MA331 HW#5 3/22/20

I pledge my honor that I have abided by the Stevens Honor System

9.37 a)

Stratum	# allowed (Claims)	# not allowed	total
small	51	6	57
medium	12	5	17
large	4	1	5
total	67	12	79

b) Small strata

% of claims not allowed $\frac{6}{57} = .1052 = 10.53\%$

Medium strata

% of claims not allowed $\frac{5}{17} = 0.2941 = 29.41\%$

Large strata

% claims not allowed $= \frac{1}{5} = .2 = 20\%$

c) In the table above, the expected count corresponds to the cell large / # not allowed is too small (<5). So the rows need to be combined

d) H_0: There is no relationship between claim sizes and whether claims is allowed

H_A: There is a relationship between claim sizes and whether a claim is allowed

e) expected counts $= \frac{\text{row} \times \text{column total}}{n}$

H_A

=>

Expected Table

stratum	# allowed	# not allowed	totals
small	48.34	8.65	57
medium/large	18.65	3.34	22
totals	67	12	79

$$\chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{Expected}} = 3.45$$

degrees of freedom $= (r-1)(c-1) = 1$

under H_0 w/ 1 degree of freedom

$$P(\chi^2 > 3.455) = 0.06$$

assuming significance level of .05, the p is larger so we fail the H_0. Thus we cannot conclude any relationship between claim sizes and whether a claim is allowed based on this data.

9.38

a) estimated claims not allowed (small) : $3342(.105) = 350.91$ claims

(medium) : $246(.294) = 72.3$ "

(large) : $58(.2) = 11.6$

b) margin of error single prop. $(E) = z^{k}\sqrt{\frac{\boxed{p(1-p)}}{n}}$

$E_{small} = 1.96\sqrt{\frac{.105(1-.105)}{57}} = 0.0796$

$E_{medium} = 1.96\sqrt{\frac{.294(1-.294)}{17}} = .2166$

$E_{large} = 1.96\sqrt{\frac{.2(.8)}{5}} = .3506$

9.50

$N \times P(x \le -.6) = .274 \times 500 = 137.12$

$N \times P(x > .6 \text{ or } x \le -.1) = .186 \times 500 = 92.9$

$N \times P(x > -0.1 \text{ or } x \le 0.1) = 0.079 \times 500 = 39.8$

$N \times P(x > 0.1 \text{ or } x \le 0.6) = 0.186 \times 500 = 92.96$

$N \times P(x > 0.6) = 0.274$

Category	Observed	Expected	$(O-E)^2$	$\frac{(O-E)^2}{E}$
1	139	137.13	3.51	0.02560
2	102	92.96	81.73	0.879
3	41	39.83	1.37	0.0345
4	78	92.96	223.79	2.407
5	140	137.13	8.26	0.06021

$\sum \frac{(O-E)^2}{E} = 3.407$ d.f. of $\chi^2 = (n-1) = 5-1 = 4$

$P(\chi^2 \ge 3.407) = 0.49$ ← the test is not a good fit.

9.51

Bins	Observed(O)	Expected(E)	$\frac{(O-E)^2}{E}$
$x \le .8$	99	105.95	.46
$-0.1 < x < .2$	110	104.45	.295
$-0.2 < < .2$	79	79.25	0.00007886
$0.2 < x < .8$	108	104.45	0.121
$x > .8$	104	105.95	0.0359
Total	500	~500	.908

At 4 degrees of freedom the χ^2 critical value at $\alpha = 0.05$ the significance level is 9.48. The test statistic value of .908 is less than the critical value, thus we can conclude that the standard normal distribution is a good fit for the data.