0 versus the alternative that it is not equal to 0 at level .05 we reject.

- True
- False

Question 33 1 pts

If we test the null hypothesis that the true slope is equal to 1 versus the alternative that it is not equal to 1 at level .05 we reject.

- True

False

Question 34 1 pts

What is the sample correlation between x and y ?

Question 35 1 pts

What is the sample correlation between the fitted values and y?

Question 36 1 pts

Question 5, Simple Linear Regression Model

Suppose we are modeling house price as depending on house size. Price is measured in
thousands of dollars and size is measured in thousands of square feet.
Suppose our model is:

$$P = 20 + 50s + \epsilon, \quad \epsilon \sim N(0, 15^2)$$

Given you have a house with s=2, what is the expected value of P?

Question 37 — 1 pts

Given you have a house with s=2, what is the standard deviation of P?

Question 38 — 1 pts

Now suppose you don't know s but you uncertainty about s is quantified by

$S \sim N(2, .2^2).$

We assume S and ϵ are independent.

What is E(P) ?

Question 39 — 1 pts

With the same assumptions as in the previous question, what is the standard deviation of P?

Not saved Submit Quiz