Name Jerry

Student Number

STA 442/2101 f2016 Quiz 2

1. (5 points) A web page has advertisements on a side panel. Visitors to the site are randomly assigned to see either ad A or ad B. Whether they click on the ad is recorded, Yes or No. If a person visits the site more than once during the brief study period, only the data from the first visit are recorded.

   (a) State a reasonable model for these data. *You do not have to justify your model* (you may make a few remarks if you wish), but the data have certain features that must be reflected in your model for full marks.

$$\left.\begin{array}{l} x_1, \ldots x_{n_1} \overset{iid}{\sim} B(1, \theta_1) \\ y_1, \ldots y_{n_2} \overset{iid}{\sim} B(1, \theta_2) \end{array}\right\}$$ with x_i & y_j independent for all i and j

Marking guidelines

2 pts Binary data

1 pt Independence within experimental conditions

1 pt Independence between experimental conditions

1 pt Parameter space. $\leq$ is $-\frac{1}{2}$. Full marks are possible even if (a) is a zero.

   (b) What is the parameter space for your model?

$$\{(\theta_1, \theta_2) : 0 < \theta_1 < 1, 0 < \theta_2 < 1\}$$

2. (5 points) Homework Question 4 was about advertising awareness for Big Red chewing gum. In the last part of the question, you were asked to calculate the smallest n that yields a power of at least 0.9 when the true level of awareness was $\theta = 0.08$. **Write the required sample size (a number from your printout) in the space below. On your printout, circle the number and write "Question 2" beside it.**

$n = 1,653$

Please **fold your R printout into the quiz**, with your name on the quiz paper showing. Make sure your name and student number also appear on your printout. *If you do not have your R printout, do not answer Question 2.*

Name Jerry

Student Number

STA 442/2101 f2016 Quiz Two

1. (5 points) Let the test statistic T be continuous, with pdf $f(t)$ and cdf $F(t)$ under the null hypothesis.The null hypothesis is rejected if $T > c$. Show that if H_0 is true, the distribution of the p-value is $U(0,1)$. Derive the density. Start with the cumulative distribution function of the p-value: $Pr\{P \leq x\} = \ldots$. You may assume that $F(t)$ is strictly increasing over the support of the distribution, so it has a unique inverse.

$0 < x < 1$, For

$$Pr\{P \leq x\} = Pr\{1 - F(T) \leq x\} = Pr\{F(T) \geq 1-x\}$$

$$= Pr\{F^{-1}(F(T)) \geq F^{-1}(1-x)\} = Pr\{T \geq F^{-1}(1-x)\}$$

$$= 1 - F(F^{-1}(1-x)) = 1-(1-x) = x$$

(Full marks for saying this is the cdf of a uniform for $0 < x < 1$)

And the density of the p-value is

$$\frac{d}{dx} Pr\{P \leq x\} = \frac{d}{dx} x = 1 \text{ for } 0 < x < 1$$

This is the density of a $U(0,1)$.

2. (5 points) Homework Question 4 was about advertising awareness for Big Red chewing gum. In the last part of the question, you were asked to calculate the smallest n that yields a power of at least 0.9 when the true level of awareness was $\theta = 0.08$. **Write the required sample size (a number from your printout) in the space below. On your printout, circle the number and write "Question 2" beside it.**

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