0012-GLP

Number	Part	A	B	C	D	E
3	a)	☐	☐	☐	☐	■
3	b)	■	☐	☐	☐	☐
7	a)	☐	☐	■	☐	☐
7	b)	■	☐	☐	☐	☐
11	a)	■	☐	☐	☐	☐
11	b)	☐	☐	■	☐	☐
15	a)	☐	☐	☐	■	☐
15	b)	☐	☐	■	☐	☐
19	a)	☐	■	☐	☐	☐
19	b)	☐	☐	■	☐	☐

Q21

a) Hypotheses:

$H_0: P_{John} = P_{MIKE} = P_{JANE} = P_{MARCY} = 0.25$

H_1: At least one of the probabilities differ from 0.25

Test variable:

$$\chi^2 = \sum_{i=1}^{K} \frac{(O_i - E_i)^2}{E_i} \quad \text{where} \quad E_i = nP$$

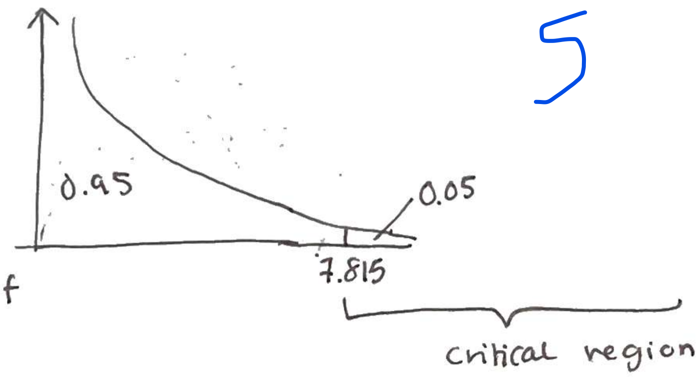
5

b) Critical value & decison rule:

$\nu = k-1$ $\quad \alpha = 0.05$

$\nu = 4-1 = 3$

$\chi^2_{crit} = 7.815$



5

Rule: Reject H_0 if $\chi^2_{obs} > 7.815$

c)

	John	Mike	Jane	Marcy	Σ
O_i	34	15	27	24	100
P_i	0.25	0.25	0.25	0.25	1.00
E_i	25	25	25	25	100
(O_i-E_i)	9	-10	2	-1	0
$(O_i-E_i)^2$	81	100	4	1	186
$\frac{(O_i-E_i)^2}{E_i}$	3.24	4	0.16	0.04	7.44

$$\sum_{i=1}^{K} \frac{(O_i-E_i)^2}{E_i} = 7.44$$

$\chi^2_{obs} = 7.44$

5

Conclusion: Since $\chi^2_{obs} = 7.44$ we fail to reject the at 5% level

we found significant evidence that the probability for each name is the same in the draws.

Q21 continue

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d) $p = 0.25$

$n = 100$ weeks

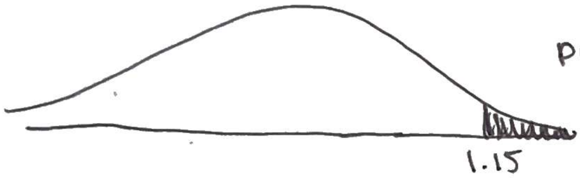
x = John's name is drawn

$E(X) = nP = 100 \cdot 0.25 = \underline{\underline{25}}$

$var(X) = nP(1-P) = 100 \cdot 0.25(1-0.25) = \underline{\underline{18.75}}$

$X \sim Bin(n=100, p=0.25)$

$P(X>30) = [\text{standardize}] = P(Z > \frac{30-25}{\sqrt{18.75}}) = P(Z>1.15)$ 5



$P(Z>1.15) = 1 - P(Z<1.15) = 1 - 0.87493 = \underline{\underline{0.125}}$

The probability that his name will be drawn more than 30 times is 0.125 (12.5%)

e) [Type II error]

A type II error occurs when we fails to reject a null hypotheses that is false. In this case it could be possible that we fail to reject a false H_0. This can be calculated by power (β).

(and explained)

β is the probability for Type II error. 4

|Q22|

0012 - GLP

a) Model 1: $Price = \beta_0 + \beta_1 \cdot MILAGE + \beta_2 \cdot AGE + \beta_3 \cdot MANUAL + \varepsilon$

$\alpha = 0.05$

Hypotheses:

$H_0: \beta_3 < -1000$

$H_1: \beta_3 \geq -1000$

Test variable:

$$t_{n-k-1} = \frac{b_3 - \beta_3^*}{s_{b_3}}$$

Critical value & decison rule:

$n = 100$

$k = 3$

$n-k-1 = 96$

$\alpha = 0.05$

$t_{96,0.05} \approx t_{95,0.05} = 1.661$ ← critical value

Rule: Reject H_0 if $t_{obs} > 1.661$

b) $b_3 = -1940.6245$

$\beta_3^* = -1000$

$s_{b_3} = 411.6950657$

$$\frac{-1940.6245 - (-1000)}{411.6950657} = \frac{-940.6245}{411.6950657} = -2.285$$

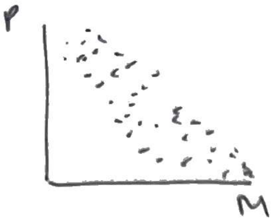
Conclusion: Since $t_{obs} = -2.285 < 1.661$ we fail to reject the null at the 5% level of significance. We have not found evidence that the price effect of β_3 is more than -1000.

c) $R^2 = 1 - \frac{SSE}{SST}$

$$1 - \frac{329247149.3}{2735466877} = 1 - 0.1204 = \underline{0.8796}$$

R^2 is a measure of how well the variation in Y can be explained by X so two possible variables could be "electric or petrol" (a dummy-variable) 1 = electric, 0 = petrol (bensin), another possible variable could be if the car has a stereo or not.... HeHe, maybe it's an old model.

e) PRICE - MILEAGE



indicates on a strong negtive correlation b/w Price and x_1 - milage.

This is not a problem for the validity for model 1 since it's between independent/dependent variable, however if it would have been a scatter plot between ex. milage and age that shows this linear relationship we would have called it multicollinearity. Which is a big problem for the model.

(X and Y.)

d) Both parts of his friends' remark is correct